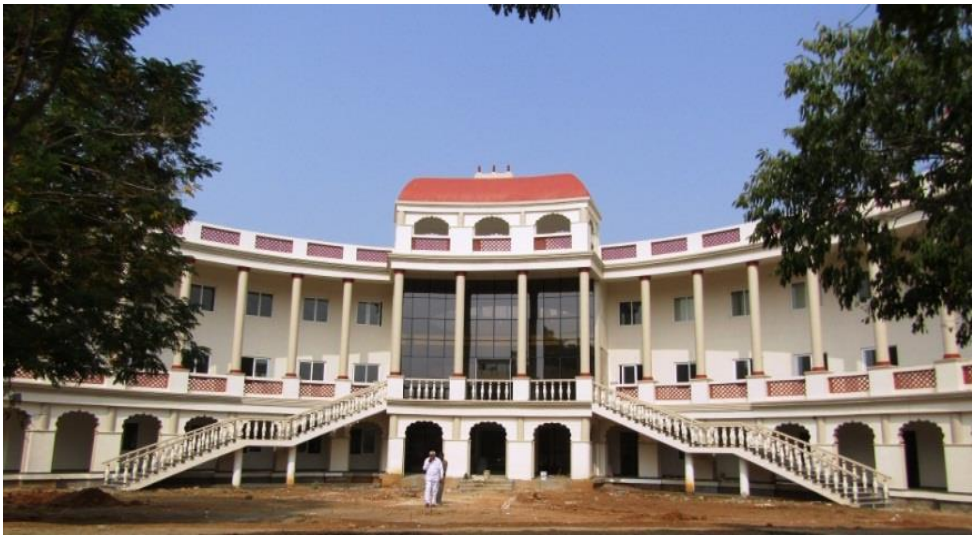
ACADEMIC REGULATIONS & CURRICULUM

Applicable to the students admitted from the Academic Year 2023-2024



COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

(B.Tech. Programme)

MAHARAJ VIJAYARAM GAJAPATHI RAJ COLLEGE OF ENGINEERING
(Autonomous)

(Approved by AICTE, New Delhi, and permanently affiliated to JNTUGV, Vizianagaram)
Listed u/s 2(f) & 12(B) of UGC Act 1956.
Vijayaram Nagar Campus, Chintalavalasa,Vizianagaram-535005, Andhra Pradesh

The visionaries

Late Dr. P V G Raju
Raja Saheb of Vizianagaram
Founder Chairman-MANSAS
Ex-Minister for Education and Health, Govt. of AP
Ex Member of Parliament

Late Dr. P. Anand Gajapathi Raju
Ex-Chairman-MANSAS
Ex-Minister for Education and Health
Govt. of AP
Ex Member of Parliament

P. Ashok Gajapathi Raju
Chairman-MANSAS
Ex-Union Minister for Civil Aviation,
Govt. of India
Ex-Minister for Finance, Govt. of AP

Academic Regulations (R23) for B. Tech (Regular-Full time)

(Effective for the students admitted into I year from the Academic Year **2023-24** onwards)

1. **Award of the Degree**

(a) Award of the B.Tech. Degree / B.Tech. Degree with a Minor if he/she fulfills the following:

(i) Pursues a course of study for not less than four academic years and not more than eight academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Eight years).

(ii) Registers for 160 credits and secures all 160 credits.

(b) **Award of B.Tech. degree with Honors**

A student will be declared eligible for the award of the B.Tech. with Honors if he/she fulfills the following:

(i) Student secures additional 15 credits fulfilling all the requisites of B.Tech. program i.e., 160 credits.

(ii) Registering for Honors is optional.

(iii) Honors is to be completed simultaneously with B.Tech. programme.

2. Students, who fail to fulfill all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech. course and their admission stands cancelled. This clause shall be read along with clause 1 a) i).

3. **Admissions**

Admission to the B. Tech Program shall be made subject to the eligibility, qualifications and specialization prescribed by the A.P. State Government/University from time to time. Admissions shall be made either based on the merit rank obtained by the student in the common entrance examination conducted by the A.P. Government/University or any other order of merit approved by the A.P. Government/University, subject to reservations as prescribed by the Government/University from time to time.

4. **Program related terms**

Credit: A unit by which the course work is measured. It determines the number of hours of instruction required per week. One credit is equivalent to one hour of teaching (Lecture/Tutorial) or two hours of practical work/field work per week.

Credit definition:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit
2 Hrs. Practical (Lab) per week	1 credit

a) ***Academic Year***: Two consecutive (one odd + one even) semesters constitute one academic year.

b) ***Choice Based Credit System (CBCS):*** The CBCS provides a choice for students to select from the prescribed courses.

5. Semester/Credits:

i. A semester comprises 90 working days and an academic year is divided into two semesters.

ii. The summer term is for eight weeks during summer vacation. Internship/ apprenticeship / work-based vocational education and training can be carried out during the summer term, especially by students who wish to exit after two semesters or four semesters of study.

iii. Regular courses may also be offered during the summer on a fast-track mode to enable students to do additional courses or complete backlogs in coursework.

iv. The Universities/HEIs can decide on the courses to be offered in the summer term depending on the availability of faculty and the number of students.

6. Structure of the Undergraduate Programme

All courses offered for the undergraduate program (B. Tech.) are broadly classified as follows:

S.No.	Category	Breakup of Credits (Total 160)	Percentage of total credits	AICTE Recommendation (%)
1.	Humanities and Social Science including Management (HM)	13	8 %	8 – 9%
2.	Basic Sciences (BS)	20	13 %	12 - 16%
3.	Engineering Sciences (ES)	23.5	14%	10 – 18%
4.	Professional Core (PC)	54.5	34 %	30 – 36%
5.	Electives – Professional (PE) & Open (OE); Domain Specific Skill Enhancement Courses (SEC)	33	21 %	19 - 23%
6.	Internships & Project work (PR)	16	10 %	8 – 11%
7.	Mandatory Courses (MC)	Non-credit	Non-credit	-

7. Course Classification:

All subjects/ courses offered for the undergraduate programme in Engineering & Technology (B.Tech. degree programs) are broadly classified as follows:

S.No.	Broad Course Classification	Course Category	Description
1.	Foundation Core Courses	Foundation courses	Includes Mathematics, Physics and Chemistry; fundamental engineering courses; humanities, social sciences and management courses
2.	Core Courses	Professional Core Courses (PC)	Includes subjects related to the parent discipline /department / branch of Engineering
3.	Elective Courses	Professional Elective Courses (PE)	Includes elective subjects related to the parent discipline/department/ branch of Engineering
		Open Elective Courses (OE)	Elective subjects which include interdisciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering
		Domain specific skill enhancement courses (SEC)	interdisciplinary/job-oriented/domain courses which are relevant to the industry
4.	Project & Internships	Project	B.Tech. Project or Major Project
		Internships	Summer Internships – Community based and Industry Internships; Industry oriented Full Semester Internship
5.	Audit Courses	Mandatory non-credit courses	Covering subjects of developing desired attitude among the learners

8. Programme Pattern

i. Total duration of the B. Tech (Regular) Programme is four academic years.
ii. Each academic year of study is divided into two semesters.
iii. Minimum number of instruction days in each semester is 90 days.
iv. There shall be mandatory student induction program for fresher's, with three-week duration before the commencement of first semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent

People, Visits to local Areas, Familiarization to Dept./Branch & Innovations etc., are included as per the guidelines issued by AICTE.

v. Health/wellness/yoga/sports and NSS /NSS /Scouts & Guides / Community service activities are made mandatory as credit courses for all the undergraduate students.

vi. Courses like Environmental Sciences, Indian Constitution and Technical Paper Writing & IPR are offered as non-credit mandatory courses for all the undergraduate students.

vii. Designs Thinking for Innovation & Tinkering Labs are made mandatory as credit courses for all the undergraduate students.

viii. Increased flexibility for students through an increase in the elective component of the curriculum, with 05 Professional Elective courses and 04 Open Elective courses.

ix. Professional Elective Courses, include the elective courses relevant to the chosen specialization/branch. Proper choice of professional elective courses can lead to students specializing in emerging areas within the chosen field of study.

x. A total of 04 Open Electives are offered in the curriculum. A student can complete the requirement for B.Tech. Degree with a Minor within the 160 credits by opting for the courses offered through various verticals/tracks under Open Electives.

xi. While choosing the electives, students shall ensure that they do not opt for the courses with syllabus contents similar to courses already pursued.

xii. A pool of interdisciplinary/job-oriented/domain skill courses which are relevant to the industry are integrated into the curriculum of all disciplines. 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/interdisciplinary courses and the other shall be a soft skills course.

xiii. Students shall undergo summer internships, for a minimum of eight weeks duration at the end of second and third year of the program. The internship at the end of second year shall be community oriented and industry internship at the end of third year.

xiv. There shall also be full internship in the final semester of the program along with the project work.

xv. Undergraduate degree with Honors is introduced for the students having good academic record.

xvi. Each college shall take measures to implement Virtual Labs (https://www.vlab.co.in) which provide remote access to labs in various disciplines of Engineering and will help student in learning basic and advanced concept through remote experimentation. Student shall be made to work on virtual lab experiments during the regular labs.

xvii. College shall assign a faculty advisor/mentor after admission to a group of students from same department to provide guidance in courses registration/ career growth / placements / opportunities for higher studies/ GATE/ other competitive exams etc.

xviii. Preferably 25% of course work for the theory courses in every semester shall be conducted in the blended mode of learning.

9. Evaluation Process

The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory and 100 marks for practical subject. Summer Internships shall be evaluated for 50 marks, Full Internship &Project work in final semester shall be evaluated for 200 marks, mandatory courses with no credits shall be evaluated for 30 mid semester marks.

A student has to secure not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the Continuous Internal Evaluation and Semester end examination marks taken together for the theory, practical, design, drawing subject or project etc. In case of a mandatory course, he/she should secure 40% of the total marks.

THEORY COUSES

Assessment Method	Marks
Continuous Internal Evaluation	30
Semester End Examination	70
Total	100

i. For theory subject, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination.
ii. For practical subject, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End- Examination.
iii. If any course contains two different branch subjects, the syllabus shall be written in two parts with 3 units each (Part-A and Part-B) and external examination question paper shall be set with two parts each for 35 marks.
iv. If any subject is having both theory and practical components, they will be evaluated separately as theory subject and practical subject. However, they will be given same subject code with an extension of "T" for theory subject and "P" for practical subject.

a) Continuous Internal Evaluation

i. For theory subjects, during the semester, there shall be two midterm examinations. Each midterm examination shall be evaluated for 30 marks of which 10 marks for objective paper (20 minutes duration), 15 marks for subjective paper (90 minutes duration) and 5 marks for assignment.
ii. Objective paper shall contain for 05 short answer questions with 2 marks each. Subjective paper shall contain 3 either or type questions (totally six questions from 1 to 6) of which student has to answer one from each either or type of questions. Each question carries 10 marks. The marks obtained in the subjective paper are condensed to 15 marks.
iii. First midterm examination shall be conducted for I, II units of syllabus with one either or type question from each unit and third either or type question from both the units. The second midterm examination shall be conducted for III, IV and V units with one either or type question from each unit.
iv. Final mid semester marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage given to the better mid exam and 20% to the other.

For Example:

Marks obtained in first mid: 25
Marks obtained in second mid: 20
Final mid semester Marks: (25x0.8) + (20x0.2) = 24

If the student is absent for any one midterm examination, the final mid semester marks shall be arrived at by considering 80% weightage to the marks secured by the student in the appeared examination and zero to the other. For Example:

Marks obtained in first mid: Absent
Marks obtained in second mid: 25
Final mid semester Marks: (25x0.8) + (0x0.2) =20

b) End Examination Evaluation:

End examination of theory subjects shall have the following pattern:

i) There shall be 6 questions and all questions are compulsory.
ii) Question I shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks.
iii) There shall be 2 short answer questions from each unit.
   a) In each of the questions from 2 to 6, there shall be either or type questions of 10 mark each. Student shall answer any one of them.
iv. The questions from 2 to 6 shall be set by covering one unit of the syllabus for each question.

End examination of theory subjects consisting of two parts of different subjects,
for example: Basic Electrical &Electronics Engineering shall have the following pattern:

i. Question paper shall be in two parts viz., Part A and Part B with equal weightage of 35 marks each.
ii. In each part, question 1 shall contain 5 compulsory short answer questions for a total of 5 marks such that each question carries 1mark.
iii. In each part, questions from 2 to 4, there shall be either or type questions of 10 mark each. Student shall answer any one of them.
iv. The questions from 2 to 4 shall be set by covering one unit of the syllabus for each question.

PRACTICAL COURSES

Assessment Method	Marks
Continuous Internal Assessment	30
Semester End Examination	70
Total	100

b) For practical courses, there shall be a continuous evaluation during the semester for 30 sessional marks and end examination shall be for 70 marks.
c) Day-to-day work in the laboratory shall be evaluated for 15 marks by the concerned laboratory teacher based on the regularity/record/viva and 15 marks for the internal test.
d) The end examination shall be evaluated for 70 marks, conducted by the concerned laboratory teacher and a senior expert in the subject from the same department.
Procedure: 20 Marks
Experimental work & Results: 30 marks
Viva voce: 20 marks.

In a practical subject consisting of two parts (Eg: Basic Electrical &Electronics Engineering Lab), the end examination shall be conducted for 70 marks as a single laboratory in 3 hours.

e) Engineering Graphics evaluation

Assessment Method	**Marks**
Continuous Internal Assessment	30
Semester End Examination	70
Total	100

Day-to-day work shall be evaluated for 15 marks by the concerned subject teacher based on the reports/submissions prepared in the class and 15 marks for the internal examination.
The internal examination pattern for Engineering Graphics, shall consist of 5 questions, either or type, of equal weightage of 3 marks.

The end examination shall be evaluated for 70 marks, conducted by the concerned teacher and a senior expert in the subject from the same department.
The end examination pattern for Engineering Graphics, shall consists of 5 questions, either or type, of 10 marks each (5x10=50) and 20 marks for Viva voce.

f) **NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE**

General Guidelines:
1. Assign slots in the Timetable for the activities.
2. Provide instructor to mentor the students.

Evaluation Guidelines:
- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totaling to 90 marks.

- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

HEALTH AND WELLNESS, YOGA AND SPORTS

General Guidelines:

1. Assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Provide field/facility and offer the minimum of five choices of as many as Games/Sports.
3. Provide sports instructor / yoga teacher to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

g) There shall be no external examination for mandatory courses with zero credits. However, attendance shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 40% or more in the internal examinations. In case, the students fails, a re-examination shall be conducted for failed candidates for 30 marks satisfying the conditions mentioned in item 1 & 2 of the regulations.

h) The laboratory records and mid semester test papers shall be preserved for a minimum of 1 year in the respective departments and shall be produced to the Committees of the University as and when the same are asked for.

10. Skill oriented Courses

i. There shall be five skill-oriented courses offered during III to VII semesters.
ii. Out of the five skill courses two shall be skill-oriented courses from the same domain. Of the remaining three skill courses, one shall be a soft skill course and the remaining two shall be skill-advanced courses from the same domain/Interdisciplinary/Job oriented.
iii. The course shall carry 100 marks and shall be evaluated through continuous assessments during the semester for 30 sessional marks and end examination shall be for 70 marks. Day-to-day work in the class / laboratory shall be evaluated for 30 marks by the concerned teacher based on the regularity/assignments/viva/mid semester test. The end examination similar to practical examination pattern shall be conducted by the concerned teacher and an expert in the subject nominated by the principal.
iv. The Head of the Department shall identify a faculty member as coordinator for the course. A committee consisting of the Head of the Department, coordinator and a senior Faculty member nominated by the Head of the Department shall monitor the evaluation process. The marks/grades shall be assigned to the students by the above committee based on their performance.
v. 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 or any other accredited bodies. If a student chooses to take a Certificate Course offered by external agencies, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency. 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.
vi. If a student prefers to take a certificate course offered by external agency and approved by University, 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 University.

11. Massive Open Online Courses (MOOCs):

A Student has to pursue and complete one course compulsorily through MOOCs approved by the BoS. A student can pursue courses other than core through MOOCs and it is mandatory to complete one course successfully through MOOCs for awarding the degree. A student is not permitted to register and pursue core courses through MOOCs.

A student shall register for the course (Minimum of either 8 weeks or 12 weeks) offered through MOOCs with the approval of Head of the Department. The Head of the Department shall appoint one mentor to monitor the students progression. The student needs to earn a certificate by passing the exam. The student shall be awarded the credits assigned in the curriculum only by submission of the certificate. Examination fee, if any, will be borne by the student.

Students who have qualified in the proctored examinations conducted through MOOCs platform can apply for credit transfer as specified and are exempted from appearing internal as well as external examination (for the specified equivalent credit course only) conducted by the university.

Necessary amendments in rules and regulations regarding adoption of MOOC courses would be proposed from time to time.

12. Credit Transfer Policy

Adoption of MOOCs is mandatory, to enable Blended model of teaching-learning as also envisaged in the NEP 2020. As per University Grants Commission (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2016, the University shall allow up to a maximum of 20% of the total courses being offered in a particular programme i.e., maximum of 32 credits through MOOCs platform.

i. The University shall offer credit mobility for MOOCs and give the equivalent credit weightage to the students for the credits earned through online learning courses.
ii. Student registration for the MOOCs shall be only through the respective department of the institution, it is mandatory for the student to share necessary information with the department.
iii. Credit transfer policy will be applicable to the Professional & Open Elective courses only.
iv. The concerned department shall identify the courses permitted for credit transfer.
v. The University/institution shall notify at the beginning of semester the list of the online learning courses eligible for credit transfer.
vi. The institution shall designate a faculty member as a Mentor for each course to guide the students from registration till completion of the credit course.
vii. The university shall ensure no overlap of MOOC exams with that of the university examination schedule. In case of delay in results, the university will re-issue the marks sheet for such students.
viii. Student pursuing courses under MOOCs shall acquire the required credits only after successful completion of the course and submitting a certificate issued by the competent authority along with the percentage of marks and grades.
ix. The universities shall resolve any issues that may arise in the implementation of this policy from time to time and shall review its credit transfer policy in the light of periodic changes brought by UGC, SWAYAM, NPTEL and state government.

Note: Students shall be permitted to register for MOOCs offered through online platforms approved by the University from time to time.

13. Academic Bank of Credits (ABC)

The University has implemented Academic Bank of Credits (ABC) to promote flexibility in curriculum as per NEP 2020 to

i. Provide option of mobility for learners across the universities of their choice

ii. Provide option to gain the credits through MOOCs from approved digital platforms.
iii. Facilitate award of certificate/diploma/degree in line with the accumulated credits in ABC
iv. Execute Multiple Entry and Exit system with credit count, credit transfer and credit acceptance from students‟ account.

14. Internships
Summer Internships

Two summer internships either onsite or virtual each with a minimum of 08 weeks duration, done at the end of second and third years, respectively. It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Power projects, software MNCs or any industries in the areas of concerned specialization of the Undergraduate program. One of the two summer internships at the end of second year (Community Service Project) shall be society oriented and shall be completed in collaboration with government organizations/NGOs & others. The other internship at the end of third year is Industry Internship and shall be completed in collaboration with Industries. The student shall register for the internship as per course structure after commencement of academic year. The guidelines issued by the APSCHE / University shall be followed for carrying out and evaluation of Community Service Project and Industry Internship.

Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee comprising of Head of the Department, supervisor of the internship and a senior faculty member of the department. A certificate of successful completion from industry shall be included in the report. The report and the oral presentation shall carry 50% weightage each. It shall be evaluated for 50 external marks. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the University.

Full Semester Internship and Project work:

In the final semester, the student should register and undergo internship (onsite/virtual) and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship.

The project report shall be evaluated with an external examiner. The total marks for project work 200 marks and distribution shall be 60 marks for internal and 140 marks for external evaluation. The supervisor assesses the student for 30 marks (Report: 15 marks, Seminar: 15 marks). At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff and the same is to be evaluated by the departmental Project Review Committee consisting of supervisor, a senior faculty and HOD for 30 marks. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner and is evaluated for 140 marks.

The college shall facilitate and monitor the student internship programs. Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.

15. Guidelines for offering a Minor

To promote interdisciplinary knowledge among the students, the students admitted into B.Tech. in a major stream/branch are eligible to obtain degree in Minor in another stream.

i. The Minor program requires the completion of 12 credits in Minor stream chosen.
ii. Two courses for 06 credits related to a Minor are to be pursued compulsorily for the minor degree, but maybe waived for students who have done similar/equivalent courses. If waived for a student, then the student must take an extra elective course in its place. It is recommended that students should complete the compulsory courses (or equivalents) before registering for the electives.

iii. Electives (minimum of 2 courses) to complete a total of 12 credits.

Note: A total of 04 Open Electives are offered in the curriculum. A student can complete the requirement for Minor within the 160 credits by opting for the courses offered through various verticals/tracks under Open Electives.

16. Guidelines for offering Honors

The objective of introducing B.Tech. (Hons.) is to facilitate the students to choose additionally the specialized courses of their choice and build their competence in a specialized area in the UG level. The programme is a best choice for academically excellent students having good academic record and interest towards higher studies and research.

i. Honors is introduced in the curriculum of all B. Tech. programs offering a major degree and is applicable to all B. Tech (Regular and Lateral Entry) students admitted in Engineering & Technology.
ii. A student shall earn additional 15 credits for award of B.Tech.(Honors) degree from same branch/department/discipline registered for major degree. This is in addition to the credits essential for obtaining the Undergraduate degree in Major Discipline (i.e., 160 credits).
iii. A student is permitted to register for Honors in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to the Honors from V Semester onwards.
iv. The concerned Principal of the college shall arrange separate class work and timetable of the courses offered under Honors program.
v. Courses that are used to fulfill the student's primary major may not be double counted towards the Honors. Courses with content substantially equivalent to courses in the student's primary Major may not be counted towards the Honors.
vi. Students can complete the courses offered under Honors either in the college or in online platforms like SWAYAM with a minimum duration of 12 weeks for a 3-credit course and 8 weeks duration for a 2-credit course satisfying the criteria for credit mobility. If the courses under Honors are offered in conventional mode, then the teaching and evaluation procedure shall be similar to regular B. Tech courses.
vii. The attendance for the registered courses under Honors and regular courses offered for Major degree in a semester are to be considered separately.
viii. A student shall maintain an attendance of 75% in all registered courses under Honors to be eligible for attending semester end examinations.
ix. A student registered for Honors shall pass in all subjects that constitute the requirement for the Honors degree program. No class/division (i.e., second class, first class and distinction, etc.) shall be awarded for Honors degree programme.
x. If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into open or core electives; they will remain extra. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.
xi. The Honors will be mentioned in the degree certificate as Bachelor of Technology (Honors) in XYZ. For example, B.Tech. (Honors) in Mechanical Engineering

Enrolment into Honors:

i. Students of a Department/Discipline are eligible to opt for Honors program offered by the same Department/Discipline.
ii. The enrolment of student into Honors is based on the CGPA obtained in the major degree program. CGPA shall be taken up to III semester in case of regular entry students and only III semester in case of lateral entry students. Students having 7 CGPA without any backlog subjects will be permitted to register for Honors.
iii. If a student is detained due to lack of attendance either in Major or in Honors, registration shall be cancelled.
iv. Transfer of credits from Honors to regular B. Tech degree and vice-versa shall not be permitted.
v. Honors is to be completed simultaneously with a Major degree program.

Registration for Honors:

i. The eligible and interested students shall apply through the HOD of his/her parent department. The whole process should be completed within one week before the start of every semester. Selected students shall be permitted to register the courses under Honors.
ii. The selected students shall submit their willingness to the principal through his/her parent department offering Honors. The parent department shall maintain the record of student pursuing the Honors.
iii. The students enrolled in the Honors courses will be monitored continuously. An advisor/mentor from parent department shall be assigned to a group of students to monitor the progress.
iv. There is no fee for registration of subjects for Honors program offered in offline at the respective institutions.

17. Attendance Requirements:

i. A student shall be eligible to appear for the external examinations if he/she acquires a minimum 75% of attendance in aggregate of all the subjects.
ii. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted.
iii. Shortage of Attendance below 65% in aggregate shall in NO CASE be condoned.
iv. Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.
v. A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek readmission for that semester from the date of commencement of class work.
vi. If the learning is carried out in blended mode (both offline & online), then the total attendance of the student shall be calculated considering the offline and online attendance of the student.
vii. For induction programme attendance shall be maintained as per AICTE norms.

18. Promotion Rules:

The following academic requirements must be satisfied in addition to the attendance requirements.

i. A student shall be promoted from first year to second year if he/she fulfills the minimum attendance requirement as per university norms.
ii. A student will be promoted from II to III year if he/she fulfills the academic requirement of securing 40% of the credits (any decimal fraction should be rounded off to lower digit) up to in the subjects that have been studied up to III semester.
iii. A student shall be promoted from III year to IV year if he/she fulfills the academic requirements of securing 40% of the credits (any decimal fraction should be rounded off to lower digit) in the subjects that have been studied up to V semester.
And in case a student is detained for want of credits for a particular academic year by ii) & iii) above, the student may make up the credits through supplementary examinations and only after securing the required credits he/she shall be permitted to join in the V semester or VII semester respectively as the case may be.
iv. When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfillment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

19. Grading:

As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades and corresponding percentage of marks shall be followed:

After each course is evaluated for 100 marks, the marks obtained in each course will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Structure of Grading of Academic Performance

Range in which the marks in the subject fall	Grade	Grade points Assigned
90 & above	S (Superior)	10
80 - 89	A (Excellent)	9
70 - 79	B (Very Good)	8
60 - 69	C (Good)	7
50 - 59	D (Average)	6
40 - 49	E (Pass)	5
< 40	F (Fail)	0
Absent	Ab (Absent)	0

i. A student obtaining Grade "F" or Grade "Ab" in a subject shall be considered failed and will be required to reappear for that subject when it is offered the next supplementary examination.
ii. For non-credit audit courses, "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA/Percentage.

Computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

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.,

$$SGPA = \Sigma (Ci \times Gi)/\Sigma Ci$$

where, Ci is the number of credits of the ith subject and Gi is the grade point scored by the student in the ith course.

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.,

$$CGPA = \Sigma (Ci \times Si)/ \Sigma Ci$$

where "Si" is the SGPA of the ith semester and Ci is the total number of credits up to that semester.

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

While computing the SGPA 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 the letters S, A, B, C, D and F.

Award of Class:

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he/she shall be placed in one of the following four classes:

Class Awarded	CGPA Secured
First Class with Distinction	≥ 7.5 (Without any supplementary appearance)
First Class	$\geq 6.5 < 7.5$

Second Class	≥ 5.5 < 6.5
Pass Class	≥ 5.0 < 5.5

Note: * Students who have written supplementary examinations to fulfil the credit requirement will not be awarded First Class with Distinction. For such students the highest degree that is awarded will be First Class Only.

CGPA to Percentage conversion Formula = (CGPA – 0.5) x 10

20. With–holding of Results

If the candidate has any dues not paid to the university or if any case of indiscipline or malpractice is pending against him/her, the result of the candidate shall be withheld in such cases.

21. Multiple Entry / Exit Option

(a) Exit Policy:

The students can choose to exit the four-year programme at the end of first/second/third year.

i) **UG Certificate in (Field of study/discipline)** - Programme duration: First year (first two semesters) of the undergraduate programme, 40 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6- credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.

ii) **UG Diploma (in Field of study/discipline)** - Programme duration: First two years (first four semesters) of the undergraduate programme, 80 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6- credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.

iii) **Bachelor of Science (in Field of study/discipline) i.e., B.Sc. Engineering in (Field of study/discipline)-** Programme duration: First three years (first six semesters) of the undergraduate programme, 120 credits.

(b) Entry Policy:

Modalities on multiple entry by the student into the B.Tech. programme will be provided in due course of time.

Note: The Universities shall resolve any issues that may arise in the implementation of Multiple Entry and Exit policies from time to time and shall review the policies in the light of periodic changes brought by UGC, AICTE and State government.

22. Gap Year Concept:

Gap year concept for Student Entrepreneur in Residence is introduced and outstanding students who wish to pursue entrepreneurship / become entrepreneur are allowed to take a break of one year at any time after II year to pursue full-time entrepreneurship programme/to establish startups. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. The principal of the respective college shall forward such proposals submitted by the students to the University. An evaluation committee constituted by the University shall evaluate the proposal submitted by the student and the committee shall decide whether to permit the student(s) to avail the Gap Year or not

23. Transitory Regulations

Discontinued, detained or failed candidates are eligible for readmission as and when the semester is offered after fulfillment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

Candidates who are permitted to avail Gap Year shall be eligible for re-joining into the succeeding year of their B.Tech from the date of commencement of class work, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

24. Minimum Instruction Days for a Semester:
The minimum instruction days including exams for each semester shall be 90 days.

25. Medium of Instruction:
The medium of instruction of the entire B.Tech undergraduate programme in Engineering &Technology (including examinations and project reports) will be in English only.

26. Student Transfers:
Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh and the Universities from time to time.

27. General Instructions:

a. The academic regulations should be read as a whole for purpose of any interpretation.
b. Malpractices rules-nature and punishments are appended.
c. Where the words "he", "him", "his", occur in the regulations, they also include "she", "her", "hers", respectively.
d. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
e. The Universities may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the Universities.
f. In the case of any doubt or ambiguity in the interpretation of the guidelines given, the decision of the Vice-Chancellor / Head of the institution is final.

Regulations for MALPRACTICES during the conduct of examinations

	Nature of Malpractices/Improper conduct	Punishment
1.a	If the candidate possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination) - **FIRST TIME** (whether copied or not)	Expulsion from the examination hall and cancellation of the performance in that subject only. • To keep the CC footage of the act as an evidence. • To obtain a statement from student and get it authorized by observer and Chief superintendent.
1.b	If the candidate possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination) - **SECOND TIME**(whether copied or not)	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, project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. • To keep the CC footage of the act as an evidence. • To obtain a statement from student and get it authorized by observer and Chief superintendent.
1.c	If the candidate possesses or keeps accessible in	Nature of punishment to be given for the improper

	examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination) - **REPITITION OF THE ABOVE ACT** (After second time and whether copied or not)	conduct shall be as per the recommendations of the committee. • The committee comprising of Principal, Vice principal, Chief superintendent, Controller of Examinations and HoD to discuss and initiate the action to be taken and recommend. • To keep the CC footage of the act as evidence. • To obtain a statement from student and invigilator and authorized by Chief superintendent.
2.a.	If the candidate gives assistance or guidance or receives it from any other candidate orally or by any other body language methods.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. • To keep the CC footage of the act as an evidence.
2.b	If the candidate communicates through cell phones / through any other means with any candidate or persons in or outside the exam hall in respect of any matter. (i) If the communication is with the person(s) who belongs to our college.	Confiscation of the mobile or electronic gadgets involved and 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, project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. • To obtain all relevant proofs of evidence from the Mobile/ gadgets and handing over of the same to the candidate. • To keep the CC footage of the act as evidence. • To obtain a statement from student and invigilator and authorized by observer and Chief superintendent.
	(ii) If the communication is with the person(s) outside the campus or people who are not related to our college.	Confiscation of the mobile or electronic gadgets involved and 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, project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. • To obtain all relevant proofs of evidence from the Mobile/ gadgets and handing over of the same to the candidate. • To keep the CC footage of the act as evidence. • To obtain a statement from student and invigilator and authorized by observer and Chief superintendent. • The person(s) involved should be handed over to the police and a case is registered against him.
3.	If the candidate impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has

		been impersonated, shall be cancelled in all the subjects of the examination (including practical's and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider/candidate not on rolls, he will be handed over to the police and a case is registered against him. • To constitute a committee comprising of Principal, Vice principal, Chief superintendent, Observer, Controller of Examinations and HoD to discuss and initiate the above action with documented proofs. • To keep the CC footage of the act as an evidence. • To obtain a statement from student, invigilator, subject expert and authorized by observer and Chief superintendent.
4	If the candidate mishandles 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. Also,if the answer script is mutilated / damaged disturbing the shape, of the script, answers, the bar code intentionally.	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. In addition to the above punishment, a committee shall be constituted and recommends appropriate punishment for the improper conduct. • To keep the CC footage of the act as an evidence. • To Obtain a statement from student and invigilator and authorized by observer and Chief superintendent.
5.	Uses objectionable, abusive or offensive language in the Examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject only. • To Obtain a statement from student and invigilator and get it authorized by Observer and Chief superintendent.
6.	Refuses to obey the orders of the Chief Superintendent/ACE/ 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 result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester. 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. • To constitute a committee comprising of Principal, Vice principal, Chief superintendent, Observer, Controller of Examinations and HoD to discuss and initiate the above action with documented proofs

	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.	• To keep the CC footage of the act as an evidence. • To Obtain a statement from student and invigilator and authorized by observer and Chief superintendent.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. • To constitute a committee comprising of Principal, Vice principal, Chief superintendent, Observer, Controller of Examinations and HoD to discuss and initiate the above action. • To keep the CC footage of the act as an evidence. • To Obtain a statement from student and invigilator and authorized by observer and Chief superintendent.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. • To constitute a committee comprising of Principal, Vice principal, Chief superintendent, Observer, Controller of Examinations and HoD to discuss and initiate the above action with documented proofs • To keep the CC footage of the act as an evidence. • To obtain a statement from student and invigilator and authorized by observer and Chief superintendent. • The candidate shall be handed over to Police and register a case.
9.	If a 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.	If the student belongs to our college: 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. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them. • To constitute a committee comprising of Principal, Vice principal, Chief superintendent, Observer, Controller of Examinations and HoD to discuss and initiate the above action.

		• To keep the CC footage of the act as an evidence. • To Obtain a statement from student and invigilator and authorized by observer and Chief superintendent.
10	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. • To keep the CC footage of the act as an evidence(If any). • To obtain a statement from invigilator and any others as witness authorized by observer and Chief superintendent.
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. • To Obtain a statement from Valuer / Chief Valuer authorized by Spot Coordinator and Controller of Examinations.

General :

- Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.
- The academic regulation should be read as a whole for the purpose of any interpretation.
- In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
- The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.

* * *

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 hurt	 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 Months	+	Rs. 50,000/-

In Case of Emergency CALL TOLL FREE NO. : 1800 - 425 - 1288

LET US MAKE MVGR A RAGGING FREE CAMPUS

Ragging

ABSOLUTELY NO TO RAGGING

1. **Ragging is prohibited as per Act 26 of A.P. Legislative Assembly, 1997.**
2. **Ragging entails heavy fines and/or imprisonment.**
3. **Ragging invokes suspension and dismissal from the College.**
4. **Outsiders are prohibited from entering the College and Hostel without permission.**
5. **Girl students must be in their hostel rooms by 7.00 p.m.**
6. **All the students must carry their Identity Cards and show them when demanded**
7. **The Principal and the Wardens may visit the Hostels and inspect the rooms any time.**

ACADEMIC REGULATIONS (R23)
FOR B.TECH. (LATERAL ENTRY SCHEME)

*(Effective for the students getting admitted into II year through Lateral Entry Scheme from the Academic Year **2024-2025** onwards)*

1. **Award of the Degree**
   (a) Award of the B.Tech. Degree / B.Tech. Degree with a Minor if he/she fulfils th following:
      (i) Pursues a course of study for not less than three academic years and not more than six academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Six years).
      (ii) Registers for 120 credits and secures all 120 credits.

   (b) **Award of B.Tech. degree with Honors**
   A student will be declared eligible for the award of the B.Tech. with Honors if he/she fulfils the following:
      (i) Student secures additional 15 credits fulfilling all the requisites of a B.Tech. program i.e., 120 credits. (ii)
      Registering for Honors is optional.
      (iii) Honors is to be completed simultaneously with B.Tech. programme.

2. Students, who fail to fulfil the requirement for the award of the degree within six consecutive academic years from the year of admission, shall forfeit their seat.

3. Minimum Academic Requirements
The following academic requirements have to be satisfied in addition to the requirements mentioned in item no.**2**

i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the mid semester evaluation and end examination taken together.

ii. A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any decimal fraction should be rounded off to lower digit) in the subjects that have been studied up to V semester.

And in case if student is already detained for want of credits for particular academic year, the student may make up the credits through supplementary exams of the above exams before the commencement of IV year I semester class work of next year.

4. Course Pattern

i) The entire course of study is three academic years on semester pattern.

ii) A student eligible to appear for the end examination in a subject but absent at it or has failed in the end examination may appear for that subject at the next supplementary examination offered.

iii) When a student is detained due to lack of credits/shortage of attendance the student may be re-admitted when the semester is offered after fulfilment of academic regulations, the student shall be in the academic regulations into which he/she is readmitted.

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

COURSE STRUCTURE - R23 REGULATIONS

B. Tech. (Regular / Honors) – COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

(Applicable from the academic year 2023-24 onwards)

I YEAR I SEMESTER						
S. No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	R23MATT101	Linear Algebra & Calculus	3	0	0	3
2	R23PHYT101	Engineering Physics	3	0	0	3
3	R23HSST001	Communicative English	2	0	0	2
4	R23CMET201	Basic Civil & Mechanical Engineering	3	0	0	3
5	R23CSET201	Introduction to Programming	3	0	0	3
6	R23HSSL001	Communicative English Lab	0	0	2	1
7	R23PHYL101	Engineering Physics Lab	0	0	2	1
8	R23MECW201	Engineering Workshop	0	0	3	1.5
9	R23CSEW201	IT Workshop	0	0	2	1
10	R23CSEL201	Computer Programming Lab	0	0	3	1.5
11	R23HSSM801	Health and wellness, Yoga and Sports	0	0	1	0.5
		Total	**14**	**0**	**13**	**20.5**

I YEAR II SEMESTER						
S. No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	R23MATT102	Differential Equations and Vector calculus	3	0	0	3
2	R23CHYT102	Chemistry	3	0	0	3
3	R23MECD201	Engineering Graphics	1	0	4	3
4	R23EEET201	Basic Electrical & ElectronicsEngineering	3	0	0	3
5	R23CSET301	Data Structures	3	0	0	3
6	R23CHYL102	Chemistry Lab	0	0	2	1
7	R23EEEL201	Electrical & Electronics Engineering Lab	0	0	3	1.5
8	R23CSEL301	Data Structures Lab	0	0	3	1.5
9	R23HSSM802	NSS/NCC/Scouts &Guides/Community Service	0	0	1	0.5
		Total	**13**	**0**	**13**	**19.5**

II YEAR I SEMESTER						
S. No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	BS&H	Probability & Statistics (Engineering Mathematics-Branch Specific)	3	0	0	3
2	BS&H	Universal Human Values – Understanding Harmony	2	1	0	3
3	Engineering Science	Discrete Mathematics	2	0	0	2
4	Professional Core	OOPs with C++	3	0	0	3
5	Professional Core	Python Programming	3	0	0	3
6	Engineering Science	UNIX Lab	0	0	2	1
7	Professional Core	OOPs with C++ Lab	0	0	3	1.5
8	Professional Core	Python Programming Lab	0	0	3	1.5
9	Skill Enhancement Course	Comprehension & Communication Skills	0	1	2	2
10	Audit Course	Environmental Science	2	0	0	-
		Total	**15**	**2**	**10**	**20**

II YEAR II SEMESTER						
S. No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	Management Course-1	Managerial Economics and Financial Analysis	2	0	0	2
2	Engineering Science	Digital Logic Design	3	0	0	3
3	Professional Core	Operating Systems	3	0	0	3
4	Professional Core	Java Programming	3	0	0	3
5	Professional Core	Database Management Systems	3	0	0	3
6	Professional Core	Operating Systems Lab	0	0	2	1
7	Professional Core	Database Management Systems Lab	0	0	3	1.5
8	Professional Core	Java Programming Lab	0	0	3	1.5
9	Skill Enhancement Course	Quantitative Aptitude Techniques	0	1	2	2
10	BS&H	Design Thinking & Innovation	1	0	2	2
		Total	**15**	**1**	**12**	**22**
Mandatory community Service Project internship of 08 weeks duration during summer vacation						

III YEAR I SEMESTER						
S. No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	Professional Core	Computer Networks	3	0	0	3
2	Professional Core	Design & Analysis of Algorithms	3	0	0	3
3	Professional Elective - I	Professional Elective – I	2	0	0	2
4	Open Elective – I	Open Elective – I	3	0	0	3
5	Open Elective – II	Open Elective – II	3	0	0	3
6	Professional Core	Computer Networks Lab	0	0	3	1.5
7	Professional Core	Design & Analysis of Algorithms Lab	0	0	3	1.5
8	Skill Enhancement Course	Process Automation Tools	0	1	2	2
9	BS&H	Tinkering Lab	0	0	2	1
10	Evaluation of Community Service Internship		-	-	-	2
		Total	**14**	**1**	**10**	**22**

III YEAR II SEMESTER						
S. No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	Professional Core	Web Technologies	3	0	0	3
2	Professional Core	Computer Organization & Architecture	3	0	0	3
3	Professional Core	Automata Theory & Compiler Design	3	0	0	3
4	Professional Elective – II	Professional Elective – II	3	0	0	3
5	Professional Elective – III	Professional Elective – III	2	0	0	2
6	Open Elective – III	Open Elective – III / MOOCS	3	0	0	3
7	Professional Core	Web Technologies Lab	0	0	2	1
8	Professional Core	Compiler Design Lab	0	0	2	1
9	Skill Enhancement Course	Mobile App Development	0	1	2	2
10	Audit Course	Technical Paper Writing & IPR	2	0	0	-
		Total	**19**	**1**	**6**	**21**
Mandatory Industry Internship of 08 weeks duration during summer vacation						

IV YEAR I SEMESTER						
S. No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	Professional Core	OOAD & Design Patterns	3	0	0	3
2	Professional Core	Software Engineering	3	0	0	3
3	Management Course – II	Human Resources Development & Organizational Behaviour	2	0	0	2
4	Professional Elective – IV	Professional Elective – IV	3	0	0	3
5	Professional Elective – V	Professional Elective – V	3	0	0	3
6	Open Elective – IV	Open Elective – IV / MOOCS	3	0	0	3
7	Professional Core	OOAD & Design Patterns Lab	0	0	2	1
8	Professional Core	Software Engineering Lab	0	0	2	1
9	Skill Enhancement Course	Sales Force/ AWS / Any other Industry Certification	0	1	2	2
10	Audit Course	Constitution of India	2	0	0	-
11	Internship	Evaluation of Industry Internship	-	-	-	2
		Total	**19**	**1**	**6**	**23**

IV YEAR II SEMESTER						
S. No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	Internship & Project Work	Full Semester Internship & Project Work	0	0	24	12
		Total				**12**

PROFESSIONAL ELECTIVES

- **Students will be able to choose from multiple threads at the beginning of Semester V for generic CSE, IT and CSIT streams.**

AI & ML (Thread – I)			
S.No.	**Professional Elective**	**Course Title**	**Credits**
1	PE – I	Data Ware Housing & Data Mining	**2**
2	PE – II	Statistical Regression & Time Series Data Analysis	**3**
3	PE – III	Artificial Intelligence: Principles & Techniques	**2**
4	PE – IV	Machine Learning Algorithms & Techniques	**3**
5	PE – V	Reinforced & Deep Learning	**3**

Open Electives Offered by CSE, IT & Allied Branches to Other Departments

S. No.	Course Title
1	Fundamentals of Data Structures
2	Basics of Operating Systems
3	Basics of Computer Networks
4	Object Oriented Programming with java
5	Basics of Database Management Systems
6	Web Design and Development

Open Electives Offered by Other Departments

Mechanical Engineering Department

S. No.	Course Title
1	Introduction to Operations Research
2	Fundamentals of Supply Chain Management
3	Fundamentals of Product Lifecycle Management
4	Corporate Leadership & Change Management
5	Solar and Wind Energy
6	Introduction to Robotics

EEE Department

S. No.	Course Title
1	Electrical Vehicles
2	Embedded Systems
3	Renewable Energy Sources & Integration
4	Electrical Wiring, Estimation and Costing
5	MATLAB Programming & Simulink
6	Soft Computing Techniques

ECE Department

S. No	Course Title
1	Principles of Mobile Communications
2	Basics of VLSI Design
3	Sensors and Transducers
4	Drone Technology
5	Embedded Systems
6	Basics of Signal Processing

Chemical Engineering Department

S. No	Course Title
1	Environment Impact Assessment
2	Non-Conventional Sources of Energy
3	Waste to Energy Conversion
4	Industrial Safety & Hazards Management
5	Industrial Pollution and Control Engineering
6	Greenfuel Technologies

Civil Engineering Department

S. No.	Course Title
1	Road Safety Engineering
2	Remote Sensing and Geoinformatics
3	Intelligent Transportation Systems
4	Project Planning and Management
5	Sustainable Materials and Green Buildings
6	Engineering for Sustainable Development

MBA Department

S. No.	Course Title
1	Macro Economics
2	Securities and Financial Instruments
3	Internet Marketing

- **Open Electives – I and II can be chosen from other departments.**
- **Open Electives - III and IV can be done in MOOC and can be either inter or intra disciplinary. If not MOOC, the default option would be Open Elective – III and IV. Course cannot be chosen if it is already done by the student.**

Open Elective – III	
S.No.	**Course Title**
1	Statistical Regression &Time Series Data Analysis
2	Cryptography and Information Security
3	Statistical & Mathematical Foundations of Data Analytics
4	Open Databases & R Programming

Open Elective – IV	
S.No.	**Course Title**
1	Semantic and Sentiment Analysis
2	Network Security & Cyber Forensic Laws
3	Multivariate and Stochastic Analytics with R
4	Data Visualization & Reporting Tools
5	Block Chain Technology & Applications

LIST OF HONORS COURSES

- **Course cannot be chosen if it is already done by the student.**

S. No.	Course Title	Credits
1	Semantic and Sentiment Analysis	**3**
2	Machine Learning Algorithms & Techniques	**3**
3	Reinforced & Deep Learning	**3**
4	Sensors and Sensing Systems	**3**
5	Statistical Regression & Time Series Data Analysis	**3**
6	Mean Stack Web Development	**3**
7	Enterprise Networking, Security & Automation	**3**
8	Ad-hoc Networks	**3**

I Year I Semester

R23MATT101	LINEAR ALGEBRA AND CALCULUS (Common to All Branches of Engineering)					
	Total Contact Hours	45 (L)	**L**	**T**	**P**	**C**
	Pre-requisite	Basic Calculus and Matrices	**3**	**0**	**0**	**3**

Course Objective

- To equip the students with standard concepts and tools of mathematics to handle various real-world problems and their applications.

Course Outcomes

1	Solve system of equation by Direct and Indirect methods.
2	Make use of Linear Algebra techniques to find higher powers and inverse of Matrices.
3	Make use of Mean value theorems to deduce Mathematical identities.
4	Use the concept of multivariable calculus to determine the maxima and minima of a multivariable function.
5	Estimate areas and volumes with help of Multiple integrals.
6	Formulate Mathematical models and estimate appropriate physical quantities.

SYLLABUS

Unit I	**MATRICES**	**9 hr**

Rank of a matrix by echelon form, normal form. Cauchy –Binet formulae (without proof). 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, Gauss Seidel Iteration Method.

Unit II	**LINEAR TRANSFORMATION AND ORTHOGONAL TRANSFORMATION**	**9 hr**

Eigenvalues, Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

Unit III	**CALCULUS**	**9 hr**

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems.

Unit IV	**PARTIAL DIFFERENTIATION AND APPLICATIONS (MULTI VARIABLE CALCULUS)**	**9 hr**

Partial derivatives, total derivatives, chain rule, change of variables, Taylor's and Maclaurin's series expansion of functions of two variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

Unit V	**MULTIPLE INTEGRALS (MULTI VARIABLE CALCULUS)**	**9 hr**

Double integrals, triple integrals, change of order of integration, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

LEARNING RESOURCES

TEXT BOOKS:

1	B.S. Grewal, *Higher Engineering Mathematics*, 44/e, Khanna Publishers, 2017.
2	Erwin Kreyszig, *Advanced Engineering Mathematics*, 10/e, John Wiley & Sons, 2018.

REFERENCE BOOKS:

1	R.K. Jain and S.R.K. Iyengar, *Advanced Engineering Mathematics*, 5/e, Alpha Science International Ltd.,2021 (9th reprint).
2	George B.Thomas, Maurice D. Weir and Joel Hass, *Thomas Calculus*, 14/e, Pearson Publishers, 2018.
3	Glyn James, *Advanced Modern Engineering Mathematics*, 5/e, Pearson publishers, 2018.
4	Michael Green berg, *Advanced Engineering Mathematics*, 9th edition, Pearson edn.
5	K Das, Er. Rajnish Verma, *Higher Engineering Mathematics*, S. Chand, 2021.

Bloom's level - Units catchment articulation matrix

CO	Blooms Level	Unit I	Unit II	Unit III	Unit IV	Unit V
CO1	BL 3	X				
CO2	BL 3		X			
CO3	BL 3			X		
CO4	BL 3				X	
CO5	BL 3					X
CO6	BL 6	X	X	X	X	X

R23PHYT101	ENGINEERING PHYSICS (Common to All Branches of Engineering)					
	Total Contact Hours	45 (L)	**L**	**T**	**P**	**C**
	Pre-requisite	Higher Secondary School Physics	**3**	**0**	**0**	**3**

Course Objective

- To bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the optical phenomenon like interference, diffraction etc. Enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.

Course Outcomes

1	Student will be able to **analyze** the intensity variation of light due to interference, diffraction and polarization
2	Student will be able to **investigate** the crystallographic phase of the unknown specimen by using the X-ray diffraction method
3	Student will be able to **interpret** the various polarization mechanisms and their frequency dependence in dielectrics; and **choose** a magnetic material for a given application based on the domain model.
4	Student will be able to **deduce** the quantized facets for a free electron in a potential box, and extend the same to **explain** the electrical conductivity and Fermi energy of metals.
5	Student will be able to **classify** the solids, **analyze** the semiconductor charge carrier concentrations, and **identify** the semiconductor type by using the Hall effect.
6	Student will be able to **elaborate** the optical phenomena, crystallographic phase, magneto-dielectric physiognomies, quantum confinement effects, and the rudiments of semiconductor band model.

SYLLABUS

Unit I	**WAVE OPTICS**	**9 hr**

Interference: Introduction - Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colors in thin films- Newton's Rings- Determination of wavelength and refractive index. **Diffraction:** Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative). **Polarization:** Introduction -Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

Unit II	**CRYSTALLOGRAPHY AND X-RAY DIFFRACTION**	**9 hr**

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes. **X-ray diffraction:** Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods.

Unit III	**DIELECTRIC AND MAGNETIC MATERIALS**	**9 hr**

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector –Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - complex dilectric constant – Frequency dependence of polarization – dielectric loss. **Magnetic Materials:** Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro& Ferri magnetic materials - Domain concept for Ferromagnetism & Domain

walls (Qualitative) - Hysteresis - soft and hard magnetic materials.		
Unit IV	**QUANTUM MECHANICS AND FREE ELECTRON THEORY**	**9 hr**
Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well. **Free Electron Theory:** Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory –electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution - Density of states - Fermi energy.		
Unit V	**SEMICONDUCTORS**	**9 hr**
Semiconductors: Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation - Hall effect and its applications.		
LEARNING RESOURCES		
TEXT BOOKS:		
1	M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy, *A Text book of Engineering Physics*, 11th Edition, S.Chand Publications, 2019.	
2	D.K.Bhattacharya and Poonam Tandon, *Engineering Physics*, 1st Edition, Oxford press, 2015.	
REFERENCE BOOKS:		
1	B.K. Pandey and S. Chaturvedi, *Engineering Physics*, 2nd Edition, Cengage Learning, 2021.	
2	Shatendra Sharma, Jyotsna Sharma, *Engineering Physics*, 1st Edition, Pearson Education, 2018.	
3	Sanjay D. Jain, D. Sahasrabudhe and Girish, *Engineering Physics*, 1st Edition, University Press, 2010.	
4	M.R. Srinivasan, *Engineering Physics*, 1st Edition, New Age international publishers, 2009	
ONLINE COURSES:		
1	https://archive.nptel.ac.in/courses/122/107/122107035/	
2	https://www.youtube.com/watch?v=GQ5XpeS3e3U&list=PLLy_2iUCG87B_Tmfs0y2tR8GNIkyRIKpW	
3	https://archive.nptel.ac.in/courses/112/106/112106227/	
4	https://archive.nptel.ac.in/courses/115/101/115101107/	
5	https://archive.nptel.ac.in/courses/108/108/108108122/	

Bloom's level - Units catchment articulation matrix

CO	Blooms Level	Unit I	Unit II	Unit III	Unit IV	Unit V
CO1	BL 4	X				
CO2	BL 5		X			
CO3	BL 5			X		
CO4	BL 4				X	
CO5	BL 4					X
CO6	BL 6	X	X	X	X	X

R23HSST001	COMMUNICATIVE ENGLISH (Common to All Branches of Engineering)					
	Total Contact Hours	30 (L)	**L**	**T**	**P**	**C**
	Pre-requisite	Nil	**2**	**0**	**0**	**2**

Course Objective

- The student will be able to apply the concepts of comprehension, Interpretation and structured presentation in varied contexts and demonstrate skilled communication.

Course Outcomes

1	Developing the ability to comprehend, analyze and elicit information.
2	Demonstrating the skill of Structured thinking.
3	Developing Competency to summarize and paraphrase content in different materials.
4	Demonstrating the skill of constructive presentation.
5	Building communicative competence.

SYLLABUS

Unit I	**THEME: HUMAN VALUES** Sample Text: *The Power of a Plate of Rice* (short story) by Ifeoma Okoye Supplementary Text: *The Lament* by Anton Chekov **Listening**: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. **Speaking**: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others. **Reading**: Skimming to get the main idea of a text; scanning to look for specific pieces of information. **Writing:** Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences. (Remedial learning with additional resources.) **Grammar:** Parts of Speech, Basic Sentence Structures-forming questions. (Remedial learning with additional resources.) **Vocabulary**: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words	**6 hr**
Unit II	**Theme: NATURE** Sample Text: *Night of the Scorpion* (poem) by Nissim Ezekiel Supplementary Text: *'IF'* by Rudyard Kipling **Listening:** Answering a series of questions after listening to audio texts. **Speaking**: Discussion in pairs/small groups on specific topics. **Reading**: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together. **Writing**: Structure of a paragraph - Paragraph writing (specific topics) **Grammar:** Cohesive devices - linkers, use of articles and zero article prepositions. **Vocabulary**: Homonyms, Homophones, Homographs.	**6 hr**
Unit III	**Lesson: BIOGRAPHY of Steve Jobs** Supplementary Text: Biography of Tenzing Norgay **Listening**: Listening for global comprehension and summarizing. **Speaking**: Discussing specific topics in pairs or small groups and reporting what is discussed. **Reading:** Reading a text in detail by making basic inferences- recognizing and interpreting specific context clues; strategies to use text clues for comprehension. **Writing:** Summarizing, Note-making, paraphrasing **Grammar**: Verbs - tenses; subject-verb agreement **Vocabulary**: Compound words, Collocations	**6 hr**
Unit IV	**Lesson: INSPIRATION: *The Toys of Peace* by Saki**	**6 hr**

	Supplementary Text: *The Man Who Planted Trees* by Jean Giono **Listening**: Making predictions while listening to conversations/ transactional dialogues without video; listening with video. **Speaking:** Role plays for the practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. **Reading**: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data. **Writing**: Letter Writing: Official Letters, Resumes. **Grammar:** Reporting verbs, Direct & Indirect speech, Active & Passive Voice. **Vocabulary**: Words often confused, Jargon.	
Unit V	**Lesson: MOTIVATION: The Power of Intrapersonal Communication (An Essay)** **Listening**: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension. **Speaking**: Formal oral presentations **Reading**: Reading comprehension. **Writing**: Writing structured essays on specific topics. **Grammar**: Editing short texts –identifying and correcting common errors in grammar (articles, prepositions, tenses, subject-verb agreement) **Vocabulary:** Technical Jargon.	**6 hr**
LEARNING RESOURCES		
TEXT BOOKS:		
1	Pathfinder: *Communicative English for Undergraduate Students*, 1st Edition, Orient Black Swan, 2023.	
2	*Empowering English* by Cengage Publications, 2023.	
REFERENCE BOOKS:		
1	Dubey, Sham Ji & Co. *English for Engineers*, Vikas Publishers, 2020.	
2	Bailey, Stephen. *Academic writing: A Handbook for International Students*. Routledge, 2014.	
3	Murphy, Raymond. *English Grammar in Use*, Fourth Edition, Cambridge University Press, 2019.	
4	Lewis, Norman. Word Power Made Easy- *The Complete Handbook for Building Superior Vocabulary*. Anchor, 2014.	
WEB RESOURCES:		
1. www.bbc.co.uk/learningenglish 2. https://dictionary.cambridge.org/grammar/british-grammar/ 3. www.eslpod.com/index.html 4. https://www.learngrammar.net/32 5. https://english4today.com/english-grammar-online-with-quizzes/ 6. https://www.talkenglish.com/grammar/grammar.aspx		

Bloom's level - Units catchment articulation matrix

CO	Blooms Level	Unit I	Unit II	Unit III	Unit IV	Unit V
CO1	BL 6	X	X	X	X	X
CO2	BL 3		X			
CO3	BL 6			X		
CO4	BL 3	X	X	X	X	X
CO5	BL 6	X	X	X	X	X

R23CMET201	BASIC CIVIL AND MECHANICAL ENGINEERING (Common to All branches of Engineering)					
	Total Contact Hours	48 (L)	**L**	**T**	**P**	**C**
	Pre-requisite	Nil	**3**	**0**	**0**	**3**

Course Objectives

- Get familiarized with the scope and importance of Civil and Mechanical Engineering in different sectors and industries.
- Introduce the preliminary concepts of Building Planning, Building Construction, Materials and the related tests.
- Provide preliminary knowledge of surveying and understand the importance of transportation and the water resources in terms of quantity and quality.
- Explain different engineering materials and manufacturing processes.
- Provide an overview of different thermal and mechanical systems; introduce basics of robotics and its applications.

Course Outcomes

1	Compile the role of a Civil Engineer in his multifaceted tasks and Discuss the principles of building planning and various construction aspects including materials
2	Solve for areas of irregular boundaries by means of lengths and bearings and for reduced level of an object
3	Elaborate the importance of Transportation in Nation's economy and the engineering measures related to highways in terms of geometrics and water resources and storage structures to appreciate the social responsibility of water conservation in terms of quality and quantity.
4	Adapt and integrate the mechanical engineering technologies in various Industrial sectors, and choose appropriate engineering materials for engineering applications.
5	Express the working of different manufacturing processes, refrigeration and air-conditioning cycles, IC engines, electric and hybrid vehicles.
6	Express and write the working of power plants, mechanical power transmission systems, and different robotic configurations.

SYLLABUS

PART A: BASIC CIVIL ENGINEERING

Unit I	**BASICS OF CIVIL ENGINEERING**	**8 hr**

Basics of Civil Engineering: Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-Technical Engineering- Transportation Engineering - Hydraulics and Water Resources Engineering - Environmental Engineering- Scope of each discipline - Building Construction and Planning- Construction Materials- Cement - Aggregate - Bricks- Cement concrete- Steel-Tests on these materials.

Factors to be considered in Building Planning- Nature of Buildings- Typical Layouts of a Residential Building- Industrial Building- Commercial Building like a Supermarket / Hotel / Theatre.

Unit II	**SURVEYING**	**8 hr**

Surveying: Objectives of Surveying- Horizontal Measurements- Vertical Measurements- Angular Measurements- Levelling instruments used for levelling- Introduction to Bearings- Simple problems on levelling and bearings-Contour mapping.

Unit III	**TRANSPORTATION ENGINEERING, WATER RESOURCES AND ENVIRONMENTAL ENGINEERING**	**8 hr**

Transportation Engineering, Water Resources and Environmental Engineering: Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences - Basic geometric

design elements of a highway- Camber- Stopping Sight Distance- Super elevation- Introduction. **Water Resources and Environmental Engineering**: Sources of water- Quality of water- Specifications and Tests- Introduction to Hydrology- Hydrograph –Rain water Harvesting- Rain water runoff- Water Storage Structures (Simple introduction to Dams and Reservoirs).		
PART B: BASICMECHANICAL ENGINEERING		
Unit IV	**INTRODUCTION TO MECHANICAL ENGINEERING AND ENGINEERING MATERIALS**	**8 hr**
Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors. **Engineering Materials -** Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.		
Unit V	**MANUFACTURING PROCESSES AND THERMAL ENGINEERING**	**8 hr**
Manufacturing Processes: Principles of Casting**,** Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing. **Thermal Engineering**– working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.		
Unit VI	**POWER PLANTS, MECHANICAL POWER TRANSMISSION AND INTRODUCTION TO ROBOTICS**	**8 hr**
Power plants – working principle of Steam, Diesel, Hydro, Nuclear power plants. **Mechanical Power Transmission -** Belt Drives, Chain, Rope drives, Gear Drives and their applications. **Introduction to Robotics -** Joints & links, configurations, and applications of robotics.		
LEARNING RESOURCES		
TEXT BOOKS:		
1	M.S.Palanisamy, *Basic Civil Engineering*, Fourth Edition, Tata Mcgraw Hill publications (India) Pvt. Ltd, 2017.	
2	S.S. Bhavikatti, *Introduction to Civil Engineering*, First Edition, New Age International Publishers, 2022.	
3	Satheesh gopi, *Basic Civil Engineering*, First Edition, Pearson publications,2009.	
4	V.Ganesan, *Internal Combustion Engines*, 4th edition, Tata McGraw Hill publications Pvt. Ltd, 2017.	
5	S.S. Rattan, *Theory of Machines*, Fourth edition, McGraw Hill Education; 2017	
6	Jonathan Wicker and Kemper Lewis, *An introduction to Mechanical Engineering*, 3rd edition, Cengage learning India Pvt. Ltd, 2012.	
REFERENCE BOOKS:		
1	S.K. Duggal, *Surveying, Vol- I and Vol-II*, 4th Edition, Tata McGraw Hill Publishers, 2017.	
2	Santhosh Kumar Garg, *Hydrology and Water Resources Engineering*, 23rd Edition, Kahnna publishers, Delhi, 2016.	
3	Santhosh Kumar Garg, *Irrigation Engineering and Hydraulic Structures*, 38th Edition, Kahnna publishers, Delhi, 2023.	
4	S K Khanna and C E G Justo and Veeraraghavan, *Highway Engineering*,10th Edition Nemchand Brothers Publications, 2019	
5	Indian Standard Drinking water Specifications – IS 10500-2012	
6	Appuu Kuttan KK, *Robotics, I.K. Volume-I*, International Publishing House Pvt. Ltd,	

	2013.
7	L. Jyothish Kumar, Pulak M Pandey, *3D printing & Additive Manufacturing Technology*, Springer publications, 2017.
8	Mahesh M Rathore, *Thermal Engineering*, Tata McGraw Hill publications (India) Pvt. Ltd, 2010.
ADDITIONAL REFERENCE MATERIAL:	
1	Subramanian KP, *Highway, Railway, Airport and Harbour Engineering*, First Edition, Scitech Publications (India) Pvt. Limited, 2010.
2	M S Shetty, *Concrete Technology (Theory & Practice)*, Revised Edition, S Chand Publishers, 2006.
3	Dr. S.C. Rangwala, *Engineering Materials*, 3rd edition, Charotor Publishing House, 2018.
4	P. K. Nag, *Power Plant Engineering*, 4th edition, McGraw Hill Education, 2017.
5	James D. Halderman, Curt Ward, *Electric and Hybrid Electric Vehicles*, Pearson Education, 2023.
ONLINE COURSES:	
1	https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-ce40/
2	https://www.udemy.com/course/surveying/
3	https://archive.nptel.ac.in/courses/112/103/112103316/
4	https://nptel.ac.in/courses/112107291

Bloom's level - Units catchment articulation matrix

CO	Blooms Level	Unit I	Unit II	Unit III	Unit IV	Unit V	Unit VI
CO1	BL 6	X					
CO2	BL 6		X				
CO3	BL 6			X			
CO4	BL 6				X		
CO5	BL 6					X	
CO6	BL 6						X

R23CSET201	INTRODUCTION TO PROGRAMMING (Common to All branches of Engineering)					
	Total Contact Hours	45 (L)	**L**	**T**	**P**	**C**
	Pre-requisite	NIL	**3**	**0**	**0**	**3**

Course Objective

- The course aims to equip students with advanced proficiency in C programming, fostering problem-solving skills and algorithmic design, while ensuring mastery in data manipulation, function implementation, and file handling techniques.

Course Outcomes

1	Students will develop essential problem-solving skills and ability to design efficient algorithms to address a wide range of challenges effectively.
2	Students will formulate solutions by constructing well-organized and efficient C programs, effectively using data types, program flow, and loop structures with appropriate utilization of keywords, operators and identifiers.
3	Students will have the ability to experiment on arrays, pointers, and dynamic memory allocation, effectively to develop strategies for manipulates data with precision and efficiency.
4	Students will construct solutions by utilizing functions, string handling, applying variable scope and storage classes effectively, and implementing recursion through C programming principles.
5	Students will create and develop skills in handling structures, unions, and self-referential structures, and demonstrate proficiency in file handling techniques for input and output operations in C.
6	Students will develop and author comprehensive programming expertise in C, encompassing computer problem-solving skills, array and pointer manipulation, function implementation, string handling, and data structure utilization through file operations.

SYLLABUS

UNIT I	INTRODUCTION TO COMPUTER PROBLEM SOLVING	9 hr

Programs and Algorithms, Computer Problem Solving Requirements, Phases of Problem Solving, Problem. Solving Strategies, Top-Down Approach, Algorithm Designing, Program Verification, Improving Efficiency, Algorithm Analysis and Notations.

UNIT II	INTRODUCTION TO C PROGRAMMING	9 hr

Introduction, Structure of a C Program. Comments, Keywords, Identifiers, Data Types, Variables, Constants, Input/output Statements. Operators, Type Conversion. Control Flow, Relational Expressions: Conditional Branching Statements: if, if-else, if-else—if, switch. Basic Loop Structures: while, do-while loops, for loop, nested loops, The Break and Continue Statements, goto statement.

UNIT III	ARRAYS & POINTERS	9 hr

Introduction, Operations on Arrays, Arrays as Function Arguments, Two Dimensional Arrays, Multidimensional Arrays. Pointers: Concept of a Pointer, Declaring and Initializing Pointer Variables, Pointer Expressions and Address Arithmetic, Null Pointers, Generic Pointers, Pointers as Function Arguments, Pointers and Arrays, Pointer to Pointer, Dynamic Memory Allocation, Dangling Pointer, Command Line Arguments.

UNIT IV	FUNCTIONS & STRINGS	9 hr

Introduction Function: Declaration, Function Definition, Function Call, Categories of Functions, Passing Parameters to Functions, Scope of Variables, Variable Storage Classes. Recursion. Strings: String Fundamentals, String Processing with and without Library Functions, Pointers and Strings.

UNIT V	STRUCTURES & FILE HANDLING	9 hr
Structures, Unions, Bit Fields: Introduction, Nested Structures, Arrays of Structures, Structures and Functions, Self-Referential Structures, Unions, Enumerated Data Type —Enum variables, Using Typedef keyword, Bit Fields. Data Files: Introduction to Files, Using Files in C, Reading from Text Files, Writing to Text Files, Random File Access.		
LEARNING RESOURCES		
TEXT BOOKS:		
1	B. A. Forouzan, *Computer science: a structured programming approach using C*, 3rd ed. India edition. New Delhi: Cengage Learning India Private Ltd., 2012	
2	R. G. Dromey, *How to solve it by computer*. Delhi: Pearson education, 2008.	
3	A. Mittal, *Programming in C: a practical approach.* New Delhi, India: Pearson Education, 2010.	
REFERENCE BOOKS:		
1	Byron Gottfried, *Schaum's Outline of Programming with C*, McGraw-Hill.	
2	Reema Thareja, *Computer Programming*, Oxford University Press	
3	Dennis Richie and Brian Kernighan, *The C Programming Language*, Pearson Education.	
4	Ashok Kamthane, *Programming In C*, Second Edition, Pearson Publication.	
5	Kanetkar, *Let us C*, Yaswanth, 16th Edition, BPB Publication.	
6	Balagurusamy, E., *Computing fundamentals and C Programming*, McGraw-Hill Education, 2008	
WEB REFERENCES:		
1	http://www.c4learn.com/	
2	http://www.geeksforgeeks.org/c/	
3	http://nptel.ac.in/courses/122104019/	
4	http://www.learn-c.org/	
5	https://www.tutorialspoint.com/cprogramming/	
ONLINE COURSES:		
1	https://mvgrce.codetantra.com	

Bloom's level - Units catchment articulation matrix

CO	Blooms Level	Unit I	Unit II	Unit III	Unit IV	Unit V
CO1	BL 3	X				
CO2	BL 6		X			
CO3	BL 3			X		
CO4	BL 6				X	
CO5	BL 6					X
CO6	BL 6	X	X	X	X	X

R23HSSL001	COMMUNICATIVE ENGLISH LAB (Common to All Branches of Engineering)					
	Total Contact Hours	30 (P)	**L**	**T**	**P**	**C**
	Pre-requisite	Nil	**0**	**0**	**2**	**1**

Course Objective

- The main objective of the course is to expose the students to a variety of self-instructional, learner friendly modes of language learning. The students will get trained in basic communication skills to become industry ready.

Course Outcomes

1	Demonstrate understanding of the different aspects of English language proficiency with emphasis on LSRW skills.
2	Develop communication skills by exposing the student to various language learning activities.
3	Analyse and apply techniques to comprehend information in audio/video material.
4	Develop professionalism by facilitating debates and group discussions.
5	Demonstrate effective presentation skills.

List of Topics

1	Communication Skills & JAM
2	Articulation of sounds & Listening to comprehend information
3	Role Play or Conversational Practice
4	E-mail Writing
5	Resume Writing, Cover letter writing
6	Group Discussions-methods & practice
7	Debates - Methods & Practice
8	PPT Presentations/ Poster Presentation
9	Interview skills

LEARNING RESOURCES

REFERENCE BOOKS:

1	Raman Meenakshi, Sangeeta-Sharma, *Technical Communication,* Oxford Press, 2018.
2	Taylor Grant, *English Conversation Practice*, Tata McGraw-Hill Education India, 2016.
3	Hewing's, Martin, *Cambridge Academic English (B2)*, CUP, 2012.
4	J. Sethi & P.V. Dhamija, *A Course in Phonetics and Spoken English*, (2nd Ed), Kindle, 2013.

WEB RESOURCES:

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/

R23PHYL101	ENGINEERING PHYSICS LAB (Common to All Branches of Engineering)					
	Total Contact Hours	30 (P)	**L**	**T**	**P**	**C**
	Pre-requisite	Higher Secondary School Physics	**0**	**0**	**2**	**1**

Course Objective

- To complement classroom learning with laboratory experiments. Calibration of instruments like travelling-microscope, spectrometer, etc. and to make precise measurements. Understand the physical principles involved in the conduct of experiment and measure the relevant experimental variables. Apply the analytical techniques and graphical analysis to experimental data and draw necessary conclusions. Prepare a concise and clear technical report to communicate his/her experimental understanding.

Course Outcomes

1	Student will be able to **conduct** experiments to reconnoitre the interference and diffraction patterns of light.
2	Student will be able to **find** the signature variation of magnetic field due to current; and the hysteresis energy loss in a magnetic material.
3	Student will be able to **measure** the physiognomies of the semiconductor devices like the energy band gap (E_g) and the temperature coefficient of resistance (α).
4	Student will be able to **observe** the pendulum oscillations and **determine** the impelling parameters like rigidity modulus (η), acceleration due to gravity (g), etc.
5	Student will be able to **verify** the laws of vibrations and **determine** the unknown fork frequency by forming standing waves on stretched strings.

List of Experiments

1	Determination of radius of curvature of a given plano-convex lens by Newton's rings.
2	Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3	Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
4	Determination of wavelength of Laser light using diffraction grating
5	Determination of energy gap of a semiconductor using p-n junction diode
6	Magnetic field along the axis of a current carrying circular coil by Stewart and Gee's Method
7	Determination of temperature coefficients of a thermistor
8	Determination of rigidity modulus of the material of the given wire using Torsional pendulum
9	Determination of frequency of the electrically maintained tuning fork by Melde's experiment
10	Sonometer: Verification of the laws of stretched string

Additional Experiments

1	Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum

LEARNING RESOURCES

TEXT BOOKS:

1	S. Balasubramanian, M.N. Srinivasan, *A Textbook of Practical Physics*, S. Chand Publishers, 2017.

REFERENCE BOOKS:

1	C.S. Robinson and Dr. Ruby Das, *A Textbook of Engineering Physics Practical*,1st Edition Laxmi Publications Pvt. Ltd., 2016.

ADDITIONAL REFERENCE MATERIAL:

1	www.vlab.co.in

R23MECW201	ENGINEERING WORKSHOP (Common to All Branches of Engineering)					
	Total Contact Hours	45 (P)	**L**	**T**	**P**	**C**
	Pre-requisite	Nil	**0**	**0**	**3**	**1.5**

Course Objective

- Students will understand various engineering trades such as carpentry, tin smithy, foundry, fabrication, fitting and electrical house wiring skills and required safety practice required and address common trouble shooting in day- today practice.

Course Outcomes	
1	Identify workshop tools and their operational capabilities.
2	Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.
3	Apply concept of fitting and sheet metal understanding in various applications.
4	Apply basic electrical engineering knowledge for House Wiring Practice.
List of Experiments	
1	Carpentry: Making of Dove tail joint
2	Carpentry: Making of half lap joint
3	Sheet Metal Working: Manufacturing Taper tray using G.I Sheet
4	Sheet Metal Working: Manufacturing conical funnel using G.I Sheet
5	Fitting: Manufacturing V-fit using mild steel plate G.I Sheet
6	Fitting: Manufacturing Dovetail fit using mild steel plate
7	Electrical Wiring: Parallel connection for bulbs along with fuse and switch.
8	Electrical Wiring: Series connection for bulbs along with fuse and switch.
9	Foundry: Green sand mold making using simple / single piece pattern.
10	Welding: Fabrication of Butt weld joint using DC ARC welding
11	Welding: Fabrication of Butt weld joint using DC ARC welding
12	Plumbing: Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.
Additional Experiments	
1	Making of study lamp using combination of carpentry and house wiring trades.
2	Frame making of dissemination using carpentry and welding.
3	Electric Load calculation in a living room.
Demonstration Experiments	
1	Safety practices and precautions to be observed in workshop.
2	Demonstration of connection in street lights using single control.
LEARNING RESOURCES	
TEXT BOOKS:	
1	B.S. Raghuwanshi, Dhanpath Rai & Co., *A Course in Workshop Technology Vol I. & II*, Dhanpat Rai& Co. 2015 & 2017.
2	Veeranna D. Kenchakka, *Workshop/ Manufacturing practices with Lab Manual*, Khanna Book Publishing House limited, 2021.
3	K.C.John, Mechanical Workshop Practice, Second edition, PHI.2018.
REFERENCE BOOKS:	
1	S. K. Hajra Choudhury, *Elements of Workshop Technology, Vol. I.* 14th edition, Media Promoters and Publishers, Mumbai, 2007.
2	H. S. Bawa,Workshop Practice,Tata-McGraw Hill, 2004.
3	P.M.Soni & P.A.Upadhyay, Wiring Estimating, Costing and Contracting, Atul

	Prakashan, 2017.
ADDITIONAL REFERENCE MATERIAL:	
1	https://mrcet.com/downloads/hs/EWS-ITWS%20%20LAB%20MANUAL.pdf
2	https://sjce.ac.in/wp-content/uploads/2018/04/Workshop-Laboratory-Manual.pdf
3	https://manavrachna.edu.in/latest/virtual-lab-workshop-for-first-year-engineering-students-mru/

<table>
<tr><td rowspan="3">R23CSEW201</td><td colspan="6">IT WORKSHOP
(Common to all branches of Engineering)</td></tr>
<tr><td>Total Contact Hours</td><td>30 (P)</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>Pre-requisite</td><td>NIL</td><td>0</td><td>0</td><td>2</td><td>1</td></tr>
<tr><td colspan="7">Course Objective</td></tr>
<tr><td colspan="7">● To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables, operating systems, Compression, Multimedia, Antivirus tools and Office Tools such as Word processors, spreadsheets, and Presentation tools.</td></tr>
<tr><td colspan="7">Course Outcomes</td></tr>
<tr><td>1</td><td colspan="6">Students will be able to analyze Hardware troubleshooting.</td></tr>
<tr><td>2</td><td colspan="6">Students will be able to identify Hardware components and inter dependencies.</td></tr>
<tr><td>3</td><td colspan="6">Students will be able to choose safeguard computer systems from viruses/worms.</td></tr>
<tr><td>4</td><td colspan="6">Students will be able to Create document and power point presentation.</td></tr>
<tr><td>5</td><td colspan="6">Students will be able to develop calculations using spreadsheets.</td></tr>
<tr><td colspan="7">List of Experiments</td></tr>
<tr><td>1</td><td colspan="6">Week-1: PC Hardware & Software Installation
1) Identify the peripherals of a computer, components in a CPU, and functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.
2) Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also, students must go through the video showing the PC assembling process. A video would be given as part of the course content.</td></tr>
<tr><td>2</td><td colspan="6">Week-2:
1) Students should install MS windows on their personal computer. The lab instructor should verify the installation and follow it with a Viva.</td></tr>
<tr><td>3</td><td colspan="6">Week-3:
1) Every student should install Linux on the computer. This computer should have Windows installed. The system should be configured as dual boot (VMWare) with Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva.
2) Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva.</td></tr>
<tr><td>4</td><td colspan="6">Week-4: Internet & World Wide Web
1) Orientation & Connectivity Boot Camp: Students should connect to their Local Area Network and access the Internet. In the process, they configure the TCP/IP setting. Finally, students should demonstrate to the instructor how to access the websites and email. Without internet connectivity, instructors must simulate the WWW on the LAN.</td></tr>
</table>

	2) Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars, and pop-up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.
5	**Week-5:** 1) Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student. 2) Cyber Hygiene: Students would be exposed to the various threats on the internet and asked to configure their computers to be safe on the internet. They need to customize their browsers to block pop-ups, and block active X downloads to avoid viruses and worms.
6	**Week-6: LaTeX and WORD** 1) Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) Office or equivalent (FOSS) tool word: Importance of LaTeX and MS office or equivalent(FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word. 2) Using LaTeX and Word to create a project certificate. Features to be covered:- Formatting Fonts in Word, Drop Cap in Word, Applying Text effects, Using Character Spacing, Borders, and Colors, Inserting Header and Footer, Using Date and Time options in LaTeX and Word.
7	**Week-7:** 1) Creating project abstract Features to be covered: Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes. 2) Creating a Newsletter: Features to be covered:- Table of Contents, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs, and Mail Merge in word.
8	**Week-8: EXCEL** Excel Orientation: The mentor needs to tell the importance of the MS Office or equivalent (FOSS)tool Excel as a Spreadsheet tool give the details of the four tasks and features that would be covered in each. Using Excel – Accessing an overview of tool bars, saving Excel files, Using help and resources. 1) Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto-fill, Formatting Text. 2) Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in Excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyperlinking, Count function.
9	**Week-9:** 1) LOOKUP/LOOKUP : Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting.

10	**Week-10: POWERPOINT** 1) Students will be working on essential PowerPoint utilities and tools which help them create introductory PowerPoint presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint. 2) Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.
11	**Week-11:** 1) Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes, etc.), and Inserting – Background, textures, Design Templates, Hidden slides.
12	**Week-12: AI TOOLS – Chat GPT** 1) Prompt Engineering: Experiment with different prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them. 2) Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a scene description, and let the model generate the rest of the content. This can be a funway to brainstorm creative ideas. 3) Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.
LEARNING RESOURCES	
TEXT BOOKS:	
1	Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream Tech, 2003
2	Introduction to Information Technology, ITL Education Solutions Limited, Pearson Education, 2012, 2nd edition
REFERENCE BOOKS:	
1	The Complete Computer Upgrade and Repair Book, Cheryl A Schmidt, WILEY Dream tech, 2013, 3rd edition
2	PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
3	LaTeX Companion, Leslie Lamport, PHI/Pearson

<table>
<tr><td rowspan="3">R23CSEL201</td><td colspan="6">COMPUTER PROGRAMMING LAB
(Common to all branches of Engineering)</td></tr>
<tr><td>Total Contact Hours</td><td>45 (P)</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>Pre-requisite</td><td>NIL</td><td>0</td><td>0</td><td>3</td><td>1.5</td></tr>
<tr><td colspan="7">Course Objective</td></tr>
<tr><td colspan="7">● The course aims to give students hands – on experience and train them on the concepts of the C- programming language.</td></tr>
<tr><td colspan="7">Course Outcomes</td></tr>
<tr><td>1</td><td colspan="6">Read, understand, and trace the execution of programs written in C language.</td></tr>
<tr><td>2</td><td colspan="6">Select the right control structure for solving the problem.</td></tr>
<tr><td>3</td><td colspan="6">Develop C programs which utilize memory efficiently using programming constructs like pointers.</td></tr>
<tr><td>4</td><td colspan="6">Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.</td></tr>
<tr><td colspan="7">LIST OF EXPERIMENTS</td></tr>
<tr><td>1</td><td colspan="6">WEEK 1:
Familiarization with programming environment.
i Basic Linux environment and its editors like Vi, Vim & Emacs, gedit etc.
ii Exposure to Turbo C, gcc
iii Writing simple programs using printf(), scanf()</td></tr>
<tr><td>2</td><td colspan="6">WEEK 2
Developing the algorithms/flowcharts for the following sample programs
i Sum and average of 3 numbers
ii Conversion of Fahrenheit to Celsius and vice versa
iii Simple interest calculation</td></tr>
<tr><td>3</td><td colspan="6">WEEK 3
Simple computational problems using arithmetic expressions.
i Finding the square root of a given number
ii Finding compound interest
iii Area of a triangle using heron’s formulae
iv Distance travelled by an object</td></tr>
<tr><td>4</td><td colspan="6">WEEK 4:
Simple computational problems using the operator’ precedence and associativity
i Evaluate the following expressions.
a. A+B*C+(D*E) + F*G
b. A/B*C-B+A*D/3
c. A+++B---A
d. J= (i++) + (++i)
ii Find the maximum of three numbers using conditional operator
iii Take marks of 5 subjects in integers, and find the total, average in float</td></tr>
<tr><td>5</td><td colspan="6">WEEK 5:
Problems involving if-then-else structures.:
i Write a C program to find the max and min of four numbers using if-else.
ii Write a C program to generate electricity bill.</td></tr>
</table>

	iii Find the roots of the quadratic equation. iv Write a C program to simulate a calculator using switch case. v Write a C program to find the given year is a leap year or not.
6	**WEEK 6:** Iterative problems: i Find the factorial of given number using any loop. ii Find the given number is a prime or not. iii Compute sine and cos series iv Checking a number palindrome v Construct a pyramid of numbers.
7	**WEEK 7:** Array manipulation, linear search i Find the min and max of a 1-D integer array. ii Perform linear search on1D array. iii The reverse of a 1D integer array iv Find 2's complement of the given binary number. v Eliminate duplicate elements in an array
8	**WEEK 8:** Matrix problems, String operations, Bubble sort i Addition of two matrices ii Multiplication two matrices iii Sort array elements using bubble sort iv Concatenate two strings without built-in functions v Reverse a string using built-in and without built-in string functions
9	**WEEK 9:** Pointers and structures, memory dereference. i Write a C program to find the sum of a 1D array using malloc() ii Write a C program to find the total, average of n students using structures iii Enter n students data using calloc() and display failed students list iv Read student name and marks from the command line and display the student details along with the total. v Write a C program to implement realloc()
10	**WEEK 10:** i Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields ii Create and display a singly linked list using self-referential structure. iii Demonstrate the differences between structures and unions using a C program. iv Write a C program to shift/rotate using bitfields. iv) Write a C program to copy one structure variable to another structure of the same type.
11	**WEEK 11:** Simple functions using call by value, solving differential equations using Eulers theorem. i Write a C function to calculate NCR value. ii Write a C function to find the length of a string. iii Write a C function to transpose of a matrix. iv Write a C function to demonstrate numerical integration of differential equations using Euler's method

12	**WEEK 12:** Recursive functions: i Write a recursive function to generate Fibonacci series. ii Write a recursive function to find the lcm of two numbers. iii Write a recursive function to find the factorial of a number. iv Write a C Program to implement Ackermann function using recursion. v Write a recursive function to find the sum of series.
13	**WEEK 13:** Simple functions using Call by reference, Dangling pointers. i Write a C program to swap two numbers using call by reference. ii Demonstrate Dangling pointer problem using a C program. iii Write a C program to copy one string into another using pointer. iv Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.
14	**WEEK 14:** File operations i Write a C program to write and read text into a file. ii Write a C program to write and read text into a binary file using fread() and fwrite() iii Copy the contents of one file to another file. iv Write a C program to merge two files into the third file using command-line arguments. v Find no. of lines, words and characters in a file vi) Write a C program to print last n characters of a given file.
TEXT BOOKS:	
1	Ajay Mittal, *Programming in C: A practical approach*, Pearson.
2	Byron Gottfried, *Schaum' s Outline of Programming with C*, McGraw Hill
REFERENCE BOOKS:	
1	Brian W. Kernighan and Dennis M. Ritchie, *The C Programming Language*, Prentice- Hall of India,1988.
2	Forouzan, Gilberg, Prasad, *C Programming, A Problem-Solving Approach*, CENGAGE, 2011.
ONLINE COURSES:	
1	https://mvgrce.codetantra.com

R23HSSM801	HEALTH AND WELLNESS, YOGA AND SPORTS (Common to All Branches of Engineering)					
	Total Contact Hours	15 (P)	**L**	**T**	**P**	**C**
	Pre-requisite	Nil	**0**	**0**	**1**	**0.5**

Course Objective

The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

Course Outcomes

1	Demonstrate the importance of yoga and sports for Physical fitness and sound health.
2	Demonstrate an understanding of health-related fitness components.
3	Compare and contrast various activities that help enhance their health.
4	Assess current personal fitness levels.
5	Develop Positive Personality

SYLLABUS

Unit I	Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups. **Activities:** Organizing health awareness programmes in community ii) Preparation of health profile iii) Preparation of chart for balance diet for all age groups	**5 hr**
Unit II	Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas-Pranayama and meditation, stress management and yoga, Mental health and yoga practice. **Activities:** Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar	**5 hr**
Unit III	Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and 49 Modern Olympics, Asian games and Commonwealth games. **Activities:** i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc. Practicing general and specific warm up, aerobics ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.	**5 hr**

LEARNING RESOURCES

REFERENCE BOOKS:

1	Gordon Edlin, Eric Golanty, *Health and Wellness*, 14th Edn. Jones & Bartlett Learning, 2022.
2	T.K.V.Desikachar, *The Heart of Yoga: Developing a Personal Practice*, Inner Traditions,1999.
3	Archie J.Bahm, *Yoga Sutras of Patanjali*, Jain Publishing Company, 1993.
4	Wiseman, John Lofty, *SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere*, Third Edition, William Morrow Paperbacks, 2014.

5	Thomas Hanlon, *The Sports Rules Book/ Human Kinetics*, 3rd ed. Human Kinetics, Inc.2014.

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I Year II Semester

R23MATT102	DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS (Common to All Branches of Engineering)					
	Total Contact Hours	45 (L)	**L**	**T**	**P**	**C**
	Pre-requisite	Basic Calculus	**3**	**0**	**0**	**3**

Course Objective

- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To furnish the learners with basic concepts and techniques at plus two level to lead them in to advanced level by handling various real-world applications.

Course Outcomes

1	Solve first order differential equations and make use of them to deal with real word problems like law of cooling, growth, decay and electrical circuits.
2	Solve the higher order differential equations to make use of them to deal with real word problems like LCR circuits and simple harmonic motion.
3	Solve the partial differential equations by various methods.
4	Interpret the physical meaning of different operators such as gradient, curl and divergence.
5	Estimate the work done against a field, circulation and flux using vector calculus.
6	Formulate Mathematical models and estimate appropriate physical quantities.

SYLLABUS

Unit I	**DIFFERENTIAL EQUATIONS OF FIRST ORDER AND FIRST DEGREE**	**9 hr**

Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay- Electrical circuits.

Unit II	**LINEAR DIFFERENTIAL EQUATIONS OF HIGHER ORDER (CONSTANT COEFFICIENTS)**	**9 hr**

Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskean, method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.

Unit III	**PARTIAL DIFFERENTIAL EQUATIONS**	**9 hr**

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients.

Unit IV	**VECTOR DIFFERENTIATION**	**9 hr**

Scalar and vector point functions, vector operator del, del applies to scalar point functions -Gradient, del applied to vector point functions - Divergence and Curl, vector identities.

Unit V	**VECTOR INTEGRATION**	**9 hr**

Line integral – circulation - work done, surface integral - flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and applications of these theorems.

LEARNING RESOURCES

TEXT BOOKS:

1	Erwin Kreyszig, *Advanced Engineering Mathematics*, 10/e, John Wiley & Sons, 2018.
2	B.S.Grewal, *Higher Engineering Mathematics*, 44/e, Khanna Publishers, 2017.

REFERENCE BOOKS:	
1	Dennis G.Zill and Warren S.Wright, *Advanced Engineering Mathematics*, Jones and Bartlett, 2018.
2	Michael Green Berg, *Advanced Engineering Mathematics*, 9th edition, Pearson edn
3	George B.Thomas, Maurice D. Weir and Joel Hass, *Thomas Calculus*,14/e, Pearson Publishers, 2018.
4	R. K. Jain and S. R. K. Iyengar, *Advanced Engineering Mathematics*, 5/e, Alpha Science International Ltd., 2021 (9th reprint).
5	B.V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education, 2017.

Bloom's level - Units catchment articulation matrix

CO	Blooms Level	Unit I	Unit II	Unit III	Unit IV	Unit V
CO1	BL 3	X				
CO2	BL 3		X			
CO3	BL 3			X		
CO4	BL 3				X	
CO5	BL 5					X
CO6	BL 6	X	X	X	X	X

R23CHYT102	CHEMISTRY (Common to EEE, ECE, CSE, IT & allied Branches)					
	Total Contact Hours	45 (L)	**L**	**T**	**P**	**C**
	Pre-requisite	Chemistry at 10 + 2 level education	**3**	**0**	**0**	**3**

Course Objective

- Students will get exposure to familiarize engineering chemistry and its applications
- Students will get exposure to train the students on the principles and applications of electrochemistry and polymers
- Students will get exposure to introduce instrumental methods, molecular machines and switches.

Course Outcomes

1	The student will be able to analyze the structure of various homo and hetero atomic molecules and also estimate the energies of the molecules using principles of Quantum mechanics and molecular orbital theory.
2	The student will be able to apply the knowledge of modern engineering materials to solve real world problems and adapt to new developments in the field of material science, electronics and energy technology.
3	The student will be able to analyze, compare, make use of and design the batteries, sensors, fuel cells and various electro analytical techniques.
4	The student will be able to select, distinguish and appraise the diversity and versatility of polymers, elastomers, plastics, conducting and biodegradable polymers, their widespread applications in various industries, and their environmental implications
5	The student will be able to have strong foundation in various analytical and spectroscopic techniques enabling him to apply and evaluate in quality control, scientific exploration and in various industries.
6	Demonstrate the ability to identify, synthesize, interpret, categorize, and characterize different materials and their significance to be used as suitable and appropriate engineering materials using the concepts of quantum mechanics, principles of storage devices, electrochemistry, polymer chemistry, and analytical instrumental methods of analysis to propose innovative solutions to engineering problems/ challenges of simple to complex nature.

SYLLABUS

Unit I	**STRUCTURE AND BONDING MODELS**	**9 hr**

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ^2, particle in one dimensional box

Molecular orbital theory – Bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O_2 and CO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order.

Unit II	**MODERN ENGINEERING MATERIALS**	**9 hr**

Semiconductors - Introduction, basic concept, application

Super conductors - Introduction basic concept, applications.

Supercapacitors - Introduction, Basic Concept-Classification – Applications.

Nano materials - Introduction, classification, properties and applications of fullerenes, carbon nanotubes and Graphines nanoparticles

Unit III	**ELECTROCHEMISTRY AND APPLICATIONS**	**9 hr**

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell,

conductometric titrations (acid-base titrations).

Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples. Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen fuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

Unit IV	**POLYMER CHEMISTRY**	**9 hr**

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation.

Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC,Teflon, Bakelite, Nylon-6,6, carbon fibers.

Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline, – mechanism of conduction and applications.

Bio-Degradable polymers - Poly Glycolic Acid (PGA), Poly Lactic Acid (PLA).

Unit V	**INSTRUMENTAL METHODS AND APPLICATIONS**	**9 hr**

Electromagnetic spectrum - Absorption of radiation: Beer-Lambert's law.

UV-Visible Spectroscopy - electronic transition, Instrumentation,

IR spectroscopy - fundamental modes and selection rules, Instrumentation.

Chromatography-Basic Principle, Classification-HPLC: Principle, Instrumentation and Application

LEARNING RESOURCES

TEXT BOOKS:

1	Jain and Jain, *Engineering Chemistry*, 16/e, DhanpatRai, 2013.
2	Peter Atkins, Julio de Paula and James Keeler, Atkins' *Physical Chemistry*, 10/e, Oxford University Press, 2010.

REFERENCE BOOKS:

1	Skoog and West, *Principles of Instrumental Analysis*, 6/e, Thomson, 2007.
2	J.D. Lee, Concise *Inorganic Chemistry*, 5th Edition, Wiley Publications, Feb.2008.
3	Fred W. Billmayer Jr, *Polymer Science*, 3rd Edition

Bloom's level - Units catchment articulation matrix

CO	Blooms Level	Unit I	Unit II	Unit III	Unit IV	Unit V
CO1	BL 4	X				
CO2	BL 3		X			
CO3	BL 3			X		
CO4	BL 3				X	
CO5	BL 3					X
CO6	BL 6	X	X	X	X	X

R23MECD201	ENGINEERING GRAPHICS (Common to All Branches of Engineering)					
	Total Contact Hours	75(15L+60P)	**L**	**T**	**P**	**C**
	Pre-requisite	Basic mathematics, imagination skills	**1**	**0**	**4**	**3**

Course Objective:

- To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing

Course Outcomes: On completion of the course, the student should be able to

1	Apply the principles of curves, scales, orthographic and isometric projections in engineering drawing.
2	Interpret orthographic projections like front, top and side views related to points, lines, planes and solids.
3	Demonstrate the projection of solids in various positions in the first quadrant.
4	Examine the principles behind development of surfaces.
5	Develop orthographic and isometric projections of solids.

SYLLABUS

Unit I	**CURVES, SCALES AND POLYGONS**	**15 hr**

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.

Curves: construction of ellipse, parabola and hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves.

Scales: Plain scales, diagonal scales and vernier scales.

Unit II	**ORTHOGRAPHIC PROJECTIONS**	**15 hr**

Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes

Projections of Planes: regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

Unit III	**PROJECTIONS OF SOLIDS**	**15 hr**

Projections of Solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

Unit IV	**SECTIONS OF SOLIDS AND DEVELOPMENT OF SURFACES**	**15 hr**

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.

Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

Unit V	**CONVERSIONS OF VIEWS**	**15 hr**

Conversion of Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer graphics: Creating 2D&3D drawings of objects including PCB and Transformations using AutoCAD	
LEARNING RESOURCES	
TEXT BOOKS:	
1	N. D. Bhatt, *Engineering Drawing*, Charotar Publishing House, 2016.
REFERENCE BOOKS:	
1	K.L. Narayana and P. Kannaiah, *Engineering Drawing*, Tata McGraw Hill, Third Edition, 2013.
2	M.B.Shah and B.C. Rana, *Engineering Drawing*, Pearson Education Inc,2009.
3	Dhananjay Jolhe, *Engineering Drawing with an Introduction to AutoCAD*, Tata McGraw Hill, 2017.
ADDITIONAL REFERENCE MATERIAL:	
1	https://nitc.ac.in/imgserver/uploads/attachments/Ed__5c3343c5-c3f9-468a-b114-8f33556810b4_.pdf
ONLINE COURSES:	
1	https://www.mygreatlearning.com/academy/learn-for-free/courses/engineering-graphics-drawing
2	https://onlinecourses.nptel.ac.in/noc21_me128/preview
3	https://www.udemy.com/course/engineering-drawing-graphics/

Bloom's level - Units catchment articulation matrix

CO	Blooms Level	Unit I	Unit II	Unit III	Unit IV	Unit V
CO1	BL 3	X	X	X		
CO2	BL 5	X	X	X		
CO3	BL 3			X	X	X
CO4	BL 4				X	X
CO5	BL 6	X	X	X	X	X

R23EEET201	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (Common to All Branches of Engineering)					
	Total Contact Hours	48 (L)	**L**	**T**	**P**	**C**
	Pre-requisite	Fundamental Physics and Maths	**3**	**0**	**0**	**3**

Course Objective

- Students will gain understanding of laws and principles of electrical and electronics engineering and able to apply this knowledge to build simple circuits in relevant fields.

Course Outcomes: Student

1	Will be able to apply the basic principles of electrical and circuits to solve DC and AC circuits.
2	Will be able to analyze the construction and operation of various electrical machines and measuring instruments also select a machine for an application.
3	Will be able to analyze power generation, electric safety measures and examine electrical power consumption and tariff.
4	Will be able to appraiser a profound comprehension of semiconductor devices, basic electronic circuits, and instrumentation by examining the principles, characteristics, & application and analyze the block diagrams and interactions within electronic instrumentation systems.
5	Will be able to design simple combinational and sequential circuits of digital electronics
6	Will be able to combine the fundamental principles of electrical and electronics engineering to design & solve simple circuits and discuss power generation, control and safety.

SYLLABUS

Unit I	**DC & AC CIRCUITS**	**8 hr**

Electrical circuit elements (R), Ohm's Law and its limitations; KCL; KVL; Electrical circuit elements (L, C);
Superposition theorem; A.C. Fundamentals; Voltage and current relationship with phasor diagrams in R, L, and C circuits; Concept of Impedance, Active power, reactive power, apparent power and power factor;

Unit II	**MACHINES AND MEASURING INSTRUMENTS**	**8 hr**

Construction, principle and operation of & Applications - DC Motor; DC Generator; Single Phase Transformer; Three Phase Induction Motor;
Construction, principle and operation of & Applications – Alternator; Construction and working principle of PMMC Instruments; MI Instruments; Wheatstone bridge;

Unit III	**ENERGY RESOURCES, ELECTRICITY BILL & SAFETY MEASURES**	**8 hr**

Conventional and non-conventional energy resources, Layout and operation of various Power Generation systems - Hydel generation; Nuclear generation; Solar power generation.; Wind power generation.
Power rating of household appliances, Definition of "unit" used for consumption of electrical energy; Two-part electricity tariff, calculation of electricity bill for domestic consumers; Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits; Earthing and types of earthing, Safety Precautions to avoid shock;

Unit IV	**SEMICONDUCTOR DEVICES**	**8 hr**

Evolution of Electronics and Classification of Materials; PN Junction Diode and Characteristics; Zener Diode and Characteristics; Transistor (NPN and PNP) Operation;

Transistor CB configuration; Transistor CE Configuration; Transistor CC Configuration; Small signal Transistor CE amplifier;		
Unit V	**BASIC ELECTRONIC CIRCUITS AND INSTRUMENTATION**	**8 hr**
Half Wave Rectifier; Full Wave Bridge Rectifier; Rectifiers with filters; Zener regulator; DC Power supply (RPS); Public Address System; Frequency response of CE amplifier; Electronic Instrumentation System;		
Unit VI	**DIGITAL ELECTRONICS**	**8 hr**
Number Systems; Binary Codes; Logic gates; Boolean Algebra; Half and Full adder; Flip Flops; Registers; Counters		
LEARNING RESOURCES		
TEXT BOOKS:		
1	D. C. Kulshreshtha, *Basic Electrical Engineering*, Tata McGraw Hill, 2019.	
2	P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, *Power System Engineering*, Dhanpat Rai & Co, 2013.	
3	R. S. Sedha, *A Textbook of Electronic Devices and Circuits*, S. Chand & Co, 2010.	
REFERENCE BOOKS:		
1	V.K. Mehtha, *Principles of Electrical and Electronics Engineering*, S.Chand Technical Publishers, 2020.	
2	S. K. Bhatacharya, *Basic Electrical and Electronics Engineering*, Person Publications, 2018.	
3	R. P. Jain, *Modern Digital Electronics*, Tata Mc Graw Hill, 2009.	
ONLINE COURSES:		
1	https://nptel.ac.in/courses/108105053	
2	https://nptel.ac.in/courses/108108076	

Bloom's level - Units catchment articulation matrix

CO	Blooms Level	Unit I	Unit II	Unit III	Unit IV	Unit V	Unit VI
CO1	BL 3	X	X				
CO2	BL 3		X				
CO3	BL 4			X			
CO4	BL 4				X	X	
CO5	BL 6						X
CO6	BL 6	X	X	X	X	X	X

R23EEET201	DATA STRUCTURES (Common to CSE, IT and Allied Branches)					
	Total Contact Hours	45 (L)	**L**	**T**	**P**	**C**
	Pre-requisite	Basic Programming	**3**	**0**	**0**	**3**

Course Objective

- Students will get exposure to use data structures such as arrays, linked lists, stacks,queues, trees and will be able to select and implement the appropriate data structures to solve the given problem

Course Outcomes:

1	Students will be able to apply various searching and sorting techniques and analyze their time complexities.
2	Students will be able to apply Linked Lists and its variants and utilize them for various applications.
3	Students will be able to compare arrays and Linked Lists and conclude which storage structure is appropriate for the given problem/data structure.
4	Students will be able to develop novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees
5	Students will be able to recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.
6	Students will be able to collaborate in teams to design and implement innovative solutions by choosing and combining the appropriate data structure(s).

SYLLABUS

Unit I	**INTRODUCTION TO LINEAR DATA STRUCTURES**	**9 hr**

Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Overview of time and space complexity analysis for linear data structures. **Searching Techniques**: Linear & Binary Search, **Sorting Techniques**: Bubble sort, Selection sort, Insertion Sort

Unit II	**LINKED LISTS**	**9 hr**

Linked Lists: Singly linked lists, representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists.

Unit III	**STACKS**	**9 hr**

Stacks: Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, backtracking, reversing list etc.

Unit IV	**QUEUES**	**9 hr**

Queues: Introduction to queues: properties and operations, implementing queues using arrays andlinked lists, Applications of queues in breadth-first search, scheduling, etc.

Deques: Introduction to deques (double-ended queues), Operations on deques and their applications.

Unit V	**TREES AND HASHING**	**9 hr**

Trees: Introduction to Trees, Binary Search Tree – Insertion, Deletion & Traversals

Hashing: Brief introduction to hashing and hash functions, Collision resolution techniques: chaining and open addressing, Hash tables: basic implementation and operations, Applications of hashing in unique identifier generation, caching, etc

LEARNING RESOURCES

TEXT BOOKS:

1	Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.

2	Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008.
3	Data Structures, 2/e, Richard F, Gilberg , Forouzan, Cengage.
REFERENCE BOOKS:	
1	Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders.
2	C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
3	Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum
4	Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein.
5	Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms" by Robert Sedgewick
ONLINE COURSES:	
1	https://www.javatpoint.com/data-structure-tutorial
2	https://www.programiz.com/dsa
3	https://www.cs.bham.ac.uk/~jxb/DSA/dsa.pdf

R23CHYL101	CHEMISTRY LAB (Common to EEE, ECE, CSE, IT & allied Branches)					
	Total Contact Hours	30 (P)	**L**	**T**	**P**	**C**
	Pre-requisite	Chemistry at 10 + 2 level education	**0**	**0**	**2**	**1**

Course Objective

- Verify the fundamental concepts with experiments

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

1	Determine the cell constant and conductance of solutions.
2	Prepare advanced polymers and nanomaterials.
3	Measure the strength of an acid present in secondary batteries.
4	Understand, analyze and apply the principles of UV - Visible and IR spectroscopic techniques.
5	Understand and determine the potentials using Potentiometry.

List of Experiments

1	Measurement of 10Dq by spectrophotometric method.
2	Conductometric titration of strong acid vs. strong base.
3	Conductometric titration of weak acid vs. strong base.
4	Determination of cell constant and conductance of solutions.
5	Potentiometry - determination of redox potentials and emfs.
6	Determination of Strength of an acid in Pb-Acid battery.
7	Preparation of a Bakelite.
8	Verify Lambert-Beer's law.
9	Wavelength measurement of sample through UV-Visible Spectroscopy.
10	Identification of simple organic compounds by IR.
11	Preparation of nanomaterials by precipitation method.
12	Estimation of Ferrous Iron by Dichrometry.

LEARNING RESOURCES

TEXT BOOKS:

1	Chemistry lab Manual. Prepared by Department of Chemistry, MVGR College of Engineering (A)

REFERENCE BOOKS:

1	J. Mendham, R. C. Denney, J. D. Barnes, and B. Sivasankar, *Vogel's textbook of quantitative chemical analysis*. New Delhi: Pearson, 2009.

ADDITIONAL REFERENCE MATERIAL:

1	https://www.youtube.com/@spardhayavardhatheyvidya3470

R23EEEL201	ELECTRICAL AND ELECTRONICS ENGINEERING LAB (Common to All Branches of Engineering)					
	Total Contact Hours	45 (P)	**L**	**T**	**P**	**C**
	Pre-requisite	BEEE	**0**	**0**	**3**	**1.5**

Course Objective

- To impart knowledge on design and practical verification basic electrical and electronic circuits and simple energy calculation.

Course Outcomes: Student will be able to

1	Design and analyze simple circuits to verify basic electrical laws and theorems.
2	Design and analyze electrical circuits to measure resistance, power and energy consumption.
3	Understand the voltage buildup procedure in DC shunt generator.
4	Design simple electronic circuits to analyze the behavior of electronic components and verify their applications.
5	Explain the operation of digital circuits.

List of Experiments

1	Verification of KCL and KVL
2	Verification of Superposition theorem
3	Measurement of Resistance using Wheat stone bridge
4	Magnetization Characteristics of DC shunt Generator
5	Measurement of Power and Power factor using Single-phase wattmeter
6	Calculation of Electrical Energy for Domestic Premises
7	Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
8	Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
9	Implementation of half wave and full wave rectifiers
10	Plot Input & Output characteristics of BJT in CE and CB configurations
11	Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
12	Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

Additional experiments

1	Measurement of Earth Resistance using Megger
2	Frequency response of CE amplifier
3	Simulation of RC coupled amplifier with the design supplied

LEARNING RESOURCES

TEXT BOOKS:

1	D. C. Kulshreshtha, *Basic Electrical Engineering*, Tata McGraw Hill, 2019.
2	P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, *Power System Engineering*, Dhanpat Rai & Co, 2013.
3	R. S. Sedha, *A Textbook of Electronic Devices and Circuits*, S. Chand & Co, 2010.

REFERENCE BOOKS:

1	V.K. Mehtha, *Principles of Electrical and Electronics Engineering*, S.Chand Technical Publishers, 2020.
2	S. K. Bhatacharya, *Basic Electrical and Electronics Engineering*, Person Publications, 2018.
3	R. P. Jain, *Modern Digital Electronics*, Tata Mc Graw Hill, 2009

ADDITIONAL REFERENCE MATERIAL:

1	https://www.udemy.com/course/complete-course-on-electronic-devices-and-circuits/
2	http://nptel.iitm.ac.in/
3	http://www.learningware.in/

R23EEEL201	DATA STRUCTURES LAB (Common to CSE, IT & Allied Branches)					
	Total Contact Hours	45 (P)	**L**	**T**	**P**	**C**
	Pre-requisite	Nil	**0**	**0**	**3**	**1.5**

Course Objective

- Students will be able to develop programs for solving real time problems by choosing appropriate data structure concepts.

Course Outcomes:

1	Students will be able to explain the role of linear data structures in organizing and accessing data efficiently in algorithms.
2	Students will be able to design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.
3	Students will be able to develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.
4	Students will be able to apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues, and apply them appropriately to solve data management challenges.
5	Students will be able to devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees

List of Experiments

1	**Exercise 1: Array Manipulation** i) Write a program to reverse an array. i) C Programs to implement the Searching Techniques – Linear &Binary Search ii) C Programs to implement Sorting Techniques – Bubble, Selection and Insertion Sort
2	**Exercise 2: Linked List Implementation** i) Implement a singly linked list and perform insertion and deletionoperations. ii) Develop a program to reverse a linked list iteratively and recursively. iii) Solve problems involving linked list traversal and manipulation.
3	**Exercise 3: Linked List Applications** i) Create a program to detect and remove duplicates from a linked list. ii) Implement a linked list to represent polynomials and performaddition. iii) Implement a double-ended queue (deque) with essential operations.
4	**Exercise 4: Double Linked List Implementation** i) Implement a doubly linked list and perform various operations tounderstand its properties and applications. ii) Implement a circular linked list and perform insertion, deletion, and traversal.
5	**Exercise 5: Stack Operations** i) Implement a stack using arrays and linked lists. ii) Write a program to evaluate a postfix expression using a stack. iii) Implement a program to check for balanced parentheses using a stack.
6	**Exercise 6: Queue Operations** i) Implement a queue using arrays and linked lists. ii) Develop a program to simulate a simple printer queue system. iii) Solve problems involving circular queues.
7	**Exercise 7: Stack and Queue Applications** i) Develop a program to simulate a simple printer queue system. ii) Use a stack to evaluate an infix expression and convert it to postfix. iii) Create a program to determine whether a given string is a palindromeor not.

	iv) Implement a stack or queue to perform comparison and check for symmetry
8	**Exercise 8: Binary Search Tree** i) Implementing a BST using Linked List. ii) Traversing of BST.
9	**Exercise 9: Hashing** i) Implement a hash table with collision resolution techniques. ii) Write a program to implement a simple cache using hashing.
LEARNING RESOURCES	
TEXT BOOKS:	
1	Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
2	Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, SiliconPress, 2008
REFERENCE BOOKS:	
1	Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
2	C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
3	Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum
4	Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, andClifford Stein
5	Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and GraphAlgorithms by Robert Sedgewick.
ADDITIONAL REFERENCE MATERIAL:	
1	https://www.udemy.com/course/complete-course-on-electronic-devices-and-circuits/
2	http://nptel.iitm.ac.in/
3	http://www.learningware.in/

R23HSSM802	NSS/NCC/SCOUTS AND GUIDES/COMMUNITY SERVICE (Common to All Branches of Engineering)					
	Total Contact Hours	15 (P)	**L**	**T**	**P**	**C**
	Pre-requisite	Nil	**0**	**0**	**1**	**0.5**

Course Objective

- The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

Course Outcomes

1	Demonstrate the importance of discipline, character and service motto.
2	Solve some societal issues by applying acquired knowledge, facts, and techniques.
3	Explore human relationships by analyzing social problems.
4	Develop service-oriented approach to extend their help for the fellow beings and downtrodden people.
5	Develop leadership skills and civic responsibilities.

SYLLABUS

Unit I	General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance. **Activities:** i) Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills ii) Conducting orientations programs for the students –future plans-activities-releasing road map etc. iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc. iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.	**5 hr**
Unit II	**NATURE & CARE** **Activities:** i) Nature & Care Best out of waste competition. ii) Poster and signs making competition to spread environmental awareness. iii) Recycling and environmental pollution article writing competition. iv) Organizing Zero-waste day. v) Digital Environmental awareness activity via various social media platforms. vi) Virtual demonstration of different eco-friendly approaches for sustainable living. vii) Write a summary on any book related to environmental issues.	**5 hr**
Unit III	**COMMUNITY SERVICE** **Activities:** i) Community Service Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities- experts-etc. 24 JNTUGV B. Tech. R23 Regulations ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS, iii) Conducting consumer Awareness. Explaining various legal provisions etc. iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education. v) Any other programmes in collaboration with local charities, NGOs etc.	**5 hr**

LEARNING RESOURCES	
REFERENCE BOOKS:	
1	Nirmalya Kumar Sinha & Surajit Majumder, *A Text Book of National Service Scheme Vol;.I*, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
2	Red Book - *National Cadet Corps – Standing Instructions Vol I & II*, Directorate General of NCC, Ministry of Defence, New Delhi
3	Davis M. L. and Cornwell D. A., *Introduction to Environmental Engineering*, McGraw Hill, New York 4/e 2008
4	Masters G. M., Joseph K. and Nagendran R. *Introduction to Environmental Engineering and Science*‖, Pearson Education, New Delhi. 2/e 2007.
5	Ram Ahuja. *Social Problems in India*, Rawat Publications, New Delhi.

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