

**4 Year B.Tech Program
of
CSE (Artificial Intelligence and Machine Learning)**



**R-24 Regulations & Scheme
(w.e.f. 2024-2025)**



DEPARTMENT OF CSE (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)
BAPATLA ENGINEERING COLLEGE :: BAPATLA
(AUTONOMOUS UNDER ACHARYA NAGARJUNA UNIVERSITY)
(SPONSORED BY BAPATLA EDUCATION SOCIETY)
BAPATLA - 522102 GUNTUR DISTRICT, A.P.
www.becbapatla.ac.in



Bapatla Engineering College: Bapatla -522102 (Autonomous)

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Department of CSE (Artificial Intelligence and Machine Learning)

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INSTITUTE VISION

To build centers of excellence, impart high quality education and instill high standards of ethics and professionalism through strategic efforts of our dedicated staff, which allows the college to effectively adapt to the ever-changing aspects of education.

To empower the faculty and students with the knowledge, skills and innovative thinking to facilitate discovery in numerous existing and yet to be discovered fields of engineering, technology and interdisciplinary endeavours.

INSTITUTE MISSION

Our Mission is to impart the quality education at par with global standards to the students from all over India and in particular those from the local and rural areas.

We continuously try to maintain high standards so as to make them technologically competent and ethically strong individuals who shall be able to improve the quality of life and economy of our country.

PROGRAM OUTCOMES

PO1-Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2-Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3-Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4-Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.



PO5-Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6-The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7-Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO8-Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO9-Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO10-Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO11-Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.



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Academic Rules & Regulations

(R24 Regulations)

Regulations for Four Year Bachelor of Technology (B.Tech)

Degree Program for the Students Admitted from the Academic Year 2024-25

1. Admissions

The sanctioned intake in a particular B.Tech program comprises of Category-A (presently 70%) and Category-B (30%) seats which is supplemented with supernumerary (10%) EWS seats. Admissions for the Category-A seats and the supernumerary seats shall be made by the Andhra Pradesh (A.P.) State Government based on the merit rank obtained by the student in the common entrance examination conducted. Admissions for the remaining Category-B seats shall be made by the college in accordance with the guidelines issued by the A.P. State Government.

2. Medium of Instruction and Examination:

The medium of instruction of the entire B.Tech undergraduate program in Engineering and Technology and the examinations will be in English only.

3. Minimum Instruction Days:

A semester comprises of 90 working days and the year is divided into two semesters.

4. Award of B.Tech. Degree:

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

- a. The student pursues a program of study in B.Tech for four academic years and in not more than eight academic years. A lateral entry student pursues a program of study for 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 not be counted in the maximum time permitted for graduation.
- b. The student registers for 160 credits and secures all 160 credits. However, a lateral entry student registers for 121 credits and secures all the 121 credits from III semester to VIII semester of regular B. Tech program.
- c. **Award of B. Tech degree with Minor:**
The student secures an additional 16 credits from Minor stream chosen and fulfills all the requisites of a B.Tech program i.e. secures 160 (Regular program) / 121 (Lateral Entry program) credits.
Minor is to be completed simultaneously with B.Tech program. Registering for a Minor degree is optional.
- d. **Award of B.Tech degree with Honors:**
The student secures an additional 16 credits fulfilling all the requisites of B.Tech program i.e. secures 160 (Regular program) / 121 (Lateral Entry program) credits.



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Registering for Honors is optional and is to be completed simultaneously with B.Tech program.

Students can register either for Honors stream or Minor stream.

5. Courses of study:

At present the following B.Tech programs of study are offered.

S. No.	Title of the UG Program	Abbreviation
1.	Civil Engineering	CE
2.	Computer Science & Engineering	CS
3.	Computer Science & Engineering (Cyber Security)	CB
4.	Computer Science & Engineering (Data Science)	DS
5.	Computer Science & Engineering (Artificial Intelligence & Machine Learning)	CM
6.	Electronics & Communication Engineering	EC
7.	Electrical & Electronics Engineering	EE
8.	Information Technology	IT
9.	Mechanical Engineering	ME

6. Credits:

- Credit:** A unit by which the course work is measured. It determines the number of hours (60 minutes) 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.
- Academic Year:** Two consecutive (one odd & one even) semesters constitute one academic year.
- Choice Based Credit System (CBCS):** The CBCS provides a choice for students to select courses (Professional, Job Oriented & Open Electives) from the prescribed set of courses.
- Each course in a semester is assigned certain number of credits based on the following

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
Internship of 4 – 6 weeks	2 Credits
Project Work of 16 weeks	12 Credits



7. Course Structure:

Every course of the B.Tech program will be placed in one of the 7 categories with suggested credits as listed below.

S. No.	Category	AICTE Recommended Credits (%)	Breakup of Credits (Total 160)
1.	Humanities and Social Sciences including Management (HM)	5 – 8 %	8 – 13
2.	Basic Science Courses (BS)	12 – 16 %	19 – 26
3.	Engineering Science Courses (ES)	10 – 18 %	16 – 29
4.	Professional Core Courses (PC)	30 – 36 %	48 – 58
5.	Electives – Professional Electives (PE); Job Oriented Electives (JOE); Open Electives (OE); Skill Enhancement Courses (SEC)	19 – 25 %	31 - 40
6.	Internships & Project Work (PR)	8 – 11 %	16
7.	Mandatory Courses (MC)	-	Non-credit

8. Course Evaluation Process:

The performance of the students in each semester shall be assessed course wise. All assessments will be done on an absolute mark basis. However, for the purpose of reporting the performance of a candidate, letter grades and grade points will be awarded.

The performance of a student in each course is assessed with alternate assessment methods, term examinations on a continuous basis during the semester called Continuous Internal Evaluation (CIE) and a Semester End Examination (SEE) conducted at the end of the semester. For each course, there shall be a comprehensive SEE of three hours duration at the end of each semester, except Mandatory courses.

The performance of a student in Internships, NSS/NCC/Scouts & Guides/Community Service and Health & Wellness/Yoga/Sports will be evaluated after completion of the course at the end of that semester.



8.1 Weightage for Course Evaluation:

The distribution of marks between CIE and SEE to be conducted at the end of the semester will be as follows:

Nature of the Course	CIE	SEE
Theory Courses	40	60
Practical Courses	40	60
Mandatory Courses	40	-
NSS/NCC/Scouts & Guides/Community Service and Health & Wellness/Yoga/Sports	-	100
Summer Internship	-	100
Project Work	40	60

8.2 CIE in Theory/Mandatory Courses:

In each Semester there shall be two Term Examinations and *Alternate Assessment Tools (AAT)* like Home Assignment, Class Test, Problem Solving, Group Discussion, Quiz, Seminar and Field Study in every theory course. The AAT with detailed modality of evaluation for each course shall be finalized by the teacher concerned before beginning of the course. It will be reviewed and approved by the Department Committee.

The Term Examination is conducted in the regular mode according to a schedule which will be common for a particular semester of study. The maximum weightage for Term Examinations, AATs and the calculation of marks for CIE in a theory course is given in the following Table.

Term Exams (Max. 20 marks*)	AAT (Max. 15 marks**)	Attendance (Max. 5 marks)
75% of marks obtained in the best performed term exam + 25% of marks obtained in the other term exam	Continuous assessment by teacher as per the predetermined course delivery & assessment plan. (Minimum two & maximum four assessments). AAT marks shall be considered based on average of all tests conducted.	Attendance secured & marks awarded will be as under: ≥75% and <80% - 2 marks ≥80% and <85% - 3 marks ≥85% and <90% - 4 marks ≥90% - 5 marks

*Term Examination will be conducted for 30 marks and reduced to 20 marks.

**Each AAT will be conducted for 10 marks and the average performance shall be scaled up to 15 marks.



8.3 CIE in Laboratory Courses:

The CIE for 40 marks of a laboratory course comprises of 15 marks for day-to-day laboratory work, 5 marks for record submission, 5 marks for attendance and 15 marks for a laboratory examination at the end of the laboratory course work. In any semester, a minimum of 90% of prescribed number of experiments / exercises specified in the syllabi for laboratory course shall be completed by the students. They shall complete these experiments / exercises in all respects and get the record certified by the internal lab teacher concerned and the Head of the Department.

8.4 CIE in Project Work:

The CIE is for 40 marks which consist of 20 marks for reviews at the end of each month as per the process document in the form of seminars / presentations, 5 marks for attendance and 15 marks for the evaluation of project report submitted at the end of the semester.

8.5 Pass criteria for CIE:

A minimum of 20 (50%) marks are to be secured exclusively in the CIE with a minimum of 65% attendance in that course to be declared as qualified (Q) in that course and be eligible to appear for the SEE of that course. If a student fails to obtain 20 marks in CIE or a minimum of 65% attendance in that course, then the student will be regarded as not qualified (NQ) and such a student can register for the course repetition as per the guidelines mentioned in clause 13 to qualify in that course. After securing 20 marks in course repetition, the student can appear for the SEE of that course as a supplementary candidate.

8.6 SEE in Theory Course, Laboratory Course and Project Work:

- a) For each theory course, there shall be a comprehensive SEE of three hours duration at the end of each Semester for 60 marks.
- b) For each laboratory course, the SEE shall be conducted by one internal and one external examiner appointed by the Principal and the duration of the exam shall be for three hours. The SEE is for 60 marks which include 15 marks for write up, 35 marks for lab experiment / exercise and 10 marks for Viva-voce.
- c) Project Work shall be evaluated in the form of a Viva-Voce and demonstration of the thesis work for 60 marks. Viva-voce Examination in project work shall be conducted by one internal examiner appointed by the HOD and one external examiner to be appointed by the Principal.

8.7 Evaluation of Internships:

Summer Internship at the end of IV & VI semesters carried out in industry / organization are to be evaluated in V & VII semesters respectively after the submission of certificate provided by the organization and a concise report submitted by the student to the department committee. The internship will be evaluated by the department committee for a total of 100 marks with 50 marks for the report and 50 marks based on seminars / presentation given to the department committee by the student.



8.8 Evaluation of NSS/NCC/Scouts & Guides/Community Service and Health & Wellness/Yoga/Sports:

The above courses will be evaluated by the department committee for a total of 100 marks with 50 marks for the activities pursued by the student during that semester and 50 marks based on seminars / presentation given to the department committee by the student.

8.9 Pass Criteria for SEE:

a) Theory/Laboratory Courses and Project Work

A minimum of 21 (35%) marks are to be secured exclusively in the SEE of the above courses for the award of the grade and securing the credits for that course.

A student eligible to appear for the SEE in a course but is absent or has failed the examination may appear for SEE of that course in the next supplementary examination when offered.

b) Internship, NSS/ NCC/ Scouts & Guides/ Community Service and Health & Wellness/ Yoga/ Sports

A minimum of 40 (40%) marks are to be secured exclusively in the evaluation of the above courses for the award of the grade and securing the credits for that course.

A student eligible to appear for the evaluation in the above courses but is absent or has failed in the examination may appear for evaluation of that course in the next supplementary examination when offered.

9. Choice Based Courses:

Students can select a course from a prescribed set of courses offered by the department in the following categories.

- a) **Professional Elective Courses:** There shall be five Professional Elective Courses from V Semester to VII. For each elective course there shall be a choice such that the student can choose a course from the list of courses offered by the department for that elective.
- b) **Job Oriented Elective Courses:** There shall be three Job Oriented Elective Courses in all programs from V to VII semester. For each elective course there shall be a choice such that the student can choose a course from the list of courses offered by the department for that elective.
- c) **Open Elective Courses:** One Open Elective Course in VII semester will be offered by various departments. A student can choose and register for an open elective course which is offered by other departments only and he / she has not studied the same course in any form during the Program.
- d) **Massive Open Online Courses (MOOCs):** A Student must pursue and complete one course compulsorily through MOOCs from approved organizations for awarding the degree. A student can pursue MOOCs courses from Professional Elective / Job Oriented Elective / Open Elective Courses only. The student must inform and take prior permission / approval from the Internal Department



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Committee. The courses must be of a minimum of 8 weeks in duration and shall contain proctored examinations. The student must acquire a certificate for the concerned course from the agency to earn the credits for that course. For further details and guidelines, the students can visit the college website.

The Internal Department Committee comprising Head of Department and two senior faculty members shall evaluate the certificate / grades / marks awarded for a course by external agencies and convert the same to equivalent marks / grades.

10. Induction Program:

There shall be a mandatory induction program for three weeks before the commencement of the first semester with no credits.

11. There shall be credit programs like NSS/NCC/Scouts & Guides/Community Service and Health & Wellness/Yoga/Sports. Also Design Thinking & Innovation and Tinkering lab are made compulsory credit courses for all branches.

12. Make-up Test:

- a) A student can appear for a Make-up Test for a maximum of two theory courses of a semester to improve marks in the Continuous Internal Evaluation (CIE).
- b) A student is eligible for the Make-up test which is conducted after the second Mid Term examination and before SEE examination if the student satisfies the following conditions.
 - i) Unable to secure 50% internal marks (CIE) and has more than or equal to 65% attendance in a particular theory course (After finalizing the internal marks).
 - ii) Attendance in Remedial classes is more than or equal to 65% (if Remedial classes are conducted) or secured greater than 50% marks in the I Mid Term Examination and AAT-1 together.
 - iii) Attended 50% of CIE tests (at least one AAT & one Mid Term Examinations).

The make-up test will be conducted for 40 marks (8 questions of 1 mark each, 2 questions of 16 marks each) in Mid Examination format covering the entire syllabus and the marks obtained in this test are final. However, the maximum marks awarded will be 20 only.

The students must apply to the principal through the respective HOD by paying prescribed fees.

The documents for registration of the Make-up test are available from the departments and college website.



13. Course Repetition:

The students not qualified to write SEE in a course may register for the repeater courses through Course Repetition. The students must apply to the principal through the respective HOD by paying prescribed fees.

A student can take up a maximum of two theory courses and one laboratory course in a semester immediately after the semester end examinations of that semester. The students who are not taking regular semester courses may additionally register for one more theory course.

The documents for registration of course and monitoring the candidates registered for course repetition are available from the departments and college website.

14. Minimum Academic Requirements for Promotion:

a) Semester Promotion

A student is eligible to register for SEE if he/she satisfies the following conditions. However, the student can appear only for the SEE of those courses in which the student is qualified (Q).

i) Attendance Requirements

A student shall be eligible to register for SEE, if he / she acquires a minimum of 75% of attendance in aggregate of all the courses in a semester.

Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted on genuine medical grounds with a doctor certificate and duly approved by the principal.

A shortage of attendance below 65% in aggregate shall in NO case be condoned. Students whose shortage of attendance is not condoned in any semester are not eligible to take their SEE of that semester and will be considered as detained in that semester.

If a student does not satisfy the attendance requirements of the present semester, he / she will not be promoted to the next semester (considered as detained in the present semester). They may seek readmission for that semester when offered next.

A stipulated fee shall be payable towards condonation of shortage of attendance to the college.

ii) Qualification in CIE

A student must qualify in a minimum of three courses in each semester (as per Clause 8.2.4) in CIE to register for the SEE of that semester.

If a student does not satisfy the above conditions, he / she will not be promoted to the next semester (considered as detained in that semester). They may seek readmission for the detained semester when offered next.



b) Promotion / Detention Conditions based on the minimum credits to be secured by the student:

A student shall be promoted from I to II, III to IV, V to VI and VII to VIII semesters if he / she fulfills the academic requirement as specified in 14.a). For other semesters i.e. II to III (1st year to 2nd year), IV to V (2nd year to 3rd year) and VI to VII (3rd year to 4th year) semesters, the following criteria is to fulfilled in addition to 14.a) clause.

i) II semester to III semester (1st year to 2nd year)

A student shall be promoted from II semester to III semester only if he / she fulfills the academic requirement of securing 25% of the credits in the courses that have been studied up to I Semester.

ii) IV semester to V semester (2nd year to 3rd year)

A student shall be promoted from IV semester to V semester only if he/she fulfills the academic requirement of securing 40% of the credits in the courses that have been studied up to III Semester.

iii) VI semester to VII semester (3rd year to 4th year)

A student shall be promoted from VI semester to VII semester only if he/she fulfills the academic requirements of securing 40% of the credits in the courses that have been studied up to V semester.

If a student is not promoted or detained for want of credits in a particular semester as per clause 14.b) above, the student may secure the required credits through supplementary examinations and only after securing the required credits he / she shall be permitted to join in the III or V or VII Semester as the case may be.

c) With-holding of Results

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

15. Guidelines for offering a Minor in a discipline:

Minor in a discipline concept is introduced in the curriculum for all conventional B. Tech programs in which it offers a Major Program (B.Tech degree). The main objective of Minor in a discipline is to provide additional learning opportunities for academically motivated students and it is an optional added feature of the B. Tech. program.

- Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in Minor specialization groups offered by a department other than their parent department.
- The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand. For example, the Minor tracks can be the fundamental courses in CSE, ECE, EEE, CE, ME etc or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, VLSI etc.
- The list of disciplines / branches eligible to opt for a particular industry relevant minor specialization shall be clearly mentioned by the respective BOS.
- There shall be no limit on the number of programs offered under Minor. The



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Institution can offer Minor programs in emerging technologies based on expertise in the respective departments or can explore the possibility of collaborating with the relevant industries/agencies in offering the program.

- e. The concerned BOS shall decide on the minimum enrolments for offering Minor program by the department. If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BOS.
- f. A student shall be permitted to register for Minor program at the beginning of 4th semester provided that the student must have acquired a minimum of **7.0 CGPA** up to the end of 3rd semester without any backlogs. A CGPA of 7.0 must be maintained in the subsequent semesters without any backlog to keep the Minor registration active.
- g. A student must earn an additional 16 credits in the specified area to be eligible for the award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the Undergraduate degree in Major discipline (i.e. 160 credits for regular students and 121 credits for Lateral Entry students). The concerned BOS shall finalize the modalities to earn the above credits.
- h. For securing the above additional 16 credits, the students must register and complete three courses of 4 credits each offered by the department concerned. These 3 courses must contain a laboratory component also (i.e. Embedded course having three lecture hours and two practical hours). The balance of 4 credits may be secured through two MOOCs courses of 2 credits each or an embedded course offered by the department.
- i. Courses that are used to fulfil the student's primary Major may not be double counted towards the Minor. Courses with content substantially equivalent to courses in the student's primary Major may not be counted towards the Minor.
- j. The student registered for Minor shall pass in all subjects that constitute the requirement for the Minor program. No class / division (i.e., second class, first class, distinction, etc.) shall be awarded for Minor degree programme
- k. If a student drops (or terminated) from the Minor program, they cannot convert the earned credits into free or core electives; they will remain extra.
- l. In case a student fails to meet the CGPA requirement for B.Tech degree as per clause 15.f or drops (or terminated) from the Minor program, he/she will be dropped from the list of students eligible for Minors degree and they will receive B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.
- m. The Minor will be mentioned in the Major degree certificate only. No additional degree certificate will be given for Minor degree.
- n. Transfer of credits from Minor to regular B. Tech degree and vice-versa shall not be permitted
- o. Minor must be completed simultaneously with a Major degree program. A student cannot earn the Minor degree after he / she has already earned bachelor's degree.
- p. The documents for registration of Minor courses are available from the departments and college website.



16. Guidelines for offering an Honors in a Discipline:

The objective of introducing B.Tech (Honors) is to facilitate the students to choose additional 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.

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. Students are eligible to opt for Honors program offered by the same Department / Discipline.

- a. Students who are desirous of pursuing special interest / advanced areas of their discipline of Engineering may opt for additional courses as part of Honors programs offered by the parent department.
- b. The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand.
- c. A student shall be permitted to register for Honors program at the beginning of 4th semester provided that the student must have acquired a minimum of **7.5 CGPA** up to the end of 3rd semester without any backlogs. A CGPA of 7.5 must be maintained in the subsequent semesters without any backlog to keep the Honors registration active.
- d. A student must earn additional 16 credits for award of B.Tech. (Honors) degree from the 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 for regular students and 121 credits for Lateral Entry students). The concerned BOS shall finalize the modalities to earn the above credits.
- e. For securing the above additional 16 credits, the students must register and complete three courses of 4 credits each offered by the department concerned. These 3 courses must contain a laboratory component also (i.e. Embedded course having three lecture hours and two practical hours). The balance of 4 credits may be secured through two MOOCs courses of 2 credits each or an embedded course offered by the department.
- f. Courses that are used to fulfil the student's primary Major may not be counted towards the Honors.
- g. The student registered for Honors shall pass in all subjects that constitute the requirement for the Honors program. No class / division (i.e., second class, first class and distinction, etc.) shall be awarded for Honors program.
- h. If a student drops or is terminated from the Honors program, the additional credits earned so far cannot be converted into open or core electives; they will remain extra.
- i. In case a student fails to meet the CGPA requirement for B.Tech degree as per clause 16.c or drops (or terminated) from the Honors program, he/she will be dropped from the list of students eligible for degree with Honors and they will receive B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them
- j. The Honors will be mentioned in the Major degree certificate only as Bachelor of Technology (Honors). No additional degree certificate will be given for Honors.
- k. Transfer of credits from Honors to regular B. Tech degree and vice-versa shall not be permitted.
- l. Honors is to be completed simultaneously with a Major degree. A student cannot earn the Honors after he / she has already earned bachelor's degree



- m. The documents for registration of Honors are available from the departments and college website.

17. Summer Internships:

Students shall undergo two summer internships each for a minimum of four weeks duration at the end of second and third years of the program for 2 credits each. The organization in which the student wishes to carry out Internship needs to be approved by Internal Department Committee comprising Head of Department and two senior faculty members. The student shall submit a report along with an internship certificate from the organization. The evaluation of the first and second summer internships shall be conducted at the end of the V Semester & VII semester respectively.

Completion of the internship is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such a case, the student shall repeat the internship in the subsequent summer. The student pursuing two summer internships in the same summer is not permitted.

Community Service Project focussing on specific local issues shall be an alternative to the four weeks of summer Internship. The Community Service Project shall be for 4 weeks in duration which includes preliminary survey for 1 week, community awareness programs for one week, community immersion program in consonance with Government agencies for 1 week and a community exit report (a detailed report) for 1 week.

18. A student shall register and put-up minimum attendance in all 160 credits and earn all the 160 credits. In the case of lateral entry students, the number of credits is 121.
19. Students who fail to earn 160 credits as indicated in the course structure within eight academic years from the year of their admission shall forfeit their seat in B.Tech. Program, and their admission shall be cancelled. However, for the students availing the Gap year facility, this period shall be extended by corresponding gap year duration availed.

Lateral entry students who fail to earn 121 credits as indicated in the course structure within six academic years from the year of their admission shall forfeit their seat in B.Tech. Course and their admission shall be cancelled. However, for the students availing gap year facility, this period shall be extended by corresponding gap year duration availed.

20. Securing Credits and award of Grade Points:

Grading

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 % of marks in the course fall	Grade	Grade Points Assigned
≥ 90	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 (Below Average)	5
< 40	F (Fail)	0
Absent	Ab (Absent)	0

A student obtaining Grade F shall be considered failed and will be required to reappear for that course when the next supplementary SEE is offered. Same is the case with a student who obtains 'Ab' in the SEE.

Since there are no credits for Mandatory /Audit courses, only 'Pass' or 'Fail' shall be mentioned for such courses.

21. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

- (i) The Semester Grade Point Average (SGPA) in a particular semester 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.,

$$SGPA = \frac{\sum_{i=1}^n C_i \times GP_i}{\sum_{i=1}^n C_i}$$

where C_i is the number of credits of the i^{th} course and GP_i is the grade point scored by the student in the i^{th} course.

- (ii) 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.,

$$CGPA = \frac{\sum_{j=1}^m SGPA_j \times TC_j}{\sum_{j=1}^m TC_j}$$



where “SGPA_j” is the SGPA of the jth semester and TC_j is the total number of credits in that semester.

- (iii) Both SGPA and CGPA shall be truncated to 2 decimal points and reported in the transcripts.
- (iii) While computing the SGPA, the courses in which the student is awarded Zero grade points will also be included.
- (iv) Grade Point: It is a numerical weightage allotted to each letter grade on a 10-point scale.
- (v) Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters S, A, B, C, D, E and F.

22. 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
First Class	$\geq 6.5 < 7.5$
Second Class	$\geq 5.5 < 6.5$
Pass Class	$\geq 5.0 < 5.5$

23. Gap Year:

Gap year concept for Student Entrepreneur shall be 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 entrepreneurship program / to establish startups. This period may be extended to two years at the most and these two years would not be counted as the maximum time for graduation.

An evaluation committee shall be constituted by the College to evaluate the proposal submitted by the student and the committee shall decide whether to permit the student(s) to avail themselves of the Gap Year.

After rejoining the student can pursue the remaining period of study under transitory regulations (if the regulation changes).

24. Transitory Regulations:

Discontinued or detained candidates (as per clause 14.b) are eligible for readmission as and when the semester is offered and after fulfillment of academic regulations. Candidates who have been detained as per clause 14.a) are eligible for readmission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered.



Candidates who were permitted with Gap Year shall be eligible for rejoining into the succeeding year of their B.Tech from the date of commencement of class work.

The readmitted students must follow the regulations in which he/she is admitted and residual courses if any must be completed based on the equivalent courses for each semester specified by the BOS considering the previous and readmitted regulations.

25. 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 Institution shall allow up to a maximum of 15 credits (5 courses, approximately 10% for the total credits of the program) through MOOCs platform.

- a. The Institution shall offer credit mobility for MOOCs and give the equivalent credit weightage to the students for the credits earned through online learning courses.
- b. 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 and take prior approval from the department.
- c. Credit transfer policy will be applicable to the Professional Elective Courses, Job Oriented Elective Courses, Open Elective Courses & Management Courses only.
- d. The concerned department shall identify the courses permitted for credit transfer.
- e. The department shall notify the list of the online learning courses at the beginning of semester eligible for credit transfer.
- f. The department shall designate a faculty member as a Mentor for each course to guide the students from registration till completion of the course.
- g. The department shall ensure no overlap of MOOC exams with that of the university examination schedule. In case of delay in results, the Institution will re-issue the marks sheet for such students.
- h. Credits transfer will be considered only after successful completion of the course and submitting a certificate issued by the competent authority along with the percentage of marks and/or grades.
- i. The institution shall submit the following to the examination section:
 - i. List of students who have passed MOOC courses in the current semester along with the certificate of completion.
 - ii. Undertaking form filled by the students for credit transfer.
- j. The Institution 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.

26. Academic Bank of Credits (ABC):

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

- a. Provide option of mobility for learners across the universities of their choice.
- b. Provide option to gain the credits through MOOCs from approved digital platforms.
- c. Facilitate award of Certificate / Diploma / Degree (B.Sc) in line with the accumulated credits in ABC
- d. Execute Multiple Entry and Exit system with credit count and credit transfer.



27. Exit Policy:

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

- a. **UG Certificate** (in Field of study / discipline) - Programme duration: First year (first two semesters) of the undergraduate programme, 39 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.
- b. **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.
- c. **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.

28. Student Transfers

Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh and the affiliated University from time to time.

29. Punishments for Malpractice cases – Guidelines:

- a) If any student caught under malpractice during the CIE examinations, the entire cycle of examinations will be cancelled and awarded zero marks for all the courses during that cycle. For example, if any student is caught while doing malpractice in an AAT, the AAT marks of all the courses in that cycle will be cancelled. Similar punishment will be considered for mid-term examinations also.
- b) For Semester End Examinations, the examinations committee may take the following guidelines into consideration while dealing with the suspected cases of malpractice reported by the invigilators / squad members etc. The punishment may be more severe or less severe depending on the merits of the individual cases.

S. No.	Nature of Malpractice/Improper conduct	Punishment
1.	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cellphones, pager, palm computers or any other form of material concerned with or related to the course 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	Expulsion from the examination hall and cancellation of the performance in that course only.



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	student which can be used as an aid in the course of the examination).	
2.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.
3.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that course and all other courses the candidate has appeared including practical examinations and project work of that semester/year examinations.
4.	Gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any other student or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the students involved. In case of an outsider, he will be handed over to the police and a case shall be registered against him.
5.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year.
6.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year.
7.	Smuggles in the Answer book or takes out or arranges to send out the question paper during the examination or answer book during or after the examination	Expulsion from the examination hall and cancellation of performance in that course and all the other courses including practical examinations and project work of that semester/year. The student is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeit of seat.



8.	Refuses to obey the orders of the Chief Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case shall be registered against them.
9.	Leaves the exam hall taking away answer script or intentionally tears up the script or any part there of inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses including practical examinations and project work of that semester/year. The candidate is also debarred for two consecutive semesters from classwork and all end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
10.	Possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year. The student is also debarred and forfeits the seat.



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11.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in S.No. 7 to S.No. 9.	For Student of the college: Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case shall be registered against them.
12.	Impersonates any other student in connection with the examination	<p>The student who has impersonated shall be expelled from examination hall. The student is debarred from writing the remaining exams, and rusticated from the college for one academic year during which period the student will not be permitted to write any exam. If the imposter is an outsider, he will be handed over to the police and a case shall be registered against him.</p> <p>The performance of the original student who has been impersonated, shall be cancelled in all the courses of the examination including practical's and project work of that semester/ year. The student is rusticated from the college for two consecutive years during which period the student will not be permitted to write any exam. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.</p>
13.	If any malpractice is detected which is not covered in the above S.No. 1 to S.No. 12 items, it shall be reported to the college academic council for further action and award suitable punishment.	
14.	Malpractice cases identified during sessional examinations will be reported to the examination committee nominated by Academic council to award suitable punishment.	



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30. ADDITIONAL ACADEMIC REGULATIONS:

- a. Any attempt to impress upon the teachers, examiners, faculty and staff of Examinations, bribing for either marks or attendance will be treated as malpractice.
- b. When a component of Continuous Internal Evaluation (CIE) or Semester End Examination (SEE) is cancelled as a penalty, he/she is awarded zero marks in that component.

31. AMENDMENTS TO REGULATIONS:

The Academic Council of Bapatla Engineering College (Autonomous) reserves the right to revise, amend, change or nullify the Regulations, Schemes of Examinations and / or Syllabi, Academic schedules, Examination schedules, Examination pattern, Moderation to students, Special opportunity to complete degree beyond stipulated time and any other matter pertained that meets to the needs of the students, society and industry without any notice and the decision is final.



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DEPARTMENT VISION

To produce Computer Science – Artificial Intelligence and Machine Learning Engineers with Global Standards, who can handle the challenges of developing software systems & services enabled with Artificial Intelligence for the society & industry, with their innovations and services.

DEPARTMENT MISSION

- To impart high quality education with effective teaching and learning process.
- To provide an environment where the students can handle research problems confidently.
- To prepare the students with latest Artificial Intelligence and Machine Learning technologies of the industry.
- To inculcate professional ethics and human values in handling the engineering challenges.

PROGRAM EDUCATIONAL OBJECTIVES

PEO1: Choose diverse professional careers in software industry, research, academia, engineering, and administrative services.

PEO2: Apply the principles of basic sciences, mathematics and computer science to solve real world problems using digital computing systems.

PEO3: Analyze, design, implement and evaluate robust, scalable and cost-effective computer-based systems and processes in the industry with sustained self learning.

PEO4: Be aware of professional and ethical practices in the context of social impacts of computing.



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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

CSE (Artificial Intelligence & Machine Learning Department)

Summary

S. No.	Category	AICTE Recommended Credits (%)	# of Courses	# of Credits	Breakup of Credits (Total 160)
1.	Humanities and Social Sciences including Management (HM)	5 – 8 %	6	9	5.6
2.	Basic Science Courses (BS)	12 – 16 %	8	20	12.5
3.	Engineering Science Courses (ES)	10 – 18 %	11	24	15
4.	Professional Core Courses (PC)	30 – 36 %	21	51.5	32.3
5.	Electives – Professional Electives (PE); Job Oriented Electives (JOE); Open Electives (OE); Skill Enhancement Courses (SEC)	19 – 27 %	5+6+1+4 =16	15+ 13.5+3 +8 = 39.5	24.6
6.	Internships & Project Work (PR)	8 – 11 %	3	16	10
7.	Mandatory Courses (MC)	-	4		Non-credit
Total			69	160	

Semester Wise Courses and Credits

Semester	# of Theory Courses	Skill Enhanced Courses	# of Lab Courses	Mandatory Courses	Other Courses	Total Courses	Credits	With Honor Credits
Semester-I	4	0	5	0	0	9	18	18
Semester-II	5	0	4	0	0	9	21	21
Semester-III	5	1	2	1	1	10	20.5	20.5
Semester-IV	5	1	2	1	1	10	20.5	24.5
Semester-V	5	1	3	1	SI1	11	24	28
Semester-VI	5	1	3	1	0	10	22	26
Semester-VII	5	1	2	0	SI2	9	22	26
Semester-VIII	0	0	1	0	0	1	12	12
Total	34	5	22	4	4	69	160	176



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For

CSE (Artificial Intelligence & Machine Learning Department)

First Year B.Tech. (SEMESTER – I) W.E.F. A.Y. 2024-25 (R24)

Course Code	Category	Course Title	Scheme of Instruction (Hours per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total	
24CM101	BS	Linear Algebra and Ordinary Differential Equations	2	1	0	3	40	60	100	3
24CM102	BS	Semiconductor Physics and Nano materials	3	0	0	3	40	60	100	3
24CM103	HM	Communicative English	2	0	0	2	40	60	100	2
24CM104	ES	Introduction to Programming	3	0	0	3	40	60	100	3
24CML101	ES	Engineering Graphics Lab	1	0	3	4	40	60	100	2.5
24CML102	BS	Semiconductor Physics Lab	0	0	2	2	40	60	100	1
24CML103	HM	English Communication skills Lab	0	0	2	2	40	60	100	1
24CML104	ES	Introduction to Programming Lab	0	0	3	3	40	60	100	1.5
24CML105	ES	IT Workshop	0	0	2	2	40	60	100	1
Induction Program		First Three Weeks (Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Familiarization to Dept./Branch & Innovations)								
TOTAL			11	1	12	24	360	540	900	18

L: Lecture

T: Tutorial

P: Practical

CIE: Continuous Internal Evaluation

SEE: Semester End Examination



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CSE (Artificial Intelligence & Machine Learning Department)

First Year B.Tech. (SEMESTER – II) W.E.F. A.Y. 2024-25 (R24)

Course Code	Category	Course Title	Scheme of Instruction (Hours per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total	
24CM201	BS	Numerical methods& Advanced Calculus	2	1	0	3	40	60	100	3
24CM202	BS	Engineering Chemistry	3	0	0	3	40	60	100	3
24CM203	ES	Basic Electrical & Electronics Engineering	3	0	0	3	40	60	100	3
24CM204	ES	Programming for Problem Solving	3	0	0	3	40	60	100	3
24CM205	BS	Discrete Mathematics	3	1	0	3	40	60	100	3
24CML201	ES	Engineering Mechanics Lab	1	0	2	3	40	60	100	2
24CML202	BS	Engineering Chemistry Lab	0	0	2	2	40	60	100	1
24CML203	ES	Basic Electrical & Electronics Engineering Lab	0	0	3	3	40	60	100	1.5
24CML204	ES	Programming for Problem Solving Lab	0	0	3	3	40	60	100	1.5
TOTAL			15	1	10	26	360	540	900	21



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For

CSE (Artificial Intelligence & Machine Learning Department)

Second Year B.Tech. (SEMESTER – III) W.E.F. A.Y. 2024-25 (R24)

Course Code	Category	Course Title	Scheme of Instruction (Hours per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total	
24CM301	BS	Probability & Statistics	2	1	0	3	40	60	100	3
24CM302	ES	Digital Logic Design	3	0	0	3	40	60	100	3
24CM303	PC	Data Structures	2	1	0	3	40	60	100	3
24CM304	PC	Object Oriented Programming	2	1	0	3	40	60	100	3
24CM305	PC	Introduction to Artificial Intelligence and Machine Learning	3	0	0	3	40	60	100	3
24CML301	SEC	Python Programming (Skill Enhancement Course - I)	1	0	2	3	40	60	100	2
24CML302	PC	Computational Statistics	1	0	2	3	40	60	100	2
24CML303	PC	Data Structures Lab	0	0	3	3	40	60	100	1.5
24CML304	PC	Object Oriented Programming Lab	0	0	3	3	40	60	100	1.5
24CML305	HM	Health and Wellness, Yoga and Sports	0	0	1	1	100	-	100	0.5
24CM306	MC	Constitution of India	2	0	0	2	40	0	40	0
TOTAL			16	3	11	30	500	540	1040	22.5



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Second Year B.Tech. (SEMESTER – IV) W.E.F. A.Y. 2024-25 (R24)

Course Code	Category	Course Title	Scheme of Instruction (Hours per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total	
24CM401	PC	Computer Organization	3	0	0	3	40	60	100	3
24CM402	PC	Operating Systems	2	1	0	3	40	60	100	3
24CM403	PC	Frontend Web Development	3	0	0	3	40	60	100	3
24CM404	PC	Database Management Systems	3	0	0	3	40	60	100	3
24CM405	PC	Design and Analysis of Algorithms	2	1	0	3	40	60	100	3
24CML401	SEC	Advanced Python Programming (Skill Enhancement Course - II)	1	0	2	3	40	60	100	2
24CML402	ES	Design Thinking & Innovation	1	0	2	3	40	60	100	2
24CML403	PC	Web Application Programming Lab	0	0	3	3	40	60	100	1.5
24CML404	PC	RDBMs Lab	0	0	3	3	40	60	100	1.5
24CML405	HM	NSS/ NCC/Scouts & Guides/Community Service	0	0	1	1	-	100	100	0.5
24CM406	MC	Environmental Science	2	0	0	2	40	0	40	0
TOTAL			17	2	11	30	400	640	1040	22.5
	Honors/Minor Course		3	0	2	5	40	60	100	4



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For

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Third Year B.Tech. (SEMESTER – V) W.E.F. A.Y. 2024-25 (R24)

Course Code	Category	Course Title	Scheme of Instruction (Hours per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total	
24CM501	PC	Automata Theory & Compiler Design	3	0	0	3	40	60	100	3
24CM502	PC	Computer Networks	3	0	0	3	40	60	100	3
24CM503	PC	Machine Learning	3	0	0	3	40	60	100	3
24CM504	PE	Professional Elective - I	3	0	0	3	40	60	100	3
24CM505	JOE	Job Oriented Elective - I	3	0	0	3	40	60	100	3
24CML501	HM	Competitive Prog. Skills Skill Enhancement Course - III	1	0	2	3	40	60	100	2
24CML502	PC	Machine Learning Lab	0	0	3	3	40	60	100	1.5
24CML503	JOE	Job Oriented Elective - I Lab	0	0	3	3	40	60	100	1.5
24CML504	PR	Summer Internship - I*	0	0	0	0	0	100	100	2
24CM506	MC	Campus Recruitment Skills	2	0	0	2	40	0	40	0
TOTAL			18	0	8	26	360	580	940	22
Honors/Minor Course			3	0	2	5	40	60	100	4

Job Oriented Elective – I

1A	Enterprise Programming
	Enterprise Programming Lab
1B	Middleware Technologies
	Middleware Technologies Lab
1C	Industrial IoT
	Industrial IoT Lab

Professional Elective – I

1A	Software Engineering
1B	Design Patterns & Frameworks
1C	Parallel Algorithms

* Summer Internship - I (PR01) need to be completed after 4th semester and it is evaluated by the end of 5th semester.



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Third Year B.Tech. (SEMESTER – VI) W.E.F. A.Y. 2024-25 (R24)

Course Code	Category	Course Title	Scheme of Instruction (Hours per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total	
24CM601	HM	Industrial Management & Entrepreneurship Development	3	0	0	3	40	60	100	3
24CM602	PC	Deep Learning Techniques	3	0	0	3	40	60	100	3
24CM603	PE	Professional Elective – II	3	0	0	3	40	60	100	3
24CM604	PE	Professional Elective – III	3	0	0	3	40	60	100	3
24CM605	JOE	Job Oriented Elective – II	3	0	0	3	40	60	100	3
24CML601	SEC	Soft Skills Skill Enhancement Course - IV	1	0	2	3	40	60	100	2
24CML603	PC	Deep Learning Techniques Lab	0	0	3	3	40	60	100	1.5
24CML604	JOE	Job Oriented Elective – II Lab	0	0	3	3	40	60	100	1.5
24CM606	MC	Technical paper writing & IPR	2	0	0	2	40	0	40	0
TOTAL			18	0	8	26	360	480	840	20
Honors/Minor Course			3	0	2	5	40	60	100	4

Job Oriented Elective – II

2A	Full-Stack Development
	Full-Stack Development Lab
2B	Mobile Application Development
	Mobile Application Development Lab
2C	Cloud Programming
	Cloud Programming Lab

Professional Elective – II

2A	Cryptography & Network Security
2B	Augmented Reality & Virtual Reality
2C	Software Defined Networks

Professional Elective – III

3A	Blockchain Technologies
3B	Computer Vision
3C	Distributed Systems



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Fourth Year B.Tech. (SEMESTER – VII) W.E.F. A.Y. 2024-25 (R24)

Course Code	Category	Course Title	Scheme of Instruction (Hours per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total	
24CM701	PC	Generative AI	3	0	0	3	40	60	100	3
24CM702	PE	Professional Elective – IV	3	0	0	3	40	60	100	3
24CM703	PE	Professional Elective – V	3	0	0	3	40	60	100	3
24CM704	OE	Open Elective	3	0	0	3	40	60	100	3
24CM705	JOE	Job Oriented Elective – III	3	0	0	3	40	60	100	3
24CML701	SEC	DevOps Skill Enhancement Course – V	1	0	2	3	40	60	100	2
24CML702	PC	Generative AI Lab	0	0	3	3	40	60	100	1.5
24CML703	JOE	Job Oriented Elective – III Lab	0	0	3	3	40	60	100	1.5
24CML704	PR	Summer Internship – II*	0	0	0	0	0	100	100	2
TOTAL			16	0	8	24	320	580	900	22
Honors/Minor Courses (MOOCs - 1)			0	0	0	0	40	60	100	2
Honors/Minor Courses (MOOCs - 2)			0	0	0	0	40	60	100	2

Job Oriented Elective – III	
3A	Feature Engineering
	Feature Engineering
3B	Natural Language Processing
	Natural Language Processing Lab
3C	Web & Social Media Analytics
	Web & Social Media Analytics Lab

Professional Elective – IV	
4A	Federated Learning
4B	Exploratory Data Analytics
4C	Data Stream Mining

Professional Elective – V	
5A	Prompt Engineering & AI Tools
5B	Reinforcement Learning
5C	Quantum Computing

* Summer Internship – II (PR02) need to be completed after 6th semester and it is evaluated by the end of 7th semester.



Bapatla Engineering College: Bapatla -522102 (Autonomous)

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Department of CSE (Artificial Intelligence and Machine Learning)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

CSE (Artificial Intelligence & Machine Learning Department)

Fourth Year B.Tech. (SEMESTER – VIII) W.E.F. A.Y. 2024-25 (R24)

Course Code	Category	Course Title	Scheme of Instruction (Hours per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total	
24CML801	PR	Project Work	0	0	24	24	40	60	100	12
Total			0	0	24	24	40	60	100	12



LINEAR ALGEBRA AND ORDINARY DIFFERENTIAL EQUATIONS														
I B. Tech. – I Semester (Code: 24CM101)														
Lectures	2	Tutorial	1	Practical	0	Credits	3							
Continuous Internal Evaluation			40	Semester End Examination						60				
Pre-Requisite: None.														
Course Objectives:														
<ul style="list-style-type: none">➤ Solve a system of linear homogeneous and non-homogeneous equations, finding the inverse of a given square matrix and also its Eigen values and Eigen vectors➤ Identify the type of a given differential equation and select and apply the appropriate analytical technique for finding the solution of first order ordinary differential equations.➤ Create and analyze mathematical models using higher order differential equations to solve application problems that arise in engineering.➤ Verify mean value theorems and expand functions of a single variable using Taylor's and Maclaurin's series.														
Course Outcomes: At the end of this course, Students will be able to														
CO1	Find the eigen values and eigen vectors of a given matrix and its inverse.													
CO2	Apply the appropriate analytical technique to find the solution of a first order ordinary differential equation.													
CO3	Solve higher order linear differential equations with constant coefficients arise in engineering applications.													
CO4	Learn the applications of mean value theorems and Taylor's theorem.													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
	POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	2	-	-	-	-	-	-	-	2	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	2	-	-	-
CO3	3	3	3	-	-	-	-	-	-	-	2	-	-	-
CO4	2	2	2	-	-	-	-	-	-	-	2	-	-	-
UNIT-I														
Linear Algebra: Rank of a Matrix; Elementary transformations of a matrix; Gauss-Jordan method of finding the inverse; Normal form of a matrix, Consistency of linear System of equations: Rouché's theorem, System of linear Non-homogeneous equations, System of linear homogeneous equations; vectors; Eigen values; properties of Eigen values(without proofs); Cayley-Hamilton theorem (without proof). [Sections: 2.7.1; 2.7.2; 2.7.6; 2.7.7; 2.10.1; 2.10.2; 2.10.3; 2.12; 2.13; 2.14; 2.15.]														
UNIT-II														
Differential Equations of first order: Definitions; Formation of a Differential equation; Solution of a Differential equation; Equations of the first order and first degree; variables separable; Linear Equations; Bernoulli's equation; Exact Differential equations; Equations														



reducible to Exact equations: I.F found by inspection, I.F of a Homogeneous equation, In the equation $M dx + N dy = 0$, $\frac{\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}}{N}$ is a function of x and $\frac{\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}}{M}$ is a function of y .

Applications of a first order Differential equations: Newton's law of cooling; Rate of decay of Radio-active materials.

[Sections: 11.1; 11.3; 11.4.1; 11.5; 11.6; 11.9; 11.10; 11.11; 11.12.1; 11.12.2; 11.12.4; 12.6; 12.8]

UNIT-III

Linear Differential Equations: Definitions; Theorem; Operator D; Rules for finding the complementary function; Inverse operator; Rules for finding the Particular Integral; Working procedure to solve the equation; Method of Variation of Parameters; Applications of Linear Differential Equations: Introduction, Oscillatory Electrical Circuits.

[Sections: 13.1; 13.2; 13.3; 13.4; 13.5; 13.6; 13.7; 13.8.1; 14.1; 14.5].

UNIT-IV

Differential Calculus:

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), Maclaurin's series, Expansion by use of known series, Taylor's series.

[4.3.1; 4.3.2; 4.3.3; 4.3.4; 4.4.1; 4.4.2; 4.4.3]

Text Books :	B.S.Grewal, "Higher Engineering Mathematics", 44 th edition, Khanna publishers, 2017.
References :	<ol style="list-style-type: none"> 1. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons. 2. N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" Laxmi Publications, 2010.



SEMICONDUCTOR PHYSICS AND NANO MATERIALS														
I B. Tech. – I Semester (Code: 24CM102)														
Lectures	3	Tutorial	0	Practical	0	Credits	3							
Continuous Internal Evaluation			40	Semester End Examination					60					
Pre-Requisite: None.														
Course Objectives:														
<div><div>➤</div><div>This unit aim to build the interest on the concept of quantum mechanics and its importance to solve and evaluate the properties of materials (conductors and semiconductors)</div></div> <div><div>➤</div><div>This unit provides various types of properties of semiconductor materials and their importance in various device fabrications</div></div> <div><div>➤</div><div>This unit aim to educate the student on various opto-electronic devices and their applications.</div></div> <div><div>➤</div><div>This unit provide information about the principles of processing, manufacturing and characterization of nano materials, nanostructures and their applications</div></div>														
Course Outcomes: At the end of this course, Students will be able to														
CO1	Understand concepts of quantum mechanics and its applications to explain material properties													
CO2	Know the concept of Fermi level and various semiconductor junctions.													
CO3	Familiar with working principles of various opto-electronic devices and their applications.													
CO4	Understand importance of nano-materials and their characteristic properties.													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
	POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	2	2	-	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	2	2	-	-	-	-	2	-	-	-	-
CO4	3	-	-	2	2	-	-	-	-	2	2	-	-	-
UNIT-I														
QUANTUM MECHANICS AND APPLICATIONS:														
Schrodinger time independent wave equation, Applications: Particle in one dimensional box, Quantum Tunneling, Scanning Tunneling Microscope, Somerfield free electron theory: conductivity of metals and concept of Fermi level, Failure of quantum free electron theory (Qualitative), Band theory of solids (Kronig –Penny model), E-K diagrams, Effective mass, Concept of hole, Types of Electronic materials: Metals, Semiconductors and Insulators.														
UNIT-II														
SEMICONDUCTORS AND PROPERTIES: Introduction to semiconductors, intrinsic and extrinsic semiconductors, Direct and Indirect band gap semiconductors. Density of states, carrier concentration equations, Fermi level and temperature dependence, Drift and Diffusion currents, Continuity equation, P-N junction diode (V-I characteristics).														



UNIT-III	
OPTO-ELECTRONIC DEVICES AND DISPLAY DEVICES: Principle and working of LED, Semiconducting laser (Laser diode), Photo detectors: Photo diode, PIN & APD Diode, Applications of Photo detectors, Photo voltaic effect, Solar cell, Efficiency of solar cell and applications, Types of liquid crystals, Liquid crystal display(LCD), Opto electric effect(Kerr effect), Magneto optic effect (Faraday Effect)	
UNIT-IV	
NANO MATERIALS: Introduction to nano technology, quantum confinement, surface to volume ratio, properties of nano materials, synthesis of nano-materials: CVD, sol-gel methods, laser ablation. Carbon nano tubes: types, properties, applications. Characterization of nano materials: XRD, SEM, applications of nano materials.	
Text Books :	1. A textbook of engineering physics by Avadhanulu and Kshirsagar S.Chand & Co. (2013) 2. Applied physics by Dr.P.SrinivasaRao. Dr.K.Muralidhar
References :	1. Text book on Nanoscience and Nanotechnology (2013): B.S. Murty, P. Shankar, Baldev Raj, B.B. Rath and J. Murday, Springer Science & Business Media. 2. Opto electronics by T. Wilson, J.F.Hawkes, PHI



COMMUNICATIVE ENGLISH															
I B. Tech. – I Semester (Code: 24CM103)															
Lectures	2	Tutorial	0	Practical	0	Credits	2								
Continuous Internal Evaluation				40	Semester End Examination						60				
Pre-Requisite: None.															
Course Objectives:															
<div>➤ to enhance the vocabulary competency of the students</div> <div>➤ to enable the students to demonstrate proficiency in the use of written English, including proper spelling, grammar, and punctuation</div> <div>➤ to enhance theoretical and conceptual understanding of the elements of grammar</div> <div>➤ understand and apply the conventions of academic writing in English</div>															
Course Outcomes: At the end of this course, Students will be able to															
CO1	Understand how to build academic vocabulary to enrich their writing skills														
CO2	Produce accurate grammatical sentences														
CO3	Analyse the content of the text in writing														
CO4	Produce coherent and unified paragraphs with adequate support and detail														
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	POs											PSOs			
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3	
CO1	-	-	-	-	-	-	2	2	3	2	2	-	2	-	
CO2	-	-	-	-	-	-	2	2	3	2	2	-	2	-	
CO3	-	-	-	-	-	-	2	2	3	2	2	-	2	-	
CO4	-	-	-	-	-	-	2	2	3	2	2	-	2	-	
UNIT-I															
1.1 Vocabulary Development: Word formation-Formation of Nouns, Verbs & Adjectives from Root words-Suffixes and Prefixes															
1.2 Essential Grammar: Prepositions, Conjunctions, Articles															
1.3 Basic Writing Skills: Punctuation in writing															
1.4 Writing Practices: Mind Mapping, Paragraph writing (structure-Descriptive, Narrative, Expository & Persuasive)															
UNIT-II															
2.1 Vocabulary Development: Synonyms and Antonyms															
2.2 Essential Grammar: Concord, Common Errors: Practice															
2.3 Basic Writing Skills: Coherence in Writing: Jumbled Sentences															
2.4 Writing Practices: Letter writing															
UNIT-III															
3.1 Vocabulary Development: One word Substitutes															
3.2 Essential Grammar: Tenses, Modal Verbs, Voices															
3.3 Basic Writing Skills: Using Phrases and clauses															
3.4 Writing Practices: Note Making															



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UNIT-IV

- 4.1 Vocabulary Development:** Words often confused
4.2 Essential Grammar: Reported speech, Common Errors: Practice
4.3 Basic Writing Skills: Sentence structures (Simple, Complex & Compound)
4.4 Writing Practices: Paraphrasing & Summarizing, Essay Writing

Text Books :	<ol style="list-style-type: none">1. Communication Skills, Sanjay Kumar & Pushpa Latha. Oxford University Press: 2011.2. Practical English Usage, Michael Swan. Oxford University Press: 1995.3. Remedial English Grammar, F.T.Wood. Macmillan: 2007.4. Study Writing, Liz Hamplyons & Ben Heasley. Cambridge University Press: 2006
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INTRODUCTION TO PROGRAMMING														
I B. Tech. – I Semester (Code: 24CM104)														
Lectures	3	Tutorial	0	Practical	0	Credits	3							
Continuous Internal Evaluation			40	Semester End Examination			60							
Pre-Requisite: None.														
Course Objectives:														
<div>➤ Understand basic concepts of C Programming such as: C-tokens, Operators, Input/output, and Arithmetic rules.</div> <div>➤ Develop problem-solving skills to translate ‘English’ described problems into programs written using C language.</div> <div>➤ Use conditional branching, looping and Arrays.</div> <div>➤ Understand the concepts of functions and recursion in C.</div>														
Course Outcomes: At the end of this course, Students will be able to														
CO1	Choose the right data representation formats based on the requirements of the problem and solve the mathematical problems using operators.													
CO2	Solve problems which contain multiple decisions using else...if.													
CO3	Work with lists and matrices using arrays.													
CO4	Solve real time complex problems by decomposition using user defined functions.													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
	POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	-	1	-	1	-	-	-	-	-	-	3	2
CO2	-	1	3	2	1	1	-	-	-	-	-	-	2	1
CO3	-	1	2	3	-	1	-	-	-	-	-	-	2	2
CO4	2	1	1	2	-	1	-	-	-	-	-	-	2	1
UNIT-I														
Introduction: Computers, Classification of Computers, Software Life Cycle, Algorithms, Flowcharts, Structured Programming, Compilers, Linker, Preprocessor, Standard Input and Output Devices, Popular Features of C.														
Variables and Expressions: Introduction, Character Set, Identifiers and Keywords, Variables, Displaying Variables, Reading Variables, Characters and Character Strings, Qualifiers, typedef Statement, Promotion and Typecasting, Value-initialized Variables, Constants, const Qualifier, Operators and Expressions, Operator Precedence and Associativity, Programming Examples.														
UNIT-II														
Basic Input-Output: Introduction, Single Character Input-Output, String Input and Output, General Output, General Input, Types of Characters in Format Strings, scanf Width Specifier, Search Sets, Assignment Suppression Character, Format Specifiers for scanf, Input Fields for scanf, When scanf Stops Scanning, Programming Examples.														



Control Structures: Introduction, if Statement, if-else Statement, Multi-way Decisions, Compound Statements, Loops - for Loop, while Loop, do-while Loop, break Statement, switch Statement, continue Statement, goto Statement, Programming Examples.	
UNIT-III	
Arrays and Strings: Introduction, How Arrays are Useful? Multidimensional Arrays, Strings, Arrays of Strings, Functions in string.h, Programming Examples.	
Scope and Extent: Introduction, Scope, Extent.	
UNIT-IV	
Functions: Introduction, Function main, Where are Functions Useful? Functions Accepting More than One Parameter, User Defined and Library Functions, Concepts Associated with Functions (Review), Function Parameters, Return Values, Recursion, Comparison of Iteration and Recursion, Variable Length Argument Lists, Programming Examples.	
Text Books :	1. Mastering C by K R Venugopal and Sudeep R Prasad McGraw -Hill Edition.
References :	1. Programming in ANSI C by E. Balaguruswamy, Fifth Edition. 2. Kernighan BW and Dennis Ritchie M, "C programming language", 2nd ed, Prentice Hall. 3. Yashavant P. Kanetkar, "Let us C", BPB Publications. 4. Ashok N.Kamthane, "Programming in C", PEARSON 2nd Edition.



ENGINEERING GRAPHICS LAB														
I B. Tech. – I Semester (Code: 24CML101)														
Lectures	1	Tutorial	0	Practical	3	Credits	2.5							
Continuous Internal Evaluation				40	Semester End Examination					60				
Pre-Requisite: None.														
Course Objectives:														
<div>➤ Clear picture about the importance of engineering graphics in the field of engineering</div> <div>➤ The drawing skills and impart students to follow Bureau of Indian Standards</div> <div>➤ To give an idea about Geometric constructions and orthographic projections</div> <div>➤ Imagination skills about orientation of points, surfaces and solids</div> <div>➤ Basic drafting skills of AutoCAD</div>														
Course Outcomes: At the end of this course, Students will be able to														
CO1	Draw projections of points and projections of lines using Auto CAD													
CO2	Plot projections of surfaces like circle, pentagon, hexagon and rhombus													
CO3	Plot the Projections of solids like Prisms and pyramids													
CO4	Convert the Isometric views into Orthographic views for simple objects.													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
	POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	1	2	1	-	-	-	-	-	-	-	-	1	1	2
CO2	3	2	1	-	-	-	-	-	-	-	-	2	3	2
CO3	1	2	3	-	-	-	-	-	-	-	-	1	3	2
CO4	1	2	1	-	-	-	-	-	-	-	-	1	2	3
UNIT-I														
INTRODUCTION: Introduction to Engineering drawing, geometrical constructions.														
INTRODUCTION TO AUTOCAD: Advantages of AutoCAD over manual drafting, Basics of sheet selection, Draw tools, Modify tools, Dimensioning.														
METHOD OF PROJECTIONS: Principles of projection, First angle and third angle projections, projections of points, projections of straight lines inclined to one plane only.														
UNIT-II														
PROJECTIONS OF PLANES: Projections of plane figures: circle, triangle, pentagon, hexagon and rhombus.														
UNIT-III														
PROJECTIONS OF SOLIDS: Projections of solids like square, pentagonal, hexagonal prisms and pyramids, axis inclined to one plane only.														
UNIT-IV														



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ORTHOGRAPHIC PROJECTIONS: Conversion of pictorial views into Orthographic views. (Treatment is limited to simple castings only).	
Text Books :	<ol style="list-style-type: none">1. Engineering Drawing with AutoCAD by Dhananjay M. Kulkarni, Revised Edition, (PHI publication), 2018.2. Engineering Drawing by N.D. Bhatt & V.M. Panchal, 43rd Edition,(Charotar Publishing House, Anand). (First angle projection) 2014.
References :	Engineering Drawing by Dhananjay A Jolhe, Revised Edition, Tata McGraw hill publishers,2019.



SEMICONDUCTOR PHYSICS LAB															
I B.Tech – I Semester (Code: 24CML102)															
Lectures	0	Tutorial	0	Practical	2	Credits	1								
Continuous Internal Evaluation				40	Semester End Examination					60					
Pre-Requisite: None.															
Course Objectives:															
<div>➤ Basic experiments such as Magnetic Field Measurements, Hall Effect and LCR resonance give the knowledge to apply them in magnetic applications and circuits design.</div> <div>➤ The measurements relating to various physical parameters of materials make the student to understand their utility, design and fabrication of several devices.</div> <div>➤ The experiments like CRO, Solar Cell, Photocell provides the thorough understanding of Opto Electronic devices useful in Engineering and Industrial applications.</div> <div>➤ Utilization of the principles of light such as interference and diffraction to measure wavelength and radius of curvature of Lenses.</div>															
Course Outcomes: At the end of this course, Students will be able to															
CO1	Acknowledge the important aspects of earth magnetic field, realize the use of Maxwell’s equations in various magnetic applications														
CO2	Realization of material properties and parameters														
CO3	Get hands-on experience in various opto-electronic devices like CRO, Solar Cell, Photo Cell and their applications														
CO4	To apply the phenomenon of interference and LASER principles to find radius of curvature and wavelength respectively by various methods														
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	POs											PSOs			
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3	
CO1	3	3	2	2	-	-	-	2	-	-	-	-	-	-	
CO2	3	3	2	2	-	-	-	2	2	-	-	-	-	-	
CO3	3	3	2	2	2	-	-	2	-	-	-	-	-	-	
CO4	3	2	-	-	-	-	-	-	-	-	2	-	-	-	
LIST OF EXPERIMENTS															
<div>1. Determination of acceleration due to gravity at a place using compound pendulum.</div> <div>2. To study the variation of intensity of magnetic field along the axis of a circular coil using Stewart-Gee’s apparatus.</div> <div>3. To draw the characteristic curves of P-N Junction diode.</div> <div>4. Determination of radius of curvature of a Plano convex lens by forming Newton’s rings.</div> <div>5. Determination of wavelengths of mercury spectrum using grating normal incidence method.</div>															



6. To draw the characteristic curves of Zener diode.
7. To draw the resonant characteristic curves of L.C.R. series circuit and calculate the Resonant frequency.
8. To draw the characteristic curves of a photocell and calculate the maximum velocity of electron.
9. Verify the laws of transverse vibration of stretched string using Sonometer.
10. Determination of rigidity modulus of the given material of the wire using Torsional pendulum.
11. To draw the load characteristic curves of a solar cell.
12. Determination of Hall coefficient of a semiconductor.
13. Determination of voltage and frequency of an A.C. signal using C.R.O.
14. Determination of Forbidden energy gap of Si & Ge.
15. Determination of wavelength of laser source using Diode laser.
16. To draw the characteristic curves of Photo diode.
17. To draw the Diode valve characteristics.

Any three experiments are virtual

Note: A minimum of **ten (10 no.)** experiments to be done and recorded



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ENGLISH COMMUNICATION SKILLS LAB															
I B.Tech – I Semester (Code: 24CML103)															
Lectures	0	Tutorial	0	Practical	2	Credits	1								
Continuous Internal Evaluation				40	Semester End Examination							60			
Pre-Requisite: None.															
Course Objectives:															
<div>➤ To comprehend the importance, barriers and strategies of listening skills in English.</div> <div>➤ To illustrate and impart practice Phonemic symbols, stress and intonation.</div> <div>➤ To practice oral skills and receive feedback on learners’ performance.</div> <div>➤ To practice language in various contexts through pair work, role plays, group work and dialogue conversations</div>															
Course Outcomes: At the end of this course, Students will be able to															
CO1	Better understand the nuances of English language through audio- visual experience and group activities														
CO2	Develop neutralization of accent for intelligibility														
CO3	Build confidence to enhance their speaking skills														
CO4	Use effective vocabulary both in formal and informal situations														
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
		POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3	
CO1	-	-	-	-	-	-	-	2	3	-	2	-	-	-	
CO2	-	-	-	-	-	-	-	2	3	-	2	-	-	-	
CO3	-	-	-	-	-	-	-	2	3	-	2	-	-	-	
CO4	-	-	-	-	-	-	-	2	3	-	2	-	-	-	
LIST OF EXPERIMENTS															
Unit-I															
1.1 Introduction to Communication Skills- Importance-Process-Types															
1.2 Barriers to Communication & Strategies for effective Communication															
1.3 Listening Skills; Importance – Purpose- Process- Types															
1.4 Barriers to Listening & Strategies for Effective Listening															
Unit-II															
2.1 Phonetics; Introduction to Consonant, Vowel and Diphthong sounds															
2.2 Syllable & Stress															
2.3 Rhythm & Intonation															
Unit-III															
3.1 Interpersonal Communication in English															
3.2 Conversational Practice in English															
Unit-IV															
4.1 JAM Session															



4.2 Debates	
Text Books :	<ol style="list-style-type: none">1. Communication Skills, Sanjay Kumar and Pushpa Lata. Oxford University Press. 20112. Better English Pronunciation, J.D. O' Connor. Cambridge University Press:19843. New Interchange (4rth Edition), Jack C Richards. Cambridge University Press:20154. English Conversation Practice, Grant Taylor. McGraw Hill:2001
References :	<ol style="list-style-type: none">1. iTell Orell Digital Lab2. Buzzers for conversations, New Interchange series



INTRODUCTION TO PROGRAMMING LAB														
I B.Tech – I Semester (Code: 24CML104)														
Lectures	0	Tutorial	0	Practical	3	Credits	1.5							
Continuous Internal Evaluation			40	Semester End Examination			60							
Pre-Requisite: None.														
Course Objectives:														
<div><div>➤</div><div>Understand basic concepts of C Programming such as: C-tokens, Operators, Input/output, Arithmetic rules.</div></div> <div><div>➤</div><div>Develop problem-solving skills to translate “English” described problems into Programs written using C language.</div></div> <div><div>➤</div><div>Use Conditional Branching, Looping, and Functions.</div></div> <div><div>➤</div><div>Understand basic concepts of C Programming such as: C-tokens, Operators, Input/output, Arithmetic rules.</div></div>														
Course Outcomes: At the end of this course, Students will be able to														
CO1	Choose the right data representation formats based on the requirements of the problem and solve the mathematical problems using operators.													
CO2	Solve problems which contain multiple decisions using else...if.													
CO3	Work with lists and matrices using arrays.													
CO4	Solve real time complex problems by decomposition using user defined functions.													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
	POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	2	-	-	-	-	-	-	-	-	-	3	2
CO2	2	3	2	-	-	-	-	-	-	-	-	-	2	1
CO3	2	2	1	-	-	-	-	-	-	-	-	-	2	2
CO4	2	1	2	-	-	-	-	-	-	-	-	-	2	1
LIST OF EXPERIMENTS														
<div>1. a) Write a C program to demonstrate the use of printf statement to print values of variables of different data types.</div> <div>b) Write a C program to demonstrate the use of printf and scanf statements to read and print values of variables of different data types.</div> <div>2. Write a C program to perform addition, subtraction, multiplication, division and modulo division on two integer numbers.</div> <div>3. Write a C program for electricity bill tacking different categories of users, different slabs in each category. (using nested if else statement).</div> <div>4. Write a C program to evaluate the following using loops</div> <div>a)1+x2/2!+x4/4!+...upto 5 terms</div> <div>b) x+x3/3!+x5/5!+...upto 5 terms</div>														



5. Write a C program to check whether the given number is
 - a) Prime or not
 - b) Perfect or abundant or deficient
6. Write a C program to print the following patterns
 - i)

```
1
12
123
1234
```
 - ii)

```
1
1 2 1
1 2 3 2 1
1 2 3 4 3 2 1
```
7. Write a C program to find the mean, mode, median, and variance of list of values by using one dimensional array.
8. Write a menu driven program to read a list of numbers and perform the following operations
 - a) Print the list
 - b) Delete duplicates from the list
 - c) Reverse the list
9. Write a program to read a list of numbers and search for given number using binary search algorithm and if found display its index otherwise display the message "element not found in the list" using functions.
10. Write a menu driven program to read two matrices and compute their sum and product using functions.
11. Write a menu driven program to read list of student names and perform the following operations using functions.
 - a) To print list of names
 - b) To sort them in ascending order
 - c) To print the list after sorting
12. Write a c program that consists of recursive functions to find
 - a) Factorial of a given number
 - b) Solve towers of Hanoi with three towers (A,B,C) with three towers initially on tower A.



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Department of CSE (Artificial Intelligence and Machine Learning)

IT WORKSHOP															
I B.Tech – I Semester (Code: 24CML105)															
Lectures	0	Tutorial	0	Practical	2	Credits	1								
Continuous Internal Evaluation			40	Semester End Examination							60				
Pre-Requisite: None.															
Course Objectives:															
<div>➤ Introduce the internal parts of a computer, peripherals, and I/O ports.</div> <div>➤ Demonstrate configuring the system with Windows Operating System and other Application Software's.</div> <div>➤ Introduce Office tools such as Word processors, Excel and Presentation tools.</div> <div>➤ Demonstrate AI tools such as ChatGPT, Dialogflow.</div>															
Course Outcomes: At the end of this course, Students will be able to															
CO1	Explore computer system peripherals and components of a mother board.														
CO2	Evaluate computer system architectures.														
CO3	Troubleshoot a computer system.														
CO4	Prepare a PPT, Certificate and Calculate GPA.														
CO5	Generate a report using Mail merge.														
CO6	Implement AI Solutions in their respective engineering branches.														
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
		POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3	
CO1	-	-	-	-	-	-	-	-	-	-	-	3	-	-	
CO2	-	-	-	-	-	-	-	-	-	-	-	3	-	-	
CO3	-	-	-	-	-	-	-	-	-	-	-	3	-	-	
CO4	-	3	-	-	-	-	-	-	-	-	-	3	1	-	
CO5	-	2	-	-	-	-	-	-	-	-	-	3	1	-	
CO6	-	-	3	1	3	-	-	-	-	-	-	3	2	-	
LIST OF EXPERIMENTS															
<div>1. Explore Peripherals of a Computer, Components of a motherboard and its functions.</div> <div>2. Install and Uninstall System and Application software on a Computer.</div> <div>3. Disassemble and Assemble the PC.</div> <div>4. Troubleshoot a computer.</div> <div>5. Prepare the following using MS office:<div>i) PPT using MS-Power Point.</div><div>ii) Design a Project Certificate and Newsletter using MS-Word</div></div> <div>6. Implement the following using Excel:<div>i) Create an Excel Work sheet for the six subjects and calculate Total, Average, Grade and Rank.</div></div>															



ii) Merge the contents of two excel sheets using VLOOKUP and sort them.

7. Generating reports using Mail Merge.
8. Prepare a report using Latex or equivalent (FOSS) tool word as word Processors.
9. Prompt Engineering in Chat GPT.
10. Develop a simple AI Chatbot.

References :

1. “IT Essentials PC Hardware and Software Companion Guide”, by David Anfinson and Ken Quamme, Third edition, CISCO Press, Pearson Education, 2008, ISBN: 978-1-58713-199-8.
2. “LaTeX Companion” by Frank MittelBach, Ulrike Fischer, Third Edition, Addison-Wesley Professional, 2023. ISBN: 978-0138166489.
3. “ChatGPT: Comprehensive Study On Generative AI Tool “ by Midhun Moorthi C, Dr. K. Vimala Devi, Dr. V. Manjula, Tareek Pattewar, First Edition, AG Publishing House, 2023, ISBN: 978-81-19338-79-5



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NUMERICAL METHODS AND ADVANCED CALCULUS														
I B. Tech. – II Semester (Code: 24CM201)														
Lectures	2	Tutorial	1	Practical	0	Credits	3							
Continuous Internal Evaluation			40	Semester End Examination			60							
Pre-Requisite: None.														
Course Objectives:														
<div>➤ Solve algebraic, transcendental and system of linear equations with the help of numerical methods.</div> <div>➤ Apply the techniques of numerical integration whenever and wherever routine methods are not applicable and solve the first order ordinary differential equations numerically with the given initial condition using different methods.</div> <div>➤ Evaluate double and triple integrals and apply them to find areas and volumes.</div> <div>➤ Evaluate the line, surface and volume integrals and learn their inter-relations and applications.</div>														
Course Outcomes: At the end of this course, Students will be able to														
CO1	Solve non-linear equations and system of linear equations with the help of Numerical techniques.													
CO2	Solve the first order ordinary differential equations numerically with the given initial condition.													
CO3	Find the area and volume of plane and three dimensional figures using multiple integrals.													
CO4	Apply vector integral theorems to obtain the solutions of engineering problems involving circulation, flux, and divergence in vector fields.													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
	POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	2	-	-	-	-	-	-	-	2	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	2	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	2	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	2	-	-	-
UNIT-I														
Numerical Solution of Equations: Introduction; Solution of algebraic and transcendental equations: Bisection method, Method of false position, Newton-Raphson method; Useful deductions from the Newton-Raphson formula; Solution of linear simultaneous equations; Direct methods of solution: Gauss-Jordan method, Factorization method; Iterative methods of solution: Jacobi’s iteration method, Gauss-Seidel iteration method.														
[Sections: 28.1; 28.2; 28.3; 28.5; 28.6.2, 28.6.3; 28.7.1; 28.7.2].														
UNIT-II														
Finite differences and Interpolation: Finite differences: Forward differences, Backward differences; Newton’s interpolation formulae: Newton’s forward interpolation formula;														



Newton's backward interpolation formula; Interpolation with unequal intervals; Lagrange's interpolation formula; Divided differences; Newton's divided difference formula; Numerical integration; Trapezoidal rule; Simpson's one-third rule; Simpson's three-eighth rule; Numerical solution of ODE's: Introduction; Euler's method; Runge-Kutta method. [Sections: 29.1.1; 29.1.2; 29.6; 29.9; 29.10; 29.11; 29.12; 30.4; 30.6; 30.7; 30.8; 32.1; 32.4; 32.7].	
UNIT-III	
Multiple Integrals: Double integrals; Change of order of integration; Double integrals in polar coordinates; Area enclosed by plane curves; Triple integrals; Volumes of solids: Volume as Triple integral, Change of variables: For triple integrals. [Sections: 7.1; 7.2; 7.3; 7.4; 7.5; 7.6.2; 7.7.2].	
UNIT-IV	
Vector calculus and its Applications: Scalar and vector point functions; Del applied to scalar point functions-Gradient: Definition, Directional derivative; Del applied to vector point functions: Divergence, Curl; Line integral; Surfaces: Surface integral, Flux across a surface; Green's theorem in the plane (without proof); Stokes theorem (without proof); Gauss Divergence theorem (without proof). [Sections: 8.4; 8.5.1; 8.5.3; 8.6; 8.11; 8.12.2; 8.12.3; 8.13; 8.14; 8.16]	
Text Books :	B.S.Grewal, "Higher Engineering Mathematics", 44th edition, Khanna publishers, 2017.
References :	1. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons. 2. N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" Laxmi Publications, 2010.



ENGINEERING CHEMISTRY															
I B. Tech. – II Semester (Code: 24CM202)															
Lectures	3	Tutorial	0	Practical	0	Credits	3								
Continuous Internal Evaluation				40	Semester End Examination						60				
Pre-Requisite: None.															
Course Objectives:															
		<ul style="list-style-type: none">➤ To familiarize importance of usage of various polymers and fuels in household & industry➤ Outline the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.➤ To impart the concept of soft and hard waters, softening methods of hard water and various instrumental methods of analysis of samples.➤ Outline the basics of some advanced concepts like computational chemistry, nanomaterials and liquid crystals.													
Course Outcomes: At the end of this course, Students will be able to															
CO1	Explain the preparation, properties, and applications of plastics, elastomers and biodegradable polymers also to explain calorific value, characteristics and applications of conventional and alternative fuels.														
CO2	Apply the knowledge of electrochemistry for understanding the working of electrodes and electrochemical energy systems, as well as corrosion theories and protection methods.														
CO3	Analyse the methods to produce soft water for industrial use and potable water by economical means and study the principles of different analytical techniques and their applications.														
CO4	Demonstrate the knowledge of computational chemistry, and applications of advanced materials in engineering.														
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	POs											PSOs			
CO	1	2	3	4	5	6	8	9	10	11	12	1	2	3	
CO1	3	3	2	-	-	2	-	-	-	-	2	-	-	-	
CO2	3	3	3	-	-	-	-	-	-	-	2	-	-	-	
CO3	3	3	3	2	-	2	-	-	-	-	3	-	-	-	
CO4	3	3	2	3	3	-	-	-	-	-	2	-	-	-	
UNIT-I															
POLYMERS AND FUEL CHEMISTRY: Introduction to polymers, functionality of monomers. Thermoplastics and Thermo-setting plastics- Preparation, properties and applications of PVC and Bakelite. Biodegradable polymers- Preparation, properties and applications of PHB and PHBV Elastomers-Preparation, properties and applications of Buna S and Buna N Fuels-Types of fuels, calorific value of fuels-determination by Bomb calorimeter, Liquid Fuels-refining of petroleum, Knocking, Octane and Cetane number, Flue gas analysis by Orsat's															



apparatus, Introduction to alternative fuels-methanol, ethanol and bio fuel-bio diesel (preparation and applications).	
UNIT-II	
<p>ELECTROCHEMICAL CELLS AND CORROSION: Single electrode potential, Reference electrodes- construction and working of standard hydrogen electrode and calomel electrode; Batteries (Li ion battery and zinc air cells), fuel cells (H₂-O₂, and molten carbonate). Electrochemical sensors-potentiometric sensors and amperometric sensors with examples. Corrosion-Definition, theories of corrosion (chemical and electrochemical), Types of corrosion-galvanic corrosion, differential aeration corrosion, stress corrosion, factors influencing rate of corrosion, corrosion control (cathodic protection), Protective coatings-electroplating (Gold) and electroless plating (nickel).</p>	
UNIT-III	
<p>WATER TECHNOLOGY: Soft and hard water, Estimation of hardness of water by EDTA Method-numerical problems, Boiler troubles-Priming, foaming, scale and sludge, Caustic embrittlement, Specifications for drinking water- World health organization (WHO) standards, Industrial water treatment- Ion-exchange process, desalination of brackish water by reverse osmosis (RO) and electro dialysis.</p> <p>INSTRUMENTAL METHODS OF ANALYSIS: Electromagnetic spectrum-UV (Principle, instrumentation, and applications), FT-IR (Principle, instrumentation, and applications), magnetic resonance imaging and CT scan (procedure and applications).</p>	
UNIT-IV	
<p>Organic reactions and synthesis of a drug molecule</p> <p>Computational chemistry: Introduction to computational chemistry, and docking studies</p> <p>Semiconductors-Introduction, basic concept, Types-Intrinsic & Extrinsic Semiconductors, applications.</p> <p>Nano materials: Introduction, classification of nano materials, engineering applications, properties and applications of Carbon nano tubes and Graphenes nanoparticles.</p> <p>Liquid crystals: Introduction, liquid crystalline displays (LCD)-applications. Polymers for light emitting diodes (LEDs)-Introduction, classification of polymer LEDs, Organic LEDs-their commercial uses.</p>	
Text Books :	<ol style="list-style-type: none"> 1. P.C. Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi 17th edition (2017). 2. Seshi Chawla, "Engineering Chemistry" Dhanpat Rai Pub, Co LTD, New Delhi 13th edition, 2013. 3. S.S. Dara, "A Textbook of Engineering Chemistry", S.Chand & Co, (2010).
References :	<ol style="list-style-type: none"> 1. Engineering Chemistry by K. Maheswaramma, Pearson publishers 2015. 2. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition 3. B. S. Murthy, P. Shankar and others, "Textbook of Nanoscience and Nanotechnology", University press (latest edition) 4. CNR Rao and JM Honig (Eds) "Preparation and characterization of materials" Academic press, New York (latest edition)



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BASIC ELECTRICAL AND ELECTRONICS ENGINEERING														
I B. Tech. – II Semester (Code: 24CM203)														
Lectures	3	Tutorial	0	Practical	0	Credits	3							
Continuous Internal Evaluation			40	Semester End Examination			60							
Pre-Requisite: Basics of Mathematics, Physics and Chemistry														
Course Objectives:														
<div><div>➤</div><div>Develop a comprehensive understanding of basic electrical circuit principles, including the analysis of DC and AC circuits using laws and theorems.</div></div> <div><div>➤</div><div>Analyze the construction, working principles, and applications of various electrical machines like DC machines, transformers, and AC machines.</div></div> <div><div>➤</div><div>Comprehend the fundamental properties and applications of semiconductor materials and devices, focusing on diodes and their practical uses.</div></div> <div><div>➤</div><div>Acquire proficiency in the operation and applications of transistors and operational amplifiers in electronic circuits, including their use in amplification and switching.</div></div>														
Course Outcomes: At the end of this course, Students will be able to														
CO1	Solve and analyze basic DC and AC electrical circuits using fundamental laws and theorems.													
CO2	Explain the construction, operation, and applications of different types of electrical machines.													
CO3	Acquire an understanding of semiconductor materials and devices and their practical applications in electronic circuits.													
CO4	Illustrate and analyze basic electronic circuits involving transistors (BJTs and MOSFETs) and operational amplifiers.													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
	POs											PSOs		
CO	1	2	3	4	5	6	8	9	10	11	12	1	2	3
CO1	3	3	3	2	-	-	-	-	-	-	2	3	-	-
CO2	3	3	2	2	-	-	-	-	-	-	2	3	-	-
CO3	3	3	2	1	-	-	-	-	-	-	2	3	-	-
CO4	3	3	3	1	-	-	-	-	-	-	2	3	-	-
UNIT-I														
Basic Definitions: Electric charge, Current, Voltage, Power, and Energy, Ohm's Law														
DC Circuits: Series and Parallel Circuits their Characteristics and analysis, Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL), Simple problems on circuit analysis. Thevenin's, Norton's and Superposition theorem.														
AC Fundamentals: Alternating Current (AC) and Voltage, Peak, RMS, and Average values of AC, form and peak factors, Phasors and phase relationships in AC circuits. AC excitation to R, L, C and their combination (series and parallel), Impedance and Power triangle.														



3-Phase circuits: Star and Delta connections, relation between line and phase values of currents and voltages with derivations.	
UNIT-II	
DC Machines: Construction and working of DC generator and its emf equation. Types of DC generators. Open circuit characteristic of DC shunt generator. Construction and working of DC motor and its torque equation, load test on DC shunt motor. Applications of DC machines.	
Transformers (AC non-rotating): Construction and working of Transformer, Types of transformers, Transformer emf equation, losses and efficiency, Regulation, load test on transformer, Applications.	
AC Machines (AC rotating): Induction Motors: Construction and working of single-phase induction motor. Capacitors start single phase induction motor. Synchronous Machines: Construction and working of Alternator, Construction and working of Synchronous motor and their applications.	
UNIT-III	
Diodes and Applications: Difference between Conductors, Insulators, and Semiconductors-Intrinsic and Extrinsic Semiconductors-N-type and P-type semiconductors. PN Junction Diode: Construction, working, and VI characteristics. Zener Diode: Construction, working, and VI characteristics, Its application as voltage regulator. Rectifiers: Half-wave and Full-wave rectifiers, working principles, and efficiency	
UNIT-IV	
Transistors: Bipolar Junction Transistor (BJT): Construction, operation, and characteristics in Common Emitter, Common Base, and Common Collector configurations. MOSFET Construction, working principle, characteristics, and applications as amplifier and as switch. Operational Amplifiers (Op-Amps): Characteristics and parameters, Inverting and Non-inverting Amplifiers, Summing amplifier, Difference amplifier, Integrator, Differentiator with their Circuit diagrams, formulas, and applications.	
Text Books :	1. S.K. Bhattacharya, “Basic Electrical and Electronics Engineering”, Pearson Publications, Second Edition. 2. V.K. MEHTA, ROHIT MEHTA, “BASIC ELECTRICAL ENGINEERING”, S.Chand Publishers, Sixth edition.



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	3. V.K. MEHTA, ROHIT MEHTA, “PRINCIPLES OF ELECTRONICS” S.Chand Publishers, 11 th edition.
References :	<ol style="list-style-type: none">1. Nagsarkar T K and Sukhija M S, “Basics of Electrical and Electronics Engineering”, Oxford press University Press, 3rd edition.2. T. Thyagarajan, K.P. Sendur Chelvi, T.R. Rangaswamy, “Electrical, Electronics And Computer Engineering” by , New Age International (P) Ltd., Publishers.3. PV Prasad, S.Sivanagaraju “Electrical Engineering Concepts and Applications” Cenage Publishers, 1st Edition.



PROGRAMMING FOR PROBLEM SOLVING														
I B. Tech. – II Semester (Code: 24CM204)														
Lectures	3	Tutorial	0	Practical	0	Credits	3							
Continuous Internal Evaluation				40	Semester End Examination						60			
Pre-Requisite: Introduction to Programming(24CM104)														
Course Objectives:														
<div>➤ Understand and apply pointers in C for memory management and manipulation, including arrays, strings, functions, and structures.</div> <div>➤ Learn file handling, dynamic memory allocation, and object-oriented programming concepts, including classes, inheritance, and polymorphism.</div> <div>➤ Learn to define and use classes and objects, including access control, member functions, and overloading in C++.</div> <div>➤ Implement operator overloading and various forms of inheritance in C++.</div>														
Course Outcomes: At the end of this course, Students will be able to														
CO1	Effectively use pointers for advanced data handling, perform pointer arithmetic, and manipulate structures and unions in C.													
CO2	Manage files, allocate memory dynamically, and apply object-oriented principles like inheritance and polymorphism in programming.													
CO3	Create and manage classes and objects, implement constructors and destructors, and use function overloading and inline functions effectively.													
CO4	Overload operators and use different inheritance types, including abstract, multilevel, multiple, hierarchical, and hybrid inheritance.													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
	POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	-	1	-	1	-	-	-	-	-	-	3	2
CO2	-	1	3	2	1	1	-	-	-	-	-	-	2	1
CO3	-	1	2	3	-	1	-	-	-	-	-	-	2	2
CO4	2	1	1	2	-	1	-	-	-	-	-	-	2	1
UNIT-I														
<p>Pointers: Introduction, Definition and Uses of Pointers, Address Operator &, Pointer Variables, Dereferencing Pointers, void Pointers, Pointer Arithmetic, Pointers to Pointers, Pointers and Arrays, Passing Arrays to Functions, Pointers and Functions, Accessing Arrays Inside Functions, Pointers and Two-dimensional Arrays, Array of Pointers, Pointer Constants, Pointers and Strings, Pointers in Standard String Library Functions, Two-dimensional Array of Characters, Array of Pointers to Strings, More String Library functions, Pointers to Functions.</p> <p>Structures and Unions: Introduction, Declaring and Using Structures, Structure Initialization, Structure within Structure, Operations on Structures, Array of Structures, Array within Structure, Creating User Defined Data Types, Pointers to Structures, Pointers within Structures,</p>														



Structures and Functions, Unions, Differences between Structures and Unions, Operations on A union, Scope of A union, Bit Fields in Structures.	
UNIT-II	
<p>Files: Introduction, End of File, File-handling Functions, File Types, Unbuffered and Buffered Files, Error Handling.</p> <p>Dynamic Memory Allocation: Introduction, Library Functions for Dynamic Memory Allocation.</p> <p>Object-Oriented Paradigm: Why new Programming Paradigms?, Evolution of Programming Paradigms, Objects, Classes, Inheritance, Polymorphism, Streams based I/O, Scope Resolution Operator, Variable Definition at the Point of Use, Type Conversion.</p>	
UNIT-III	
<p>Classes and Objects: Introduction, Class Specification, Class Objects, Accessing Class Members, Defining Member Functions, Outside member functions as inline, Accessing member functions within the Class, Data hiding, Passing objects as arguments, Returning objects from functions, Friend functions and Friend classes, Static data and member functions, Constructors, Destructors.</p> <p>Overloading: Introduction, Parameters Passing by Reference, Inline Functions, Function Overloading.</p>	
UNIT-IV	
<p>Operator Overloading: Introduction, Overloadable Operators, Unary Operator Overloading, operator Keyword, Operator return values, Binary Operator Overloading, Arithmetic Operator Overloading, Concatenation of strings, Comparison Operators, Arithmetic Assignment Operators, Overloading with friend functions, Assignment operator Overloading.</p> <p>Inheritance: Introduction, Derived class declaration, forms of inheritance, inheritance and member accessibility, Constructors in derived classes, Destructors in derived classes, abstract classes, multilevel inheritance, multiple inheritance, hierarchical inheritance, hybrid inheritance, object composition-delegation.</p>	
Text Books :	<ol style="list-style-type: none"> 1. “Programming with C” by Byron Gottfried, Second Edition, Schaum’s Outline Series, McGraw-Hill. 2. “Programming with C++” by John R. Hubbard, Second Edition, Schaum’s Outline Series, McGraw-Hill.
References :	<ol style="list-style-type: none"> 1. Nagsarkar T K and Sukhija M S, “Basics of Electrical and Electronics “Programming in ANSIC” by E. Balaguruswamy, Fifth Edition, McGraw Hill Education India. 2. “Let us C” by Yashavant P.Kanetkar, 14th Edition, BPB Publications. 3. Kernighan BW and Dennis Ritchie M, “C programming language”, 2nd edition, Prentice Hall.



DISCRETE MATHEMATICS														
I B. Tech. – II Semester (Code: 24CM205)														
Lectures	3	Tutorial	0	Practical	0	Credits	3							
Continuous Internal Evaluation				40	Semester End Examination						60			
Pre-Requisite: None.														
Course Objectives:														
Understand operations on discrete structures such as sets, functions, and relations.														
➤	Formulate short proofs using methods of proof of an implication. Verify the correctness of an argument using propositional logic and truth tables. Construct mathematical arguments using logical connectives and quantifiers.													
➤	Verify the correctness of an argument using rules of inference for quantified propositions. Apply algorithms and use definitions to solve problems to prove statements in elementary number theory. Understand counting and indirect counting techniques and combinatory in the context of discrete probability.													
➤	Understand sequences, generating functions, and recurrence relations.													
➤	Understand and compute coefficients for generating functions. Understand and solve homogeneous recurrence relations.													
➤	Understand and solve Inhomogeneous recurrence relations.													
➤	Understand the properties of binary relations, partial orderings and lattices. Construct graphs and adjacency matrices for binary relations.													
Course Outcomes: At the end of this course, Students will be able to														
CO1	Understand the basic principles of sets, relations, functions and inference rules for validating arguments.													
CO2	Prove that the given statement is valid by using mathematical induction and utilize a variety of counting strategies to solve computational problems.													
CO3	Discuss different methods for solving different types of recurrence relations.													
CO4	Understand various operations and representations of a binary relation.													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
	POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	3	-
UNIT-I														
Foundations: Sets, Relations and Functions, Fundamentals of Logic, Logical Inferences, Methods of Proof of an implication, First order Logic & Other methods of proof.														
UNIT-II														
Rules of Inference for Quantified propositions, Mathematical Induction.														
Elementary Combinatorics: Basics of Counting, Combinations and Permutations.														



Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with repetitions, Enumerating Permutation with Constrained repetitions.	
UNIT-III	
Recurrence relations: Generating functions of sequences, Calculating Coefficients of Generating Functions	
Recurrence Relations: Solving recurrence relations by Substitution and generating functions, The methods of characteristic roots.	
UNIT-IV	
Recurrence Relations: solutions of Inhomogeneous recurrence relations.	
Relations: Special properties of binary relations, Operations on relation. Ordering relations, Lattice, Paths and Closures, Directed Graphs and Adjacency Matrices.	
Text Books :	Toe L.Mott, Abraham Kandel & Theodore P.Baker, “Discrete Mathematics for Computer Scientists & Mathematicians”, PHI 2 nd edition, 2012.
References :	<ol style="list-style-type: none"> 1. C.L. Liu, “Elements of Discrete Mathematics”, McGraw-Hill Education, 2nd edition. 2. Rosen, “Discrete Mathematics”, McGraw-Hill Education, 8th edition.



Bapatla Engineering College: Bapatla -522102 (Autonomous)

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Department of CSE (Artificial Intelligence and Machine Learning)

ENGINEERING MECHANICS AND SURVEYING LAB															
I B.Tech – II Semester (Code: 24CML201)															
Lectures	1	Tutorial			0			Practical			2	Credits			2
Continuous Internal Evaluation					40			Semester End Examination					60		
Pre-Requisite: Basics of Mathematics & Physics															
Course Objectives:															
		<div>➤ The course aims to equip students with the fundamental principles and techniques necessary to solve problems related to forces and supports in engineering mechanics.</div> <div>➤ The course is designed to provide students with a thorough understanding of frictional forces and their applications in engineering mechanics.</div> <div>➤ The course is designed to provide students with the essential skills and knowledge to analyze truss structures.</div> <div>➤ The course aims to provide students with a deep understanding of rotational dynamics and the principles governing the motion of rigid bodies.</div> <div>➤ The course aims to provide students with the fundamental skills and techniques required for various surveying methods in civil engineering.</div>													
Course Outcomes: At the end of this course, Students will be able to															
CO1	Utilize the Parallelogram Law, Triangle Law, and Polygon Law to determine the resultant of concurrent forces. Apply Varignon’s Principle to find the magnitude and position of the resultant force in a system. Calculate support reactions for beams subjected to transverse loads using principles of equilibrium. Calculate the geometric center (centroid) of various lamina shapes through integration and composite area methods.														
CO2	Determine the coefficient of static friction between a block and a rough surface under horizontal force. Calculate the angle of inclination at which a block just starts to slide down an inclined plane.														
CO3	Determine the axial forces in truss members using the method of joints.														
CO4	Experimentally determine and verify the angular acceleration of a rolling disc on an inclined plane. Calculate the moment of inertia of a flywheel through experimental procedures.														
CO5	Perform a cross-staff survey to determine the area of a plot. Determine the elevation difference between two points and the height of the ceiling of a building using leveling techniques. Determine the horizontal distance between inaccessible points and the height of an object using a theodolite.														
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	POs											PSOs			
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4
CO1	3	3	-	2	-	-	-	-	1	-	2	3	3	3	3
CO2	3	3	-	2	-	-	-	-	1	-	2	3	3	3	3
CO3	3	3	-	2	-	-	-	-	1	-	2	3	3	3	3
CO4	3	3	-	2	-	-	-	-	1	-	2	3	3	3	3



LIST OF EXPERIMENTS

FORCE SYSTEM

Force – characteristics of force – system of forces – moment of a force - laws of forces – supports and their reactions, Centroid – determination of centroid for plane figures. (2)

List of experiments

1. Determination of the magnitude of the resultant force using a) Parallelogram law and b) Triangle law c) Polygon law
2. Determination of the magnitude of the resultant force using Varignon's principle.
3. Determination of the support reactions for a beam subjected to transverse loads.
4. Determination of the geometric center of different lamina.

FRICTION

Friction – laws of friction – coefficient of friction – angle of repose. (2)

List of experiments

5. Determination of the coefficient of static friction between the block and rough surface when the block is subjected to horizontal force.
6. Determination of the angle of inclination at which a block just starts to slide down an inclined plane.

ANALYSIS OF TRUSS

Truss – Method of analysis. (2)

List of experiments

7. Determination of the axial forces in the truss members.

MASS MOMENT OF INERTIA & ROTATION OF A RIGID BODY ABOUT A FIXED AXIS

Area moment of inertia – mass moment of inertia – Relation between mass and area moment of inertia, Kinematics of rotation – Equation of motion for a rigid body rotating about a fixed axis – D'Alembert's principle. (3)

List of experiments

8. Verification of angular acceleration of a rolling disc on an inclined plane.
9. Determination of the moment of inertia of flywheel.

SURVEYING

Surveying – principles of surveying – chain surveying – theodolite surveying – leveling. (5)

List of experiments

10. Determination of the area of a plot using cross - staff survey.
11. Determination of the elevation difference between two points using leveling and height of ceiling of a building.
12. Determination of the horizontal distance between inaccessible points using theodolite.
13. Determination of the height of an object using theodolite.



ENGINEERING CHEMISTRY LAB														
I B.Tech – II Semester (Code: 24CML202)														
Lectures	0	Tutorial	0	Practical	2	Credits	1							
Continuous Internal Evaluation				40	Semester End Examination							60		
Pre-Requisite: None.														
Course Objectives:														
<div><div>➤</div><div>To familiarize students with practical chemical analysis techniques for determining key water quality parameters.</div></div> <div><div>➤</div><div>To provide hands-on experience in performing volumetric and instrumental titrations to understand their chemical principles and applications.</div></div> <div><div>➤</div><div>To develop proficiency in using laboratory equipment, following safety protocols, and accurately conducting experiments.</div></div> <div><div>➤</div><div>To teach students the synthesis of common organic compounds and their characterization techniques.</div></div>														
Course Outcomes: At the end of this course, Students will be able to														
CO1	Determine water quality parameters such as alkalinity and hardness.													
CO2	Conduct volumetric titrations to estimate the concentration of chemical substances.													
CO3	Apply instrumental methods such as pH metry and conductometry for titration experiments and colorimetry for verification of Beers law.													
CO4	Synthesize and characterize common organic compounds like soap, resins, and aspirin.													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
		POs										PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	2	3	-	3	-	-	-	-	2	-	-	-
CO2	3	3	2	2	-	3	-	-	-	-	2	-	-	-
CO3	3	3	2	3	3	-	-	-	-	-	2	-	-	-
CO4	2	-	-	3	-	2	-	-	-	-	-	-	-	-
LIST OF EXPERIMENTS														
<div>1. Determination of Alkalinity of Tap water.</div> <div>2. Determination of Total Hardness of ground water sample by EDTA method</div> <div>3. Estimation of Mohr’s salt by Permanganometry.</div> <div>4. Estimation of Active Chlorine Content in Bleaching Powder</div> <div>5. pH metric titration between strong acid and strong base.</div> <div>6. Conductometric Titrations between Strong acid and strong base.</div> <div>7. Verification of Beers Law using potassium permanganate by colorimetry.</div> <div>8. Preparation of Soap.</div> <div>9. Preparation of Urea-formaldehyde resin</div> <div>10. Preparation of Aspirin.</div>														



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Text Books :	<ol style="list-style-type: none">1. Practical Engineering Chemistry by K.Mukkanti, Etal, B.S. Publicaitons, Hyderabad, 2009.2. Inorganic quantitative analysis, Vogel, 5th edition, Longman group Ltd. London, 1979.
References :	<ol style="list-style-type: none">1. Text Book of engineering chemistry by R.n. Goyal and HarmendraGoel.2. A text book on experiments and calculations- Engineering Chemistry. S.S. Dara.3. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.



BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB														
I B.Tech – II Semester (Code: 24CML203)														
Lectures	0	Tutorial	0	Practical	3	Credits	1.5							
Continuous Internal Evaluation				40	Semester End Examination							60		
Pre-Requisite: None.														
Course Objectives:														
<div>➤ Enable students to verify and apply basic electrical laws and theorems</div> <div>➤ Equip students with practical skills to conduct experiments on electrical machines</div> <div>➤ Provide students with hands-on experience in analyzing the V-I characteristics of semiconductor devices and their applications</div> <div>➤ Develop students' abilities to analyze and characterize the operations transistor, MOSFET and Op-Amps.</div>														
Course Outcomes: At the end of this course, Students will be able to														
CO1	Verify and apply basic network theorems Theorem through practical experimentation, thereby gaining a deep understanding of circuit analysis techniques.													
CO2	Demonstrate the ability to perform experiments on electrical machines and interpret their operational characteristics and performance metrics.													
CO3	Analyze the V-I characteristics of diodes, and understand their roles in rectifier circuits and enhancing their understanding of semiconductor behavior in practical applications.													
CO4	Characterize the performance of BJTs, MOSFETs and designing and analyzing operational amplifier circuits to prepare them for advanced electronic circuit design.													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
	POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	2	3	-	-	-	3	2	-	1	3	-	-
CO2	3	3	2	3	-	-	-	3	2	-	1	3	-	-
CO3	3	3	2	3	-	-	-	3	2	-	1	3	-	-
CO4	3	3	2	3	-	-	-	3	2	-	1	3	-	-
LIST OF EXPERIMENTS														
<div>1. Verification of KCL and KVL</div> <div>2. Verification of Superposition theorem</div> <div>3. Verification of Thevenin’s theorem</div> <div>4. Verification of Norton’s theorem</div> <div>5. Parameters of choke coil</div> <div>6. Open Circuit Characteristics of DC Shunt Generator</div> <div>7. Load Test on DC Shunt Motor</div> <div>8. Load Test on Transformer</div>														



9. V-I characteristics of PN junction Diode
 10. V-I characteristics of Zener Diode
 11. Half-Wave Rectifier
 12. Full-Wave Rectifier
 13. Characteristics of BJT in Common Emitter Configuration
 14. Characteristics of MOSFET
 15. Summing and Difference Amplifiers using Op-Amps
- Note: Minimum 10 experiments should be carried.



PROGRAMMING FOR PROBLEM SOLVING LAB														
I B.Tech – II Semester (Code: 24CML204)														
Lectures	0	Tutorial	0	Practical	3	Credits	1.5							
Continuous Internal Evaluation				40	Semester End Examination							60		
Pre-Requisite: Introduction to Programming(24CM104)														
Course Objectives:														
<div>➤ Understand and apply pointers in C for memory management and manipulation, including arrays, strings, functions, and structures.</div> <div>➤ Learn file handling, dynamic memory allocation, and object-oriented programming concepts, including classes, inheritance, and polymorphism.</div> <div>➤ Learn to define and use classes and objects, including access control, member functions, and overloading in C++.</div> <div>➤ Implement operator overloading and various forms of inheritance in C++.</div>														
Course Outcomes: At the end of this course, Students will be able to														
CO1	Effectively use pointers for advanced data handling, perform pointer arithmetic, and manipulate structures and unions in C.													
CO2	Manage files, allocate memory dynamically, and apply object-oriented principles like inheritance and polymorphism in programming.													
CO3	Create and manage classes and objects, implement constructors and destructors, and use function overloading and inline functions effectively.													
CO4	Overload operators and use different inheritance types, including abstract, multilevel, multiple, hierarchical, and hybrid inheritance.													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
	POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	2	-	-	-	-	-	-	-	-	-	3	2
CO2	2	3	2	-	-	-	-	-	-	-	-	-	2	1
CO3	2	2	1	-	-	-	-	-	-	-	-	-	2	2
CO4	2	1	2	-	-	-	-	-	-	-	-	-	2	1
LIST OF EXPERIMENTS														
<div>1. Write C programs for the following using pointers and functions:<div>a) Declare the array of 20 integer numbers. Find and display the average of only even numbers by using pointers.</div><div>b) Write a program to reverse the string using pointers.</div><div>c) Calculate the addition of two 4 X 4 matrices using pointers. Take the input from user.</div></div> <div>2. A Bookshop maintains the inventory of books that are being sold at the shop. The list includes details such as author, title, price, publisher and stock position. Whenever a customer wants a book the sales person inputs the title and the author, and the system searches the list and displays whether it is available or not. If it is not, an appropriate message is displayed, if it is,</div>														



then the system displays the book details and request for the number of copies required, if the requested copies are available the total cost of the requested copies is displayed otherwise the message “required copies not in stock” is displayed. Write a program for the above in structures with suitable functions.

3. Write a program in C to merge two files and write them to another file.
4. Write a C program to read a data file of students' records with fields (Regno, Name, M1, M2, M3, M4, M5) and write the successful students data (percentage > 40%) to a data file.
5. Write a C++ program with a class to represent a bank account. Include the following members:
Data Members – 1. Name of the depositor 2. Account Number 3. Type of account 4. Balance amount in the account.
Member function – 1. To assign initial values 2. To deposit an amount 3. To withdraw an amount after checking the balance 4. To display name and Balance.
6. Create a class called 'TIME' that has
 - three integer data members for hours, minutes and seconds
 - constructor to initialize the object to zero
 - constructor to initialize the object to some constant value
 - member function to add two TIME objects
 - member function to display time in HH:MM:SS formatWrite a main function to create two TIME objects, add them and display the result in HH:MM:SS format.
7. Write a C++ program to illustrate static member functions.
8. Write a C++ program to implement function overloading in order to compute power(m,n) where i) m is double and n is int ii) m and n are int. Use a default value of 2 for n to make the function to calculate squares when this argument is omitted.
9. Create a 'STRING' class which overloads ‘==’ operator to compare two STRING objects using
a) friend function b) without using friend function.
10. Write a C++ program to overload ‘++’ and ‘--’ operators to convert a string to uppercase and lowercase respectively.
11. Write a C++ program on Composition.
12. Write a C++ program on Inheritance.



PROBABILITY & STATISTICS															
II B. Tech. – III Semester (Code: 24CM301)															
Lectures	2	Tutorial	1	Practical	0	Credits	3								
Continuous Internal Evaluation			40	Semester End Examination						60					
Pre-Requisite: None															
Course Objectives:															
<div><div>➤</div><div>Apply the continuous probability densities to various problems in science and engineering.</div></div> <div><div>➤</div><div>Estimate the point and interval estimators of the mean, variance and proportion for the given Sample data and apply Z-test, t-test to various real-life problems</div></div> <div><div>➤</div><div>Apply various sample tests like F-test and χ^2 -test for decision making regarding the population based on sample data.</div></div> <div><div>➤</div><div>Compute the level of correlation, the best fit curve to the given data by the method of least squares and also perform ANOVA arising in the field of engineering.</div></div>															
Course Outcomes: At the end of this course, Students will be able to															
CO1	Apply discrete and continuous probability distributions to various problems arising in Engineering applications.														
CO2	Perform Test of Hypothesis for a population parameter for single sample.														
CO3	Perform Test of Hypothesis for population parameters for multiple samples.														
CO4	Interpret the results of correlation, regression and one way ANOVA for the given data.														
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	POs											PSOs			
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3	
CO1	3	3	-	-	-	-	-	-	-	-	2	-	3	-	
CO2	3	3	2	-	-	-	-	-	-	-	2	-	3	-	
CO3	3	3	2	-	-	-	-	-	-	-	2	-	3	-	
CO4	3	3	3	-	-	-	-	-	-	-	2	-	3	-	
UNIT-I															
Continuous Random Variables, Normal Distribution, Normal Approximation to the Binomial Distribution, Uniform Distribution, Gamma Distribution and its applications, Beta Distribution and its applications, Weibull distribution. (Sections 5.1, 5.2, 5.3, 5.5, 5.7, 5.8, 5.9.)															
UNIT-II															
Populations and Samples, The sampling distribution of the mean (σ known), The sampling distribution of the mean (σ unknown), The sampling distribution of the variance, Point estimation, Interval estimation, Tests of Hypotheses, Null Hypothesis and Tests of hypotheses, Hypothesis concerning one mean. (Sections 6.1, 6.2, 6.3, 6.4, 7.1, 7.2, 7.4, 7.5, 7.6)															
UNIT-III															



Comparisons-Two independent Large samples, Comparisons-Two independent small samples, matched pairs comparisons, The estimation of variances, Hypotheses concerning one variance, Hypotheses concerning two variances. (Sections 8.2, 8.3, 8.4, 9.1, 9.2, 9.3)	
UNIT-IV	
Estimation of proportions, Hypotheses concerning one proportion, Hypotheses concerning two proportions. The method of least squares, curvilinear regression, multiple regression, correlation, Completely Randomized Designs (One way ANOVA). (10.1, 10.2, 10.3, 11.1, 11.3, 11.4, 11.6, 12.1, 12.2)	
Text Books :	Miller & Freund's "Probability and Statistics for Engineers", Richard A. Johnson, 8 th Edition, PHI.
References :	1. R.E Walpole, R.H. Myers & S.L. Myers „Probability & Statistics for Engineers and Scientists“, 6 th Edition, PHI. 2. Murray R Spiegel, John J. Schiller, R. Alu Srinivas Probability & Statistics“, Schaum's outline series.



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DIGITAL LOGIC DESIGN														
II B. Tech. – III Semester (Code: 24CM302)														
Lectures	3	Tutorial	0	Practical	0	Credits	3							
Continuous Internal Evaluation			40	Semester End Examination			60							
Pre-Requisite: Basic Computer Knowledge.														
Course Objectives:														
<ul style="list-style-type: none">➤ Apply various simplification methods to simplify the Boolean expressions.➤ Design and analysis of combinational circuits.➤ Design and analysis of sequential circuits.➤ Design various counters, registers and PLD's.➤ Apply various simplification methods to simplify the Boolean expressions.														
Course Outcomes: At the end of this course, Students will be able to														
CO1	Understand different number systems, binary codes and conversion between number system. Understand and apply Boolean algebra and K-maps to simplify Boolean functions													
CO2	Understand and apply tabulation method to simplify the Boolean functions. Understand, analyze and design various combinational circuits.													
CO3	Know the fundamentals of various flip-flops, analyze and design sequential circuits.													
CO4	Understand design of various registers and counters. Design of various PLD's for Boolean functions.													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
	POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-	3	-	-
UNIT-I														
DIGITAL SYSTEMS AND BINARY NUMBERS: Digital System, Binary Numbers, Number base Conversions, Octal and Hexadecimal Numbers, Complements of Numbers, Signed Binary Numbers, Binary Codes, Binary Storage and Registers, Binary Logic, Error Detection and Correction: 7 bit Hamming Code.														
BOOLEAN ALGEBRA & LOGIC GATES: Introduction, Basic definitions, Axiomatic definition of Boolean algebra, Basic theorems and properties of Boolean algebra, Boolean functions, Canonical and Standard Forms, Other Logic Operations, Digital logic gates.														
GATE –LEVEL MINIMIZATION: Introduction, The map method, Four-variable K-Map, Product-of-Sums Simplification, Don't –Care Conditions.														
UNIT-II														
MINIMIZATION: The Tabulation method, Determination of prime implicants, Selection of prime-implicants.														



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COMBINATIONAL LOGIC: Introduction, Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adders - Subtractors, Decimal Adder, Magnitude Comparator, Decoders, Encoders, Multiplexers.	
UNIT-III	
SYNCHRONOUS SEQUENTIAL LOGIC: Introduction, Sequential Circuits, Storage Elements - Latches, Storage Elements -Flip Flops, Analysis of Clocked Sequential Circuits: State Equations, State Table, State Diagram, Flip Flop Input Equations, Analysis with D, JK and T Flip Flops; State reduction and Assignment, Design Procedure.	
UNIT-IV	
REGISTERS and COUNTERS: Registers, Ripple Counters, Synchronous Counters. MEMORY and PROGRAMMABLE LOGIC: Introduction, Random Access Memory: Read and Write Operations, Types of Memories; Read Only Memory, Programmable Logic Devices: PROM, PLA, PAL.	
Text Books :	<ol style="list-style-type: none">1. M. Morris Mano, Michael D. Ciletti, "Digital Design", 5th Edition, PrenticeHall, 2013. ISBN-10: 0-13-277420-8.2. A. Anand Kumar, "fundamentals of digital circuits", 4th Edition, PHI.
References :	<ol style="list-style-type: none">1. John F. Wakerly, "Digital Design: Principles and Practices", 4th Edition, Pearson, 2006.2. Brian Holdsworth, Clive Woods, "Digital Logic Design", 4th Edition, Elsevier Publisher, 2002.3. Donald E Givone, "digital principles and design", TMT.



DATA STRUCTURES															
II B. Tech. – III Semester (Code: 24CM303)															
Lectures	2	Tutorial	1	Practical	0	Credits	3								
Continuous Internal Evaluation				40	Semester End Examination						60				
Pre-Requisite: Programming for Problem Solving (24CM204)															
Course Objectives:															
<div>➤ Understand the role of Data structures in structuring and analysis procedure of an algorithm.</div> <div>➤ Learn the concept of Stack, Queue and various Sorting techniques.</div> <div>➤ Understand the concept of Binary Tree, Binary Search Tree, AVL tree, Heap Data Structures</div> <div>➤ Learn the concept of Hashing and Graph traversals</div>															
Course Outcomes: At the end of this course, Students will be able to															
CO1	Analyze the concepts of algorithm evolution and compute their time & space complexities. To elaborate various lists along with their operations.														
CO2	Solve various real time problems using stack and queue data structures. Develop algorithms and programs for various sorting techniques.														
CO3	Analyze the concepts of trees, binary trees, AVL trees and priority queues.														
CO4	Analyze various hashing techniques and Graph traversals														
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	POs											PSOs			
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3	
CO1	3	3	3	-	-	-	-	-	-	-	-	3	3	-	
CO2	3	3	3	-	-	-	-	-	-	-	-	3	3	-	
CO3	3	3	3	-	-	-	-	-	-	-	-	3	3	-	
CO4	3	3	3	-	-	-	-	-	-	-	-	3	3	-	
UNIT-I															
Introduction: Algorithm, Importance of Algorithm Analysis, Complexity of an Algorithm, Asymptotic Analysis and Notations. Data Structure, Classification of Data Structures. Lists: Abstract Data Types, The List ADT, Singly Linked List ADT, Doubly Linked List ADT, Circular Linked List ADT, Polynomial ADT: addition, multiplication operations.															
UNIT-II															
Stacks and Queues: The Stack ADT and its applications such as Infix to Postfix expression conversions, Evaluation of Postfix expressions. The Queue ADT, Queue Application-Radix sort. Basic Sorting Techniques: Bubble sort, Selection sort, Insertion sort, Shell sort															
UNIT-III															
Trees: Preliminaries, Binary Trees, The Search Tree ADT, Binary Search Trees, Implementations, AVL Trees-Single Rotations, Double rotations, Implementations. Priority Queues (Heaps): Model, Simple implementations, Binary Heap, Heap Sort.															
UNIT-IV															



Hashing: General Idea, Hash Function, Separate Chaining, Open Addressing.	
Graphs: Preliminaries, Representation of graphs, Graph traversals (DFS, BFS)	
Text Books :	Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, Pearson Education, 2013, Second Edition, ISBN- 978-81-7758-358-8.
References :	<ol style="list-style-type: none">1. Y.Langsam, M.J.Augeustein and A.M.Tenenbaum, “Data Structures Using C”, Pearson Education Asia, 2006, Second Edition, ISBN- 81-203-1177-9.2. Richard F.Gilberg, Behrouz A. Forouzan, “Data Structures – A Pseudocode Approach with C”, Thomson Brooks / COLE, 1998, Second Edition, ISBN- 978-0-534-39080-83. Aho, J.E. Hopcroft and J.D. Ullman, “Data Structures and Algorithms”, Pearson Education Asia, 1983, 1st edition, ISBN- 978-0201000238.



OBJECT ORIENTED PROGRAMMING														
II B. Tech. – III Semester (Code: 24CM304)														
Lectures	2	Tutorial	1	Practical	0	Credits	3							
Continuous Internal Evaluation			40	Semester End Examination			60							
Pre-Requisite: Introduction to Programming (24CM104), Programming for Problem Solving(24CM204)														
Course Objectives:														
<div>➤ Understand the advantages of Object Oriented Programming over Procedural-Oriented Programming, learn the basics of variables, operators, control statements, arrays, classes and objects.</div> <div>➤ Understand, write and implement the following concepts: Inheritance, Exception Handling, Interfaces, Packages and Strings and StringBuffer.</div> <div>➤ Understand and write programs on Collections, Multithreading and I/O.</div> <div>➤ Understand and implement applications using JFX.</div>														
Course Outcomes: At the end of this course, Students will be able to														
CO1	Demonstrate OOP concepts, its advantages over structured programming.													
CO2	Develop and implement Inheritance, Exception Handling, Interfaces, Packages and Strings and StringBuffer.													
CO3	Analyze Collections, Multithreading and I/O.													
CO4	Create code using JavaFX.													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
	POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	3	-	-	-	-	-	-	-	-	3	3	2
CO2	3	2	3	-	-	-	-	-	-	-	-	3	3	2
CO3	3	2	3	-	-	-	-	-	-	-	-	3	3	2
CO4	3	2	3	-	2	-	-	-	-	-	-	3	3	2
UNIT-I														
An Introduction to Java: History, Java Byte Code, Java Buzzwords Data Types, Variables and Arrays Operators Control Statements Introducing Classes A Closer Look at Methods and Classes														
UNIT-II														
Inheritance Exception Handling Packages and Interfaces Strings: String Constructors, Any 10 String class methods, StringBuffer class, Any 10 StringBuffer class methods.														



UNIT-III

Type Wrappers, Autoboxing/Unboxing

Collections: Collections Overview, Names of Collection Interfaces, Collection Classes: LinkedList, Array List

Multithreaded Programming: Introduction, Life Cycle, Thread creation – Thread Class, Runnable Interface, Thread Priority, Synchronization, Interthread Communication.

I/O: I/O Basics, Reading Console Input, Writing Console Output, The Print Writer class, Reading and Writing Files, Automatically Closing a File.

UNIT-IV

Introducing JavaFX GUI Programming: JavaFX Basic Concepts, A JavaFX Application Skeleton, Compiling and Running a JavaFX Program, The Application Thread, A Simple JavaFX Control: Label, Using Buttons and Events, Drawing Directly on a Canvas.

Exploring JavaFX Controls: Using Image and ImageView, ToggleButton, RadioButton, CheckBox, ListView, ComboBox, TextField, ScrollPane, TreeView.

Introducing JavaFX Menus: Menu Basics, An Overview of MenuBar, Menu, and MenuItem, MenuBar, Menu, MenuItem, Create a Main Menu, Add Mnemonics and Accelerators to Menu Items, Add Images to Menu Items, Use RadioMenuItem and CheckMenuItem, Create a Context Menu, Create a Toolbar, Put the Entire MenuDemo Program Together, Continuing Your Exploration of JavaFX

Text Books :	“Java The Complete Reference”, 10th Edition, Herbert Schildt, TMH Publishing Company Ltd, New Delhi, 2017.
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References :	1. “Big Java “, 4th Edition, Cay Horstman, John Wiley & Sons, 2009. 2. “Java How to Program (Early Objects)”, H. M. Dietel and P. J. Dietel, 11th edition Pearson Education, 2018.
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Bapatla Engineering College: Bapatla -522102 (Autonomous)

Approved by AICTE :: Affiliated to ACHARYA NAGARJUNA UNIVERSITY
Department of CSE (Artificial Intelligence and Machine Learning)

INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING															
II B.Tech – III Semester (Code: 24CM305)															
Lectures	3	Tutorial	0	Practical	0	Credits	3								
Continuous Internal Evaluation				40	Semester End Examination						60				
Pre-Requisite: None															
Course Objectives:															
<div>➤ To provide a strong foundation of fundamental concepts in Artificial Intelligence.</div> <div>➤ To provide a basic exposition to the goals and methods of Artificial Intelligence.</div> <div>➤ To provide fundamentals of machine learning.</div> <div>➤ Understand Supervised Learning & Unsupervised Learning.</div>															
Course Outcomes: At the end of this course, Students will be able to															
CO1	Enumerate the history and foundations of Artificial Intelligence.														
CO2	Apply the basic principles of AI in problem solving.														
CO3	Choose the appropriate representation of Knowledge.														
CO4	To Implement Scikit Learn Library Package of Machine Learning. Identify Supervised Learning & Unsupervised Learning.														
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	POs											PSOs			
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3	
CO1	2	2	2	1	2	-	-	-	-	-	-	1	3	2	
CO2	2	2	1	1	2	-	-	-	-	-	-	1	3	2	
CO3	2	2	1	1	2	-	-	-	1	-	2	2	2	2	
CO4	2	2	2	2	2	-	-	-	1	-	2	2	3	2	
UNIT-I															
Introduction: What Is AI, foundation of AI and history of AI, The State of the Art. Intelligent Agents: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents. Solving Problems by Searching: Problem Solving Agents, Searching for Solutions, Example problems- 8-puzzle problem, tic-tac-toe game playing, Water jug problem.															
UNIT-II															
Uninformed Search Strategies: Breadth First Search, Uniform Cost Search, Depth First Search, Iterative Deepening DFS and Bidirectional Search. Informed (Heuristics) Search Strategies: Greedy BFS, A* Algorithm. Beyond classical search: Hill-climbing search, AND-OR Graphs, Min Max Search, Alpha–Beta Pruning. Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems.															
UNIT-III															
Knowledge Representation: Semantic Nets, Conceptual Dependency, Scripts. Expert Systems: Architecture of expert systems, Roles of expert systems, Knowledge Acquisition, Typical expert systems – MYCIN.															



Introduction to Machine Learning: what is Machine Learning, Types of Machine Learning, Datasets, Features, Labels, Training vs Testing, Model, Validation set, Accuracy, ML-Pipeline: Steps in developing a machine learning application, Python for ML: Scikit-learn Fundamentals, In-built Datasets and data preprocessing.	
UNIT-IV	
Supervised Learning: Regression models: Simple Linear Regression, Cost function, Evaluation metrics, Scikit-learn Implementation Classification: Perceptron, Classification Metrics: Confusion matrix, Precision, Recall, Accuracy, F-Score, ROC curves, Scikit-learn Implementation. Unsupervised Learning: K-means Clustering and Scikit-learn Implementation.	
Text Books :	<ol style="list-style-type: none">1. Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach” , 3rd Edition, Pearson.2. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, Second Edition, Aurelien Geron, O'Reilly publishers, ISBN: 781492032649.
References :	<ol style="list-style-type: none">1. Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, 20112. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill3. Tom M. Mitchell, Machine Learning, McGraw Hill Edition, 20134. Andreas C. Muller and Sarah Guido. Introduction to Machine Learning with Python. Oreilly, 1 edition, 2016. ISBN 9781449369415.



PYTHON PROGRAMMING (Skill Enhancement Course - I) II B. Tech. – III Semester (Code: 24CML301/SEC1)															
Lectures	1	Tutorial	0	Practical	2	Credits	2								
Continuous Internal Evaluation			40	Semester End Examination			60								
Pre-Requisite: None															
Course Objectives:															
<div>➤ Understand and write code using the basics of Python, Statements, Expressions, Conditional Executions, and Functions.</div> <div>➤ Write code for Iteration, Strings, File I/O.</div> <div>➤ Write code in creating, usage of Lists, Dictionaries, and Tuples.</div> <div>➤ Understand the concepts of Object Orientation, Databases and write code implementing them.</div>															
Course Outcomes: At the end of this course, Students will be able to															
CO1	Identify the basic python constructs with a view of using them in problem solving.														
CO2	Explore the usability of functions and strings in modular programming														
CO3	Apply lists,dictionaries,tuples and file operations to organize the data in real world problems.														
CO4	Implement the problems in terms of real world objects using object oriented and database concepts.														
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	POs											PSOs			
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3	
CO1	3	3	3	-	-	-	2	-	2	-	3	3	3	3	
CO2	3	3	3	-	-	-	2	-	2	-	3	3	3	3	
CO3	3	3	3	-	-	-	2	-	2	-	3	3	3	3	
CO4	3	3	3	-	-	-	2	-	2	-	3	3	3	3	
Topic															L
Python: Introduction, Basic elements, Control structures.														4	
Functions: function calls, built-in functions, type conversion functions, random numbers, math functions, adding new functions, definitions and uses, flow of execution, parameters and arguments, fruitful functions and void functions.														3	
Strings: string is a sequence, getting the length of a string using len, traversal through a string with a loop, string slices, strings are immutable, looping and counting, the in operator, string comparison, string methods, parsing strings, format operator.														3	
Lists: a list is a sequence, lists are mutable, traversing, operations, slices, methods, deleting elements, functions, strings, parsing lines, objects and values, aliasing, arguments.														3	
Dictionaries: dictionary as a set of counters, dictionaries and files, looping and dictionaries. advanced text parsing.														3	



Tuples: tuples are immutable, comparing tuples, tuple assignment, dictionaries and tuples, multiple assignment with dictionaries, the most common words, using tuples as keys in dictionaries, sequences.	2
Functional Programming: Join function, comprehension (list and dict), lambda, reduce, filter and map function.	5
Object-Oriented Programming: Classes and Objects, Classes and Functions, Classes and Methods, Inheritance	4
Files I/O: persistence, opening files, text files and lines, reading files, searching through a file, letting the user choose the file name, using try except and open, writing files.	3

LIST OF EXPERIMENTS

Basic elements, Control structures:

1. Write a Python program to input two numbers and display their sum, difference, product, and quotient of division. (Covers variables, expressions, operators, input/output).
2. Write a Python program to check if a number is positive, negative, or zero. (Covers if, elif, else).
3. Write a Python program to find the largest of three numbers using nested if. (Covers nested conditionals).
4. Write a Python program to print the Fibonacci sequence up to n terms using a loop. (Covers loops, updating variables).
5. Write a Python program to find the factorial of a number using a while loop. (Covers while loop and loop control).

Functions:

6. Write a Python program to define a function that checks whether a number is prime. (Covers user-defined functions, return values).
7. Write a Python program using built-in functions like len(), type(), int() and random.randint() to demonstrate their usage. (Covers built-in and standard library functions).

Strings:

8. Write a Python program to count the number of vowels, consonants, digits, and special characters in a string. (Covers string traversal, conditions, in operator).
9. Write a Python program to extract the domain name from an email address. (Covers slicing, find(), string methods)

Lists:

10. Write a Python program to remove duplicates from a list and sort it. (Covers list methods and operations).
11. Write a Python program to split a list every Nth element.
Sample Input: list1 = ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j', 'k', 'l', 'm', 'n']
Expected Output: output_list = [['a', 'd', 'g', 'j', 'm'], ['b', 'e', 'h', 'k', 'n'], ['c', 'f', 'i', 'l']]
12. Write a Python program to compute the similarity between two lists.
Sample Input: Colors1 = ["red", "orange", "green", "blue", "white"]
Colors2 = ["black", "yellow", "green", "blue"]



Expected Output: Colors1-Colors2 = ['white', 'orange', 'red']

Colors2-Colors1 = ['black', 'yellow']

13. Write a Python program to find the second largest number in a list. (Covers list traversal and conditions).

Dictionaries:

14. Write a Python program to count the frequency of each word in a user-provided string using a dictionary. (Covers dictionary creation and looping).

15. Write a Python program to combine two dictionaries by adding values for common keys.

Sample Input: dict1 = {'a': 100, 'b': 200, 'c': 300}

dict2 = {'a': 300, 'b': 200, 'd': 400}

Sample output: Combined_dict = {'a': 400, 'b': 400, 'd': 400, 'c': 300}

Tuples:

16. Write a Python program to replace last value of tuples in a list.

Sample Input: list1 = [(10, 20, 40), (40, 50, 60), (70, 80, 90)]

Expected Output: new_list = [(10, 20, 100), (40, 50, 100), (70, 80, 100)]

17. Write a Python program to sort a list of tuples based on the second element. (Covers tuples and sort).

Functional Programming:

18. Write a Python program to join the list elements using join function.

Sample Input: ['Department', 'of', 'Computer', 'Science', 'and', 'Engineering']

Expected Output1: DepartmentofComputerScienceandEngineering

Expected Output2: Department of Computer Science and Engineering

Expected Output3: Department-of-Computer-Science-and-Engineering

Expected Output4: Department@-of@-Computer@-Science@-and@-Engineering

Expected Output5: Department+of+Computer+Science+and+Engineering

19. Write a Python single line script to create a list of squares of even numbers in a range of numbers using comprehension.

Sample Input: [1, 2, 3, 4, 5, 6]

Expected Output: [4, 16, 36]

20. Write a Python Program to create a lambda function to add two numbers.

21. Write a Python single line script to filter odd numbers from a list using lambda and filter functions.

Sample Input: [1, 2, 3, 4, 5, 6]

Expected Output: [1, 3, 5]

22. Write a python single line script to convert a list of numbers to strings and join them with any special character.

Sample Input: [1, 2, 3, 4, 5, 6]

Expected Output1: 1+2+3+4+5+6

Expected Output2: "1" "2" "3" "4" "5" "6"

Expected Output3: 123456



Expected Output4: 1-2-3-4-5-6

Expected Output5: $1^2 3^4 5^6$

23. Write a Python single line script to double the list values using map and anonymous function.

Sample Input: [1, 2, 3, 4, 5, 6]

Expected Output: [2, 4, 6, 8, 10, 12]

24. Write a Python single line program to get the transpose of a 2D matrix using nested list comprehension.

Sample Input: matrix = [[1, 2, 3],
[4, 5, 6]]

Expected Output: [[1, 4], [2, 5], [3, 6]]

25. Write a Python single line program to sort a dictionary by values using lambda function.

Sample Input: {'S1': 88, 'Stu2': 72, 'Stu3': 91, 'S4': 90, 'S5': 79}

Expected Output: {'Stu2': 72, 'S5': 79, 'S1': 88, 'S4': 90, 'Stu3': 91}

26. Write a Python single line script to assign grades based on marks using conditional logic in list. Where student_grade = 'A' if student_marks >= 90, student_grade = 'B' if student_marks >= 75, student_grade = 'C' if student_marks >= 50, else student_grade = 'F'.

Sample Input: student_marks = [95, 67, 80, 45, 76]

Sample Output: student_grades = ['A', 'C', 'B', 'F', 'B']

27. Write a Python single line script to join dictionary keys into a single special character separated string using join function.

Sample Input: {'name': 'John', 'age': 20, 'grade': 'A'}

Sample Output: name, age, grade

28. Write a Python single line script to sort a list of tuples using lambda on the second element of the tuple.

Sample Input: [('apple', 3), ('banana', 1), ('cherry', 2)]

Sample Output: Sorted Tuples: [('banana', 1), ('cherry', 2), ('apple', 3)]

29. Write a Python program to filter prime numbers using a helper function (like: is_prime) and filter with lambda.

30. Write a Python single line script to flatten a nested list of two dimension into a single dimension list using list comprehension.

Sample Input: nested_list = [[1, 2], [3, 4], [5, 6], [7], [8, 9, 10]]

Sample Output: flat_list = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

31. Write a python single line script for the following using map() function

a. Given a list of numbers, return the list of squares

Sample Input: numbers = [1, 2, 3, 4, 5]

Sample Output: squares = [1, 4, 9, 16, 25]

b. Convert a list of string numbers to actual integers

Sample Input: string_numbers = ['1', '2', '3', '4', '5']



Sample Output: numeric_numbers = [1, 2, 3, 4, 5]

c. Convert Celsius to Fahrenheit (Formula $F = (C * 9/5) + 32$)

Sample Input: Celsius = [0, 20, 37, 100]

Sample Output: Fahrenheit = [32.0, 68.0, 98.6, 212.0]

d. Add two lists element-wise

Sample Input: list1 = [1, 2, 3, 4, 5, 6], list2 = [6, 7, 8, 1, 2, 9]

Sample Output: combined_list = [7, 9, 11, 5, 7, 15]

e. Capitalize list of Names

Sample Input: names = ['computer', 'science', 'and', 'engineering']

Sample Output: capitalized_names = ['Computer', 'Science', 'And', 'Engineering']

f. Extract first letter of each word

Sample Input: words = ['apple', 'banana', 'cherry']

Sample Output: words_first_letters = ['a', 'b', 'c']

g. Define a custom function that return the factorial of a number and use map() to apply it to a list of numbers.

Sample Input: numbers = [3, 4, 5]

Sample Output: numbers_factorial = [6, 24, 120]

Object-Oriented Programming:

32. Write a Python program to define a class Student with attributes name and marks, and a method to display them. (Covers class, object, methods).

33. Write a Python program to demonstrate inheritance with classes Person and Employee. (Covers inheritance and method overriding).

Files I/O:

34. Write a Python program to read a text file and count the number of lines, words, and characters. (Covers file reading and parsing)

35. Write a Python program to write a list of strings into a text file. (Covers file writing).

36. Write a Python program to find the longest word in each line of given file.

Text Books :	1. A Python Book: Beginning Python, Advanced Python, and Python Exercises, Dave Kuhlman, Open Source MIT License. 2. Python for Data Analysis, Wes McKinney, O' Reilly.
References :	1. Python Data Science Handbook-Essential Tools for Working with Data Science from Scratch, JoelGrus, O'Reilly.



COMPUTATIONAL STATISTICS LAB														
II B. Tech. – III Semester (Code: 24CML302)														
Lectures	1	Tutorial	0	Practical	2	Credits	2							
Continuous Internal Evaluation			40	Semester End Examination			60							
Pre-Requisite: None														
Course Objectives:														
<div>➤ Understand installation of R and installing packages. Understand writing R code for mathematical functions.</div> <div>➤ Write R Code for importing and exporting data. Understand and write R code for graphs.</div> <div>➤ Understand the various types of Discrete and Continuous Probability Distributions</div> <div>➤ Understand and write R code for hypothesis testing, regression</div>														
Course Outcomes: At the end of this course, Students will be able to														
CO1	Installation of R Studio & installation of required packages. Write commands for mathematical calculations, vectors, Matrices, Data frames & Arrays. Write programs using functions.													
CO2	Implement R Programs to import & export csv files, excel files. write R code for Different Visualizations													
CO3	Apply various built-in functions in R to solve various probability and distributions like Normal, Binomial and Poisson distributions.													
CO4	Implement Hypothesis testing, Linear regression.													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
	POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	3	-	-	-	2	-	2	-	3	3	3	3
CO2	3	3	3	-	-	-	2	-	2	-	3	3	3	3
CO3	3	3	3	-	-	-	2	-	2	-	3	3	3	3
CO4	3	3	3	-	-	-	2	-	2	-	3	3	3	3
SYLLABUS														
Introduction to R: Use of R, Obtaining and installing R-Studio.														
Basics of R: Basic Math, Variables, Data types, Vectors, Calling function, Function documentation, Missing data.														
Advanced Data Structures: Data frames, Lists, Matrices and Arrays.														
Reading and Writing Data in R: Reading and Writing CSV , Excel files														
Basic graphs: Bar plot, Pie chart, Histograms, Kernel Density plots, Box plots, Dot plots.														
Descriptive Statistics: Mean, median, mode, Variance and standard deviation, Covariance and Correlation.														
Probability Distributions: Normal Distribution, Poison Distribution and Binomial Distribution.														
Statistical Inference: Hypothesis testing: t-test, chi-square test, Goodness-of-fit tests, Confidence intervals using R, P-values and statistical significance.														
Linear Models: Simple linear regression. Multiple linear regressions.														



LIST OF EXPERIMENTS	
	<ol style="list-style-type: none"> 1. a). Write R Code using R as a calculator. b). Write R Code on Vector Operation. 2. Write R code which demonstrate i) Array ii) List iii) Matrix iv) Data Frames 3. Write R code which demonstrate functions and control loops 4. Write R Code to Importing & Exporting data from i) CSV file ii) Excel file 5. Write R code which demonstrate plotting of graphs i) Histogram ii) Pie Graph iii) Plot Graph iv) Box Plot v) Dot Plot vi) Kernel Density Plots 6. Write an R – Script to demonstrate the concept of Normal Probability distribution, Binomial Distribution and Poisson distribution. 7. Write an R – Script to demonstrate the concept of one sample t-test and Two sample t-test. 8. Write R code to demonstrate chi-square test of Good fit and Independent. 9. Write R code which demonstrate statistics functions i) Mean ii) Median iii) Range iv) Variance v) Co- variance 10. Write R code which demonstrates Linear Regression.
Text Books :	<ol style="list-style-type: none"> 1. R for Everyone, Advanced analytics and graphics by Jared P Lander, Addison Wisley Data and analytics series, Pearson Education. 2. R in Action, Data Analysis and graphics with R, Robert L Kabacoff, Manning Publisher 3. Maria Dolores Ugarte, Ana F. Militino, Alan T. Arnholt “Probability and Statistics with R”, 2nd edition on, CRC Press, 2016. 3. P. Dalgaard, Introductory Statistics with R, 2nd edition. (Springer 2008).
References :	<ol style="list-style-type: none"> 1. Beginning R by Dr. Mark Gardener, Wrox Publisher. 2. Associate Analytics Facilitator Guide Provided by NASSCOM. http://183.82.43.252/~gopam/html/NASSCOM. 2. Michale Akritas, “Probability & Statistics with R for Engineers and Scientists”, 2nd edition on, CRC Press, 2016



DATA STRUCTURES LAB														
II B. Tech. – III Semester (Code: 24CML303)														
Lectures	0	Tutorial	0	Practical	3	Credits	1.5							
Continuous Internal Evaluation				40	Semester End Examination							60		
Pre-Requisite: Programming for Problem Solving Lab (24CML204)														
Course Objectives:														
<div><div>➤</div><div>Understand and program basic data structures like arrays and linked lists with their applications.</div></div> <div><div>➤</div><div>Understand and Program data structures like stacks and queues with their applications. Understand and implement sorting algorithms.</div></div> <div><div>➤</div><div>Understand and program on trees, binary trees, binary search trees, AVL trees, expression trees and their traversal methods and priority queues</div></div> <div><div>➤</div><div>Basic knowledge of graphs representations and traversing methods. Understand the concept of hashing and their mechanisms.</div></div>														
Course Outcomes: At the end of this course, Students will be able to														
CO1	Apply programming techniques using pointers, DMA and structures to implement SLL and DLL.													
CO2	Design and implement ADTs of stack, queue and its applications and implement different sorting techniques.													
CO3	Analyze and implement BST, AVL tree and priority queue.													
CO4	Analyze and implement graph traversals (DFS and BFS)													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
	POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	3	-	3	-	2	-	2	-	3	3	3	3
CO2	3	3	3	-	3	-	2	-	2	-	3	3	3	3
CO3	3	3	3	-	3	-	2	-	2	-	3	3	3	3
CO4	3	3	3	-	3	-	2	-	2	-	3	3	3	3
LIST OF EXPERIMENTS														
<div><div>1.</div><div>Write a program to perform the following operations on an ArrayList. a). Creation, b). Insertion, c). Deletion, d). Search, e). Display</div></div> <div><div>2.</div><div>Write a program to perform the following operations on a Singly Linked List. a). Creation, b). Insertion, c). Deletion, d). Search, e). Display</div></div> <div><div>3.</div><div>Write a program to perform the following operations on a Circular Single Linked List. a). Creation, b). Insertion, c). Deletion, d). Search, e). Display</div></div> <div><div>4.</div><div>Write a program to perform addition and multiplication of two polynomials using a Single Linked List.</div></div> <div><div>5.</div><div>Write a program to implement stack operations using a linked list.</div></div> <div><div>6.</div><div>Write a program to convert a given infix expression to postfix notation and then evaluate the resulting postfix expression using a stack.</div></div>														



7. Write a program to implement queue operations using a linked list.
8. Write a program that performs Radix sort on a given set of elements using a queue.
9. Write a program to sort the array elements using the following techniques.
 - a). Bubble Sort, b). Selection Sort, c). Insertion Sort, d). Shell Sort.
10. Write a program to perform Binary Search tree operations.
 - a). Creation, b). Insertion, c). Deletion, d). Search, e). Traversals
11. Write a program to implement an AVL tree that interactively allows
 - a). Insertion, b). Find_min, c). Find_max.
12. Write a program to sort the array elements using Heap Sort.
13. Write a program to perform the following hashing techniques.
 - a). Linear Probing b). Quadratic Probing.
14. Write a program to implement the following graph traversal methods.
 - a). DFS b). BFS.

Text Books :	Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, Second Edition, Pearson Education
References :	<ol style="list-style-type: none">1. Y.Langsam, M.J.Augeustein and A.M.Tenenbaum, “DataStructures Using C”, Pearson Education Asia, 2004.2. Richard F.Gilberg, Behrouz A. Forouzan, “Data Structures – A Pseudocode Approach with C”, ThomsonBrooks / COLE, 1998.



Bapatla Engineering College: Bapatla -522102 (Autonomous)

Approved by AICTE :: Affiliated to ACHARYA NAGARJUNA UNIVERSITY
Department of CSE (Artificial Intelligence and Machine Learning)

OBJECT ORIENTED PROGRAMMING LAB															
II B.Tech – III Semester (Code: 20CML304)															
Lectures	0	Tutorial	0	Practical	3	Credits	1.5								
Continuous Internal Evaluation			40	Semester End Examination							60				
Pre-Requisite: Introduction to Programming (24CML104), Programming for Problem Solving(24CML204)															
Course Objectives:															
<div>➤ Understand the advantages of Object Oriented Programming over Procedural-Oriented Programming, learn the basics of variables, operators, control statements, arrays, classes and objects.</div> <div>➤ Understand, write and implement the following concepts: Inheritance, Exception Handling, Interfaces, Packages and Strings and StringBuffer.</div> <div>➤ Understand and write programs on Collections, Multithreading and I/O.</div> <div>➤ Understand and implement applications using Events and JFX.</div>															
Course Outcomes: At the end of this course, Students will be able to															
CO1	Demonstrate OOP concepts, its advantages over structured programming.														
CO2	Develop and implement Inheritance, polymorphism.														
CO3	Analyze Exception Handling, Multithreading, I/O.														
CO4	Create code for Event Handling, JavaFX.														
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
		POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3	
CO1	3	2	3	-	-	-	-	-	-	-	-	3	3	2	
CO2	3	2	3	-	-	-	-	-	-	-	-	3	3	2	
CO3	3	2	3	-	-	-	-	-	-	-	-	3	3	2	
CO4	3	2	3	-	2	-	-	-	-	-	-	3	3	2	
LIST OF EXPERIMENTS															
<div>1. Write a Java program to declare, initialize and access the elements of single-dimensional Arrays and multi-dimensional Arrays. Display the array elements using loops.</div> <div>2. Develop a Java program to demonstrate the use of static variables, static methods, and static blocks.</div> <div>3. Create a Java program that demonstrates method overloading (Compile-time Polymorphism) and method overriding (Runtime Polymorphism) using inheritance.</div> <div>4. Write a Java program to illustrate the concept of multiple inheritance through the implementation of multiple interfaces.</div> <div>5. Develop a Java program that demonstrates the use of all exception handling keywords: <i>try</i>, <i>catch</i>, <i>throw</i>, <i>throws</i>, and <i>finally</i>.</div> <div>6. Write a Java program to create and handle one or more user-defined exceptions with meaningful messages.</div>															



7. Design a Java program to demonstrate the creation and use of packages. Include at least two classes from different packages.
8. Implement a Java program to demonstrate inter-thread communication using *wait()*, *notify()*, and *notifyAll()* methods.
9. Write a Java program to copy the contents of one file to another using ***FileInputStream*** and ***FileOutputStream***. Demonstrate the use of try-with-resources for automatic resource management.
10. Design a JavaFX application that enables users to draw directly on a Canvas using mouse events.
11. Create a JavaFX application to demonstrate handling action events with appropriate UI components.
12. Develop a JavaFX application to demonstrate the usage of list-based controls with event handling.
13. Design a JavaFX application that demonstrates the creation and use of menus with event handling.

Text Books :	“Java The Complete Reference”, 10th Edition, Herbert Schildt, TMH Publishing Company Ltd, New Delhi, 2017.
References :	<ol style="list-style-type: none">1. “Big Java “, 4th Edition, Cay Horstman, John Wiley & Sons, 2009.2. “Java How to Program (Early Objects)”, H. M. Dietel and P. J. Dietel, 11th edition Pearson Education, 2018.



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HEALTH AND WELLNESS, YOGA AND SPORTS															
II B. Tech. – III Semester (Code: 24CML304)															
Lectures	0	Tutorial	0	Practical	1	Credits	0.5								
Continuous Internal Evaluation				100	Semester End Examination							-			
Pre-Requisite: None.															
Course Objectives:															
➤		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: At the end of this course, Students will be able to															
CO1	Outline the importance of yoga and sports for Physical fitness and sound health. (L2)														
CO2	Make use of various activities that help to enhance their health. (L3)														
CO3	Develop Positive Personality for individual and group work. (L3)														
CO4	Categorize the health-related fitness components and analyze the current personal fitness levels. (L4)														
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
		POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3	
CO1	-	-	-	-	-	-	-	-	-	2	-	3	-	-	
CO2	-	-	-	-	-	-	-	-	-	2	-	3	-	-	
CO3	-	-	-	-	-	-	-	-	-	2	-	3	-	-	
CO4	-	-	-	-	-	-	-	-	-	2	-	3	-	-	
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:															
i) Organizing health awareness programmes in community															
ii) Preparation of health profile															
iii) Preparation of chart for balance diet for all age groups															
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															
UNIT-III															
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.															



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ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.	
Text Books :	<ol style="list-style-type: none">1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning, 20222. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
References :	<ol style="list-style-type: none">1. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 20142. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc. 2014



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CONSTITUTION OF INDIA													
II B.Tech – III Semester (Code:24CM306/MC02)													
Lectures	2	Tutorial	0	Practical	0	Credits	0						
Continuous Internal Evaluation			40	Semester End Examination			-Nil-						
Pre-Requisite: None.													
Course Objectives:													
<div><div>➤</div><div>To provide basic information about fundamental law of the country.</div></div> <div><div>➤</div><div>To educate the student about fundamental Rights and fundamental duties of citizens.</div></div> <div><div>➤</div><div>To educate the students about Government organs, methods of functioning</div></div> <div><div>➤</div><div>To motivate students to leave narrow selfish outlook and inculcate broad national, human outlook.</div></div>													
Course Outcomes: At the end of this course, Students will be able to													
CO1	Understand the importance of the constitution in a Democratic Society												
CO2	Understand the fundamental rights, duties of a citizen by discharging his duties to become a good citizen.												
CO3	Remember about judicial supremacy and independence of judiciary and fight for his legitimate rights through court of law.												
CO4	Applying the principles to participate in the democratic process of governance and in nation building activities.												
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes													
	POs										PSOs		
CO	1	2	3	4	5	7	8	9	10	11	1	2	3
CO1	1	2	2	-	1	-	-	3	-	3	3	-	-
CO2	-	-	1	1	1	-	-	-	-	3	3	3	2
CO3	-	-	1	-	1	2	-	-	-	3	3	-	-
CO4	3	1	2	-	-	-	-	3	-	1	3	2	-
UNIT-I													
1.1 Meaning of the constitutional law and constitutionalism.													
1.2 Historical perceptive of the constitution of India													
1.3 Salient features and characteristics of the constitution of India.													
1.4 Preamble, union and its territory and citizenship.													
UNIT-II													
2.1. Fundamental rights principles.													
2.2. Directive principles of state policy.													
2.3. Fundamental duties.													
2.4. The government of the union, the president, The Prime Minister, and the council of ministers, The parliament of India, The supreme court, the union judiciary													
UNIT-III													



- 3.1. The Machinery of Government in the states, The Governor, The Chief Minister and council of Ministers, The State legislature, High court, Judiciary in the states
- 3.2. Union territories.
- 3.3. The Federal System, division of powers between centre and states, legislative administration and financial relation.
- 3.4. Emergency Provisions, President Rule, National Emergency, Financial Emergency

UNIT-IV

- 4.1. Local self-Government, Panchayat Raj, Municipalities and municipal Corporation
- 4.2. Miscellaneous Provisions, the comptroller and Auditor general of India, The Public Service commission, Special Provisions relating to certain classes, Elections — Political parties.
- 4.3. Amendment of the Constitution.
- 4.4. Laws Relating to Women

Text Books:	<ol style="list-style-type: none"> 1. Introduction to constitution of India, D.D.Basu, 24th Edition, Lexis Nexus, 2019. 2. The constitution of India by P.M.Bhakshi, 18th Edition, Universal law publishing, 2021.
Reference:	<ol style="list-style-type: none"> 1. Constitutional Government in India - M V Pylee , Kindle Edition, Asia Publishing House, 2004. 2. Indian Government and Politics — D C Dasgupta, 8th Edition, Vikas Publishing house, 2007. 3. The Oxford Hand Book of the Indian Constitution, Sujit Chowdary, Madhav Khosla Pratapabhem Mehla, oxford university press UK, 2016. 4. Laws Relating to Women, National Commission For Women, New Delhi, July 2020.



COMPUTER ORGANIZATION														
II B. Tech. – IV Semester (Code: 24CM401)														
Lectures	3	Tutorial	0	Practical	0	Credits	3							
Continuous Internal Evaluation				40	Semester End Examination						60			
Pre-Requisite: Digital logic design (24DS302)														
Course Objectives:														
➤	Represent the data, micro-operations, and hardware implementation of arithmetic, logic and shift unit.													
➤	Know about the instruction codes and generation of control signals using hardwired and micro-programmed approaches.													
➤	Learn about the different types of instructions and arithmetic operations.													
➤	Understand the organization of the memory and I/O units.													
Course Outcomes: At the end of this course, Students will be able to														
CO1	Understand the basic structure of computer and analyzing the concepts of machine instructions.													
CO2	Illustrate the various arithmetic operation and learn about basic processing time.													
CO3	Review the basic computer instruction set and create flowcharts for the arithmetic operations.													
CO4	Recognize the I/O and memory organizations.													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
	POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-	3	-	-
UNIT-I														
COMPUTER DATA REPRESENTATION: Introduction to Computer Organization, Data Types, Complements, Fixed-Point Representation, Floating-Point Representation.														
REGISTER TRANSFER LANGUAGE AND MICROOPERATIONS: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro Operations, Logic micro operations, Shift Micro Operations, Arithmetic Logic Shift Unit.														
UNIT-II														
BASIC COMPUTER ORGANIZATION AND DESIGN: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt, Design of Accumulator Logic.														
MICRO PROGRAMMED CONTROL: Control Memory, Address Sequencing, Microprogram Example. Design of Control Unit.														



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UNIT-III	
CENTRAL PROCESSING UNIT: General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer vs Complex Instruction Set Computers.	
COMPUTER ARITHMETIC: Addition and Subtraction, Multiplication Algorithms, Division Algorithms.	
UNIT-IV	
THE MEMORY SYSTEM: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory.	
INPUT-OUTPUT ORGANIZATION: Peripheral Devices, Input-Output Interface, Modes of Transfer, Priority Interrupt, Direct Memory Access.	
Text Books :	Computer System Architecture, M.MorrisMano, 3rdEdition, Pearson/PHI
References :	<ol style="list-style-type: none"> 1. Computer Organization, Carl Hamacher, ZvonksVranesic, SafeaZaky, 5th Edition, McGraw Hill. 2. Computer Organization and Architecture, William Stallings, Sixth Edition, Pearson/PHI.



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OPERATING SYSTEMS															
II B.Tech – III Semester (Code: 24CM402)															
Lectures		3		Tutorial		0		Practical		0		Credits		3	
Continuous Internal Evaluation						40		Semester End Examination						60	
Pre-Requisite: None															
Course Objectives:															
➤		To learn the mechanism of OS to handle processes & Threads and their communication.													
➤		To learn the algorithms involved in CPU scheduling.													
➤		To gain knowledge on concepts that includes Dead locks and Main Memory													
➤		To know the concepts related to Virtual Memory, File Access Methods & Mass Storage structure.													
Course Outcomes: At the end of this course, Students will be able to															
CO1		Analyze the structure of OS and basic architectural components involved in OS design.													
CO2		Develop various process scheduling algorithms for a given specification of CPU utilization, throughput, TAT, WT & RT.													
CO3		Articulate the causes and effects of deadlocks and comprehend memory management concepts.													
CO4		Comprehend virtual memory management, Design and implement various file allocation methods and Disk Scheduling Algorithms.													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	POs											PSOs			
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3	
CO1	3	3	3	-	-	-	-	-	-	-	-	3	-	-	
CO2	3	3	3	-	-	-	-	-	-	-	-	3	-	-	
CO3	3	3	3	-	-	-	-	-	-	-	-	3	-	-	
CO4	3	3	3	-	-	-		-	-		-	3	-	-	
UNIT-I															
Introduction: What OSs Do, Computer System Operation, OS Structure, OS Operations.															
Operating-System Structures: OS Services, User and operating system Interface, System Calls, Types of System Calls, System Programs, OS Design and Implementation.															
Processes: Process Concept, Process Scheduling, Operations on Processes, Inter- process Communication.															
Threads: Overview, Multicore Programming, Multithreading Models.															
UNIT-II															
CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms.															
Process Synchronization: Background, The Critical-Section Problem, Peterson’s Solution Synchronization Hardware, Mutex Locks, Semaphores, Classic problems of Synchronization Monitors.															
UNIT-III															
Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks.															



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Deadlock Prevention, Avoidance, Detection and Recovery. Memory Management: Background, Swapping, Contiguous Memory Allocation: Fixed partitioning, Variable partitioning, Non-Contiguous Memory Allocation: Paging, Structure of Page Table, multilevel paging, Segmentation, Segmentation with paging.	
UNIT-IV	
Virtual-Memory: Background, Demand Paging, Translation lookaside buffer, Page Replacement, Allocation of Frames, Thrashing. File System Interface: File concept, Access Methods, Directory and Disk Structure, File System Implementation: File System Structures, Directory Implementation, Allocation Methods Mass Storage Structure: Overview, Disk Structure, Disk Scheduling, Disk Management, RAID levels	
Text Books :	1. Silberschatz & Galvin, “Operating System Concepts”, 10th edition, John Wiley & Sons (Asia) Pvt.Ltd. ISBN 9781118063330.
References :	1. William Stallings, “Operating Systems –Internals and Design Principles”, 9/e, Pearson. ISBN 9789352866717 2. Charles Crowley, “Operating Systems: A Design-Oriented Approach”, Tata McGraw Hill Co., 2019 edition. ISBN-9780074635513 3. Andrew S.Tanenbaum, “Modern Operating Systems”, 4nd edition,2017 PHL. ISBN-9781292061429



WEB APPLICATION DEVELOPMENT														
II B.Tech – IV Semester (Code: 24CM403)														
Lectures	3	Tutorial	0	Practical	0	Credits	3							
Continuous Internal Evaluation				40	Semester End Examination						60			
Pre-Requisite: None.														
Course Objectives:														
➤	To understand the structure and function of the web.													
➤	To design static and dynamic web pages using HTML, CSS, and JavaScript.													
➤	To build interactive web applications using modern front-end frameworks.													
➤	To explore tools, best practices, and deployment techniques in front-end development.													
Course Outcomes: At the end of this course, Students will be able to														
CO1	Design responsive web interfaces using HTML5 and CSS3.													
CO2	Develop interactive web features using JavaScript and DOM.													
CO3	Create dynamic front-end applications using React.js.													
CO4	Utilize version control systems and deploy web applications online.													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
	POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	3	1	2	1	-	-	-	-	-	3	2	-
CO2	3	3	3	2	3	1	-	-	-	-	-	3	3	-
CO3	3	3	3	2	3	1	-	-	-	-	-	3	3	-
CO4	2	2	2	2	3	2	-	-	-	-	-	3	3	-
Unit-I														
Introduction to Web Architecture: Client-server model, HTTP/HTTPS, Web servers.														
HTML5: Document structure, semantic elements, forms, multimedia.														
CSS3: Styling, box model, positioning, Flexbox, Grid.														
Responsive Web Design: Media queries, mobile-first design.														
Lab Practice: Create a static multi-section webpage with a responsive layout.														
Unit-II														
JavaScript Basics: Syntax, variables, data types, functions, loops.														
DOM Manipulation: Event handling, modifying DOM elements.														
ES6 Features: Arrow functions, let/const, template literals, spread/rest.														
Form Validation: Client-side validation techniques.														
Lab Practice: Develop interactive elements like sliders, form validators.														
Unit-III														
Introduction to React.js: JSX, Components, Props, State, Functional Components vs Class Components. Handling Forms and Events in React.														
React Hooks: useState, useEffect.														
Routing in React: React Router basics.														
Lab Practice: Build a React application with navigation and dynamic data.														



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Unit-IV

Tools, Deployment & Best Practices: Version Control with Git and GitHub. NPM and Webpack (Introductory Concepts).

Performance Optimization: Lazy loading, asset management.

Deployment: GitHub Pages, Netlify, Vercel. Introduction to CI/CD (Conceptual Overview).

Lab Practice: Host a React app on GitHub Pages or Netlify with version control.

Text Books :

3. Jon Duckett, HTML and CSS: Design and Build Websites, Wiley, 2011. ISBN: 978-1-118-00818-8
4. Alex Banks & Eve Porcello, Learning React, O'Reilly, 3rd Edition, 2022
5. Ethan Brown, Learning JavaScript: JavaScript Essentials for Modern Application Development, O'Reilly, 2016.

References :

1. Mark Myers, A Smarter Way to Learn JavaScript, CreateSpace, 2014.
2. Robin Nixon, Learning PHP, MySQL & JavaScript, O'Reilly, 2021.
3. Documentation: <https://developer.mozilla.org> (MDN Web Docs)
4. Documentation: <https://reactjs.org> (Official React Documentation)



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DATABASE MANAGEMENT SYSTEMS														
II B. Tech. – IV Semester (Code: 20CM404)														
Lectures	3		Tutorial		0		Practical		0		Credits		3	
Continuous Internal Evaluation					40		Semester End Examination					60		
Pre-Requisite: None														
Course Objectives:														
➤		Familiarize with fundamental concepts of database and various database architectures and Design relations for Relational databases using conceptual data modeling.												
➤		Implement formal relational operations in relational algebra and SQL.												
➤		Identify the Indexing types and normalization process for relational databases												
➤		Use mechanisms for the development of multi user database applications.												
Course Outcomes: At the end of this course, Students will be able to														
CO1		Apply knowledge of database design methodology which give a good formal foundation in relational data model and Understand and apply the principles of data modeling using ER Model.												
CO2		Create relational algebra expressions, relational calculus, and SQL for queries and be familiar with relational database theory												
CO3		Design database schema and Identify and solve the redundancy problem in database tables using normalization.												
CO4		Learn about transaction processing, concurrency management, and recovery methods.												
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
	POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	3	3	-	-	-	-	-	-	-	3	3	2
CO2	3	3	3	3	3	-	-	-	-	-	-	3	3	2
CO3	3	3	3	3	-	-	-	-	-	-	-	3	3	2
CO4	3	3	3	3	-	-	-	-	-	-	-	3	3	2
UNIT-I														
Databases and Database Users: Introduction - An Example, Characteristics of the Database Approach, Actorson the Scene, Workers behind the Scene, Advantages of Using the DBMS Approach.														
Database System Concepts and Architecture: DataModels, Schemas and Instances ,Three-SchemaArchitecture and Data Independence, Database Languages and Interfaces, The Database System Environment, Centralized and Client/Server Architectures for DBMSs.														
Data Modeling Using the Entity-Relationship (ER) Model : Using High-Level Conceptual Data Models forDatabase Design, An Example Database Application, Entity Types, Entity Sets, Attributes, and Keys - Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, Refining the ER Design for the COMPANY Database - ER Diagrams, Naming Conventions, and Design Issues														
UNIT-II														



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<p>The Relational Algebra and Relational Calculus : Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations: JOIN and DIVISION, The Tuple Relational Calculus, The Domain Relational Calculus.</p> <p>Schema Definition, Constraints, Queries, and Views : SQL Data Definition and Data Types, Specifying Constraints in SQL, Schema Change Statements in SQL, Basic Queries in SQL, INSERT, DELETE, and UPDATE Statements in SQL , Views (Virtual Tables) in SQL</p>	
UNIT-III	
<p>Indexing Structures for Files: Types of Single-Level Ordered Indexes, Multilevel Indexes - Dynamic Multilevel Indexes Using B+-Trees.</p> <p>Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys - General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form.</p> <p>Relational Database Design Algorithms and Further Dependencies: Properties of Relational Decompositions -Lossless Join Decomposition and Dependency Preserving Decomposition, Multi-valued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form.</p>	
UNIT-IV	
<p>Introduction to Transaction Processing Concepts and Theory: Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability, Characterizing Schedules Based on Serializability</p> <p>Concurrency Control Techniques: Two-Phase Locking Techniques for Concurrency Control, Concurrency Control Based on Timestamp Ordering, Validation (Optimistic) Concurrency Control Techniques, Multiple Granularity.</p> <p>Database Recovery Techniques: Recovery Techniques Based on Deferred Update, Recovery Techniques Based on Immediate Update, Shadow Paging.</p>	
Text Books :	1. Fundamentals of Database Systems, Ramez Elmasri and Navathe Pearson Education, 6th edition
References :	1. Introduction to Database Systems, C.J. Date Pearson Education 2. Database Management Systems, Raghu Rama krishnan, Johannes Gehrke, TATA McGraw Hill 3rd Edition 3. Database System Concepts, Silberschatz, Korth, McGraw hill, 5th edition



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DESIGN AND ANALYSIS OF ALGORITHMS														
II B. Tech. - IV Semester (Code: 24CM405)														
Lectures	2	Tutorial	1	Practical	0	Credits	3							
Continuous Internal Evaluation				40	Semester End Examination						60			
Pre-Requisite: Data Structures (24CM303)														
Course Objectives: Students will be able to														
➤	Understand about designing and the effectiveness of an algorithm, and applying the Master Theorem to find the complexity.													
➤	Strengthen the divide and conquer paradigms and know the optimal solution finding with the greedy method.													
➤	Acquaintance with algorithm design strategies of Dynamic programming and easily know the significant graph algorithms and their analyses.													
➤	Get the ability to backtrack and branch with bound values and NP problems.													
Course Outcomes: At the end of this course, Students will be able to														
CO1	Analyze algorithms' performance using various strategies and apply the Master theorem to estimate the complexity of divide-and-conquer algorithms.													
CO2	Apply the divide-and-conquer and greedy techniques to solve problems and perform complexity analysis.													
CO3	Articulate on graph problems and identify the applicability of the dynamic programming paradigm for designing solutions to problems.													
CO4	Utilize the backtracking and branch and bound algorithms to find every potential solution to combinatorial and optimization issues. In addition, classify the P and NP complicated problems.													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
	POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	3	-	-	-	-	-	-	-	3	3	3	-
CO2	3	3	3	-	-	-	-	-	-	-	3	3	3	-
CO3	3	3	3	-	-	-	-	-	-	-	3	3	3	-
CO4	3	3	3	-	-	-	-	-	-	-	3	3	3	-
UNIT-I														
Introduction: Algorithm, Pseudo code for expressing algorithms, Performance Analysis- Space complexity, Time complexity, Asymptotic Notation.														
Master Theorem: Introduction, Generic Form- Case1, Case2, Case3, Inadmissible equations, Application to standard algorithms.														
UNIT-II														
Divide and conquer: General method, applications - Quicksort, Merge sort, Stassen’s matrix multiplication.														
Greedy method: General method, applications-Job sequencing with deadlines, Fractional knapsack problem, Minimum cost spanning trees – Prim’s Algorithm, Kruskal’s Algorithm, Single source shortest paths – Dijkstra Algorithm.														
UNIT-III														



Dynamic Programming: General method, applications - Multi-stage graphs using Forward & Backward approach, 0/1 knapsack problem, Reliability design, The Travelling salesperson problem, Longest common subsequence algorithm.

Graph Applications: Connected components, Bi-Connected Components, Strongly Connected Components.

UNIT-IV

Backtracking: General method, applications - The 8-queens problem, sum of subsets problem.

Branch and Bound: General method, applications- LC Branch and Bound solution for 0/1 knapsack problem.

NP-Hard and NP-Complete problems: Basic concepts - non-deterministic algorithms, NP-Hard and NP Complete classes, Cook's theorem.

Text Books :	E. Horowitz, S.Sahni and S. Rajasekaran, "Fundamentals of Computer Algorithms", Galgotia Publication.
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References :	<ol style="list-style-type: none">1. T. H. Cormen, Leiserson, Rivest, and Stein, "Introduction to Computer Algorithms" The MIT Press.2. Sara Basse, A.V. Gelder, "Computer Algorithms: Introduction to Design & Analysis, 3e", Pearson Education.
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Department of CSE (Artificial Intelligence and Machine Learning)

ADVANCED PYTHON PROGRAMMING														
(Skill Enhancement Course – 2)														
II B. Tech. – IV Semester (Code: 24CML401/SEC2)														
Lectures	1	Tutorial	0	Practical	2	Credits	2							
Continuous Internal Evaluation				40	Semester End Examination						60			
Pre-Requisite: Python Programming (24CML301)														
Course Objectives:														
➤	Earn the skills to understand and implement Python modules and packages, and perform database connectivity and operations for effective data management and application development.													
➤	Learn the foundational knowledge and practical skills in using the NumPy module for efficient numerical computing and array-based operations in Python.													
➤	Learn the ability to efficiently manipulate, analyze, and clean data using the Pandas module for effective data wrangling.													
➤	Equip with the skills to create effective data visualizations using Matplotlib and Seaborn for insightful data analysis and presentation.													
Course Outcomes: At the end of this course, Students will be able to														
CO1	Develop the ability to understand and implement Python modules and packages, along with performing database connectivity and operations for efficient data management and application development.													
CO2	Gain foundational knowledge and practical skills in utilizing the NumPy module for high-performance numerical computations and array-based operations in Python.													
CO3	Acquire the capability to manipulate, clean, and analyze data effectively using the Pandas module, enabling robust data wrangling techniques.													
CO4	Attain proficiency in creating insightful and impactful data visualizations using Matplotlib and Seaborn to support data analysis and presentation.													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
	POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	1	1	1	1	3	-	-	-	1	2	2	2	1	1
CO2	2	3	2	2	3	-	-	-	1	2	2	1	2	1
CO3	1	3	2	2	3	-	-	-	1	2	2	2	1	2
CO4	1	2	2	2	3	-	-	-	-	2	2	2	1	2
SYLLABUS														
Modules and Packages: Introduction python module, creating module, using the module, accessing from module, creating package, package initialization, importing from packages, different ways to import modules and packages, creating sub packages and importing.														
Database Connectivity & Operations: Introduction to Python SQLite3 DB module, using SQLite3 to create insert, retrieve, delete, update and drop table operations on tables.														
NumPy Module: Introduction to NumPy, A Multidimensional Array Object, Creating ndarrays, Data Types for ndarrays, Operations between Arrays and Scalars. Basic Indexing and Slicing. Boolean														



Indexing, Fancy Indexing, Data Processing Using Arrays, Expressing Conditional Logic as Array Operations, Expressing Binary and Bitwise Operators, Methods for Boolean Arrays , Sorting , Unique.

Pandas Module: Introduction to pandas, Pandas Series, Pandas DataFrames, creating DataFrame, reading from csv files & Excel files, reading from json files, data cleaning, cleaning wrong format, cleaning wrong data, data correlations, pandas for plotting, displaying plots.

Data Wrangling: Combining and Merging Data Sets, Database style Data Frame Merges, Merging on Index, Concatenating Along an Axis, Combining Data with Overlap, Reshaping and Pivoting, Reshaping with Hierarchical Indexing, Data Transformation, Removing Duplicates, Replacing Values.

Plotting and Visualization using Matplotlib: Introduction to Matplotlib, Figures and Subplots, Colors, Markers, and Line Styles, Ticks, Labels, and Legends, Annotations and Drawing on a Subplot, Saving Plots to File, Line Plots, Bar Plots, Histograms and Density Plots, Scatter Plots, Pie chart using Matplotlib.

Plotting and Visualization using Seaborn: Introduction to Seaborn, Plotting using Scatter Plot, Strip Plot, Swarm Plot, Count Plot, Box Plot, Pair Plot, Cat Plot, Implot Plot, DistPlot.

LIST OF THE PROGRAMS

1. Implement Modules and packages in Python

- Write a Python program to Create a Module to use a Module.
- Write a Python program to Rename a Module.
- Write a Python program to import specific names from a module without importing the module as a whole.
- Write a Python program to list all the functions (or variable names) in a module.
- Write a Python program to create and import packages
- Write a Python program to create and import subpackages

2. Database Connectivity & Operations: Python SQLite3.

- Write a Python program to demonstrate database operations such as create, insert, select, & where in below Student Table.
- Write a Python program to demonstrate database operations such as update, delete, & drop table in below Student Table.
- Write a python program to create the below Employee table.
- Write a python program to sort employee names in the Employee table.
- Write a python program using Aggregate functions (MIN, MAX, SUM and AVG) for below table.

STUDENT TABLE		
Name	Branch	Address
Naresh	IT	Hyderabad
Venkat	CSE	Bapatla
Rajesh	AIML	Guntur
Vinay	CBDS	Tenali
Bose	CIVIL	Ongole

EMPLOYEE TABLE			
Emp_ID	Emp_Name	Dept	Salary
400	Suresh	Physics	40000
401	Jaya Lakshmi	Chemistry	50000
402	Durgesh	Maths	50000
403	Sai	Physics	45000
404	Pallavi	English	48000



3. NumPy

- Develop a Python Program to create & split arrays using NumPy module.
- Develop a Python Program to test all aggregate functions in NumPy module.
- Develop a Python Program to generate a matrix of random numbers within range and print its Transpose.
- Develop a Python Program that calculates variance, co variance, correlation by taking sample statistical data.
- Develop a python program to find rank, determinant, and trace of a matrix.
- Develop a Python program on Boolean arrays and Binary Operators.
- Develop a Python program for Expressing Conditional Logic as Array Operations.

4. Pandas

- Develop a python program to implement Pandas Series with labels and dictionary.
- Develop a program to creating a Pandas DataFrame using dictionary and 2-D array.
- Develop a program which makes use of following Panda's methods.
i) describe () ii) head() iii) tail() iv) info().
- Develop a program for Preprocessing of Dataframe.
- Develop a python program of group by() and pivot() method.
- Demonstrate pandas Merging, Joining and Concatenating.
- Write code to read data from text file, CSV file, Excel file and JSON file into a Dataframe. Print the overview of data and slice data using different indexing/slicing methods.
- Convert a Dataframe to .csv, .json, .xml, .txt and .xlsx files.

5. Using Matplotlib package, draw the following and customize them.

- 1) Scatter Plot 2) Bar Plot 3) Pie Chart 4) Histogram 5) Box Plot

6. Using Seaborn package, draw the following.

- 1) Scatter Plot 2) Strip Plot 3) Swarm Plot 4) Count Plot 5) Box Plot.

7. Using Seaborn package, draw the following.

- 1) Pair Plot 2) Cat Plot 3) Count Plot 4) Implot Plot 5) DistPlot.

Text Books :	<ol style="list-style-type: none">Wes McKinney, "Python for Data Analysis", O'Reilly, ISBN:978-1-449-31979-3, 1st edition, October 2012.Rachel Schutt & O'neil, "Doing Data Science", O'Reilly, ISBN:978-1-449-35865-5, 1st edition, October 2013.Problem solving and python programming fundamentals and application: NumPy, Pandas and Matplotlib. Harsha Bhasin.
References :	<ol style="list-style-type: none">Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media, 2015Matt Harrison, "Learning the Pandas Library: Python Tools for Data Munging, Analysis, and Visualization, O'Reilly, 2016.



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DESIGN THINKING AND INNOVATION														
II B. Tech. - IV Semester (24CML402)														
Lectures	1	Tutorial		0	Practical		2	Credits		2				
Continuous Internal Evaluation				40	Semester End Examination					60				
Pre-Requisite: None														
Course Objectives:														
➤	Provide an overview of design thinking.													
➤	Engage students to allow them to integrate these components into their own courses.													
➤	Nurture their skills to contribute for solving community-based problems													
➤	Provide a framework to work in teams to solve problems													
Course Outcomes: At the end of this course, Students will be able to														
CO1	Describe the components of design thinking													
CO2	List attributes of expert designers													
CO3	Employ prototyping into their design experiences													
CO4	Discuss the importance of users in the design process in proposing solutions													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
	POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	2	-	-	-	-	-	-	-	2	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	2	-	-	-
CO3	3	3	3	-	-	-	-	-	-	-	2	-	-	-
CO4	2	2	2	-	-	-	-	-	-	-	2	-	-	-
UNIT-I														
Introduction to Design Thinking: Characteristics of design thinking, Expert and novice design characteristics, Opportunities for student to learn skills needed for the development of expertise. Case study for design thinking success: Creating a culture of design learning, Gathering information from users, Rapid prototyping.														
UNIT-II														
Users and community partners: Understanding users, identifying users, creating tools for understanding users Requirements and specifications: Defining specifications, State of the art comparisons, Testing requirements														
UNIT-III														
Prototyping: Prototypes for technology, Prototypes for communication Ideation and concept generation: Brainstorming, Concept generation, Functional decomposition. Testing and design to prevent failures: Testing of designs, Design for Failure Modes and Effects Analysis (DFMEA), Delivery to users														
UNIT-IV														
Teaming concepts in design: Managing student teams, Organizing teams, Assessing teams, Mentoring and advising teams Closure and summary: Reviewing design cycles and concepts, Putting it into action														



Practical Exercises

1. Design Thinking Mind Map Exercise
2. Functional Decomposition – eg: Mechanical Pencil
3. Thirty Circle Exercise – IDEO thinking
4. Shopping Cart Design Exercise - IDEO
5. Brain storm and innovate bicycle for better urban mobility
6. Develop an Empathy Map – case study
7. The Lean Canvas Model – business model
8. Technology Readiness Assessment – to evaluate project risks
9. Prototyping Exercise – using paper/thermos coal/cardboard/recyclable material
10. Case study of any Jugaad – economic rural solution
11. Design thinking using sprint base software
12. Presentation on Idea Proposal – along with a Prototype (Domain Specific)
13. Risk Analysis – case study – DFMEA Analysis
14. Test Plan Preparation – case study
15. Interaction with Technical community- viable product delivery

Practical Exercises (Branch Specific)

16. Design and develop a prototype animation model for the need of society.
17. Design and implement a prototype web application for the need of real world.

Note: *Minimum of 10 Exercises have to be completed and documented. Out of these 5 exercises can be tuned to branch specific if necessary.*

Text Books :

1. IdrisMootee, “Design Thinking for Strategic Innovation”, John Wiley & Sons (2013).
2. “Change by design”, Tim Brown, Harper Collins, 2009
3. “Design Thinking- The Guide Book” – Facilitated by the Royal Civil service Commission, Bhutan
4. Engineering design by George E Dieter

References :

1. 101 Design Methods: A Structured Approach for Driving Innovation in Your Organization by Vijay Kumar
2. Human-Centered Design Toolkit: An Open-Source Toolkit To Inspire New Solutions in the Developing World by IDEO
<https://www.interaction-design.org/literature/topics/design-th/nking>
<https://www.interaction-design.org/literature/article/how-tq->



WEB APPLICATION DEVELOPMENT LAB														
II B.Tech – IV Semester (Code: 24CML403)														
Lectures	0	Tutorial	0	Practical	03	Credits	1.5							
Continuous Internal Evaluation				40	Semester End Examination							60		
Pre-Requisite: None.														
Course Objectives:														
➤	To understand the structure and function of the web.													
➤	To design static and dynamic web pages using HTML, CSS, and JavaScript.													
➤	To build interactive web applications using modern front-end frameworks.													
➤	To explore tools, best practices, and deployment techniques in front-end development.													
Course Outcomes: At the end of this course, Students will be able to														
CO1	Design responsive web interfaces using HTML5 and CSS3.													
CO2	Develop interactive web features using JavaScript and DOM.													
CO3	Create dynamic front-end applications using React.js.													
CO4	Utilize version control systems and deploy web applications online.													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
	POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	3	1	2	1	-	-	-	-	-	3	2	-
CO2	3	3	3	2	3	1	-	-	-	-	-	3	3	-
CO3	3	3	3	2	3	1	-	-	-	-	-	3	3	-
CO4	2	2	2	2	3	2	-	-	-	-	-	3	3	-
List of Experiments														
<div>1. Set up the development environment. Create a basic HTML page with a header, footer, and content section.</div> <div>2. Build a form using HTML5 form elements. Include text fields, radio buttons, checkboxes, and validation attributes.</div> <div>3. Design a page layout using CSS Flexbox. Style different sections of a webpage using custom classes.</div> <div>4. Use CSS Grid to create a responsive gallery layout. Add media queries to adapt layout for mobile screens.</div> <div>5. <div>a) Write JavaScript to manipulate DOM elements. Create a dynamic to-do list that adds/removes items.</div><div>b) Add interactivity using event listeners. Implement a simple JavaScript calculator.</div></div> <div>6. Create a form with real-time validation using JavaScript. Display error messages dynamically.</div> <div>7. <div>a) Set up a React app using Create React App. Create a component-based UI for a simple profile page.</div><div>b) Use props and state in a React app. Create a counter and a dynamic list of tasks.</div></div>														



8. Use React Hooks (useState, useEffect) to create an API fetch example. Display fetched data in components.
9. Build a multi-page app using React Router. Add navigation and route-based components.
10. Initialize a project repository with Git. Push changes to GitHub and manage branches.
11. Optimize a web page for performance. Use Chrome DevTools and Lighthouse to analyze and improve.
12. Deploy a React app to GitHub Pages or Netlify. Ensure live demo is accessible.

Text Books :	<ol style="list-style-type: none">1. Jon Duckett, HTML and CSS: Design and Build Websites, Wiley, 2011. ISBN: 978-1-118-00818-82. Alex Banks & Eve Porcello, Learning React, O'Reilly, 3rd Edition, 20223. Ethan Brown, Learning JavaScript: JavaScript Essentials for Modern Application Development, O'Reilly, 2016.
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References :	<ol style="list-style-type: none">1. Mark Myers, A Smarter Way to Learn JavaScript, CreateSpace, 2014.2. Robin Nixon, Learning PHP, MySQL & JavaScript, O'Reilly, 2021.3. Documentation: https://developer.mozilla.org (MDN Web Docs)4. Documentation: https://reactjs.org (Official React Documentation)
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RDBMS LAB														
II B.Tech – IV Semester (Code: 24CML404)														
Lectures	0	Tutorial	0	Practical	3	Credits	1.5							
Continuous Internal Evaluation				40	Semester End Examination						60			
Pre-Requisite: None.														
Course Objectives:														
➤	Analyze the students on database languages.													
➤	Interpret the Knowledge on database design.													
➤	Determine the knowledge on key constraints and Normalization.													
➤	Determine the knowledge on procedures and functions.													
Course Outcomes: At the end of this course, Students will be able to														
CO1	Design database by using ER Diagrams													
CO2	Implement DDL, DML, DCL Commands using SQL.													
CO3	Apply key constraints to get a normalized database.													
CO4	Implement procedures and functions using PL/SQL													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
	POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	3	3	3	-	2	-	2	-	3	3	3	3
CO2	3	3	3	3	3	-	2	-	2	-	3	3	3	3
CO3	3	3	3	3	3	-	2	-	2	-	3	3	3	3
CO4	3	3	3	3	3	-	2	-	2	-	3	3	3	3
LIST OF EXPERIMENTS														
Experiment 1: Working with ER Diagram														
Example: ER Diagram for Sailors Database														
Entities		Relationship		Primary Key Attributes										
Sailor		Reserves		SID (Sailor Entity)										
Boat				BID (Boat Entity)										
Experiment 2: Working with DDL, DML, DCL and Key Constraints														
Creation, Altering and Dropping of Tables and Inserting Rows into a Table (Use Constraints While Creating Tables) Examples Using Select Command.														
Experiment 3: Working with Queries and Nested QUERIES														
Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints														
Experiment 4: Working with Queries USING Aggregate Operators & views														



Queries using Aggregate Functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and Dropping of Views

Experiment 5: Working with Conversion Functions & String Functions

Queries using Conversion Functions (TO_CHAR, TO_NUMBER AND TO_DATE), String Functions (CONCATENATION, LPAD, RPAD, LTRIM, RTRIM, LOWER, UPPER, INITCAP, LENGTH, SUBSTR AND INSTR), Date Functions (SYSDATE, NEXT_DAY, ADD_MONTHS, LAST_DAY, MONTHS_BETWEEN), LEAST, GREATEST, TRUNC, ROUND, TO_CHAR, TO_DATE

Experiment 6: Working with LOOPS using PL/SQL

Program Development using WHILE LOOPS, FOR LOOPS, Nested Loops using ERROR Handling.

Experiment 7: Working with Functions Using PL/SQL

Program Development using Creation of Stored Functions, Invoke Functions in SQL Statements and Write Complex Functions.

Experiment 8: Working with Stored Procedures

Programs Development using Creation of Procedures, Passing Parameters IN and OUT of PROCEDURES

Experiment 9: Working with CURSORS

Develop Programs using Features Parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of Clause and CURSOR Variables.

Experiment 10: Working with Triggers using PL/SQL

Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers

Text Books :

1. Oracle PL/SQL by Example, Benjamin Rosenzweig, Elena Silvestrova, Pearson Education 3rdEd
2. Oracle Database Logic PL/SQL Programming, ScottUrman, TataMc-Graw Hill.
3. SQL and PL/SQL for Oracle 10g, Black Book, Dr.P.S.Deshpande



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NSS/ NCC/SCOUTS & GUIDES/COMMUNITY SERVICE														
II B.Tech – IV Semester (Code: 24CML405)														
Lectures	0	Tutorial	0	Practical	2	Credits	0.5							
Continuous Internal Evaluation				100	Semester End Examination						---			
Pre-Requisite: None.														
Course Objectives:														
➤	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: At the end of this course, Students will be able to														
CO1	Understand the importance of discipline, character and service motto.													
CO2	Solve some societal issues by applying acquired knowledge, facts, and techniques.													
CO3	Explore human relationships by analyzing social problems.													
CO4	Determine to extend their help for the fellow beings and downtrodden people and also Leadership skills and civic responsibilities.													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
	POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	-	-	-	-	-	-	-	-	2	-	3	-	-	-
CO2	-	-	-	-	-	-	-	-	2	-	3	-	-	-
CO3	-	-	-	-	-	-	-	-	2	-	3	-	-	-
CO4	-	-	-	-	-	-	-	-	2	-	3	-	-	-
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														
.														
UNIT-II														
Nature & Care														
Activities:														
i) Best out of waste competition.														
ii) Poster and signs making competition to spread environmental awareness.														
iii) Recycling and environmental pollution article writing competition.														
iv) Organising 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.														



UNIT-III

Community Service

Activities:

- i) 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.
- 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.

Text 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)
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References :	
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ENVIRONMENTAL SCIENCE														
II B. Tech. – III Semester (Code: 24CM406/MC01)														
Lectures	2	Tutorial		0	Practical			0	Credits			0		
Continuous Internal Evaluation				40	Semester End Examination						0			
Pre-Requisite: Chemistry, Physics, Geography and Earth Science														
Course Objectives: To learn														
➤	To understand and learn about ecosystem and biodiversity exist in nature.													
➤	To know about the natural resources and sustainability													
➤	To understand different types of pollutions present in Environment													
➤	To know the global environmental problems with case studies													
Course Outcomes: At the end of this course, Students will be able to														
CO1	Students develop a strong understanding of ecosystems, biodiversity and the importance of their conservation													
CO2	Students gain an understanding of the protection of natural resources for environmental protection and sustainability.													
CO3	Know how to manage the harmful pollutions													
CO4	Create awareness among the youth on environmental concerns important in the long-term interest of the society.													
Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes														
	POs											PSOs		
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	-	-	-	3	3	-	-	-	-	1	-	-
CO2	3	2	-	-	-	3	3	2	-	-	-	1	-	-
CO3	3	2	-	-	-	3	3	2	-	3	-	1	-	-
CO4	3	2	-	-	-	3	3	-	-	-	-	1	-	-
UNIT-I														
Ecosystems: Definition, Structure and Functions of Ecosystems, Forest Ecosystem. Biodiversity: Definition and levels of Biodiversity; Values of Biodiversity, Threats and Conservation of Biodiversity.														
UNIT-II														
Natural resources: Land: Land as a resource, Causes and effects of land degradation, Water: floods and drought, Dams - benefits and problems. Sustainability: Rain water harvesting and Watershed management.														
UNIT-III														
Pollution: Definition; Causes, effects and control of air, water pollution: Solid Waste Management - 3R approach, composting and vermicomposting. Environmental acts: Water and air (Prevention and Control of pollution) acts, Environmental protection act, Forest Conservation act.														
UNIT-IV														
Environmental issues: Global warming, Ozone layer depletion, Acid rains Case Studies: Bhopal Tragedy, Mathura Refinery and TajMahal														



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Text Books :	<ol style="list-style-type: none">1. “Environmental Science and Engineering” by Benny Joseph, Tata McGraw-Hill Publishing Company Limited, New Delhi.2. “Introduction to Environmental Science”, Anjaneyulu Y, B S Publications3. “Comprehensive environmental studies”- JP Sharma, Laxmi Publications.
References :	<ol style="list-style-type: none">1. “Environmental studies”, R.Rajagopalan, Oxford University Press.2. “Environmental Science”, 11th Edition – Thomson Series – By Jr. G. Tyler Miller.3. Text Book of environmental Studies – Erach Bharucha