BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

R24-Scheme & Syllabus

(w.e.f. 2024-2025)

4 Year B. Tech Program

of

Electronics and Communication Engineering

BAPATLA ENGINEERING COLLEGE :: BAPATLA

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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 secures 160 (Regular program) / 121 (Lateral Entry program) credits.
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:

a. **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.

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

c. **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.

d. 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 – 23 %	37
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

8.2.1 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.

8.2.2 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.

8.2.3 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.

8.2.4 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.

8.3.1 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.

8.3.2 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.

8.3.3 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.

8.3.4 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 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 amandatory 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.

a. Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in Minor specialization groups offered by a department other than their parent department.
b. 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.
c. The list of disciplines / branches eligible to opt for a particular industry relevant minor specialization shall be clearly mentioned by the respective BOS.

d. There shall be no limit on the number of programs offered under Minor. The 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 4 th 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 offeredbytheparent 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 4 th 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.,

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

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.,

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

where "$SGPA_j$" is the SGPA of the j^{th} 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	≥ 6.5 < 7.5
Second Class	≥ 5.5 < 6.5
Pass Class	≥ 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:
    1. List of students who have passed MOOC courses in the current semester along with the certificate of completion.
    2. 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	Expulsion from the examination hall and cancellation of the performance in that course only.

	(material shall include any marks on the body of the 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.
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	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. 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.
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.	

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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R-24 Course Structure Summary

S. No	Category	Description	Credits	% of Credits
1	HS	Humanities and Social Sciences including Management (HM)	8	5
2	BS	Basic Science Courses (BS)	20	12.5
3	ES	Engineering Science Courses (ES)	24	15
4	PC	Professional Core Courses (PC)	55	34.3
5	PE/ OE/JO	Electives – Professional Electives (PE); Job Oriented Electives (JOE); Open Electives (OE); Skill Enhancement Courses (SEC)	35	20.09
6	INT/PW	Internships & Project Work (PR)	16	10
7	MC	Mandatory Courses (MC)	0	Non Credit
Total			160	100

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Effective from the Academic Year 2024-2025 (R24 Regulations) First Year B. Tech (SEMESTER – I)

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	
24EC101	BS	Linear Algebra and Ordinary Differential Equations	2	1	0	3	40	60	100	3
24EC102	BS	Engineering Chemistry	3	0	0	3	40	60	100	3
24EC103	ES	Fundamentals of Electrical and Electronics Engineering	3	0	0	3	40	60	100	3
24EC104	ES	Programming using C	3	0	0	3	40	60	100	3
24EC105	ES	Circuit Theory	3	0	3	3	40	60	100	3
24ECL101	BS	Engineering Chemistry Lab	0	0	2	2	40	60	100	1
24ECL102	ES	Fundamentals of Electrical and Electronics Engineering Lab	0	0	3	3	40	60	100	1.5
24ECL103	ES	Programming using C Lab	0	0	3	3	40	60	100	1.5
24ECL104	ES	IT Workshop	0	0	2	2	40	60	100	1
TOTAL			14	1	13	25	360	540	900	20
Induction Program	First 3 weeks (Physical activity, Creative arts, Universal Human values, Literary, Proficiency Module, Familiarization with branch/dept)									

CIE	Continuous Internal Evaluation	L	Lecture
SEE	Semester End Examination	T	Tutorial
BS	Basic Science	P	Practical
ES	Engineering Science	MC	Mandatory Course

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First Year B. Tech (SEMESTER – II)

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	
24EC201	BS	Numerical Methods& Advanced Calculus	2	1	0	3	40	60	100	3
24EC202	BS	Semiconductor Physics and Nano Materials	3	0	0	3	40	60	100	3
24EC203	HM	Communicative English	2	0	0	2	40	60	100	2
24EC204	ES	Programming using C++	3	0	0	3	40	60	100	3
24ECL201	ES	Engineering Graphics Lab	1	1	3	4	40	60	100	2.5
24ECL202	ES	Engineering Mechanics and Survey Lab	1	0	2	3	40	60	100	2
24ECL203	BS	Semiconductor Physics Lab	0	0	2	2	40	60	100	1
24ECL204	HM	English Communication Skills Lab	0	0	2	2	40	60	100	1
24ECL205	ES	Programming using C++ Lab	0	0	3	3	40	60	100	1.5
TOTAL			12	2	12	25	360	540	900	19

CIE	Continuous Internal Evaluation	L	Lecture
SEE	Semester End Examination	T	Tutorial
BS	Basic Science	P	Practical
ES	Engineering Science	PC	Professional Core
HS	Humanities & Social Science		

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Second Year B. Tech (SEMESTER – III)

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	
24EC301	BS	Probability and Statistics	2	1	0	3	40	60	100	3
24EC302	PC	Analog Electronics	3	0	0	3	40	60	100	3
24EC303	PC	Digital Electronics	2	1	0	3	40	60	100	3
24EC304	PC	Electromagnetic Field Theory	3	0	0	3	40	60	100	3
24ECL301 / SEC1	SEC	Data Structures using Python	1	0	2	3	40	60	100	2
24ECL302	ES	Design Thinking & Innovation Lab	1	0	2	3	40	60	100	2
24ECL303	PC	Analog Electronics Lab	0	0	2	2	40	60	100	1
24ECL304	PC	Digital Electronics Lab	0	0	2	2	40	60	100	1
24ECL305	HM	NSS/NCC/Scouts & Guides/Community	0	0	1	1	-	100	100	0.5
24EC305/MC 01	MC*	Environmental Science	2	0	0	2	40	-	40	0
TOTAL			14	2	9	25	360	580	940	18.5

CIE	Continuous Internal Evaluation	L	Lecture
SEE	Semester End Examination	T	Tutorial
BS	Basic Science	P	Practical
PC	Professional Core	MC	Mandatory Course
SEC	Skill Enhancement Course		

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electronics and Communication Engineering

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	
24EC401	BS	Quantum Technologies	2	1	0	3	40	60	100	3
24EC402	PC	Signals and Systems	2	1	0	3	40	60	100	3
24EC403	PC	Electromagnetic Waves and Transmission Lines	3	0	0	3	40	60	100	3
24EC404	PC	Analog and Digital Communications	3	0	0	3	40	60	100	3
24EC405	PC	Analog Integrated Circuits	3	0	0	3	40	60	100	3
24ECL401 / SEC2	SEC	Digital Design using Verilog HDL	1	0	2	3	40	60	100	2
24ECL402	PC	Analog Integrated Circuits Lab	0	0	2	2	40	60	100	1
24ECL403	PC	Analog and Digital Communications Lab	0	0	2	2	40	60	100	1
24ECL404	HM	Health and Wellness Through Yoga and Sports [PRACTICAL ORIENTED]	0	0	1	1	-	100	100	0.5
24EC406 / MC02	MC*	Constitution of India	2	0	0	2	40	-	40	0
TOTAL			16	2	7	25	360	580	940	19.5
24EC4H/4M	HONOR / MINORS		3	0	2	5	40	60	100	4

L: Lecture T: Tutorial P: Practical
CIE: Continuous Internal Evaluation SEE: Semester End Examination

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Third Year B. Tech (SEMESTER– V) -*Draft Version*

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	
24EC501	PC	Antenna and Wave Propagation	3	0	0	3	40	60	100	3
24EC502	PC	Micro Processors and Micro Controllers	3	0	0	3	40	60	100	3
24EC503	PC	Digital Signal Processing	2	1	0	3	40	60	100	3
24EC504 / PE1	PE	Professional Elective-1	3	0	0	3	40	60	100	3
24EC505 /JO1	JOE	Job Oriented Elective-1	3	0	0	3	40	60	100	3
24ECL501	HM	Soft Skills Lab	1	0	2	3	40	60	100	2
24ECL502	PC	Signal Processing Lab	0	0	3	3	40	60	100	1.5
24ECL503	PC	Micro Processors and Micro Controllers Lab	0	0	3	3	40	60	100	1.5
20ECL504	PC	AI & ML Lab	1	0	2	2	40	60	100	1
24ECL504 / INT1	INT	Summer Internship-1	0	0	0	0	-	100	100	2
24EC506 / MC03	MC*	Technical Paper Writing and IPR	2	0	0	2	40	-	40	0
TOTAL			18	1	10	28	400	640	1040	23
20EC5H /20EC5M	Honors/Minor Course		3	1	0	4	40	60	100	4

CIE	Continuous Internal Evaluation	L	Lecture
SEE	Semester End Examination	T	Tutorial
SEC	Skill Enhancement Course	P	Practical
PC	Program Core	MC	Mandatory Course
JO	Job Oriented Elective	PE	Professional Elective
INT	Internship	HM	Humanities and Management

*** Summer Internship done after completion of IV Semester, evaluation done in V Semester**

Job Oriented Elective - I	1A	Programming with JAVA
	1B	Data Communications and Computer Networks
	1C	Pattern Recognition and Applications
	1D	Real Time Operating Systems
Professional Elective - I	1A	Information Theory and Coding Techniques
	1B	Telecommunication and Switching Systems
	1C	Artificial Neural Networks.
	1D	Nano Materials and Sciences

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Third Year B. Tech (SEMESTER–VI)- -*Draft Version*

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	
20EC601	PC	Linear Control Systems	2	1	0	3	40	60	100	3
20EC602	PC	VLSI Design	3	0	0	3	40	60	100	3
20EC603	PC	Microwave and Optical Communications	3	0	0	3	40	60	100	3
20EC604/ PE 2	PE	Professional Elective-II	3	0	0	3	40	60	100	3
20EC605 /PE3	PE	Professional Elective-III	3	0	0	3	40	60	100	3
20EC606 /JO2	JOE	Job Oriented Elective-II	3	0	0	3	40	60	100	3
20ECL601/ SEC-3	SEC	Internet of Things Lab	1	0	2	3	40	60	100	2
20ECL602	PC	VLSI Design Lab	0	0	3	3	40	60	100	1.5
20ECL603	PC	ANN Lab	0	0	3	3	40	60	100	1.5
20EC607 /MC04	MC	Campus Recruitment Training	0	0	0	2	40	-	40	0
		TOTAL	18	1	8	29	400	540	940	23
20EC6H/ 20EC6M	Honors/Minor Course		3	1	0	4	40	60	100	4

CIE	Continuous Internal Evaluation	L	Lecture
SEE	Semester End Examination	T	Tutorial
SEC	Skill Enhancement Course	P	Practical
PC	Program Core	MC	Mandatory Course
JO	Job Oriented Elective	PE	Professional Elective
INT	Internship	HM	Humanities and Management

Job Oriented Elective-II	2A	Cloud Computing
	2B	Deep Learning
	2C	Natural Language Processing
	2D	Large Language Models
Professional Elective – II	2A	Wireless Sensor Networks
	2B	OFDM
	2C	Satellite Communication
	2D	Smart Antennas
Professional Elective – III	2A	Digital Image Processing
	2B	Bio-Medical Signal Processing
	2C	MEMS
	2D	Speech Processing

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Fourth Year B. Tech (SEMESTER– VII)- -*Draft Version*

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	
20EC701	HM	Telecommunication Management	3	0	0	3	40	60	100	3
20EC702	PC	Wireless and Mobile Communication	3	0	0	3	40	60	100	3
20EC703 /PE4	PE	Professional Elective	3	0	0	3	40	60	100	3
20EC704 /O	OE	Open Elective	3	0	0	3	40	60	100	3
20EC705 /PE5	PE	Professional Elective	3	0	0	3	40	60	100	3
20EC706 /JO3	JOE	Industrial Management and Entrepreneurship Development	3	0	0	3	40	60	100	3
20ECL701 / SEC4	SEC	Embedded Systems and Design	1	0	2	3	40	60	100	2
20ECL702	PC	Microwave and Optical Communication Lab	0	0	3	3	40	60	100	1.5
20ECL703	PC	Wireless Communications Lab	0	0	3	3	40	60	100	1.5
20ECL704 /INT2	INT	Summer Internship	0	0	0	0	0		100	2
		TOTAL	19	0	2	21	40	60	100	25
20EC7H /20EC7M	Honors/Minor Course		3	1	0	4	40	60	100	4

CIE	Continuous Internal Evaluation	L	Lecture
SEE	Semester End Examination	T	Tutorial
PE	Professional Elective	P	Practical
OE	Open Elective	JO	Job Oriented Elective
HS	Humanities and Social Sciences	SO	Skill Advanced Course

PE Elective – IV:	3A	Radar Engineering
	3B	Real Time Signal Processing
	3C	Video Processing
	3D	Advanced DSP
PE Elective – V:	4A	AI and ML for Wireless Communication
	4B	Cryptography and Network Security
	4C	Generative AI
	4D	Blockchain Technology
JO Elective-III	5A	Low Power VLSI
	5B	FPGA Design
	5C	Semiconductor Device Modelling
	5D	Analog VLSI
	5E	System on Chip architecture

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OPEN ELECTIVES

***Offered to other departments**

Department	CODE	SUBJECT
AIML	CM1	Artificial Intelligence
	CM2	Introduction to Machine Learning
CIVIL	CE1	Air Pollution and Control
	CE2	Remote Sensing and GIS
CB	CB1	Digital Forensics
	CB2	Introduction to Information Security and Cyber Laws
CSE	CS1	Database Management System
	CS2	Java Programming
DS	DS1	Data Warehousing and Data Mining
	DS2	Social Network Analysis
ECE	EC1	Digital Image Processing
	EC2	Embedded System & Design
EEE	EE1	Non-Conventional Energy Sources
	EE2	Electrical Energy Conservation and Auditing
	EE3	Industrial Electrical Systems
EIE	EI1	Sensors and Signal Conditioning
IT	IT1	Cyber Security
	IT2	Web Technologies
MECH	ME1	Automobile Engineering
	ME2	Renewable energy sources
	ME3	Project Management
	ME4	Entrepreneurship Development
CHEMISTRY	CY1	Chemistry in Space technology
	CY2	Artificial Intelligence in Sustainable Chemistry
	CY3	Material Chemistry in daily life
ENGLISH	EL1	Professional Communication
MATHS	MA1	Graph Theory
	MA2	Abstract Linear Algebra
PHYSICS	PH1	Nano materials and Technology
	PH2	Optoelectronic devices and applications
	PH3	Fiber optics communication
NCC	NCC	National Cadet Corps

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Fourth Year B. Tech (SEMESTER– VIII) -*Draft Version*

Course Code	Category	Course Title	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total Marks	
20EC801	PW	Project work	0	0	24	24	40	60	100	12
TOTAL			0	0	24	24	40	60	100	12

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LINEAR ALGEBRA AND ORDINATRY DIFFERENTIAL EQUATIONS I B. Tech. I Semester (24EC101)							
Lectures	2	Tutorial	1	Practical	0	Credits	3
Continuous Internal Evaluation			40	Semester End Examination			60

Pre-Requisite: None.

Course Objectives:

- Solve a system of linear homogeneous and non-homogeneous equations, findingthe 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 differentialequations 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	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	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: Rouche'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 :	1. B.S.Grewal, "Higher Engineering Mathematics", 44thedition, Khanna publishers, 2017.
References :	[1] Erwin Kreyszig, "Advanced Engineering Mathematics", 9th edition, JohnWiley & Sons. [2] N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" Laxmi Publications, 2010.

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Engineering Chemistry
I B. Tech. – Semester-I (Code:24EC102)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Evaluation			40	Semester End Examination			60

Pre-Requisite: None.

Course Objectives:

- 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

CO 1	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.
CO 2	Apply the knowledge of electrochemistry for understanding the working of electrodes and electrochemical energy systems, as well as corrosion theories and protection methods.
CO 3	Analyse the methods to produce soft water for industrial use and potable waterby economical means and study the principles of different analytical techniques and their applications.
CO 4	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**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO 1	3	3	2			2	3							
CO 2	3	3	3				2							
CO 3	3	3	3	2		2	2							
CO 4	3	3	2	3	3									

UNIT-1: POLYMERS AND FUEL CHEMISTRY	12 Hours

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 PHBVElastomers-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).

12 Hours

UNIT-2: 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 (H_2-O_2, 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).

UNIT-3: WATER TECHNOLOGY AND INSTRUMENTAL METHODS OF ANALYSIS — 12 Hours

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.
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).

UNIT-4: ADVANCED CONCEPTS/MATERIALS IN ENGINEERING CHEMISTRY — 12 Hours

Computational chemistry: Introduction to computational chemistry, and docking studies
Semiconductors-Introduction, basic concept, Types-Intrinsic & Extrinsic Semiconductors, applications.
Nano materials: Introduction, classification of nano materials, engineering applications,properties and applications of Carbon nano tubes and Graphenes nanoparticles.
Liquid crystals: Introduction, liquid crystalline displays (LCD)-applications. Polymers for light emitting diodes (LEDs)-Introduction, classification of polymer LEDs, Organic LEDs-their commercial uses.

Text Books :

1. P.C. Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi 17th edition (2017).
2. Seshi Chawla, "Engineering Chemistry" DhanpatRai Pub, Co LTD, New Delhi 13 th edition, 2013.
3. S.S. Dara, "A Textbook of Engineering Chemistry", S.Chand & Co, (2010).

References :	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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Fundamentals Of Electrical and Electronics Engineering I B. Tech. I Semester (24EC103)

Lectures	2	Tutorial	1	Practical	0	Credits	3
Continuous Internal Evaluation			40	Semester End Examination			60

Pre-Requisite: None.

Course Objectives:

- Understand the fundamentals of electrical components like R,L,C and get familiarity with current, voltage, work and energy
- Calculate RMS, Peak value, Average value of AC signal and analyze behavior of different R,L,C circuits.
- Verify the operation and characteristics of PN junction diode as well as zener diode.
- Verify the operation and characteristics of bipolar junction transistor, MOSFET, JFET. verify the output waveforms of rectifiers

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

CO1	Summarize the significance of electrical circuit elements
CO2	Calculate the RMS, Average, Peak values for various AC signals.
CO3	Understand the characteristics of BJT,MOSFET and JFET.
CO4	Learn the applications of PN junction diode and Zener diode.

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	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	2	-	-	-	-	-	-	-	-	-	-	-

UNIT-I

Basic Concepts, Laws and Principles

Introduction ,Conductors, Insulators, and Semiconductors, Electric Field and Magnetic Field, Electric Current, Resistance, Potential, and Potential Difference ,Ohm's Law ,Work, Power, and Energy , Electromagnetism and Electromagnetic Induction, Dynamically Induced EMF and Statically Induced EMF, Self-induced EMF and Mutually Induced EMF, Self-inductance of a Coil, Mutual Inductance , Electrical Circuit Elements, Energy Stored in a Capacitor, Capacitor in Parallel and in Series

UNIT-II

AC Fundamentals and Single-phase Circuits

Introduction , Generation of Alternating Voltage in an Elementary Generator ,Concept of Frequency, Cycle, Time Period, Instantaneous Value, Average Value and Maximum Value of Sinusoidal and Non-sinusoidal Wave Forms ,Concept of Average Value and Root Mean Square (RMS)Value of an Alternating Quantity ,Concept of Phase and Phase Difference , Single-phase AC Circuits, Behavior of R, L, and C in AC Circuits, L–R Series Circuit ,R–C Series Circuit, R–L–C Series Circuit ,AC Parallel Circuits, AC Series—Parallel Circuits

UNIT-III
Semiconductor Devices and circuits Introduction, Intrinsic and Extrinsic Semiconductors, Fermi level, The p–n Junction, Biasing of p–n Junction , Volt-ampere Characteristic of a Diode, An Ideal Diode, Diode Resistance, Diode Parameters and Diode Ratings, Zener Diode , Zener Diode As Voltage Regulator
UNIT-IV
Transistors Construction and working of Bipolar Junction Transistor, Transistor current components, Transistor Configurations, Input and Output characteristics of Transistor in CB,CE,CC Configurations, Transistor As an Amplifier , Field Effect Transistors: Junction Field Effect Transistor ,Characteristics of JFET, MOSFET : The Enhancement MOSFET (EMOSFET), The Depletion MOSFET , Characteristics of EMOSFET and DMOSFET **Rectifiers and Filter** Introduction, Analysis of Half-wave Rectifier, center tapped Full wave Rectifier, Bridge Rectifier ,Analysis of Full-wave Rectifier , Comparison of Half-wave and Full-wave Rectifiers ,half wave rectifier with capacitive Filter

Text Books :	"Basic Electrical and Electronics Engineering", S.K. Bhattacharya, Pearson Publications
References :	[1] "Basic Electrical, Electronics and Computer Engineering", Muthusubramanian R, Salivahanan S and Muraleedharan K A, Tata McGraw Hill, Second Edition, (2006). [2]. "Basics of Electrical and Electronics Engineering", Nagsarkar T K and Sukhija M S, Oxford press University Press.

PROGRAMMING Using C
I B.Tech. I Semester (Code:24EC104)

Lectures	:	3 Hours/Week	Tutorial	:	0 Hour/Week	Practical	:	0
CIE Marks	:	40	SEE Marks	:	60	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will learn how to

☐	Understand basic concepts of C-Programming such as: C-tokens, Operators, Input/ output, and Arithmetic rules.
☐	Develop problem solving skills to translate "English" described problems into Programs written using C language
☐	Apply pointers for parameter passing, referencing and differencing and linking data structures
☐	Manipulate variables and types to change the problem state, including numeric, character, array and pointer types, as well as the use of structures and

Course Outcomes: After studying this course, the students will be able to

CO1	Formulate simple algorithms for arithmetic and logical problems and rememberthe basics of computer fundamentals of computer history.
CO2	Translate the algorithms to programs also to test and execute the programs and correct syntax and logical errors and implementing conditional branching, iterationand recursion.
CO3	Analyze the problem for its decomposition into functions.
CO4	Understand the file handling and dynamic memory allocation using c programming language.

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												
CO2	3	3												
CO3	3	3												
CO4	3	3												
AVG	3	3												

UNIT-1 (12 Hours)

Introduction to C: Overview of C, Constants, Variables and Data Types, Operators and Expressions, Managing I/O Operations. Decision Making and Branching.

Programming Exercises for Unit- I: C-expressions for algebraic expressions, evaluation of arithmetic and Boolean expressions. Syntactic and logical errors in a given program, output of a given program, values of variables at the end of execution of a program fragment, Programs using Scientific and Engineering formulae. Finding the largest of the three given numbers.

Computation of discount amount on different types of products with different

discount percentages. Finding the class of an input character, finding the type of triangleformed with the given sides, computation of income-tax, finding given year is leap year or not, and conversion of lower case character to its uppercase.	
UNIT-2	(12 Hours)
Decision Making and Looping, Arrays, Character Arrays and Strings. **Programming Exercises for Unit-II:** To print the sum of the digits of a given number and to displaythe image of a given number. To find whether a given number is prime, printing Fibonacci sequence and to find prime factors of a given number. To print graphic patterns of symbols and numbers. To find the length of a string, compare strings, reverse a string, copy a string and to find whether the given string is palindrome or not with and without using String Handling Functions. Transpose of a matrix and sorting of names using arrays.	
UNIT-3	(12 Hours)
User-defined Functions, Structures and Unions, Pointers **Programming Exercises for Unit -III:** Functions-Recursive functions to find factorial & GCD (Greatest Common Divisor), string operations using pointers and pointer arithmetic. Swapping two variable values. Sorting a list of student records on register number using array of pointers.	
UNIT-4	(12 Hours)
File Management in C, Dynamic Memory Allocation, Preprocessor **Programming Exercises for Unit - IV**: Operations on complex numbers, and to read an input file of marks and generate a result file, sorting a list of names using command line arguments. Copy the contents of one file to another file. Allocating memory to variables dynamically.	
Text Books :	1. "Programming in ANSIC" by E. Balaguruswamy, Fifth Edition, McGraw Hill Education India. 2. "Let us C" by Yashavant P.Kanetkar, 14th Edition, BPB Publications.
References :	1. Kernighan BW and Dennis Ritchie M, "C programming language", 2nd edition, Prentice Hall. 2. Herbert Schildt, "C:The Complete Reference",4thedition,Tata Mcgraw-Hill. 3. Ashok N.Kamthane,"Programming in C", PEARSON 2nd Edition.

CIRCUIT THEORY

I B. Tech. – I Semester (Code: 24EC105)

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: Students will be able

- Learn basics of circuit analysis-KVL, KCL, Mesh analysis and Nodal Analysis
- Learn basics of circuit analysis using star and delta models
- Analyze dc/ac electric circuits and important theorems of circuit analysis
- Illustrate the transient response of source free and driven RL, RC circuits

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

CO1	Solve various DC circuits by applying network reduction & analysis techniques
CO2	Apply Nodal and Mesh Analysis techniques to analyze electrical circuits.
CO3	Analyze circuits using network theorems.
CO4	Analyze RL and RC circuits, including the transient response, to understand their time-dependent behavior and responses under different driving conditions.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

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

UNIT-I

VOLTAGE AND CURRENT LAWS: Introduction, nodes, paths, loops and branches, Kirchhoff's current and voltage laws, series and parallel connection of resistors, capacitors & inductors, source transformations, voltage and current division.

UNIT-II

BASIC NODAL AND MESH ANALYSIS: Nodal analysis, the super node, Mesh analysis, and The super mesh, A comparison of Nodal vs. Mesh analysis, Super Node vs. Super Mesh.

UNIT-III

NETWORK THEOREMS: superposition, Thevenin and Norton equivalent circuits, maximum power transfer Theorem, Reciprocity Theorem, and delta-wye conversion.

UNIT-IV

BASIC RL AND RC CIRCUITS: The source free RL circuit, properties of the exponential response, the source free RC circuit, driven RL circuits, natural and forced response, driven RC circuits.

Text Books :

1. William H. Hayt, Jack E. Kemmerly and Steven M. Durbin, Engineering Circuit Analysis, 8th Edition,TMH, 2012.
2. C K Alexander and M. N. O. Sadiku, Electric Circuits, McGraw Hill

References :	1. Abhijit chakrabarti, Circuit theory analysis and synthesis, Dhanapatrai & co (p) Ltd, 2018. 2. A Sudhakar and Shyam Mohan SP, Circuits and Networks: Analysis and Synthesis, 4th Edition, TMH, 2010. 3. A Edminister, Electric circuits, Schaum outline series, 7th Edition, McGraw Hill, 2017. 4. M E Vanvalkenburg, Network Analysis, 3rd Edition, PHI, 2006. 5. C L Wadhwa, Network analysis and synthesis, New Age International, 2nd Edition, 2006.
NPTEL Course Links:	1. NPTEL :: Electrical Engineering - NOC:Network Analysis, https://nptel.ac.in/courses/108/105/108105159 2. NPTEL :: Electrical Engineering - NOC:Basic Electric Circuits, https://nptel.ac.in/courses/108/104/108104139/ 3. NPTEL :: Electrical Engineering - NOC:Basic Electrical Circuits, https://nptel.ac.in/courses/108/106/108106172/

BAPATLA ENGINEERING COLLEGE:: BAPATLA
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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ENGINEERING CHEMISTRY LAB I B. Tech. – Semester-I (Code: 24ECL101)							
Lectures	0	Tutorial	0	Practical	2	Credits	1
Continuous Internal Evaluation			40	Semester End Examination			60

Pre-Requisite: None.

Course Objectives: Students will be able

- To familiarize students with practical chemical analysis techniques for determining key water quality parameters.
- To provide hands-on experience in performing volumetric and instrumental titrations to understand their chemical principles and applications.
- To develop proficiency in using laboratory equipment, following safety protocols, and accurately conducting experiments.
- To teach students the synthesis of common organic compounds and their characterization techniques.

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

CO-1	Determine water quality parameters such as alkalinity and hardness.
CO-2	Conduct volumetric titrations to estimate the concentration of chemical substances.
CO-3	Apply instrumental methods such as pH metry and conductometry for titrationexperiments and colorimetry for verification of Beers law.
CO-4	Synthesize and characterize common organic compounds like soap, resins, and aspirin.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

CO	**POs**											**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	1	2	3
CO-1	3	3	2	3		3								
CO-2	3	3	2	2		3								
CO-3	3	3	2	3	3									
CO-4	2			3		2								

LIST OF EXPERIMENTS

1. Determination of Alkalinity of Tap water.
2. Determination of Total Hardness of ground water sample by EDTA method
3. Estimation of Mohr's salt by Permanganometry.
4. Estimation of Active Chlorine Content in Bleaching Powder
5. pH metric titration between strong acid and strong base.

6. Conductometric Titrations between Strong acid and strong base. 7. Verification of Beers Law using potassium permanganate by colorimetry. 8. Preparation of Soap. 9. Preparation of Urea-formaldehyde resin 10. Preparation of Aspirin.	
Text Books :	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 :	1. Text Book of engineering chemistry by R.n. Goyal and HarrmendraGoel. 2. A text book on experiments and calculations- Engineering Chemistry. S.S. Dara. 3. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.

Fundamentals Of Electrical and Electronics Engineering Lab I B. Tech. I Semester (24ECL102)							
Lectures	0	Tutorial	0	Practical	3	Credits	1.5
Continuous Internal Evaluation			40	Semester End Examination			60

Pre-Requisite: None.

Course Objectives:

- Experiments like CRO, Function generator, RPS and multimeter give knowledge about their applications in electronic devices and circuits .
- The verification of KCL, KVL and theorems make the student to understand how currents and voltages can be found in circuits.
- The experiments like PN diode, Zener diode, CE characteristics provide the thorough understanding of fundamental Electronic devices useful in Engineering and Industrial applications.
- Utilization of diodes as rectifiers can be understood in half wave and full wave rectifiers.

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

CO1	Acknowledge the importance of CRO,Function Generator, RPS and multimeter in analyzing electronic devices and circuits
CO2	Analyze Kirchhoff voltage & current laws and verify circuit theorems
CO3	Get hands-on experience upon electronic devices like PN diode, Zener diode, BJT and their applications
CO4	To apply the usage of diode as half wave and full wave rectifiers

	POs											**PSOs**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	2			3					3			3		
CO2		2		3					3			3		
CO3	2			3					3			3		
CO4		3		3					3			3		
AVG	2	2.5		3					3			3		

LIST OF EXPERIMENTS

1. Identification and testing of various circuit elements (R, L, C, diode, transistor).
2. Study of CRO and Function Generator.
3. Frequency and Amplitude Measurement Using CRO
4. Study of RPS, Bread Board and Multimeter.
5. Verification of KCL and KVL
6. Verification of Thevenin 's Theorem
7. Verification of Norton's Theorem
8. Verification of Maximum Power Transfer Theorem
9. Verification of Super Position Theorem
10. V-I characteristics of PN Diode.
11. V-I characteristics of Zener Diode
12. Characteristics of BJT in Common Emitter configuration
13. Verification of output waveforms of Half wave rectifier
14. Verification of output waveforms of Full wave rectifier

.

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

Text Book :	Fundamentals of Electrical and Electronics Engineering laboratory Manual .

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PROGRAMMING USING C LAB
I B.Tech. I Semester (Code:24ECL103)

Lectures	0	Tutorial	0	Practical	3	Credits	1.5
Continuous Internal Evaluation		40		Semester End Examination		60	

Pre-Requisite: None.

Course Objectives: Students will be able to

☐	Understand basic concepts of C Programming such as: C-tokens, Operators, Input/output, Arithmetic rules.
☐	Develop problem solving skills to translate "English" described problems into Programs written using C language
☐	Apply pointers for parameter passing, referencing and differencing and linking data structures.
☐	Manipulate variables and types to change the problem state, including numeric, character, array and pointer types, as well as the use of structures and unions, File

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

CO1	Address the challenge, pick and analyze the appropriate data representation formats and algorithms.
CO2	Choose the best programming construct for the job at hand by comparing it to other structures and considering their constraints.
CO3	Develop the program on a computer, edit, compile, debug, correct, recompile and run it.
CO4	Identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.

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		2	3		3									
CO3		2	3		3									
CO4		3	2		3									
AVG	3	2.5	2.67		3									

LIST OF EXPERIMENTS — 36 Hours

1. A program for electricity bill taking different categories of users, different slabs in each category. (Using nested if else statement).

Domestic Customer		
Consumption Units	**Consumption Units**	
0 – 200	0.50 per unit	
201 – 400	100 plus	0.65 per unit
401 – 600	230 plus	0.80 per unit
601 and above	390 plus	1.00 per unit

2. Write a C program to evaluate (using the following loops):

Domestic Customer		
Consumption Units	**Rate of Charges(Rs.)**	
0 – 50	0.50 per unit	
100 – 200	50 plus	0.60 per unit
201 – 300	100 plus	0.70 per unit
301 and above	200 plus	1.0 per unit

   a) $1 + x^2/2! + x^4$ / 4!+ …upto ten terms
   b) $x + x^3/3! + x^5/5! + \ldots$ upto 7 digit accuracy
3. Write a C program to check whether the given number is
   a) Prime or not.
   b) Perfect or Abundant or Deficient.
4. Write a C program to display statistical parameters (using one – dimensional array).
   a) Mean b) Mode c) Median d) Variance.
5. Write a C 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.
6. Write a C program to read a list of numbers and search for a given number using Binary search algorithm and if found display its index otherwise display the message "Element not found in the List".
7. Write a C program to read two matrices and compute their sum and product.
8. A menu driven program with options (using array of character pointers).
   a) To insert a student name
   b) To delete astudent name
   c) To print the names of students
9. Write a C program to read list of student names and perform the following operations
   a) To print the list of names.
   b) To sort them in ascending order.
   c) To print the list after sorting.
10. Write a C program that consists of recursive functions to
   a) Find factorial of a given number
   b) Solve towers of Hanoi with three towers (A, B & C) and three disks initially on tower A.
11. 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, 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.
12. 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.

IT Workshop
B.Tech – I Semester (24ECL104) Common to all Branches

Lectures	0	Tutorial	0	Practical	2	Credits	1
Continuous Internal Evaluation			40	Semester End Examination			60

Pre-Requisite: None.

Course Objectives: Students will be able

- Introduce the internal parts of a computer, peripherals, and I/O ports.
- Demonstrate configuring the system with Windows Operating System and other Application Software's.
- Introduce Office tools such as Word processors, Excel and Presentation tools.
- Demonstrate AI tools such as ChatGPT, Dialogflow.

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	2	-	-	-	-	-	-	-	3	2	-	-	-	-
CO2	2	-	-	-	-	-	-	-	3	2	-	-	-	-
CO3	2	2	2	2	2	-	-	-	3	2	-	-	-	-
CO4	3	3	3	2	3	-	-	-	3	2	-	-	-	-
CO5	3	2	2	2	2	-	-	-	3	2	-	-	-	-
CO6	3	3	3	2	3	-	-	-	3	2	-	-	-	-

LIST OF EXPERIMENTS

1. Explore Peripherals of a Computer, Components of a motherboard and its functions.
2. Install and Uninstall System and Application software on a Computer.
3. Disassemble and Assemble the PC.
4. Troubleshoot a computer.
5. Prepare the following using MS office:
   i) PPT using MS-Power Point.
   ii) Design a Project Certificate and Newsletter using MS-Word
6. Implement the following using Excel:
   i) Create an Excel Work sheet for the six subjects and calculate Total, Average, Grade and Rank.
   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

NUMERICAL METHODS AND ADVANCED CALCULUS
I B. Tech. – II Semester (Code:24EC201)

Lectures	2	Tutorial	1	Practical	0	Credits	3
Continuous Internal Evaluation			40	Semester End Examination			60

Pre-Requisite: None.

Course Objectives:

- Solve algebraic, transcendental and system of linear equations with the help of numerical methods.
- 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.
- Evaluate double and triple integrals and apply them to find areas and volumes.
- Evaluate the line, surface and volume integrals and learn their inter-relations andapplications.

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 Numericaltechniques.
CO2	Solve the first order ordinary differential equations numerically with the given initialcondition.
CO3	Find the area and volume of plane and three dimensional figures using multipleintegrals.
CO4	Apply vector integral theorems to obtain the solutions of engineering problemsinvolving 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	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	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'sbackward 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, JohnWiley & Sons. [2] N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" LaxmiPublications, 2010.

SEMICONDUCTOR PHYSICS AND NANOMATERIALS

I B. Tech.

Common to CS,CM,CB,DS,EC,IT

Code: 24EC202

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Evaluation			40	Semester End Examination			60

Pre-Requisite: None.

Course Objectives:

- 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).
- This unit provides various types of properties of semiconductor materials and their importance in various device fabrications.
- This unit aim to educate the student on various opto-electronic devices and theirapplications.
- This unit provide information about the principles of processing, manufacturing and characterization of nano materials, nanostructures and their applications.

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

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

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, C arrier 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. Carbonnano tubes: Types, Properties, Applications. Characterization of Nano materials: XRD, SEM, Applications of Nano materials.

Text Books :	1. A text book of engineering physics by Avadhanulu and Kshirsagar S.Chand & Co. (2013) 2. Applied physics by Dr.P. Srinivasa Rao. 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. – II Semester (Code: 24EC203)

Lectures	2	Tutorial	0	Practical	0	Credits	2
Continuous Internal Evaluation			40	Semester End Examination			60

Pre-Requisite: None.

Course Objectives:

- To enhance the vocabulary competency of the students
- To enable the students to demonstrate proficiency in the use of written English, including Proper spelling, grammar, and punctuation
- To enhance theoretical and conceptual understanding of the elements of grammar
- Understand and apply the conventions of academic writing in English

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	-	-	-
CO2	-	-	-	-	-	-	-	2	2	3	2	-	-	-
CO3	-	-	-	-	-	-	-	2	2	3	2	-	-	-
CO4	-	-	-	-	-	-	-	2	2	3	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, 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, Conjunctions, 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	
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 :	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

PROGRAMMING USING C++
I B. Tech. – II Semester (Code: 24EC204)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Evaluation		40		Semester End Examination		60	

Pre-Requisite: C Language

Course Objectives: Students will learn how to

☐	Develop a greater understanding of the issues involved in programming language design and implementation
☐	Develop an in-depth understanding of functional, logic, and object-oriented programming paradigms.
☐	Implement several programs in languages other than the one emphasized in the core curriculum (C++).
☐	Understand design/implementation issues involved with variable allocation and binding, control flow, types, subroutines, parameter passing.

Course Outcomes: After studying this course, the students will be able to

CO1	Learn the features of C++ supporting object oriented programming.
CO2	Understand the relative merits of C++ as an object oriented programming language.
CO3	Apply the major object-oriented concepts to implement object oriented programs in C++, encapsulation, inheritance and polymorphism.
CO4	Analyze advanced features of C++ specifically stream I/O, templates and operator over loading.

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	2												
CO3	3	2												
CO4	2	3												
AVG	2.67	2.33												

UNIT-1 (12 Hours)

Introduction: Basic concepts of OOP, benefits and applications of OOP, what is C++, applications of C++, C++ statements, structure of a C++ program, creating the source file, compiling and linking. C++ tokens, keywords, identifiers and constants, data types in C++, operators in C++,symbolic constants, type compatibility, declaration of variables, dynamic initialization of variables, reference variables, scope resolution operator, member dereferencing operator, memory management operator, type cast operator, expressions and their types, special assignment expressions, implicit conversions, operator overloading, operator precedence, control structures. C++ streams and stream classes, unformatted I/O operations, formatted I/O operations, managing output with manipulators

UNIT-2	(12 Hours)
Functions in C++: main function, function prototyping, call by reference, return by reference, inline functions, default arguments, const arguments, function overloading, friend and virtual functions. **Classes and objects:** specifying a class, defining member functions, nesting member functions, private member functions, static data members and member functions, arrays of objects, objects as function arguments, returning objects, local classes.	
UNIT-3	(12 Hours)
Constructors and Destructors: constructors, parameterized constructors, multiple constructors in a class, constructors with default arguments, dynamic initialization of objects, Copy constructor, dynamic constructor, const objects, and destructors. Defining Operator Overloading, overloading unary and binary operators, overloading binary operators using friends, rules for operator overloading, manipulation of strings using operators.	
UNIT-4	(12 Hours)
Pointers: pointers to objects, this pointer, pointers to derived classes, pure virtual functions. **Inheritance:** single inheritance, making a private member inheritance, multilevel inheritance, hierarchical inheritance, hybrid inheritance, virtual base classes, abstract classes	
Text Books :	1. Object oriented programming with C++, Balagurusamy, 4th edition, Tata McGraw-Hill publications, 2008. 2. Object oriented programming with ANSI and turbo C++, Ashok N. Kamthane, Pearson Education, 2005.
References :	1. C++ programming language by Bjarne Stroustup, 3rd edition, Pearson education, 2009.

ENGINEERING GRAPHICS
I B.Tech – II Semester (Code:24ECL201)

Lectures	1	Tutorial	0	Practical	3	Credits	2.5
Continuous Internal Evaluation			40	Semester End Examination			60

Pre-Requisite: None.

Course Objectives:

- Clear picture about the importance of engineering graphics in the field of engineering
- The drawing skills and impart students to follow Bureau of Indian Standards
- To give an idea about Geometric constructions and orthographic projections
- Imagination skills about orientation of points, surfaces and solids
- Basic drafting skills of AutoCAD

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

LIST OF EXPERIMENTS

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

ORTHOGRAPHIC PROJECTIONS: Conversion of pictorial views into Orthographic views. (Treatment is limited to simple castings only).

Text Books :	1. Engineering Drawing with AutoCAD by Dhananjay M. Kulkarni, Revi publication), 2018. 2. Engineering Drawing by N.D. Bhatt & V.M. Panchal, 43rd Edition,(Charotar Publishing House, Anand). (First angle projection) 2014.
References :	1. Engineering Drawing by Dhananjay A Jolhe, Revised Edition, Tata McGraw hill publishers,20219.

BAPATLA ENGINEERING COLLEGE:: BAPATLA

(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ENGIINEERING MECHANICS & SURVEYING LAB

I B.Tech – II Semester (Code: 24ECL202)

Lectures	1	Tutorial	0	Practical	2	Credits	2
Continuous Internal Evaluation			40	Semester End Examination			60

Pre-Requisite: Basics of Mathematics & Physics

Course Objectives:

1.	The course aims to equip students with the fundamental principles and techniques necessary to solve problems related to forces and supports in engineering mechanics.
2.	The course is designed to provide students with a thorough understanding of frictional forces and their applications in engineering mechanics.
3.	The course is designed to provide students with the essential skills and knowledge to analyze truss structures.
4.	The course aims to provide students with a deep understanding of rotational dynamics and the principles governing the motion of rigid bodies.
5.	The course aims to provide students with the fundamental skills and techniques required for various surveying methods in civil engineering.

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	-	3	3	3	3
CO2	3	3	-	2	-	-	-	-	-	1	-	3	3	3	3

CO3	3	3	-	2	-	-	-	-	-	1	-	3	3	3	3
CO4	3	3	-	2	-	-	-	-	-	1	-	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 INERTRIA & 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.

Note: A minimum of Ten (10 No) shall be done and recorded

Text Books :	1. Engineering mechanics by S. Timoshenko and D. H. Young – Mc Graw-Hill International edition (For concepts and symbolic problems) 2. Surveying Volume I by Dr K.R.Arora.
References :	1. Engineering mechanics statics and dynamics by A. K. Tayal – Umesh publication, Delhi (For numerical problems using S.I. system of units 2. Surveying Volume I by B.C.Punmia

SEMICONDUCTOR PHYSICS LAB (Code:24ECL203)
I B.Tech

Lectures	0	Tutorial	0	Practical	2	Credits	1
Continuous Internal Evaluation			40	Semester End Examination			60

Pre-Requisite: None.

Course Objectives:

- Basic experiments such as Magnetic Field Measurements, Hall Effect and LCR resonance give the knowledge to apply them in magnetic applications and circuits design.
- The measurements relating to various physical parameters of materials make the student to understand their utility, design and fabrication of several devices.
- The experiments like CRO, Solar Cell, Photo cell provides the thorough understanding of Opto Electronic devices useful in Engineering and Industrial applications.
- Utilization of the principles of light such as interference and diffraction to measure wavelength and radius of curvature of Lenses.

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

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

LIST OF EXPERIMENTS

1. Determination of acceleration due to gravity at a place using compound pendulum.
2. To study the variation of intensity of magnetic field along the axis of a circular coil using Stewart-Gee's apparatus.
3. To draw the characteristic curves of P-N Junction diode.
4. Determination of radius of curvature of a Plano convex lens by forming Newton's rings.
5. Determination of wavelengths of mercury spectrum using grating normal incidence method.
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

Text Books :	Engineering Physics laboratory Manual by P.Sreenivasarao & K.Muralidhar, Himalaya Publications.

English Communication Skills Lab
I B. Tech. – II Semester (Code: 24ECL204)

Lectures	0	Tutorial	0	Practical	2	Credits	1
Continuous Internal Evaluation			40	Semester End Examination			60

Pre-Requisite: None.

Course Objectives:

- To comprehend the importance, barriers and strategies of listening skills in English.
- To illustrate and impart practice Phonemic symbols, stress and intonation.
- To practice oral skills and receive feedback on learners' performance.
- To practice language in various contexts through pair work, role plays, group work and dialogue conversations

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	-	-	-	-
CO2	-	-	-	-	-	-	-	-	2	3	-	-	-	-
CO3	-	-	-	-	-	-	-	-	2	3	-	-	-	-
CO4	-	-	-	-	-	-	-	-	2	3	-	-	-	-

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 :	1. Communication Skills, Sanjay Kumar and Pushpa Lata. Oxford University Press. 2011 2. Better English Pronunciation, J.D. O' Connor. Cambridge University Press:1984 3. New Interchange (4rth Edition), Jack C Richards. Cambridge University Press:2015 English Conversation Practice, Grant Taylor. McGraw Hill:2001
References (Software) :	1. iTell Orell Digital Lab 2. Buzzers for conversations, New Interchange series

PROGRAMMING USING C++ LAB
I B. Tech. – II Semester (Code: 24ECL205)

Lectures	0	Tutorial	0	Practical	3	Credits	1.5
Continuous Internal Evaluation		40		Semester End Examination		60	

Pre-Requisite: None.

Course Objectives: Students will be able to

☂	Understand advantages of C++ programming over procedural oriented programming learn the basics of variables, operators, control statements, arrays, classes and objects.
☂	Understand, write and implement the following concepts: Inheritance, Interfaces, Packages, Strings and Collections
☂	Understand and write programs on Exception Handling, I/O, and Multithreading
☂	Understand and implement applications using Applets, AWT, Swings and Events

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

CO1	Understand basics of variables and operators such as variables, conditional and iterative execution methods etc.
CO2	Identify classes, objects, members of a class and relationships among them needed for a specific problem and Write C++ principles and proper program
CO3	Demonstrate the concepts of polymorphism, inheritance, packages and interfaces.
CO4	Write C++ to implement error-handling techniques using exception handling

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									
CO2	3				3									
CO3	3				3									
CO4		2	2		3									
AVG	3	2	2		3									

LIST OF EXPERIMENTS — 36 Hours

Write C++ programs to illustrate the concept of the following:

1. Arrays
2. Structures
3. Pointers
4. Objects and Classes
5. Console I/O operations
6. Scope resolution and memory management operators
7. Inheritance

8. Polymorphism
9. Virtual Functions
10. Friend Functions
11. Operator overloading
12. Function overloading
13. Constructors and Destructors
14. This pointer
15. File I/O operations

Note: A minimum of ten programs are to be executed and recorded to attain eligibility for University Practical examination.

PROBABILITY AND STATISTICS
Common to all branches II
B.Tech. III Semester
24CB301/24CE301/24CS301/24CM301/24DS301/24EC301/24EE301/24IT301/24ME301

Lectures	:	2 Hours/Week	Tutorial	:	1 Hour/Week	Practical	:	0
CIE Marks	:	40	SEE Marks	:	60	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will learn how to

☐	Apply the discrete and continuous probability densities to various problems in science and engineering.
☐	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
☐	Apply various sample tests like F-test and χ^2 -test for decision making regarding the population based on sample data.
☐	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.

Course Outcomes: After studying this course, the students will be able to

CO-1	Apply discrete and continuous probability distributions to various problems arising in Engineering applications.
CO-2	Perform Test of Hypothesis for a population parameter for single sample.
CO-3	Perform Test of Hypothesis for population parameters for multiple samples.
CO-4	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**
CO-1	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO-2	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO-3	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO-4	3	3	3	-	-	-	-	-	-	-	-	-	-	-

UNIT-1 (12 Hours)

Descriptive measures, Random variables and Probability distributions: Arithmetic mean, median and mode, Random variables, Binomial distribution, The mean and variance of a probability distribution, Poisson approximation to the Binomial distribution, Continuous Random Variables, Normal Distribution, Normal Approximation to the Binomial Distribution, Uniform Distribution, Weibull distribution. (Sections 2.5, 4.1, 4.2, 4.4, 4.6,5.1, 5.2, 5.3, 5.5,5.9.)

UNIT-2	(12 Hours)
Sampling distributions and Inferences concerning one mean: 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-3	(12 Hours)
Comparing two treatments and Inferences concerning variances: 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-4	(12 Hours)
Inferences concerning proportions, Regression Analysis and Analysis of variance: Estimation of proportions, Hypotheses concerning one proportion, Hypotheses concerning two proportions, the method of least squares, curvilinear regression, multiple regression, correlation, some general principles, 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, 8th Edition, PHI, 2011.
References :	1. R.E Walpole, R.H. Myers & S.L. Myers 'Probability & Statistics for Engineers and Scientists', 6th Edition, PHI. 2. Murray R Spiegel, John J.Schiller, R. Alu Srinivasa, 'Probability &Statistics', Schaum's outline series.

Analog Electronics
II B.Tech. III Semester (Code:24EC302)

Lectures	:	3 Hours/Week	Tutorial	:	0 Hour/Week	Practical	:	0
CIE Marks	:	40	SEE Marks	:	60	Credits	:	3

Pre-Requisite: Fundamentals of Electrical and Electronics Engineering

Course Objectives: Students will

- Understand the concepts of Transistor biasing, thermal stabilization and Characteristics of PNPN devices.
- Design and analyze transistor circuits at low frequencies using the hybrid model.
- Analyze distortion in multistage amplifiers and also develop skills in identifying and mitigating performance limitations.
- Evaluate the impact of feedback on amplifier circuit parameters gain, resistance, and distortion factors

Course Outcomes: After studying this course, the students will be able to

CO1	Analyze the different biasing techniques of BJT and Interpret the characteristics of PNPN devices.
CO2	Apply h-parameter methods to design and analyze transistor circuits at low frequencies.
CO3	Identify and address distortion and frequency response issues in transistor
CO4	Evaluate feedback impact on amplifier circuits, optimizing performance by considering gain, resistance, and distortion factors.

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		
CO2		3	2									2		
CO3		3										2		
CO4	3	2										2		
AVG	3	2.5	2									2		

Syllabus

UNIT-1 (12 Hours)

Transistor Biasing and Thermal Stabilization: Operating point, Bias Stability, Self Bias, Stabilization against variations in ICO, VBE, and β, Bias Compensation, Thermistor and sensistor compensation, Thermal runaway.
PNPN and Other Devices: SCR, DIAC, TRIAC, UJT.

UNIT-2 (12 Hours)

BJT at low frequency: Transistor Hybrid model, Analysis of transistor amplifier using h-parameter model, Emitter follower, Millers theorem and its dual, Cascading transistor amplifiers, Simplified CE & CC Hybrid models, CE Amplifier with an Emitter Resistance, High Input Resistance Transistor Circuits – Darlington pair, Boot strapped Emitter Follower.
FET at low frequency: FET Small signal model, Common Source and Common Drain amplifiers at low frequencies.

UNIT-3	(12 Hours)
Multi stage amplifiers: Classification of amplifiers, Distortion in amplifiers, Frequency response of an amplifier, Methods of Coupling (Direct, Transformer, RC Coupling), Two stage RC-coupled amplifier,. **Power amplifiers:** Class-A large-signal amplifier, Second-harmonic distortion, Transformer coupled audio power amplifier, Efficiency, Push-pull amplifiers, Class-B amplifier, Class-AB operation.	
UNIT-4	(12 Hours)
Feedback amplifiers: Classification of amplifiers, The feedback concept, Transfer gain with feedback, General Characteristics of Negative Feedback Amplifiers, Input & Output resistance, Method of analysis of a feedback amplifier, Voltage-series feedback.	

Text Books :	1. Jacob Millman and Christos C Halkias, "Integrated Electronics: Analog and Digital Circuits and Systems", Tata McGraw-Hill Education, 2003. 2. V.K. Mehta, "Principles of Electronics", S.Chand & Company LTD., 2008.
References :	1. N.N.Bhargava, D.C.Kulshrestha and S.C.Gupta Basic Electronics and Linear Circuits by, TTTISeries, TataMcGraw-Hill Education, 2003. 2. S. Salivahanan and N. Suresh Kumar, Electronic Devices and Circuits by, 3rd Edition, Tata McGraw-Hill Education, 2012.

BAPATLA ENGINEERING COLLEGE:: BAPATLA

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DIGITAL ELECTRONICS

II B.Tech. III Semester (Code: 24EC303)

Lectures	:	2 Hours/Week	Tutorial	:	1 Hour/Week	Practical	:	0
CIE Marks	:	40	SEE Marks	:	60	Credits	:	3

Course Objectives: Students will

- Acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronic circuits
- Learn how to realize digital Circuits using Gates.
- Analyze the implementation of combinational logic circuits.
- Explore the knowledge on MSI circuits.
- Understand the basic knowledge of flip flops and its application
- Design of various digital circuits.
- Illustrate the importance of different Logic Families
- Implement logic functions using PLD's

Course Outcomes: After studying this course, the students will be able to

CO1	Understand different Number systems, Complements and various binary codes and to Simplify Boolean functions using Boolean algebraic rules and laws
CO2	Simplify Boolean function using K-Map and Tabulation Methods and to Design various combinational logic circuits using logic gates &MSI circuits
CO3	Learn the concept of flip-flops and its functionality for the analysis and design of sequential circuits.
CO4	Design of different sequential circuits like counters, Registers and realization of digital circuits using various Programmable Logic Devices (PLDs)

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	
CO2	3	3										3	2	
CO3	3	3	2									3	2	
CO4	3	3	2									3	2	
AVG	3	3	2									3	2	

Contents of Syllabus	
UNIT-1	(12 Hours)
Number Systems and Codes: Decimal, Binary, Octal and Hexadecimal number systems and their conversion. Number systems arithmetic; Complements: The r's Complement, the (r- 1)'s Complement, Subtraction using method of complements. Sign-magnitude representation, 1's&2's complement representations, Codes: Introduction, Classification of Binary codes; BCD code, Excess-3 code, Gray code, Error detection and Correction codes. **Boolean Algebra and Logic gates:** Boolean Postulates & theorems, Digital Logic gates, Simplification of Boolean expressions, Implementation of Boolean expressions using logic gates, Canonical and Standard forms.	
UNIT-2	(12 Hours)
Minimization of Switching Functions: Simplification of logical functions using Karnaugh map method (Up to five variables), Don't-Care conditions, Quine- McCluskey minimization technique. **Combinational Logic Design:** General design Procedure, Design of: Half-Adder, Full- Adder, Half - Subtractor, Full – Subtractor. Design of Code converters, Ex-OR and Ex-NOR circuits, NAND and NOR implementation of Boolean functions. Multiplexer, Combinational logic design using multiplexers, Demultiplexers / Decoders and their use in combinational logic design, Design of BCD to7 segment decoder, Magnitude comparator, Encoders.	
UNIT-3	(12 Hours)
Sequential Logic Design: Architectural Distinctions between Combinational and Sequential circuits, Latches, Flip- Flops, RS- Latch using NAND and NOR Gates, Characteristic Tables, Excitation Tables and Characteristic equations of SR, JK, D, T and Master slave JK flip-flop, Conversion from one type of Flip-Flop to another. Analysis and Synthesis of clocked sequential circuits.	
UNIT-4	(12 Hours)
Registers and Counters: Registers, shift Registers, Left shift, Right shift, SISO, SIPO, PIPO, PISO, Bidirectional Shift Register, Universal Shift Register, Design of Asynchronous and Synchronous Counters, Modulus of the Counters, Ripple Counters, Ring Counter, Johnson Counter, up-down counter **Logic families**: Significance and Characteristics of logic families. DTL, TTL, MOS, CMOS logic families **Programmable Logic Devices**: Introduction, Programmable Logic Array (PLA) Programmable Array Logic, Programmable Read only memory, Implementation of Combinational Logic circuits using PROM, PLA, PAL.	
Text Books:	1. M. Morris Mano "Digital Logic and Computer Design", PHI2003. 2. RP Jain "Modern Digital Electronics", IVth ed., TMH.
References:	1. A. Anand Kumar, "Fundamentals of Digital Circuits", PHI2006.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ELECTROMAGNETIC FIELD THEORY

II B.Tech. III Semester (Code:24EC304)

Lectures	:	3 Hours/Week	Tutorial	:	0 Hour/Week	Practical	: 0
CIE Marks	:	40	SEE Marks	:	60	Credits	: 3

Pre-Requisite: None

Course Objectives: Students will	
☐	Understand basic laws of electrostatics to determine electric field intensities and other parameters for various charge distributions.
☐	Learn the Maxwell's equations for static electric fields and apply the boundary conditions.
☐	Use the basic laws of magnetostatics for computing magnetic field intensities and understand the use of defining flux densities, magnetic potential and the energy density.
☐	Study the EM wave propagation in free space and various material media and use the Poynting vector for power calculations.

Course Outcomes: After studying this course, the students will be able to	
CO1	Determine electric field intensities and flux densities, electric potential and the energy density using the basic laws of electrostatics
CO2	Apply the Maxwell's equations on static electric fields to determine boundary conditions across different media and analyze the different capacitor problems.
CO3	Apply the basic laws of magnetostatics to determine magnetic field intensities and flux densities, magnetic potential and the energy density.
CO4	Analyze the EM wave propagation in free space, dielectric and conducting media and derive the expression for Poynting vector.

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
CO2	3	2												2
CO3	3	2												2
CO4	2	3												2
AVG	2.75	2.25												2

SYALLABUS	
UNIT-1	(12 Hours)

ELECTROSTATICS–I

The experimental law of coulomb, Electric field intensity, Field due to a continuous volume charge distribution, Field of a line charge, sheet of charge. Electric Flux Density, Guass's law, Applications of Gauss law, Divergence, Maxwell's First equation (Electrostatics), Energy expended in moving a point charge in an electric field, The line integral, Definition of potential and potential difference. The potential field of a point charge, system of charges, potential gradient, the dipole and Energy density in electrostatic field.

UNIT-2	(12 Hours)
ELECTROSTATICS –II The nature of dielectric materials, boundary conditions for perfect dielectric materials. Capacitance. Several capacitance examples. Capacitance of a two wire line. Derivations of Poisson's and Laplace's equations, Examples of the solution of Laplace's equation. Current and current density, continuity of current, conductor properties and boundary conditions.	
UNIT-3	(12 Hours)
THE STEADY MAGNETIC FIELD Biot-Savart Law, Ampere's Circuital Law, Magnetic Flux and Magnetic Flux Density, The scalar and vector magnetic potentials. Magnetic Forces and Materials: Force on a moving charge, Force on a differential current element, Force between differential current elements, Force and torque on a closed circuit, the nature of magnetic materials, Magnetization and Permeability. Magnetic boundary conditions. Potential energy in magnetic fields	
UNIT-4	(12 Hours)
TIME VARYING FIELDS AND MAXWELL'S EQUATIONS Faraday's law, Displacement current, Maxwell's equations in point form, integral form. **THE UNIFORM PLANE WAVE** Wave propagation in free space, dielectrics. Poynting theorem and wave power. Propagation in good conductors: skin effect. Wave polarization	

Text Books :	1. W H Hayt, J A Buck, J Akhtar Engineering Electromagnetics, 8th Edition McGraw Hill Education, 2014. 2. EC Jordan and KG Balmain, Electromagnetic Waves and Radiating Systems, 2nd Edition, Prentice Hall of India
References :	1. Mathew NO Sadiku, Elements of Electromagnetics, Oxford University Press, 2003. 2. Joseph A Edminister, Theory and Problems of Electromagnetics, 2nd Edition, Schaum's Outline Series, Mc-Graw Hill International, 1993.

DATA STRUCTURES USING PYTHON **II B.Tech. III Semester (Code: 24ECL301 / SEC1)**								
Lectures	:	1 Hours/Week	Tutorial	:	0 Hour/Week	Practical	:	2
CIE Marks	:	40	SEE Marks	:	60	Credits	:	2

Pre-Requisite: None

Course Objectives: Students will

➢	Implement different searching and sorting techniques.
➢	Create different linear data structures like linked lists, stacks, and queues.
➢	Create non-linear data structures like trees and graphs.
➢	Understand the searching mechanism like depth first search and breadth first search.

Course Outcomes: After studying this course, the students will be able to

CO1	Compose different sorting and searching algorithms
CO2	Implement linear data structures like linked list, stacks, and queues.
CO3	Develop non-linear data structures like trees and graphs.
CO4	Demonstrate traversal techniques on non-linear data structures.

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			3				3				2	2
CO2	2	3			3				3				2	2
CO3	2	3			3				3				2	2
CO4	2	3			3				3				2	2
AVG	2	3			3				3				2	2

Syllabus

UNIT-1

Python Primer: Python overview, Class and object in Python, Data Types, operators and precedence, Expressions, Control flow Statements, functions, simple Input and Output, Modules and the import statement.

UNIT-2

Linked lists: Singly linked list, circularly linked list, doubly linked list.

Stacks: The stack abstract data type, Simple array-based stack implementation, reversing data using a stack, implementing stack with a linked list.

Queues: The queue abstract data type, Array based queue implementation, implementing queue with a linked list, Double-ended queues.

UNIT-3

Trees: Tree definitions, tree abstract data type, binary trees, linked structure for binary tree, Array-based representation of a binary tree, tree traversal algorithms, binary search trees, AVL trees.
UNIT-4
Graph: The Graph ADT, Edge list structure, Adjacency list structure, Adjacency map structure, Adjacency matrix structure.

LIST OF EXPERIMENTS

1. Python program to implement bubble sort, selection sort, insertion sort.
2. Python program to implement merge sort, quick sort.
3. Python program on linear search and binary search.
4. Python program to implement Singly Linked List.
5. Python program to implement Doubly Linked List.
6. Python program to implement Circular Linked List.
7. Python programs to implement stacks using arrays and linked lists.
8. Python programs to implement queues using arrays and linked lists.
9. Python programs to implement double ended queues.
10. Python program to perform Binary Tree traversal operations.
11. Python programs to perform Binary search tree operations.
12. Python program to create different types of graphs using graph ADT.

Note: *A minimum of 10 (Ten) Programs have to be performed and recorded by the candidate to attain eligibility for Semester End Examination*.

Text Books :	1. Michael T. Good Rich, Roberto Tamassia, Michael H. Gold wasser. "Data Structures & Algorithms", John Wiley & sons 2013. 2. Y. Daniel Liang, "Introduction to programming using python", Pearson, 2013.
References :	1. Bill Lubanovic," Introducing Python Modern Computing in Simple Packages", Reilly Publication, 1st Edition, 2015. 2. R. Nageswara Rao, "Core python programming", Dream tech, 2017 . 3. Mark Summer field, "Programming in Python3", Pearson Education, 2nd Edition. 4. Magnus Lie Hetland "Beginning Python – From Novice to Professional", A Press Publication, 3rd Edition, 2017

Design Thinking and Innovation
II B. Tech. III Semester (24XXXXX)

Lectures	1	Tutorial	0	Practical	2	Credits	2
Continuous Internal Evaluation			-	Semester End Examination			-

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	Discuss the importance of users & community partners in the design process in proposing solutions
CO3	Employ prototyping and failure handling into their design experiences
CO4	List attributes of expert designers

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PSOs													
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	3	2	3	3	3	3	3	3	3	1	3	-	-	-
CO2	3	3	3	3	3	3	3	3	3	2	3	-	-	-
CO3	3	3	3	3	3	3	3	3	3	2	3	-	-	-
CO4	3	3	3	1	2	2	3	3	3	2	3	-	-	-

UNIT-1

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-2

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-3

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-4

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. IDEO Tool Kit – Design Thinking Case Study
2. Community Project – identification – community partner –prototype evaluation
3. Functional Decomposition – eg: Mechanical Pencil
4. Prototyping Exercise – using paper/thermos coal/cardboard/recyclable material, testability and maintainability
5. Requirement and Specification Analysis
6. The Lean Canvas Model – business model
7. Thirty Circle Exercise – IDEO thinking
8. Risk Analysis – case study – DFMEA Analysis

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.ora/literature/topics/design-th/nkinq https://www.interaction-design.prg/literature/article/how-tq-

BAPATLA ENGINEERING COLLEGE:: BAPATLA

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DIGITAL ELECTRONICS LAB

II B.Tech. III Semester (Code: 24ECL304)

Lectures :	0 Hours/Week	Tutorial :	0 Hours/Week	Practical :	2 Hours/Week
CIE Marks :	40	SEE Marks :	60	Credits :	1

Pre-Requisite: Fundamentals of Digital Electronics.

Course Objectives: Students will be able	
☐	To apply knowledge of Boolean algebra fundamentals to realize digital systems
☐	To design and conduct experiments related to various combinational logic circuits
☐	To implement various sequential logic circuits.
☐	To design and conduct experiments related to counters and registers.

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

CO1	Realize different logic gates using discrete components and universal gates
CO2	Design and test various combinational logic circuits experimentally
CO3	Realize various operations using Digital ICs experimentally
CO4	Design and test various sequential logic circuits experimentally

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					3			2	2	
CO2	2	2	3	3					3			2	2	
CO3	2	2		3					3			2	2	
CO4	2	2	3	3					3			2	2	
AVG	2	2	3	3					3			2	2	

LIST OF EXPERIMENTS 36 Hours

1. Realization of Gates using Discrete Components.
2. Realization of Gates using Universal Building Block (NAND only).
3. Design of Combinational Logic Circuits like Half–adder, Full–adder, Half– Subtractor and Full-Subtractor.
4. Verification of 4-bit Magnitude Comparator.
5. Design of Encoders like 4:2 and 8:3encoder.
6. Design of Decoders like BCD to Decimal decoder.
7. Design of Code Converters (Binary to Gray).
8. Design of Multiplexers/ De Multiplexers.
9. Verification of Truth Table of Flip-Flops using Gates.

10. Design of Shift register (To Verify Serial to parallel, parallel to Serial, Serial to Serial and parallel to parallel Converters) using Flip-Flops.
11. Design of Ring & Johnson Counters using Flip-Flops.
12. Conversion of Flip-Flops (JK-T, JK –D).
13. Design of Binary/Decade Counter.
14. Design of Asynchronous Counter, Mod Counter, Up Counter, Down Counter & Up/Down Counter.
15. Design of Synchronous Counter, Mod Counter, Up Counter, Down Counter & Up/Down Counter.

NOTE: *A minimum of 10 (Ten) experiments have to be performed and recorded by the candidate to attain eligibility for Semester End Examination*

NSS/ NCC/SCOUTS & GUIDES/COMMUNITY SERVICE

II B. Tech. – III Semester (Code:)Category : HM

Lectures	0	Tutorial	0	Practical	1	Credits	0.5
Continuous Internal Evaluation		--		Semester End Examination			100

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				
CO2										2				
CO3										2				
CO4										2				

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&SurajitMajumder, A Text Book of National Service SchemeVol;.I, VidyaKutir Publication, 2021 (ISBN 978-81-952368-8-6)

ENVIRONMENTAL SCIENCE
II B. Tech. – III Semester (Code:/MC01)

Lectures	2	Tutorial	0	Practical	0	Credits	0
Continuous Internal Evaluation			40	Semester End Examination			___

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**	**4**
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, waterpollution: **Solid Waste Management** - 3R approach, composting and vermin-composting. .	
UNIT-IV	
Environmental issues: Global warming, Ozone layer depletion, Acid rains **Case Studies:** Bhopal Tragedy, Mathura Refinery and TajMahal	
Text Books :	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 Publications 3. "Comprehensive environmental studies"- JP Sharma, Laxmi Publications.
References :	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 – ErachBharucha

Quantum Technologies **II B.Tech. IV Semester (Code: 24EC401)**								
Lectures	:	2 Hours/Week	Tutorial	:	1 Hour/Week	Practical	:	0
CIE Marks	:	40	SEE Marks	:	60	Credits	:	3

Pre-Requisite: Linear Algebra

Course Objectives: Students will

- Understand the Foundations of Quantum Mechanics Relevant to Computation
- Describe and Manipulate Quantum Bits
- Implement and Interpret Quantum Algorithms
- Construct and Analyze Quantum Circuits

Course Outcomes: After studying this course, the students will be able to

CO1	Use linear algebra and quantum postulates ti solve quantum mechanical problems.
CO2	Work confidently with qubits and multi-qubit systems.
CO3	Analyze the implementation of various quantum algorithms
CO4	Design of quantum 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												
CO2	3	3	3											
CO3	3	3	3											
CO4	3	3	3											
AVG	3	3	3											

Syllabus

UNIT-1 (12 Hours)

Quantum Computing and its Components: Motivation for studying quantum computing, History of computing including Turing Machines, Major players in the industry, Origin of quantum computing, Major concepts of quantum computing, Qubits and Multi Qubit states, Bra-Ket notation, Block sphere representation, Measuring quantum states.

UNIT-2 (12 Hours)

Math foundation and Circuit Design for quantum computing: Introduction to Matrix algebra, Dirac notation, Inner product and Hilbert spaces, Matrices and Tensors, Unitary operations and Projectors. **Quantum Circuit Design Fundamentals:** Introduction, Distributed quantum computing, Qubit design methods, Operations on Qubits, Types of Reversible and Quantum logic Gates, Universal sets of Quantum Gates	
UNIT-3	(12 Hours)
Quantum Circuits Design: No cloning theorem and it's proofs, Implementing measurements with quantum gates, General quantum circuits, Programming models for a quantum computing model, Steps performed on classical and quantum computer, Parallelism and Debuchi's Theorem, Teleportation and Superdense coding.	
UNIT-4	(12 Hours)
Quantum Algorithms: Introduction, Quantum Walks, Major Algorithms: Shor's Algorithm, Grover's search algorithm, Deutsch and Deutsch-Jozsa algorithm, Simon's Algorithm.	
Text Books:	1. Rajiv Chopra, "Quantum Computing and Techniques: First Edition", Khanna Books Publishing; 2025.
References:	1. Michael A. Nielsen, Isaac L. Chuang, "Quantum Computation and Quantum Information: 10th Anniversary Edition", Cambridge University Press; 1st edition, 2011 2. P Kaye, R Laflamme and M Mosca, "An Introduction to Quantum Computing", Oxford University Press, 2007

BAPATLA ENGINEERING COLLEGE:: BAPATLA

(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SIGNALS AND SYSTEMS **II B.Tech. IV Semester (Code:24EC402)**								
Lectures	:	2 Hours/Week	Tutorial	:	1 Hour/Week	Practical	:	0
CIE Marks	:	40	SEE Marks	:	60	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will

- To introduce the fundamental concepts, classification, and mathematical operations of continuous-time signals and systems, enabling students to analyze and model their behavior for engineering applications.
- To provide a comprehensive understanding of time-domain and frequency-domain analysis of continuous-time systems using convolution and Fourier series representations.
- To impart knowledge of frequency-domain analysis using the Continuous-Time Fourier Transform, signal correlation, spectral properties, and the fundamentals of signal sampling.
- To understand and apply Laplace Transform techniques for analyzing and solving continuous-time system behaviors and differential equations.

Course Outcomes: After studying this course, the students will be able to

CO1	Understand, classify, and perform operations on continuous-time signals, analyze and model continuous-time systems based on their characteristics and behavior.
CO2	Analyze continuous-time systems using convolution, realize systems through differential equations, and represent periodic signals using exponential and trigonometric Fourier series along with their properties.
CO3	Apply the Fourier transform to analyse continuous-time signals and systems, compute correlation and spectral characteristics, and understand the principles and significance of the sampling process.
CO4	Compute Laplace and inverse Laplace transforms, determine regions of convergence, apply their properties and theorems, and solve differential equations using Laplace Transform 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												
CO2	3	3	3											
CO3	3	3	3											
CO4	3	3	3											
AVG	3	3	3											

Syllabus	
UNIT-1	(12 Hours)
Mathematical Description of Continuous–Time Signals: Introduction, Elementary (or) Standard Signals, Detailed Classification of Continuous-time Signals, Basic Operations on Continuous-time signals **Mathematical Description of Continuous–Time Systems:** Introduction, Detailed Classification of Continuous-time Systems	
UNIT-2	(12 Hours)
Time-Domain Analysis of Continuous-Time Systems: The Convolution integral, Properties of Convolution integral, Block diagram realization of Differential equations. **The Continuous-Time Fourier Series:** Introduction, Representation of Fourier Series, Existence of Fourier Series, Fourier series representation of continuous time periodic signals, Exponential Fourier Series, Trigonometric Fourier Series, Properties of Continuous-Time Fourier Series.	
UNIT-3	(12 Hours)
The Continuous-Time Fourier Transform: Introduction, Definition for Continuous-Time Fourier Transform, Existence of Fourier Transforms, Fourier transform of Standard Signals, Properties of Fourier Transforms, Solution of Differential equations using Fourier Transform. **Signal Correlation and Spectral Properties:** Correlation of functions, Cross Correlation, Auto Correlation, Properties of Cross and Auto Correlation, Energy Spectral Density and Power Spectral Density and their properties. **Sampling:** Introduction to Sampling Process, Sampling Theorem.	
UNIT-4	(12 Hours)
Laplace Transforms: Introduction**,** Concept of region of convergence (ROC) & Its Properties, Existence of Laplace transform, Bilateral and Unilateral Laplace transforms, Properties and theorems of Laplace transforms, Inverse Laplace transform, Solution of Differential equations using Laplace Transform.	
Text Books:	1. Fundamentals of Signals and Systems, 2nd Edition , Michel J Roberts, Govind Sharma, Tata McGraw Hill, 2010.
References:	1. Signals and Systems, Simon Haykin, John Wiley,2004 2. Signals and Systems, A V Oppenheim, A S Wilsky& IT Young, PHI/Pearson, 2003 3. Signal, Systems and Communications, B P Lathi, BSP, 2003.

EM Waves and Transmission Lines

II B. Tech. - IV semester (Code: 24EC403)

Lectures	:	3 Hours/Week	Tutorial	:	0	Practical	:	0
CIE Marks	:	40	SEE Marks	:	60	Credits	:	3

Pre-Requisite: Electromagnetic Field Theory (20EC304)

Course Objectives: The objective of this course is to

➢	Analyze concepts related to reflections and transmission of plane wave at differentinterfaces.
➢	Analyze the characteristics the lossy, lossless and distortion less microwave transmission lines and apply the Smith chart to solve various transmission line parameters.
➢	Solve the wave equations for different modes of propagation in rectangular waveguides and analyze its characteristics.
➢	Solve the wave equations for different modes of propagation in circular waveguides and analyze its characteristics.

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

CO1	Analyze the reflection and refraction mechanisms of plane waves in different media.
CO2	Analyze the characteristics the lossy, lossless and distortion less microwave transmission lines and apply the Smith chart to solve various transmission line parameters.
CO3	Solve the wave equations for different modes of propagation in rectangular waveguides and analyze its characteristics.
CO4	Solve the wave equations for different modes of propagation in circular waveguides and analyze its characteristics.

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	1											2
CO2	2	3	1											2
CO3	2	3	1											2
CO4	2	3	1											2
AVG	2	3	1											2

UNIT-I — 12 Hours

REFLECTION AND REFRACTION OF PLANE WAVES:
Reflection by a perfect conductor-Normal incidence, Reflection by a perfect conductor-oblique incidence, Reflection by a perfect dielectric-Normal incidence, Reflection by a perfect insulator-oblique incidence, surface impedance.

UNIT-II — 12 Hours

MICROWAVE TRANSMISSION LINES:
Introduction, transmission line equations and solutions, reflection coefficient and transmission coefficient, standing wave and standing wave ratio, line impedance and admittance, smith chart, impedance matching-single stub matching.

UNIT-III	12 Hours
RECTANGULAR WAVEGUIDES: Solutions of wave equations in rectangular coordinates, TE modes in rectangular waveguides, TM modes in rectangular waveguides, power transmission in rectangular waveguides, power losses in rectangular waveguides, excitations of modes in rectangular waveguides, characteristics of standard rectangular waveguides.	
UNIT-IV	12 Hours
CIRCULAR WAVEGUIDES: Solutions of wave equations in cylindrical coordinates, TE modes in circular waveguides, TM modes in circular waveguides, TEM modes in circular waveguides, power transmission in circular waveguides or coaxial lines, power losses in circular waveguides, excitations of modes in circular waveguides, characteristics of standard circular waveguides	
Text Books:	1. Edward Jordan, Keith G. Balmain, Electromagnetic Waves and Radiating Systems, 2nd edition, PHI India. (Unit I). 2. Samuel Y Liao, Microwave Devices & Circuits, 3rd edition, PHI India (Unit II, III, IV).
References:	1. R.K.Shevgaonkar Electromagnetic waves by, Tata McGraw Hill. 2. P A Rizzi, Micro Wave Engineering: Passive Circuits, PHI, 2002.

Analog & Digital Communications
II B.Tech. IV Semester (Code: 24EC404)

Lectures	:	2 Hours/Week	Tutorial	:	1 Hour/Week	Practical	:	0
CIE Marks	:	40	SEE Marks	:	60	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will

- Fundamental concept of amplitude modulation schemes.
- Various analog modulation and demodulation techniques in analog communication systems.
- Learn the fundamental concepts of Digital Modulation Schemes.
- Learn the basics of Baseband and Passband modulation.

Course Outcomes: After studying this course, the students will be able to

CO1	Understand Amplitude Modulation in time and frequency domains.
CO2	Analyze transmission of signals using frequency modulation techniques.
CO3	Understand the fundamental concepts of Pulse Modulation.
CO4	Evaluate the performance of various passband techniques with respect to the probability of error.

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									2		3
CO2	3	2	2									2		3
CO3	2	2										2		2
CO4	3	2	2									2		3
AVG	2.75	2	2									2		3

Syllabus

UNIT-1 (12 Hours)

AMPLITUDE MODULATION: Introduction to Continuous-wave Modulation, Need for Modulation. Amplitude Modulation, Virtues, Limitations, and Modifications of Amplitude Modulation, Double Sideband- Suppressed Carrier Modulation, Coherent detection, Costas Receiver, Quadrature Carrier Multiplexing, Single-Sideband Modulation, Vestigial Sideband Modulation.

UNIT-2 (12 Hours)

ANGLE MODULATION: Basic Definitions, Properties of Angle Modulated Waves, Relationship between PM and FM waves, Narrow-Band Frequency Modulation, WideBand Frequency Modulation, Transmission Bandwidth of FM waves, Generation of FM waves, Demodulation of FM signals. Pre-emphasis and De-emphasis in FM.

UNIT-3 (12 Hours)

PULSE MODULATION: Introduction, Sampling Process (ideal and flat-top), Pulse-Amplitude Modulation, Pulse-Position Modulation, Quantization Process, Quantization Noise, Pulse Code

Modulation: Encoding, Regeneration, Decoding, Delta Modulation, Differential Pulse Code Modulation, Line Codes.	
UNIT-4	(12 Hours)
BASE BAND PULSE TRANSMISSION: Introduction, Matched filter, Properties. **PASS BAND TRANSMISSION:** Pass band transmission model, Binary Amplitude-Shift Keying (BASK), Phase-Shift Keying (BPSK, QPSK), Frequency-Shift Keying (BFSK, MSK), Noncoherent Digital Modulation Schemes (BASK, BFSK, DPSK), M-ary Digital Modulation Schemes (M-ary PSK).	
Text Books:	1. Simon Haykin, Communication Systems, 3rd Edition, John Wiley & Sons.
Reference Books:	1. Taub and Schilling, Principles of Communication Systems, 2nd Edition, TMH, 1986. 2. Bernard Sklar, Digital Communication, 2nd Edition, Pearson Education, 2001.

ANALOG INTEGRATED CIRCUITS
II B.Tech. IV Semester (Code:24EC405)

Lectures	:	3 Hours/Week	Tutorial	:	0 Hour/Week	Practical	:
CIE Marks	:	40	SEE Marks	:	60	Credits	:

Pre-Requisite: Digital Electronics & Analog Circuits

Course Objectives: Students will

➢	Understand the fundamentals of operational amplifier and its linear and non-linear applications
➢	Explain the operation and able to design oscillators, wave form generators and active filters using op-amp
➢	Implement clippers, clampers, and peak detectors, along with data conversion techniques (ADC/DAC) using op-amp
➢	Explore the functional blocks, working principles, and practical applications of special integrated circuits such as the 555 Timer, PLL, and voltage regulators.

Course Outcomes: After studying this course, the students will be able to

CO1	Understand and apply the basic operations of operational amplifiers to perform linear and nonlinear applications.
CO2	Design and evaluate different types of oscillators, waveform generators and active filters using op-amp.
CO3	Analyze the working of nonlinear wave shaping circuits and Data Converters.
CO4	Analyze the functioning and design of special IC's

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		
CO2	3	3	3									2		
CO3	3	3	2									2		
CO4	3	2	3									2		
AVG	3	2.5	2									2		

UNIT-I (14 Hours)

OPERATIONAL AMPLIFIERS: Operational amplifier and block diagram representation, Schematic symbol, Ideal op-amp, Equivalent circuit of an op-amp, Voltage series feedback Amplifier, Voltage shunt feedback Amplifier , Practical op-amp, DC Characteristics, Slew rate.

OP-AMP APPLICATIONS: The summing amplifier, Differential and instrumentation amplifiers, Voltage to current and current to voltage conversion, Differentiators and integrators, Precision rectifiers, Comparators, Schmitt Trigger.

UNIT-II (14 Hours)

OSCILLATORS AND ACTIVE FILTERS: Oscillator principles, Oscillator types, Frequency stability, Phase shift oscillator, Wein bridge oscillator, Quadrature oscillator, Square-wave

generator, Triangular wave generator, Sawtooth wave generator Introduction of filters, First Order and Second Order Low Pass, High Pass Filter, Band Pass Filters, Band Reject Filter and All Pass Filter.	
UNIT-III	(10 Hours)
CLIPPERS, CLAMPERS & CONVERTERS: Positive and negative clippers, Positive and negative clampers, Peak detector, S/H circuit. D/A conversion fundamentals, Weighted resistor and R-2R Ladder D/A converters, A/D conversion: Parallel Comparator Type, Counter Type, Successive Approximation Register Type and Dual Slope Type	
UNIT-IV	(10 Hours)
APPLICATIONS OF SPECIAL IC'S : The 555 timer, 555 as Monostable and Astable Multivibrator and applications. Phase Locked Loops, Basic principles, VCO, Monolithic PLLs, 565 PLL applications, A 723 Voltage Regulator and its design.	
Text Books :	1. Op-Amps & Linear Integrated Circuits by RamaKant A.Gayakwad 4th Edition, PHI/Pearson Education, 2003. 2. Linear Integrated Circuits by D.Roy and Choudhury, Shail B.Jain,2nd Edition, New Age International,2003.
References :	1. Microelectronics: Circuit Analysis and Design,Donald A. Neamen,4th Edition, McGraw Hill,2010. 2. Microelectronic Circuits, Sedra Smith, 7th Edition Oxford University Press, 2010.

Constitution of India **II B.Tech. IV Semester (Code:24EC406/MC02)**								
Lectures	:	2 Hours/Week	Tutorial	:	0 Hour/Week	Practical	:	0
CIE Marks	:	40	SEE Marks	:	-	Credits	:	0

Pre-Requisite: None

Course Objectives: Students will learn

- The importance of fundamental rights as well as fundamental duties
- The powers of Union government in Indian federal system
- The functioning of Indian Parliamentary System at state level
- The administration of local government and activities of ECI

Course Outcomes: After studying this course, the students will be able to

CO1	Comprehend the Fundamental Rights and Fundamental Duties of the Indian Citizen and to implant morality, social values, and their social responsibilities.
CO2	Analyze the distribution of powers between Center and State and differentiate the roles of President and Cabinet.
CO3	Differentiate the functioning of Indian Parliamentary System at State level.
CO4	Get acquainted with Local Administration and Election Commission.

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						
CO2						3		3						
CO3						3		3						
CO4						3		3						
AVG						3		3						

Syllabus

UNIT-1	(6 Hours)

Introduction: 'Constitution' meaning of the term, Indian Constitution: Sources, Features, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT-2	(6 Hours)

Union Government and its Administration: Structure of the Indian Union: Federal System, Centre-State relations, President: Role, Power and Position, PM and Central Council of ministers, Central Secretariat.	
UNIT-3	(6 Hours)
State Government and its Administration: Governor: Role and Position, CM and State Council of ministers, State Secretariat: Organization, Structure and Functions.	
UNIT-4	(6 Hours)
Local administration: District's Administration head: Role and Importance, Municipalities: 74th Amendment Act of 1992, Panchayati raj: 73rd Amendment Act of 1992, Role and functioning of ECI.	
Text Books:	1. Laxmikanth 'Indian Polity'-6th edition- McGraw- hill, India. 2. Dr.P.K.Agrawal, Dr.K.N.Chaturvedi 'Constitution of India' - Kindle Edition.
References:	1. D.D. Basu,'Indian Constitution'-24th edition-lexis nexis publishers.

DIGITAL DESIGN USING VERILOG HDL
II B.Tech. IV Semester (Code: 24ECL401)

Lectures	:	1 Hours/Week	Tutorial	:	1 Hour/Week	Practical	:	2
CIE Marks	:	40	SEE Marks	:	60	Credits	:	2

Pre-Requisite: Digital Electronics

Course Objectives: Students will

- Understand the basics of Hardware Description Languages, Program structure and basic language elements of Verilog.
- Gain experience by designing, modeling, implementing, and verifying several digital circuits using Verilog HDL.
- Know the gate-level modeling and dataflow modeling of combinational and simple sequential circuits.
- Learn the behavioral modeling of combinational and sequential circuits

Course Outcomes: After studying this course, the students will be able to

CO1	Illustrate the design flow and design methodologies for a digital design
CO2	Describe the basic conventions and interfaces for modules and ports.
CO3	Implement digital circuits using gate primitives and dataflow constructs.
CO4	Simulate digital circuits using behavioral description.

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	
CO2	3				3								3	
CO3	2	3			3								3	
CO4	2	2			3								3	
AVG	2.5	2.33			3								3	

Syllabus

UNIT-1 (12 Hours)

Overview of Digital Design with Verilog HDL: Evolution of CAD, emergence of HDLs, typical HDL-based design flow, importance of HDL.

Hierarchical Modeling Concepts: Top-down and bottom-up design methodology, differences between modules and module instances, components of a simulation, design block, stimulus block.

UNIT-2 (12 Hours)

Basic Concepts: Lexical conventions, data types, system tasks, compiler directives **Modules and Ports:** Module definition, port declaration, connecting ports, hierarchical name referencing.	
UNIT-3	(12 Hours)
Gate-Level Modeling: Modeling using basic Verilog gate primitives, description of and/or and buf/not type gates, rise, fall and turn-off delays, min, max, and typical delays, Examples **Dataflow Modeling:** Continuous assignments, delay specification, expressions, operators, operator types, Examples.	
UNIT-4	(12 Hours)
Behavioral Modeling: Structured procedures, initial and always, Procedural Assignments, timing controls, conditional statements, multiway branching, loops, sequential and parallel blocks, Examples.	
Text Books:	1. Samir Palnitkar, Verilog HDL: A Guide to Digital Design and Synthesis, Second Edition, Prentice Hall PTR, 2003
References:	1. T.R. Padmanabhan, B. Bala Tripura Sundari , Design through Verilog HDL , Wiley, 2009. 2. Zainalabdien Navabi, Verilog Digital System Design, TMH, 2nd Edition

Practical Exercises

1.	Introduction to Verilog Simulator	CO1
2.	Adders & Subtractors	CO1
3.	Full adder using Half Adder various types	CO1
4.	Full adder testing using Test Bench	CO1
5.	Priority Encoder 74x148 or 8x3 encoder using 4x2 encoder	CO2
6.	Decoder 74x138 or 3x8 decoder using 2x4 decoder	CO2
7.	Multiplexer 74x151, 8:1 mux using 4:1 using 2:1 mux	CO2
8.	Multiplier	CO2
9.	Arithmetic Unit Implementation 74x181	CO2
10.	4-Bit Parity Generator, Comparator 74x85	CO2
11.	Logical Unit Implementation	CO3
12.	Fast Adders, 74x283	CO3
13.	Flip flops, Level, Edge triggered	CO3
14.	4-Bit Universal shift register	CO3
15.	Counters 74x163, 74x169	CO4

16.	3-bit Linear Feedback Shift Register	CO4
17.	74x194, Mod-8 Counter, Ring counter	CO4
18.	Bus Transceiver, 74x245, Bus/Register Transfer	CO4
19.	Simulation/Study of Static/Dynamic electrical behavior	CO4
20.	Simulation/Study of CMOS logic families, Low voltage CMOS interfacing.	CO4

Note: A Minimum of 10 experiments to be completed.

Analog Integrated Circuits LAB
II B.Tech. IV Semester (Code: 24ECL402)

Lectures	:	2 Hours/Week	Tutorial	:	1 Hour/Week	Practical	:	0
CIE Marks	:	40	SEE Marks	:	60	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will

- Design and verify the circuits based on IC 741 Op-Amp.
- Realize the circuits related to the applications of 555 Timer.
- Test the functionality of voltage regulators using IC 723
- Verify the operation of IC 565 and IC 566.

Course Outcomes: After studying this course, the students will be able to

CO1	Design and test linear applications of Op-Amp like Adder, Integrator, precision full wave rectifier, Active filters.
CO2	Demonstrate non-linear and waveform generation circuits such as oscillators, Schmitt triggers using op-amp.
CO3	Analyse and implement timer-based and PLL circuit using IC 555 and IC 565
CO4	Design and verify voltage regulators (fixed and variable) using IC 723 and other regulator ICs, and construct DAC circuits using R-2R ladder networks.

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	2								2		
CO2	3	2	3	2								2		
CO3	3	2	3	2								2		
CO4	3	2	3	2								2		
AVG	3	2	3	2								2		

LIST OF EXPERIMENTS

1	Measurement of Op-amp Parameters
2	Applications of Op-amp(Adder, Subtractor, Integrator, Differentiator)
3	Design of Full Wave Rectifier using Op-amp
4	Design of Low Frequency Oscillators using Op-amp(Wein Bridge & RC Phase Shift Oscillators)
5	Waveform Generation using Op-amp (Square & Triangular)
6	Instrumentation Amplifier using op-Amp IC741
7	Design and Verification of Schmitt Trigger using Op-ampIC741
8	Design Of Active Filters – LPF, HPF (First Order)
9	Design of State Variable Filter using Op-amps
10	Applications of IC 555 timer (Monostable & Astable Multivibrators, Schmitt Trigger)
11	PLL Using 1C 565

12	Design of Fixed Voltage Regulators
13	Design of Variable Voltage Regulator using IC723
14	Design of VCO using IC 566
15	Design of 4 bit DAC using R-2R ladder Network

NOTE: A minimum of 10 (Ten) experiments have to be performed and recorded by the candidate to attain eligibility for Semester End Examination.

Text Book:	1. Op-Amps & Linear Integrated Circuits by RamaKant A.Gayakwad 4th Edition, PHI/Pearson Education, 2003. 2. Linear Integrated Circuits by D Roy Choudhury Shail B Jain ,2nd Edition, New Age International,2003.
Reference Books:	1. Microelectronics: Circuit Analysis and Design by Donald A. Neamen,4th Edition, McGraw Hill,2010. 2. Microelectronic Circuits, Sedra Smith, 7th Edition Oxford University Press, 2010.

Analog & Digital Communications Lab
II B.Tech. IV Semester (Code: 24ECL403)

Lectures	:	2 Hours/Week	Tutorial	:	1 Hour/Week	Practical	:	0
CIE Marks	:	40	SEE Marks	:	60	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will

- Realize Amplitude Modulation (AM) and demodulation for various message signals.
- Construct a circuit for angle modulation and demodulation (FM and PM).
- Explore the various pulse modulation and demodulation techniques.
- Describe some important digital band-pass modulation techniques used in practice.

Course Outcomes: After studying this course, the students will be able to

CO1	Demonstrate various continuous modulation and demodulation techniques.
CO2	Verify angle modulation and demodulation techniques.
CO3	Analyze the pulse modulation and demodulation techniques.
CO4	Simulate digital band-pass modulation techniques

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					3			2		2
CO2	2	2		3					3			2		2
CO3	2	2		3	3				3			2		2
CO4	2	2		3	3				3			2		2
AVG	2	2		3	3				3			2		2

LIST OF EXPERIMENTS

1	Amplitude Modulation and Demodulation.
2	Frequency Modulation and Demodulation.
3	Verification of sampling theorem.
4	Pre-Emphasis and De-Emphasis Circuits.
5	Generation and Detection of PCM.
6	Delta Modulation and Demodulation.
7	PAM Generation and Reconstruction.
8	PWM Generation and Reconstruction.
9	PPM Generation and Reconstruction.
10	Generation and Detection of FSK.
11	Generation and Detection of PSK.
12	Write a program to represent the given binary code in any two Line codes formats.
13	Write a program to generate Binary Amplitude Shift Keying modulation.
14	Write a program to generate Binary Phase Shift Keying modulation.
15	Write a program to generate Binary Frequency Shift Keying modulation.

NOTE: A minimum of 10 (Ten) experiments have to be performed and recorded by the candidate to attain eligibility for Semester End Examination.	
Text Book:	1. Simon Haykin and Michael Moher, "An Introduction to Analog & Digital Communications",2ND Ed., Wiley, (2007).
Reference Books:	1. H Taub & D. Schilling, Gautam Sahe, "Principles of Communication Systems", TMH, 3rd Edition, (2007). 2. Sam Shanmugam, "Analog and Digital Communication Systems", John Wiley and Sons, 1992.

HEALTH AND WELLNESS, YOGA AND SPORTS

II B. Tech. – IV Semester (Code: 24ECL404)

Lectures	0	Tutorial	0	Practical	2	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				
CO2										2				
CO3										2				
CO4										2				

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. ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.	
Text Books :	1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning,2022 2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice 3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
References :	1. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to SurvivingAnywhere Third Edition, William Morrow Paperbacks, 2014 2. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc.2014

Evaluation Guidelines:

1. Evaluated for a total of 100 marks.

2. A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, Totaling to 90 marks.

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

ANTENNAS AND WAVE PROPAGATION

III B.Tech – V Semester (Code: 24EC501)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	40	Semester End Examination (3 Hours)	:	60		

Prerequisites: EMFT and EMTL

Course Objectives: The objective of this course is

CO1: To understand the radiation phenomenon associated with various types of antennas along with emphasis on their applications.

CO2: To attain knowledge on basic parameters those are considered in the antenna design process and the analysis while designing an antenna.

CO3: To understand the radiation mechanisms associated with the antenna arrays.

CO4: To analyze the electric and magnetic field emissions from various antennas and mathematical formulation of the analysis. To obtain the basic knowledge about concepts of radio wave propagation in the atmosphere.

Course Outcomes: Students will be able to

CLO1: Gain knowledge about the radiation pattern of various basic antennas and mechanisms associated with it.

CLO2: Understand the basic parameters that are important in the design of antennas.

CLO3: Analyze the radiation patterns and other parameters of antenna arrays.

CLO4: Understand the radiation mechanisms associated of broadband antennas present and Recognize the importance of radio wave propagation required for communication and know how the radio waves gets effected when propagating through atmosphere.

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	1	1	1	-								2	1
CO2	3	3	1	1	-								3	2
CO3	2	2	3	2	2								3	3
CO4	2	1	1	1	-								2	1
AVG	2.5	1.75	1.5	1.25	2								2.5	1.75

SYLLABUS

UNIT – I

RADIATION: Radiation Mechanism, Potential functions-heuristic approach, Maxwell's equation approach, Potential functions for sinusoidal oscillations, Alternating current element, Power radiated by current element, Application to short antennas, Assumed current distribution, Radiation from quarter wave Monopole / half wave dipole. Traveling wave antennas.

UNIT – II

P

ANTENNA FUNDAMENTALS: Isotropic, Directional, Omni-directional patterns, Principle patterns, Field regions, Radiation density, Radiation intensity, Directive gain, Power gain, Half power Beamwidth, Antenna polarization, Power loss factor, Radiation efficiency, Effective aperture of antenna, Relation between maximum effective aperture and directivity, Friss transmission equation.

ARRAY ANTENNAS: Two-element array, Uniform linear array, Side lobe level and beam width of broadside array, Beam width of end fire array, Principle of multiplication of patterns, Binomial array.

UNIT – III

Characteristics of typical antennas: Rhombic antennas, Folded Dipole, Loop antenna, Yagi-Uda array, Helical antenna, Log periodic antenna, Pyramidal Horn antenna, Corner reflector antenna, Parabolic reflector antennas –Paraboloid, Cassegrain system of reflectors, Basic principles of slot antennas, microstrip antenna, Rectangular Microstrip antenna.

UNIT – IV

RADIO WAVE PROPAGATION: Ground wave Propagation, Space-wave Propagation, Effect of curvature of an Ideal Earth, Variations of Field strength with height in space-wave Propagation, Atmospheric effects in space-wave Propagation, Radio-Horizon, Duct Propagation, Extended-range Propagation resulting from Tropospheric Scattering, Ionospheric Propagation, Gyro frequency, Refraction and reflection of Sky Waves by the Ionosphere, Critical Frequency, Skip Distance, Maximum Usable Frequency.

TEXT BOOKS:

1. Edward C Jordan and Keith G Balmain, Electromagnetic Waves and Radiating Systems, 2nd Edition, PHI, 2003.
2. Constantine A Balanis, Antenna Theory: Analysis and Design, Harper and Row Publishers, 2002

REFERENCE BOOKS:

1. J. D. Kraus and Ronald J Marhefka, Antennas For all Applications, TMH, 2003.
2. G. S. N. Raju, Antennas and Wave Propagation, 1st Edition, Pearson Publication.

PIC MICROCONTROLLERS

III B.Tech – V Semester (Code: 24EC502)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	40	Semester End Examination (3 Hours)	:	60		

PREREQUISITES: Courses on Switching Theory and Logic Design, Linear and Digital IC Applications & Microcontrollers and Interfacing.

COURSE DESCRIPTION: PIC microcontroller architecture, Interrupts and timers of PIC microcontroller, interfacing

COURSE OUTCOMES: After successful completion of this course, the students will be able to:

CO1: Analyze Architectural features of PIC family of Microcontrollers for control applications.

CO2: Analyze PIC18 Architecture and Instruction Set to develop computing applications.

CO3: Develop Programs for PIC18 using ports, timers and associated on Chip resources for Specified Applications.

CO4: Design microcomputer based systems with the knowledge of Interfaces and Peripherals of PIC18 to Solve various engineering problems.

DETAILED SYLLABUS:

UNIT-I: PIC ARCHITECTURE & PROGRAMMING (12 Periods)

PIC ARCHITECTURE:

Architecture of PIC18, Register Organization, Memory Organization - ROM space & RAM.

PIC PROGRAMMING

Data formats & Directives, Instruction Set: Arithmetic, Logic, branching, Bit wise, bank switching, Simple PIC Programs.

UNIT-II: PORTS, TIMERS & PROGRAMMING (12 Periods)

Pin description of PIC18F452, Basic Port Structure, I/O port programming; Macros and modules, Structure of Timer 0 & its Programming using Assembly and C, Counter programming, Structure of timers 1, 2 and 3 & their Programming.

UNIT-III: PIC-SERIAL PORT AND INTERRUPTS (12 Periods)

Basics of communication – Serial/Parallel, RS232 & PIC18 connection to RS232, Serial Port Structure & programming; PIC18 interrupts, Programming timer interrupts, Programming serial interrupts.

UNIT-IV: PIC INTERFACING (12 Periods)

7 segment LED and LCD interfacing, keyboard interfacing, interfacing ADC, DAC, Interfacing DC motor, stepper motor, PWM using CCP.

Total Periods: 48

TEXT BOOK:

1. Muhammad Ali Mazidi, Rolin D. McKinlay, Danny causey, *PIC Microcontroller and Embedded Systems: Using C and PIC18*, Pearson Education, 2015.

REFERENCE BOOK:

1. Ramesh S. Gaonkar, *Fundamentals of Microcontrollers and Applications in Embedded Systems (With PIC18 Microcontroller Family),* Penram International, 2010.

ADDITIONAL LEARNING RESOURCES:

1. http://crystal.uta.edu/~zaruba/CSE3442/
2. https://owd.tcnj.edu/~hernande/ELC343/
3. http://www.ciebookstore.com/Content/Images/uploaded/PIC18-Study-Guide-CIE.pdf

CO-PO-PSO Mapping Table

Course outcome	Program outcomes											Program specific outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	-	-	-		-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	3	-	-
CO3	3	2	3	-	-	1	-	-	-	-	-	3	-	-
CO4	3	2	3	1	-	1	-	1	-	-	-	3	-	-
Average	3	2.5	3	1	-	1	-	1	-	-	-	3	-	-
Course Correlation Level	3	3	3	1		1		1	-	-	-	3	-	-

Correlation Level: 3-High ; 2-Medium ; 1-Low

DIGITAL SIGNAL PROCESSING
III B.Tech. V Semester (Code:24EC503)

Lectures	:	3 Hours/Week	Tutorial	:	0 Hour/Week	Practical	:	0
CIE Marks	:	40	SEE Marks	:	60	Credits	:	3

Pre-Requisite: Signals and Systems

Course Objectives: Students will learn how to

- To Study the various types of Digital signals and systems and their frequency domain representation.
- To Learn and solve the concepts of DFT and FFT and their importance in signal processing applications
- To Design IIR Digital filters through Approximation Procedures and their realizations.
- To Design FIR Digital filters through windowing Techniques and study the basic concepts of Decimation and interpolation operations.

Course Outcomes: After studying this course, the students will be able to

CO1	Analyze various types of Digital signals and systems.
CO2	Determine and demonstrate the DFT and FFT of a given signal.
CO3	Design an IIR Digital Filter for given specifications.
CO4	Develop a FIR Digital Filter for given specifications and Realization of digital filters

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	2												3
CO3	2	3	3											3
CO4	2	3	3											3
AVG	2.5	2.75	3											3

UNIT-1 (12 Hours)

DISCRETE-TIME SIGNALS AND SYSTEMS: Introduction to Digital Signal Processing, Advantages and Applications, Discrete time signals, LTI system: Stability and Causality. Frequency domain representation of discrete time signals and systems.

Z-TRANSFORMS: The Z Transform, Region of Convergence, Z-Transform theorems and Properties, Persaval's relation, Inverse Z-transform using: (i) Cauchy's Integration theorem (ii) Partial fraction method (iii) Long division method. One sided Z- Transform, Solution of Difference equations using one sided Z-Transform.

UNIT-2 (12 Hours)

THE DFT AND FFT: Discrete Fourier Transform (DFT), Properties of DFT, Computations for evaluating DFT, Computation of Inverse DFT, Decimation in time FFT algorithms (DITFFT),

Decimation in Frequency FFT algorithms (DIFFFT),.	
UNIT-3	(12 Hours)
DESIGN OF IIR FILTERS: Introduction, Properties of IIR filter, Design of Digital Butterworth and Chebyshev filters using: (i) Bilinear transformation method (ii) Impulse invariance method. Design of Digital filters using frequency transform method.	
UNIT-4	(12 Hours)
DESIGN OF FIR FILTERS: Introduction, Characteristics of Linear Phase FIR filters, Frequency response of FIR linear phase filters, Design of Linear-Phase FIR Filters Using Windows, Design of Linear-Phase FIR Filters by the Frequency-Sampling Method. **REALIZATION OF DIGITAL FILTERS:** Direct, Canonical, Cascade and Parallel realizations of Digital filters, Realization of Linear phase FIR filters **FUNDAMENTALS OF MULTIRATE SYSTEMS:** Introduction, Decimation, Interpolation.	
Text Books :	1. Lonnie C Ludeman, "Fundamentals of Digital Signal Processing," John Wiley & Sons, 2009. 2. Sanjit K Mitra, "Digital Signal Processing: A Computer Based Approach," 3rd Edition, TMH, SIE, 2008.
References :	1. John G. Proakis, Dimitris G Manolakis, "Digital Signal Processing: Principles, Algorithms and Applications," 4th Edition, Pearson Education, 2007. 2. Alan V Oppenheim and Ronald W Schafer, Discrete Time Signal Processing, Pearson Education, 2007. 3. Andreas Antoniou, "Digital Signal Processing", Tata Mc Graw Hill, 2006. 4. Johnny R.Johnson-Introduction to Digital Signal Processing, Prentice Hall, 1989

Pattern Recognition
III B.Tech – V Semester (Code : 24EC504A)

Lectures	:	3 Hours/Week	Continuous Assessment	:	40M
Final Exam	:	3 Hours	Final Exam Marks	:	60M

Pre-Requisite: Nil

Course Objectives: Students will be able to

- Learn about importance pattern recognition and its broad applications.
- Study of various linear classification algorithms and Support vector machines.
- Understanding of different nonlinear classification algorithms and networks.
- Study of various feature selection and feature generation methods.

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

CO1	Analyze probability density function between the patterns using bayes classifier for supervised learning. .
CO2	Estimate cost function and minimum mean square error between the pattern classes using linear classifier algorithms such as LMS, Support Vector Machines.
CO3	Estimate the cost choice function and minimum mean square error between the pattern classes using Non-Linear classifier algorithms such as back propagation algorithms, Multi- Layer perceptron Algorithms
CO4	Apply feature selection and generation techniques to identify features and separate objects in an image.

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												3
CO2	2	3												3
CO3	2	3												3
CO4	3	2												3
AVG	2.25	2.75												3

UNIT-1 12 Hours

Introduction to Pattern Recognition: Importance of pattern recognition, Features, Feature Vectors and Classifiers, Supervised, Unsupervised and Semi Supervised Learning.

Classifiers based on Baye's Decision Theory: Baye's decision theory, Discriminant Functionsand decision surfaces, Bayesian classification for Normal Distributions, Estimation of Unknown probability density functions, The Nearest Neighbor Rule.

UNIT-2 12 Hours

Linear Classifiers: Linear Discriminant functions and Decision Hyperplanes, The perceptron Algorithm, Least Squares Method, Mean Square Error Estimation, LMS Algorithm.

Support Vector Machine: Separable classes, Nonseparable classes, Support VectorMachines-A geometric Viewpoint.	
UNIT-3	12 Hours
Non Linear Classifiers: The XOR problem, The two layer perceptron, Three layer perceptrons, The Backpropagation Algorithm, The cost function choice, choice of the network size, A simulation example, Networks with weight sharing, generalized linear classifiers, polynomial classifiers, Radial basis Function Networks.	
UNIT-4	12 Hours
Feature Selection: Preprocessing, The peaking phenomenon, Feature selection based on statistical hypothesis testing, ROC curve, class separability measures, feature subset selection. **Feature Generation:** Basis Vectors and Images, The KL Transform, The Singular Value Decomposition, Independent Component Analysis, Non-negative Matrix Factorization, Regional features, Features for shape and size characterization.	

Text Books:	1. Sergios Theodoridis, Konstantinos Koutroumbas, Pattern Recognition, Academic Press,Fourth Edition, 2009. 2. Pattern Classification (2 edition) – Richard Duda, Peter E Hart, David G Stork, JohnWiley & Sons, 2001.
References :	1. Pattern Recognition and Machine Learning, Christopher M.Bishop, Springer Publications2006.

CO-PO-PSO Mapping Table

Correlation Level: 3-High ; 2-Medium;

Course outcome	Program outcomes											Program specific outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1														
CO2														
CO3														
CO4														
Average														
Course Correlation Level														

DATA COMMUNICATION AND COMPUTER NETWORKS

III B.Tech – V Semester (Code: 24EC505B)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	40	Semester End Examination (3 Hours)	:	60		

Prerequisites: Basics of Computer hardware and software

Course Objectives: To learn

CO1: To learn various protocols, Network hardware, Network software.
CO2: To gain knowledge about functionality of each layer in OSI, TCP/IP protocols.
CO3: Understand basics and challenges of network communication.
CO4: Interpret the operation of the protocols that are used inside the Internet.

Course Outcomes: Students will be able to

CLO1: Independently understand basic computer network technology.
CLO2: Understand and explain Data Communications System and its components.
CLO3: Identify the different types of network topologies and protocols.
CLO4:Understand and building the skills of subnetting and routing mechanisms.

SYLLABUS

UNIT – I

Introduction to Data Communication and Networking: Uses of Computer Networks, Network Hardware, Network Software Internet Reference Models (OSI and TCP/IP).
Physical Layer: Basis for Data Communication, Guided Transmission Media, Wireless Transmission Medium, Circuit Switching and Telephone Network, High Speed Digital Access.

UNIT – II

Data Link Layer: Data Link Layer Design Issues, Error Detection and Correction, Data Link Control and Protocols, Example Data Link Protocol.
Medium Access Layer: Channel Allocation Problem, Multiple Access, CSMA, CSMA/CD, CSMA/CA.

UNIT – III

Local Area Network:Ethernet, Fast Ethernet, Gigabit Ethernet, Wireless LAN, Blue tooth, Connecting devices:- Repeaters, Hub, Bridges, Switch, Router, Gateways, Virtual LAN,
Network Layer:Network Layer Design Issues, Routing Algorithms Congestion control Algorithms,

UNIT – IV

Transport layer:Transport Layer Service, Elements of Transport protocols, Internet protocols (UDP and TCP)
Application Layer:DNS- Domain Name System, Electronic Mail, World Wide Web, Multimedia (Audio Compression, Streaming Audio, Voice over IP, Video Compression, Video on Demand).

TEXT BOOKS:

1. Andrew S. Tanenbaum, David.J.Wetherall, “ComputerNetworks”, Prentice-Hall, 5th Edition, 2010.
2. Behrouz A. Foruzan, Data communication andNetworking, 4th Edition,TMH, 2004.

REFERENCE BOOKS:

1. W.Tomasi,"Introduction to Data Communications and Networking" Pearson education.
2. G.S.Hura and M.Singhal,"Data and Computer Communications",CRCPress,Taylor and Francis Group.
3. S.Keshav,"An Engineering Approach to CoputerNetworks",Pearson Eduction,2nd Edition.

CO-PO-PSO Mapping Table

Course outcome	Program outcomes											Program specific outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO2	-	1	-	-	-	-	-	-	-	-	-	-	-	2
CO3	2	3	-	-	-	-	-	-	-	-	-	-	-	2
CO4	2	3	-	-	-	-	-	-	-	-	-	-	-	2
Average														
Course Correlation Level														

Correlation Level: 3-High ; 2-Medium ; 1-Low

Information Theory and Coding

III B. Tech. - V semester (Code: 24EC505C)

Lectures	:	3 Hours/Week	Continuous Assessment	:	40M
Final Exam	:	3 Hours	Final Exam Marks	:	60M

Pre-Requisite: Digital Communications

Course Objectives:

- Information Theory essentials and Source Coding concepts.
- Channel Coding Techniques to Combat Errors – Block Codes, Cyclic Codes, Convolutional Codes.
- Model Encoder and Decoders for Error Free Transmission and Reception.

Course Outcomes: After the completion of the Course Students will be able to:

CO1	Analyze and evaluate fundamental information and source coding techniques for improving efficiency of a communication system.
CO2	Develop channel coding schemes to improve the reliability of a communication system.
CO3	Analyze and evaluate various cyclic redundancy codes suitable in Digital Communication.
CO4	Apply convolutional coding techniques for error correction in telecommunication systems.

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	1									3	2	
CO2	3	3	1									3	2	
CO3	3	3	1									3	2	
CO4	3	3	1									3	2	
AVG	3	3	1									3	2	

UNIT-1 — 12 Hours

SOURCE CODING:

Mathematical models of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, coding for discrete memory less Sources, Properties of Codes, Huffman Code, Run Length Codes.

UNIT-2 — 12 Hours

CHANNEL CODING :

Introduction to Linear Block Codes, Generated Matrix, Systematic Linear Block Codes, Encoder Implementation of Linear Block Codes, Parity Check Matrix, Syndrome Testing, Error Detecting and Correcting Capability of Linear Block Codes, Hamming Codes.

UNIT-3 — 12 Hours

CYCLIC CODES: Algebraic Structure of Cyclic Codes, Binary Cyclic Code Properties, Encoding in Systematic Form, Syndrome Computation and Error Detection, Decoding of Cyclic Codes, Cyclic Hamming Codes BCH Codes: Description of the Codes, Minimum Distance and BCH Bounds, Decoding Procedure for BCH Codes.	
UNIT-4	12 Hours
CONVOLUTIONAL CODES: Encoding of Convolutional Codes, Structural Properties of Convolutional Codes, State Diagram, Tree Diagram, Trellis Diagram, Maximum, Likelihood Decoding of Convolutional Codes, Viterbi Algorithm.	
Text Books :	1. Error Control Coding – Fundamentals and Applications by SHU LIN and Daniel J. Costello, JR., Prentice Hall Inc. 2. Simon Haykin – Communication Systems, 4th edition.
References :	1. Digital Communications – Fundamentals and Applications by Bernard Sklar, Pearson Education Asis, 2003. 2. Digital Communications – John G. Proakis, Mc. Graw Hill Publications.

Machine Learning

III B.Tech – V Semester (Code: 24EC504D)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	40	Semester End Examination (3 Hours)	:	60		

Prerequisites: None

Course Objectives: In this course, students will learn the following topics

CO1: Certain fundamental concepts and applications of machine learning.
CO2: generative and discriminative classifiers
CO3: Concepts of evaluation of classifiers and ensemble learning
CO4: instance based learning and clustering techniques.

Course Outcomes: Students will be able to

CLO1: Understanding the basics of machine learning and applications of machine learning and how they work and the difference between supervised and un supervised learning
CLO2: Know the role of generative and discriminative classifiers
CLO3: Understanding the evaluation of classifiers and ensemble learning.
CLO4: Learn various techniques of data clustering.

SYLLABUS

Unit-1

Machine learning basics: What is machine learning? Key terminology, Types of Machine Learning Systems : Supervised Learning, Unsupervised Learning, Reinforcement Learning, how to choose the right algorithm, Steps in developing a machine learning application, Main Challenges of Machine Learning, Data sets

Regression: Simple linear regression, Optimization of model parameters using stochastic gradient decent algorithm, Batch and mini-batch gradient descent, Multiple linear regression, Polynomial Regression. Regularized Linear Models- Lasso Regression and Ridge Regression, Evaluation metrics.

UNIT-2

Generative Classifiers: Classifying with Bayesian decision theory, Bayes' rule, Naïve Bayes classifier.

Discriminative Classifiers: Logistic Regression, Decision Tree: training and visualization, Making Predictions, Estimating Class Probabilities, The CART Training Algorithm, Attribute selection measures- Gini impurity Linear Support vector machines.

UNIT-3

Instance-based Learning: Introduction, K-nearest neighbors.

Evaluation of Classifier: Measuring Accuracy Using Cross-Validation, Confusion Matrix, Precision and Recall, Precision/Recall Trade-off, The ROC Curve.

Ensemble Learning: Random Forests: bagging and trees, Boosting- Gradient Boosting.

UNIT-4

Computational Learning Theory: Introduction, PAC learning, sample complexity for finite hypothesis spaces.

Unsupervised Learning: K-means clustering algorithm, Hierarchical clustering algorithm, Principal component analysis.

Text Books:

1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, Second Edition, Aurelien Geron, O'Reilly publishers, ISBN: 781492032649
2. Applied Machine Learning , M.Gopal, McGraw Hill Education, 1 Edition , 2018, ISBN-13:978-93-5316-025-8.

Reference Books:

1. Machine Learning by Tom Mitchell, Mc Graw Hill 1997, 1st edition
2. Pattern Recognition and Machine Learning by Bishop, 2006 1st edition , ISBN: 978-0-387-31073-2

CO-PO-PSO Mapping Table

Course outcome	Program outcomes											Program specific outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	3	-	-
CO3	3	2	3	-	-	1	-	-	-	-	-	3	-	-
CO4	3	2	3	1	-	1	-	1	-	-	-	3	-	-
Average	3	2.5	3	1	-	1	-	1	-	-	-	3	-	-
Course Correlation Level	3	3	3	1		1		1	-	-	-	3	-	-

Correlation Level: 3-High ; 2-Medium ; 1-Low

PROGRAMMING WITH JAVA

III B.Tech. V Semester (Code:24EC505A/JO1)

Lectures	:	2 Hours/Week	Tutorial	:	0 Hour/Week	Practical	:	2 Hour/Week
CIE Marks	:	40	SEE Marks	:	60	Credits	:	3

Pre-Requisite: C ++ Fundamentals

Course Objectives: Students will learn the	
➢	Basics of Object Oriented Programming concepts used in JAVA.
➢	Usage of classes and objects in developing JAVA programs.
➢	Various inheritance concepts along with packages and interfaces in JAVA programs
➢	Exception handling mechanisms and Multithreading concepts in JAVA

Course Outcomes: After studying this course, the students will be able to	
CO1	Write and implement simple JAVA programs using Object Oriented Programming concepts
CO2	Understand the concepts of classes and objects to develop JAVA programs
CO3	Develop reusable programs using the concepts of inheritance, interfaces and packages.
CO4	Apply the concepts of Exception handling and Multithreading while implementing JAVA programs.

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									2
CO2	3	2	2		3									2
CO3	3	2	2		3									2
CO4	3	2			3									2
AVG	3	2	2		3									2

Syllabus

UNIT-1 (12 Hours)

INTRODUCTION: Introduction to Java, Java buzzwords, OOP Principles, data types, variables, dynamic initialization, scope and life time of variables, arrays, operators, control statements, type conversion and casting, compiling and running of simple Java program.

UNIT-2 (12 Hours)

CLASSES AND OBJECTS: Concepts of classes and objects, introducing methods, constructors, usage of static with data and methods, access control, this key word, garbage collection, overloading methods and constructors, parameter passing - call by value, recursion, nested classes and inner classes, exploring the String class

UNIT-3 (12 Hours)

INHERITANCE: Basic concepts, member access rules, usage of super key word, forms of inheritance, method overriding, abstract classes, dynamic method dispatch, using final with inheritance, the Object class.

PACKAGES AND INTERFACES: Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces

UNIT-4 (12 Hours)

EXCEPTION HANDLING AND MULTITHREADING: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions, creating own exception sub classes, Concepts of Multithreading, differences between process and thread, thread life cycle, creating multiple threads using Thread class, Runnable interface, Synchronization, thread priorities, inter thread communication, daemon threads, deadlocks, thread groups.

Practical Exercise:

1. Java Basic Programs
2. Java Array Programs
3. Implement the concept of Scope and lifetime of a variable
4. Implement the concept of polymorphism
5. Implement the concept of objects and classes
6. Illustrate the different types of Constructors
7. Write a Java program using static, this and final keyword
8. Implement the concept of Method overloading
9. Implement reusability concept using inheritance
10. Develop Java programs using Abstract Class
11. Implement multiple inheritance using interface
12. Write a Java program to demonstrate packages
13. Implement User defined Exceptions in java
14. Implement Built-in Exceptions in java
15. Develop Java programs using Multithreading

Text Books:
1. The Complete Reference 9th Edition by Herbert Schildt, McGraw-Hill Companies.
2. Big Java 2nd Edition, Cay Horstmann, John Wiley and Sons

References:
1. Java How to Program, Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI.
2. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education.

OPTIMIZATION TECHNIQUES

III B.Tech – V Semester (Code: 24EC504B)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	40	Semester End Examination (3 Hours)	:	60		

Prerequisites: Basic Engineering Mathematics(Calculus,LinearAlgebra)

Course Objectives:Tolearn

- CO1:Fundamentals of optimization problems and their mathematical formulation.
- CO2: Classical optimization techniques for solving unconstrained and constrained problems.
- CO3:Linear programming methods and their applications in engineering systems.
- CO4:Non linear and modern optimization techniques for complex real-world problems.

CourseOutcomes:Studentswillbeableto

- CLO-1:Formulate engineering problems as optimization problems.
- CLO-2:Apply classical optimization techniques to solve analytical problems.
- CLO-3:Solve linear programming problems using systematic algorithms.
- CLO-4:Analyze and apply non linear and modern optimization techniques.

SYLLABUS

UNIT-I

FOUNDATIONS OF OPTIMIZATION:
Introduction to optimization, Engineering applications of optimization, Statement of an optimization problem:Design variables, Constraints, Objective function, Classification of optimization problems, Basic concepts of convex and non-convex functions.

UNIT– II

CLASSICAL OPTIMIZATION TECHNIQUES:
Single-variable optimization, Multivariable optimization without constraints, Optimization with equality constraints using Lagrange multipliers, Optimization with inequality constraints, Introduction to Kuhn–Tucker conditions.

UNIT– III

LINEAR PROGRAMMING:

Introduction to Linear Programming,Formulation of linear programming problems,Graphical solution method, Simplex method, Concept of duality in linear programming, Applications of linear programming in engineering, Transportation problem.

UNIT– IV

NON LINEAR AND MODERN OPTIMIZATION METHODS:

One-dimensional optimization methods (Golden section / Fibonacci method), Gradient-based optimization (Steepest descent method), Introduction to constrained nonlinear optimization, Overview of modern optimization techniques: Genetic Algorithms,Particle Swarm Optimiza- tion.

TEXT BOOKS:

1. S.S.Rao,*Engineering Optimization:Theory and Practice*,Wiley.
2. Kalyanmoy Deb,*Optimization for Engineering Design*,PHI.

REFERENCE BOOKS:

1. H.A.Taha,*Operations Research:AnIntroduction*,Pearson.
2. EdwinK.P.Chong,StanislawH.Zak,*An Introduction to Optimization*,Wiley.
3. S. Boyd andL. Vandenberghe,*Convex Optimization*, Cambridge University Press.

Course Nature: Professional Elective(ECE/Interdisciplinary)

CO-PO-PSO Mapping Table

Course outcome	Program outcomes											Program specific outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	3	-	-
CO3	3	2	3	-	-	1	-	-	-	-	-	3	-	-
CO4	3	2	3	1	-	1	-	1	-	-	-	3	-	-
Average	3	2.5	3	1	-	1	-	1	-	-	-	3	-	-
Course Correlation Level	3	3	3	1		1		1	-	-	-	3	-	-

Correlation Level: 3-High ; 2-Medium ; 1-Low

Nano Science and Nanomaterials
III B.Tech – V Semester (Code: 24EC504C)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	40	Semester End Examination (3 Hours)	:	60		

Prerequisites: Engineering Physics

Course Objectives: To

CO1: Learn Quantum aspects in relation to nano structures
CO2: Learn various techniques useful for preparation of nano materials
CO3: Explore the various characterization techniques to observe nano particles and composition
CO4: Device the nano electronic components suitable to various industries

Course Outcomes: Students will be able to

CLO-1: Apply Quantum theory to understand nano structures.
CLO-2: Scale up synthesis of nano materials
CLO-3: Know the characterization techniques of nano materials
CLO-4: Know the usage of nano particles in electronics and medicine.

UNIT – I

Introduction:

Introduction to Nano technology; Definitions of terms related to Nano science /Nano technology: (i) Nano Science (ii) Nano technology (iii) Nano materials (iv) Nano particles; Application areas of Nanotechnology.

Quantum Nano-engineering:

Particle in a Box, Quantum Limit: From 3D to 0D, Quantum Confinement in Semiconductors, 3D Density of States, 2D Model, 1D Model, Q0D Model

UNIT – II

Synthesis of Nano-materials:

Top-down and Bottom-up approaches; Ball milling, Physical Vapor Deposition, Electro deposition, Chemical Vapor Deposition, Atomic Layer Deposition (ALD), Sol–Gel techniques, Introduction to lithography, X-ray lithography, Electron beam lithography, Ion-beam lithography

UNIT – III

Characterization of Nano-materials:

X-ray Diffraction, Scanning Electron Microscopy, Scanning tunnelling Microscopy, UV-Visible Spectroscopy

UNIT – IV

Carbon Nano materials:

Carbon Nano tubes (CNT), Properties and applications of CNT, Fullerenes, Graphene, Importance of Graphene, and Applications of Graphene

Applications of Nano materials:

Quantum electronic devices: CNFETS, CNFEDS; Biological applications: Bio-Chemical sensor

TEXT BOOKS:

1. " Introduction to Nano Basics to Nano science and Nano technology", Amretashis

Sengupta and Chandan Kumar Sarkar Editors: Springer-Verlag Berlin Heidelberg 2015.

2. "Engineering Physics" D.K.Bhattacharya and Poonam Tandom, Oxford university Press, 2015

REFERENCE BOOKS:

1. "Introduction to Nan science And Nano technology", Chris Binns 2010 by John Wiley & Sons, Inc...
2. "An Introduction to Nano science and Nano technology", Alain Nouailhat2008 by ISTE Ltd and John Wiley & Sons, Inc...

CO-PO-PSO Mapping Table

Course outcome	Program outcomes											Program specific outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	-	1	-	-	-	-	-	-	-	-	2	-
CO2	1	3	1	2	-	1	-	-	-	-	-	-	3	-
CO3	3	2	2	3	-	1	-	-	-	-	-	-	3	-
CO4	2	2	3	3	3	2	-	-	-	-	-	-	3	-
Average														
Course Correlation Level														

3.

4. **Correlation Level: 3-High ; 2-Medium ; 1-Low**

QUANTUM COMMUNICATION
III B.Tech – V Semester (Code: 24EC505-JOE1D)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	40	Semester End Examination (3 Hours)	:	60		

Unit-1

Elements of Quantum Mechanics: The notion of qubits, axioms of a closed quantum system, quantum dynamical systems, quantum measurements and POVM.

Unit-2

Introduction to Quantum decision theory: Analysis of a quantum communication system, introduction to the Helstrom decision theory of quantum binary communication systems, decision theory of K-ary Quantum communication systems, Holevo's theorem, constellation of quantum states.

Unit-3

Introduction to Quantum communication systems: Introduction to Glauber's representation of coherent quantum states, Quantum binary communication systems and different modulation schemes: OOK, BPSK, QAM, PSK, PPM, overview of quantum squeezed states.

Unit-4

Introduction to Quantum Information Theory: Notion of density operators, partial trace, reduced density operator, Schmidt rank, purification of mixed states, entanglement, quantum teleportation. Introduction to classical information theory: Shannon entropy, classical channels and channel coding. Notion of vonNeumann entropy, quantum channels, accessible information and Holevo bound, transmission through a noisy quantum channel. Introduction to Quantum Cryptography and Quantum Key Distribution.

Text Books:

1. **"Quantum Communications", Gianfranco Cariolaro, Springer, 2015.**
2. **"Quantum Communication, Quantum Networks, and Quantum Sensing", Ivan B. Djordjevic, Academic Press, 2022.**

SOFT SKILLS
III B. Tech – V Semester (Code: 24ECL501)

Practicals	:	3 Hours/Week (1T+2P)	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Pre-Requisite: None

Course Objectives: Students will be able to

- To make the engineering students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.
- To know the importance of interpersonal and intrapersonal skills in an employability setting.
- Actively participate in group discussions / interviews and prepare & deliver Presentations.
- Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of teamwork, Inter-personal relationships, stress management and leadership quality.

Course Outcomes: Students will be able to

CO1	Use appropriate body language in social and professional contexts.
CO2	Demonstrate emotional intelligence and life skills by managing stress, setting goals, and effectively organizing time in real-life situations.
CO3	Develop and deliver structured presentations using appropriate visual and oral techniques while applying cognitive skills for innovative thinking.
CO4	Utilize employability skills to perform effectively in group discussions, interviews, and team environments.

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	3	2	-	-	-
CO2	-	-	-	-	-	-	-	2	3	2	3	-	-	-
CO3	-	-	-	-	-	-	-	2	3	3	2	-	-	-
CO4	-	-	-	-	-	-	-	2	3	3	3	-	-	-

LIST OF EXPERIMENTS

1. Body Language & Habitual Intelligence

a. Facial Expressions – Kinesics – Oculesics- Proxemics
b. Appearance and Grooming
c. Habit Science Fundamentals
d. Four Laws of Behaviour Change (Applied to Communication Skills)

2. Emotional Intelligence & Life Skills

a. Self-Awareness through Johari Window and SWOC analysis
b. Self-Motivation
c. Attitude & Personality Traits

d. Managing Stress
e. Goal Setting
f. Time Management

3. Business Presentations and Cognitive Skills

a. Preparing effective Presentations
b. Power Point Presentations
c. Poster Presentation/image presentation
d. Oral Presentation
e. Cognitive Skills: Lateral and Creative Thinking.

4. Employability Skills

a. Group Discussion
b. Team Building and Leadership Qualities
c. Resumé writing and Interview skills

References :	1. Personality Development and Soft skills (Second Edition), Barun K. Mithra. Oxford University Press: 2016 2. The Definitive Book of Body Language, Allan & Barbara. Pease International:2004 3. Working with Emotional Intelligence, Daniel Goleman. Bloomsbury:1998 4. English for Jobseekers, Lina Mukhopadhyay. Cambridge University Press:2013 5. The 7 Habits of Highly Effective People, Stephen R. Covey. St. Martin's Press:2014 6. Clear, James. *Atomic Habits: An Easy & Proven Way to Build Good Habits & Break Bad Ones*. Random House India, 2018. 7. De Bono, Edward. *Six Thinking Hats*. Revised ed., Penguin Books, 2000.

Microcontrollers Lab (24ECL503)

III B.Tech – V Semester (Code: 24ECL503)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	40	Semester End Examination (3 Hours)	:	60		

COURSE OUTCOMES: After successful completion of this course, the students will be able to:

CO1: Analyze Architectural features of PIC family of Microcontrollers for control applications.

CO2: Analyze PIC18 Architecture and Instruction Set to develop computing applications.

CO3: Develop Programs for PIC18 using ports, timers and associated on Chip resources for Specified Applications.

CO4: Design microcomputer based systems with the knowledge of Interfaces and Peripherals of PIC18 to Solve various engineering problems.

LIST OF EXERCISES:

Programs using PIC Microcontroller

1. Arithmetic operations.
2. Logical & Branch operations
3. Bit manipulation operations.
4. Macros & Modular programming.
5. Time Delay programs.

Interfacing with PIC microcontrollers

6. Interface switches, LEDs, 7-segment display.
7. Interfacing of PIC18 with Keyboard and LCD.
8. Interfacing of PIC18 with DAC.
9. Interfacing using serial communication & DC Motor
10. Interfacing Stepper Motors

RESOURCES

MPLABXIDE 5.30 SIMULATOR
PIC18F452 DEVELOPMENT BOARDS WITH ACCCESSORIES

TEXT BOOKS:

1. Muhammad Ali Mazidi, Rolin D. McKinlay, Danny causey, *PIC Microcontroller and Embedded Systems: Using C and PIC18*, Pearson Education, 2015.

REFERENCE BOOKS:

1. Ramesh S. Gaonkar, *Fundamentals of Microcontrollers and Applications in Embedded Systems (With PIC18 Microcontroller Family),* Penram International, 2010.

CO-PO-PSO Mapping Table

Course outcome	Program outcomes											Program specific outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	3	-	-
CO3	3	2	3	-	-	1	-	-	-	-	-	3	-	-
CO4	3	2	3	1	-	1	-	1	-	-	-	3	-	-
Average	3	2.5	3	1	-	1	-	1	-	-	-	3	-	-
Course Correlation Level	3	3	3	1		1		1	-	-	-	3	-	-

Correlation Level: 3-High ; 2-Medium ; 1-Low

ARTIFICIAL NEURAL NETWORKS

III B. Tech – V Semester (Code:20ECL504)

Lectures	0	Tutorial	0	Practical	3	Credits	1.5
Continuous Internal Assessment	:	40	Semester End Examination (3 Hours)	:	60		

Prerequisites: None

Course Objectives: To learn

CO1: The basic understanding of neural networks and Neural Network Architectures.
CO2: Classification of patterns and patterns association.
CO3: Implementation of competitive neural nets and back propagation algorithm.

Course Outcomes: Students will be able to

CO1: Understand the functionality of Artificial Neural Model for different structures and activation functions.
CO2: Describe the characteristics of pattern classification.
CO3: Distinguish between competitive and feed forward neural networks.
CO4: Interpret the working of Back propagation algorithm.

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	2	2									3
CO2	2	3	2	2	2									3
CO3	2	3	2	2	2									3
CO4	2	3	2	2	2									3
AVG	2	3	2	2	2									3

Practical Exercises

1. Write a program to generate the activation functions that are being used in Neural Networks
2. Write a program to realize the ANDNOT function using McCulloch-Pitts neural net.
3. Write a program to cluster the given samples using unsupervised learning (winner takes all algorithm).
4. Write a program to realize the logical AND with a neural net that learns the desired function through Hebb learning.
5. Write a program to realize the logical AND with a neural net that learns the desired function through Perceptron learning.
6. Write a program to realize the logical AND with a neural net that learns the desired function through LMS learning.
7. Write a program to realize a logical function with the help of ADALINE Learning.
8. Write a program to realize a logical function with the help of MADALINE Learning (XOR problem).
9. Write a program to implement an auto-associative net to store the patterns [-1 -1 -1 -1] and [-1 -1 1 1]. Test the performance of the net with the test patterns [-1 -1 -1 -1] (stored pattern), [1 1 1 1] (unknown pattern.)
10. Write a program to implement a hetero-associative net to map four patterns [1 1 0 0], [0 1 0 0], [0 0 1 1] and [0 0 1 0] to two output patterns [1 0], [0 1] so that patterns [1 1 0 0] and [0 1 0 0] are associated with [1 0] and the patterns [0 0 1 1], and [0 0 1 0] are associated with [0 1].
11. Write a program to find weight matrix in bipolar form for the bi-directional Associative memory (BAM) network based on the following binary input output pairs.

$$S(1) = (1\ 1\ 0) \qquad t(1) = (1\ 0)$$

S(2) = (1 0 1) t(2) = (0 1)

12. Write a program for clustering the vectors by using Kohonen's SOM network.
13. Write a program for clustering the following vectors into two clusters by using an LVQ net.

Vector	Class
(1 1 0 0)	1
(0 0 0 1)	2
(0 0 1 1)	2
(1 0 0 0)	1
(0 1 1 0)	2

14. Write a program for clustering the vectors by using ART-1 neural network.
15. Write a program to implement XOR function with momentum factor using Back- Propagation algorithm.

TEXT BOOK:

1. Introduction to SOFT COMPUTING by Samir Roy and Udit Chakraborty, Pearson Publishing,2013.

REFERENCE BOOKS:

1. Introduction to Neural Networks using Matlab 6.0 by S N Sivanandam, S Sumathi, S N Deepa, Tata McGraw Hill Publishing,7th Reprint, 2008
2. J.M. Zurada Introduction to Artificial Neural Systems, Jaico Publications.
3. B. Yegnanarayana, Artificial Neural Networks, PHI, New Delhi.
4. Waserman: Neural Computing – Theory and Practice.
5. Kishan Mehrotra, Chelkuri K. Mohan, SanjavRanka, elements of Artificial Neural Networks, Tenram International.