Bapatla Engineering College

(Autonomous)

B.Tech

Information Technology
Curriculum Effective from A.Y. 2024-25
(R24 Regulation)

Bapatla Engineering College :: Bapatla

(Autonomous under Acharya Nagarjuna University)
(Sponsored by Bapatla Education Society)
BAPATLA - 522102 Guntur District, A.P., INDIA
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Contents

Vision of the College

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

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

Mission of the College

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

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

Vision of the Department

Our vision is to empower our students with the skills and knowledge necessary to meet the challenges of the 21st century, driving sustainable socio-economic development through innovative solutions and responsible use of technology.

Mission of the Department

1. Catering to the needs of students by providing good infrastructure and by imparting skills relevant to the IT industry.
2. To motivate students and faculty members towards self-learning to acquire knowledge about emerging technologies in the IT industry.
3. Promoting research that leads to innovative solutions using cutting-edge technologies in IT domain for the benefit of the society.
4. To inculcate team spirit, leadership qualities and ethics among the students and faculty.

Program Educational Objectives

The students graduated in Information Technology will be able to

PEO1: Become successful and ethical professionals in IT and ITES (Information Technology Enabled Services) industries contributing to societal progress.

PEO2: Engage in lifelong learning, adapting to changing technological scenarios.

PEO3: Communicate and work effectively in diverse teams and exhibit leadership qualities.

Knowledge and Attitude Profile (WK)

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Program Outcomes

1. **Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
2. **Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
3. **Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
4. **Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
5. **Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
6. **The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
7. **Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
8. Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
9. **Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
10. **Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
11. **Life-Long Learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

Program Specific Outcomes

B.Tech. in Information Technology graduates will be able to:

PSO1 **Domain Knowledge:** Acquire knowledge of hardware functionality, design and development of software components required to process the information.

PSO2 **Problem Solving Skills:** Analyze data, Identify required data structures, design suitable algorithms, develop, operate and maintain software for real world problems.

PSO3 **Paradigm Shifts:** Understand the progressive changes in computing, possess knowledge of context aware applicability of paradigms.

Academic Rules & Regulations (R24 Regulations)
Regulations for Four Year Bachelor of Technology (B.Tech)
Degree Program for the Students Admitted from the Academic Year 2024-25

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

2. **Medium of Instruction and Examination:** The medium of instruction of the entire B.Tech undergraduate program in Engineering and Technology and the examinations will be in English only.

3. **Minimum Instruction Days:** A semester comprises of 90 working days and the year is divided into two semesters.

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

   a. The student pursues a program of study in B.Tech for four academic years and in not more than eight academic years. A lateral entry student pursues a program of study for three academic years and not more than six academic years. However, for the students availing Gap year facility, this period shall be extended by two years at the most and these two years would not be counted in the maximum time permitted for graduation.

   b. The student registers for 160 credits and secures all 160 credits. However, a lateral entry student registers for 121 credits and secures all the 121 credits from III semester to VIII semester of regular B. Tech program.

   c. **Award of B. Tech degree with Minor:** The student secures an additional 16 credits from Minor stream chosen and fulfills all the requisites of a B.Tech program i.e. secures 160 (Regular program) / 121 (Lateral Entry program) credits. Minor is to be completed simultaneously with B.Tech program. Registering for a Minor degree is optional.

   d. **Award of B.Tech degree with Honors:** The student secures an additional 16 credits fulfilling all the requisites of B.Tech program i.e. secures 160 (Regular program) / 121 (Lateral Entry program) credits. 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 Programme	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 to 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 term examinations 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 for 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	-
Embedded Courses (Theory + Practical)	50	50
NSS / NCC / Scouts & Guides / Community Service and Health & Wellness / Yoga / Sports	-	100
Summer Internship	-	100
Project Work	40	60

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

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

Term Exams (Max. 20 marks[1])	AAT (Max. 15 marks[2])	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

[1] Term Examination will be conducted for 30 marks and reduced to 20 marks.
[2] Each AAT will be conducted for 10 marks and the average performance shall be scaled up to 15 marks.

8.3 **CIE in Laboratory Courses:** The CIE for 40 marks of a laboratory course comprises of 15 marks

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

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

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

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

a) For each theory course, there shall be a comprehensive SEE of three hours duration at the end of each Semester for 60 marks.

b) For each laboratory course, the SEE shall be conducted by one internal and one external examiner appointed by the principal and the duration of the exam shall be for three hours. The SEE is for 60 marks which include 15 marks for write up, 35 marks for lab experiment / exercise and 10 marks for Viva-voce.

c) Project Work shall be evaluated in the form of a Viva-Voce and demonstration of the thesis work for 60 marks. Viva-voce Examination in project work shall be conducted by one internal examiner appointed by the HOD and one external examiner to be appointed by the Principal.

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

8.8 **Evaluation of NSS/NCC/Scouts & Guides/Community Service and Health & Wellness/Yoga/Sports:** The above courses will be evaluated by the department committee for a total of 100 marks with 50 marks for the activities pursued by the student during that semester and 50 marks based on seminars / presentation given to the department committee by the student.

8.9 **Pass Criteria for SEE:**

a) **Theory/Laboratory Courses and Project Work**

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

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

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

- A minimum of 40 (40%) marks are to be secured exclusively in the evaluation of the above courses for the award of the grade and securing the credits for that course.
- A student eligible to appear for the evaluation in the above courses but is absent or has failed in the examination may appear for evaluation of that course in the next supplementary examination when offered.

8.10 **CIE in Embedded Course:** In each embedded course 25 marks are alloted for theory part and 25 marks for practical part. Theory part is evaluated in terms of two term examinations and practical part is evaluated in terms of day-to-day work and one term examination.

a) **Theory Part – 25 marks:** For theory part the term examination is conducted in the regular mode according to a schedule given for Honors / Minor courses which will be common for a particular semester of study. The weightage for Term Examinations and the calculation of marks for CIE in theory part is given in the following Table.

Term Exams in Theory Part (Max. 25 marks)
15 marks from the best performed term exam + 10 marks from the other term exam

b) **Practical part – 25 marks:** The practical part comprises of 10 marks for day-to-day laboratory work, 5 marks for record submission and 10 marks for a practical examination at the end of the practical 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.

8.11 **SEE in Embedded Course:** For each course, SEE shall be conducted for theory part only. A comprehensive SEE will be conducted of three hours duration at the end of each semester course for 50 marks.

8.12 **Pass Criteria in Embedded Course:**

a. **In CIE** a minimum of 25 (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 25 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 will be discontinued from the Honors / Minor degree program.

a. **In SEE** a minimum of 20 (40%) marks of theory part is to be secured exclusively in the SEE of each course. A student eligible to appear for the SEE in a course but is absent or failed in the examination will be discontinued from the Honors / Minor degree program.

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.

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

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

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

12. **Make-up Test:**

   a) A student can appear for a Make-up Test for a maximum of two theory courses of a semester to improve marks in the Continuous Internal Evaluation (CIE).

   b) A student is eligible for the Make-up test which is conducted after the second Mid Term examination and before SEE examination if the student satisfies the following conditions.

      i) Unable to secure 50% internal marks (CIE) and has more than or equal to 65% attendance in a particular theory course (After finalizing the internal marks).

ii) Attendance in Remedial classes is more than or equal to 65% (if Remedial classes are conducted) or secured greater than 50% marks in the I Mid Term Examination and AAT-1 together.

iii) Attended 50% of CIE tests (at least one AAT & one Mid Term Examinations).

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

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

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

13. **Course Repetition:** The students not qualified to write SEE in a course may register for the repeater courses through Course Repetition. The students must apply to the principal through the respective HOD by paying prescribed fees. A student can take up a maximum of two theory courses and one laboratory course in a semester immediately after the semester end examinations of that semester. The students who are not taking regular semester courses may additionally register for one more theory course. The documents for registration of course and monitoring the candidates registered for course repetition are available from the departments and college website.

14. **Minimum Academic Requirements for Promotion:**

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

i) **Attendance Requirements**

- A student shall be eligible to register for SEE, if he / she acquires a minimum of 75% of attendance in aggregate of all the courses in a semester.
- Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted on genuine medical grounds with a doctor certificate and duly approved by the principal.
- A shortage of attendance below 65% in aggregate shall in NO case be condoned. Students whose shortage of attendance is not condoned in any semester are not eligible to take their SEE of that semester and will be considered as detained in that semester.
- If a student does not satisfy the attendance requirements of the present semester, he / she will not be promoted to the next semester (considered as detained in the present semester). They may seek readmission for that semester when offered next.
- A stipulated fee shall be payable towards condonation of shortage of attendance to the college.

ii) **Qualification in CIE**

- A student must qualify in a minimum of three courses in each semester (as per Clause 8.5) 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 4th semester provided that the student must have acquired **a minimum of 7.0 CGPA up to the end of 3rd semester without any backlogs. A CGPA of 7.0 must be maintained in the subsequent semesters without any backlog to keep the Minor registration active.**

g. A student must earn an additional 16 credits in the specified area to be eligible for the award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the Undergraduate degree in Major discipline (i.e. 160 credits for regular students and 121 credits for Lateral Entry students). The concerned BOS shall finalize the modalities to earn the above credits.

h. For securing the above additional 16 credits, the students must register and complete three courses of 4 credits each offered by the department concerned. These 3 courses must contain a laboratory component also (i.e. Embedded course having three lecture hours and two practical hours). The balance of 4 credits may be secured through two MOOCs courses of 2 credits each or an embedded course offered by the department.

i. If a student opts for two MOOC's, the courses must be of a minimum of 8 weeks in duration and shall contain proctored examinations. As per MOOCs guidelines 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.

j. Courses that are used to fulfil the students' primary Major may not be double counted towards the Minor. Courses with content substantially equivalent to courses in the students' primary Major may not be counted towards the Minor.

k. 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

l. 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.

m. 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.

n. The Minor will be mentioned in the Major degree certificate only. No additional degree certificate will be given for Minor degree.

o. Transfer of credits from Minor to regular B.Tech degree and vice-versa shall not be permitted

p. 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.

q. The documents for registration of Minor courses are available from the departments and college website.

16. **Guidelines for offering an Honors in a Discipline:** The objective of introducing B.Tech (Honors) is to facilitate the students to choose additional specialized courses of their choice and build their competence in a specialized area in the UG level. The programme is a best choice for academically excellent students having good academic record and interest towards higher studies and research.

Honors is introduced in the curriculum of all B. Tech. programs offering a Major degree and is applicable to all B. Tech (Regular and Lateral Entry) students admitted in Engineering & Technology. Students are eligible to opt for Honors program offered by the same Department / Discipline.

a. Students who are desirous of pursuing special interest / advanced areas of their discipline of Engineering may opt for additional courses as part of Honors programs offered by the parent department.
b. The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand.
c. A student shall be permitted to register for Honors program at the beginning of 4th semester provided that the student must have acquired **a minimum of 7.5 CGPA up to the end of 3rd semester without any backlogs. A CGPA of 7.5 must be maintained in the subsequent semesters without any backlog to keep the Honors registration active.**
d. A student must earn additional 16 credits for award of B.Tech. (Honors) degree from the same branch / department / discipline registered for Major degree. This is in addition to the credits essential for obtaining the Undergraduate degree in Major discipline (i.e., 160 credits for regular students and 121 credits for Lateral Entry students). The concerned BOS shall finalize the modalities to earn the above credits.
e. For securing the above additional 16 credits, the students must register and complete three courses of 4 credits each offered by the department concerned. These 3 courses must contain a laboratory component also (i.e. Embedded course having three lecture hours and two practical hours). The balance of 4 credits may be secured through two MOOCs courses of 2 credits each or an embedded course offered by the department.
f. If a student opts for two MOOC's, the courses must be of a minimum of 8 weeks in duration and shall contain proctored examinations. As per MOOCs guidelines 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.
g. Courses that are used to fulfil the students' primary Major may not be counted towards the Honors.
h. 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.
i. 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.
j. 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
k. 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.
l. Transfer of credits from Honors to regular B.Tech degree and vice-versa shall not be permitted.

m. 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

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

18. A student shall register and put-up minimum attendance in all 160 credits and earn all the 160 credits. In the case of lateral entry students, the number of credits is 121.

19. Students who fail to earn 160 credits as indicated in the course structure within eight academic years from the year of their admission shall forfeit their seat in B.Tech. Program, and their admission shall be cancelled. However, for the students availing the Gap year facility, this period shall be extended by corresponding gap year duration availed. Lateral entry students who fail to earn 121 credits as indicated in the course structure within six academic years from the year of their admission shall forfeit their seat in B.Tech. Course and their admission shall be cancelled. However, for the students availing gap year facility, this period shall be extended by corresponding gap year duration availed.

20. **Securing Credits and award of Grade Points: Grading**
After each course is evaluated for 100 marks, the marks obtained in each course will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Structure of Grading of Academic Performance

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

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

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

21. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA): (i) The Semester Grade Point Average (SGPA) in a particular semester is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

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

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.,

$$SGPA = \frac{\sum_{j=1}^{m} SGPA_j \times TC_j}{\sum_{j=1}^{m} TC_j} \tag{2}$$

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.

SN	Nature of Malpractice / Improper conduct	Punishment
1	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cellphones, pager, palm computers or any other form of material concerned with or related to the course of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the course of the examination).	Expulsion from the examination hall and cancellation of the performance in that course only.
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.

SN	Nature of Malpractice / Improper conduct	Punishment
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 /Asst. Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which 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.

SN	Nature of Malpractice / Improper conduct	Punishment
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.No7 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 practicals 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.

SN	Nature of Malpractice / Improper conduct	Punishment
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.

Discipline and Code of Conduct for Students

The following are some of the important rules of discipline. All students are required to be aware of and act consistently with these values.

1. Students must punctually attend all lectures, practical's, tutorials, assignments, tests, examinations, etc. A student whose attendance and/or progress in the various tests and examinations are not satisfactory and who does not perform the required number of assignments, tutorials and/or practical's are likely to lose their terms. Prolonged absence even on ground of ill health may also lead to loss of terms. Defaulters will not be sent up for Final /University Examinations.
2. The identity card is meant for identifying bonafide students and is used for permitting the students to participate in various activities and programs of the college. Every student must wear Identity card as long as he/she is in the college campus. It must be produced by the student whenever demanded by the member of the teaching or non-teaching staff of the college. Every student must wear his/her Identity card in the college every day. He/She must take proper care of it to avoid its misuse by other students and outsiders. In case the Identity card is lost, the matter should be immediately reported to the Principal and an application should be made for a duplicate Identity card, which will be issued on payment of charges.
3. The conduct of the students in the classes and in the premises of the college shall be such as will cause no disturbance to teachers, fellow students or other classes.
4. Every student shall wear a clean formal dress while coming to the college also when representing the college for various activities out station. No Society or Association shall be formed in the College and no person should be invited in the college campus without the specific permission of the Principal.
5. No student is allowed to display any Notice/Circular/Poster/Banner in the College premises without the prior permission of the Principal.
6. Using foul language in the college campus is prohibited. If any student is caught using foul language, disciplinary action shall be initiated against the student.
7. Use of BEC name tag or logo by the students for their caste, political, religious, personal reasons is prohibited. Further placing banners on caste, political, religious, personal reasons, promoting cinema heroes & political leaders, taking possessions and burning fire crackers in front of the college is strictly prohibited. If any student is involved in such activities in and around the campus, severe disciplinary action will be taken including rusticating from the college and filing a criminal case.
8. Outsiders are not permitted in the college premises without the prior permission of the Principal. College students are not allowed to bring their relatives/friends to the college premises without the permission of the principal.
9. All meetings, cultural programs, debates, elocutions etc. organized on the college premises must be held in presence of teaching staff members and with the prior permission of the Principal. The subjects of debates/elocutions must have the prior approval of the principal.
10. Conducting fresher's meet, farewell meets etc. by the students outside the campus are prohibited. If any student is involved in such activities (organizing as well as participating), severe disciplinary action will be taken including rusticating from the college.

11. Students must take proper care of the college property. Strict action will be taken against students damaging College property and will be required to compensate the damage.
12. Students should not be involved in academic offences including cheating or plagiarism in academic course work malpractices at the College/Board/University Examinations
13. Smoking is strictly prohibited in the college premises.
14. If, for any reason, the continuance of a student in the College is found detrimental to the best interest of the college, the Management may ask the student to leave the college without assigning any reasons and the decision will be final and binding on the student.
15. Playing music on Transistors, Tape-Recorders, Car Stereos, Mobile phones or any other similar gadgets with or without earphones is strictly prohibited in the college premises. Defaulters will be punished and their instrument shall be confiscated.
16. Use of Mobile phones is strictly prohibited in the academic area of the college, Defaulters will be penalized and their instrument confiscated.
17. Students who are travelling to college on personal vehicles (2/4 wheelers) need to have valid driving license issued by RTO and follow all the rules listed by RTO. Students have to park the vehicle in the parking area of the college.
18. Students must not hang around in the college premises while the classes are at work.
19. Students must not attend classes other than their own without the permission of the authority concerned.
20. Students shall do nothing inside or outside the college that will interface with the discipline of the college or tarnish the image of the college.
21. Students are not allowed to communicate any information about college matters to Press.
22. Matters not covered above will be decided at the discretion of the Principal. Acts of misbehavior, misconduct, indiscipline or violation of the Rules of Discipline mentioned above liable for one more punishment as stated below:
    a) Warning to the students.
    b) Warning to the student as well as inform the parents.
    c) Imposition of a fine.
    d) Denial of gymkhana, library, laboratory, N.C.C., N.S.S. student aid or any other facility for a specified period or for the whole Term/Year.
    e) Expulsion from College for a specified period
    f) Cancellation of Terms.
    g) Refusal of admission in the term or academic year.
    h) Cancellation of admission.
    i) Rustication.

Anti Ragging Rules and Regulations
(As per AICTE norms)

1. **What constitutes Ragging:** Ragging constitutes one or more of any of the following acts:
   a) any conduct by any student or students whether by words spoken or written or by an act which has the effect of teasing, treating or handling with rudeness a fresher or any other student;
   b) indulging in rowdy or undisciplined activities by any student or students which causes or is likely to cause annoyance, hardship, physical or psychological harm or to raise fear or apprehension thereof in any fresher or any other student;
   c) asking any student to do any act which such student will not in the ordinary course do and which has the effect of causing or generating a sense of shame, or torment or embarrassment so as to adversely affect the physique or psyche of such fresher or any other student;
   d) any act by a senior student that prevents, disrupts or disturbs the regular academic activity of any other student or a fresher;
   e) exploiting the services of a fresher or any other student for completing the academic tasks assigned to an individual or a group of students.
   f) any act of financial extortion or forceful expenditure burden put on a fresher or any other student by students;
   g) any act of physical abuse including all variants of it: sexual abuse, homosexual assaults, stripping, forcing obscene and lewd acts, gestures, causing bodily harm or any other danger to health or person;
   h) any act or abuse by spoken words, emails, posts, public insults which would also include deriving perverted pleasure, vicarious or sadistic thrill from actively or passively participating in the discomfiture to fresher or any other student;
   i) any act that affects the mental health and self-confidence of a fresher or any other student with or without an intent to derive a sadistic pleasure or showing off power, authority or superiority by a student over any fresher or any other student.
2. **Actions to be taken against students for indulging and abetting ragging in technical institutions Universities including Deemed to be University imparting technical education:**
   a) The punishment to be meted out to the persons indulged in ragging has to be exemplary and justifiably harsh to act as a deterrent against recurrence of such incidents.
   b) Every single incident of ragging a First Information Report (FIR) must be filed without exception by the institutional authorities with the local police authorities.
   c) The Anti-Ragging Committee of the institution shall take an appropriate decision, with regard to punishment or otherwise, depending on the facts of each incident of ragging and nature and gravity of the incident of ragging.
   d) Depending upon the nature and gravity of the offence as established the possible punishments for those found guilty of ragging at the institution level shall be any one or any combination of the following:
      i. Cancellation of admission
      ii. Suspension from attending classes
      iii. Withholding/withdrawing scholarship/fellowship and other benefits
      iv. Debarring from appearing in any test/examination or other evaluation process

v. Withholding results
vi. Debarring from representing the institution in any regional, national or international meet, tournament, youth festival, etc.
vii. Suspension/expulsion from the hostel
viii. Rustication from the institution for period ranging from 1 to 4 semesters
ix. Expulsion from the institution and consequent debarring from admission to any other institution.
x. Collective punishment: when the persons committing or abetting the crime of ragging are not identified, the institution shall resort to collective punishment as a deterrent to ensure community pressure on the potential raggers.

Guidelines for Remedial Classes and Make-up Test

(R24 Regulations)

a) Faculty need to identify the underperforming students in their respective subject. An underperforming student is one, whose marks are less than 50% in the I Mid Term Examination and AAT 1 together. A list of such students should be prepared by the faculty soon after the I Mid Term examination is over and get it signed by the concerned HOD.

b) Faculty should conduct remedial classes for the underperforming students with an objective of improving their marks in the CIE. Minimum number of remedial classes to be taken should be 20% of the classes taken prior the I Mid Term Examination which is 6 classes. Teaching methodology is left to the faculty member, but he/she should keep the objective in mind.

c) Regular students who could not appear for the I Mid Term Examination and AAT (with genuine reason) should appear to the remedial classes with the prior permission of the HOD.

d) The entire process of conduct of remedial classes should be well documented and is subjected to academic audit.

The guidelines for conducting the Make-up test: (Refer to S.No:12 in academic rules and regulations)

Bapatla Engineering College

(Autonomous)

Department of Information Technology

Application for Make-up Test

Date:

1 Name of the Candidate :

2 Register Number :

3 Academic Year :

4 Branch :

5 Year & Semester of Study :

6 Student Mobile No. :

Course Code Title	% of attendance	CIE Marks				(To be filled by the concerned subject faculty)	
		AAT-1	MID-1	AAT-2	MID-2	% of attendance in remedial classes*	Signature

* Write 'NA' if the student's name is not in the remedial class list.

Signature of the Student

Signature of the
Head of the Department

Fee Particulars:

The make-up test fee has to be paid through HDFC payment gateway and a printout of the receipt has to be taken. The student has to submit the office copy of the receipt in the COE office, get the signature and has to submit the signed application form along with student copy of the receipt in the department.

Amount paid in Rs	Date of payment	Signature of Exam Section Clerk

Note:

1. As per the "Make-up test guidelines", the eligible students have to fill this form, with the signature of the concerned subject faculty and the HOD.
2. After making the payment, the filled form along with a photocopy of the payment receipt has to be submitted in the department.
3. The make-up test will be scheduled and conducted by the department.

Guidelines for Internships

- As per R24 guidelines, every student has to undergo internship twice, once between IV and V semester, the other between VI and VII Semester. The first internship is for a duration of 4 to 6 weeks.
- There shall be a departmental internship committee consisting of the Head of the Department and two faculty members nominated by the HOD. The committee shall identify the potential organizations which can provide internship opportunity to the students. The department shall enter into an MOU with the concerned organization and the details will be shared with the students.
- The students shall be informed to apply for undergoing internship in the specified proforma. The details and consent of the organization in which he/she is seeking for internship are to be furnished. Further, the student along with the parent must submit an undertaking form. The committee shall scrutinize the applications and approve the same. If a student fails to acquire internship, he/she may be permitted to undergo equivalent work (mini project, research project, fabrication work, field work, research paper, etc.,) in the department under the guidance of a faculty member.
- After the completion of the internship, the student must submit the report and attend a departmental internal assessment for award of grade and credits.

Internship Approval Proforma

Name of the Department	
Name of the Student	
Registered No	
Email id	
Mobile No	
Academic Year	
Internship Semester	After VI Semester / After IV Semester

Internship Details

Internship Organization	
Duration in weeks	
Start Date of Internship	
End Date of Internship	
Probable Date of Certificate Submission	

Note:

1. The consent letter from the organization is to be enclosed
2. Undertaking form from the student and parent

Signature of the Student

Signature of the
Internship Committee

Signature of the
Head of the Department

Guidelines for Massive Open Online Courses (MOOCs)

1. Head of the department should constitute a three member MOOC committee under his chairmanship along with two more members.
2. The committee should take the responsibility of
   a) Notifying the MOOC courses twice in a semester (May and November) along with the details of portals offering the MOOC such as NPTEL/SWAYAM.
   b) Checking the relevance of courses to the concerned branch.
   c) Verifying the syllabus of chosen MOOC course and to ensure that it is not studied in the regular curriculum (either full or partial)
3. A student willing to take MOOCS course should apply in the prescribed format to the concerned Head of the Department at least one week prior to the commencement of the MOOC course.
4. The MOOC committee should ensure the following
   - The course duration must be minimum of 8 weeks
   - The course should contain a proctored examination for evaluation
   - The agency offering MOOCs should be a recognized and reputed one and approved by the BOS of the concerned program.
5. Students should submit the Course completion certificate with marks memos to the department MOOCs committee.
6. If the certifying authority/agency is not able to conduct the exam, then the student can show certified course progress, applied hall ticket and mail communication from the authority as proofs and can avail the extension time by one semester for submitting the course completion certificate.
7. After the student submits the MOOCs certificates, the committee should recommend 3 credits and the appropriate grade to be allocated to the student and send to the Controller of Examination.
8. If a student fails to successfully complete and acquire the certificate as per the guidelines and timelines specified by the concerned MOOCs authority, he/she has to register for that course subsequently. Unsuccessful candidates in the first attempt shall be marked as supplementary.

Bapatla Engineering College

(Autonomous)

Department of Information Technology

MOOCS Application

Date:

Name of the Department:	
Name of the Student:	
Registered No:	
Email id:	
Mobile No:	
Academic Year & Semester	

Course title	MOOCS agency	Duration in weeks	Course start &end date	Probable date of certificate submission	MOOCs course in lieu of (Professional elective /Job oriented elective /Open elective /Management courses)	Remarks

Note: Syllabus, Timelines and Guidelines of the MOOC course should be attached.

Signature of the Student

Recommendations of the
MOOCs Committee

Signature of the
Head of the Department

Guidelines for Project work

1. In R24 regulations, there is no theory or practical courses in VIII semester. An exclusive 12 credit course is included as Project Work and Internship. At the end of the semester the student should submit a project report. A student shall also be permitted to submit project report on the work carried out during the internship in case of Advance Placement.
2. The Head of the department should constitute a three-member Project Work Committee (PWC) under his chairmanship with three faculty members as defined in the Process Document for project work (R20 regulation). The PWC shall adhere to the process explained in the said document.
3. Evaluation of the Project work: (Refer 8.4 and 8.6(c)) in academic rules and regulations)
4. The project work committee should ensure the following, if the students are doing project work at any organization/ industry.
   i) The student gets placement before commencement of eighth semester and joined the organization/Industry as advance placement. The student who obtained project work opportunity in organization / Industry may also be allowed as per the recommendation of the PWC.
   ii) The above students will be informed to apply in the specified proforma for approval to undergo for project work along with the details and consent of the organization in which he/she is seeking for doing project work. Further, the student and the parent/guardian have to submit an undertaking form to the concerned department. The PWC shall scrutinize the applications and approve.
   iii) The list of such approved students undertaking project work in organization/ industry shall be maintained in the department by the PWC.
   iv) The students who are undertaking the project work outside the campus have to necessarily submit the monthly attendance duly certified by the concerned authority in the organization/ industry.
   v) The PWC will have to maintain interaction regularly with the out-side organization/ concerned who are offering the project works.
   vi) During the course of project work, the student has to attend the departmental internal reviews/assessment periodically as notified by the department mandatory. After the completion of the project work, the student has to submit the report and attend semester end assessment examination by paying prescribed exam fee for award of grade and credits.
   vii) The students who are undertaking the project work outside the campus will have to complete their project work with in the stipulated period (as per Academic Calander) along with the in-house project work students.

Bapatla Engineering College

(Autonomous)

Department of Information Technology

Project Work Approval Proforma

Date:

Name of the Department	
Name of the Student	
Registered No.	
Email id	
Mobile Number	
Academic Year and Semester	

Project Work Details:

Organization/Industry Name	
Duration in weeks	
Start date of project work	
End date of project work	
Probable date of project work completion certificate submission	

Note:

1. The consent letter from the organization/industry is to be enclosed.
2. Undertaking form from the student and parent.

Signature of the Student

Recommendations of the
Project Work Committee (PWC)

Signature of the
Project Coordinator

Signature of the
Head of the Department

Process document for Project work

As per the R24 regulations, students are required to do a project work in the VIII semester and submit a report. The following is the process to be followed for the project work.

A. Project batches and Guide allocation

- The Head of the department should constitute a three-member Project Work Committee (PWC) under his chairmanship with three faculty members. One of them shall be a senior faculty member and acts as a Project Coordinator.
- List of faculty members and their specializations, research areas will be communicated to the students. The information is disseminated via email, notice boards and display on the website. List of projects and their titles/themes should be identified and same may be communicated to all the students. Project batches are formed based on the performance of the students up to VI semester.
- Students are given an option of specifying their choices for the project titles/guides and the final allocation of guides to project batches is done based on the merit order and the choices opted by the project batches.
- It is to be ensured that no project batch should have more than 4 students.
- Not more than two batches should be allocated to each project guide.

B. Project classification and mapping with program outcomes and program specific outcomes.
Projects may be broadly classified into the following categories.

- Application oriented: When the project is related to hardware, then all the components are procured and assembled to get the desired outcome. If it is related to software, then a complete working version of the application is to be created.
- Research oriented: In this category extensive review of literature is done. This aims to learn and implement new methods or procedures and validate results.
- Simulation projects: These projects may be hardware or software related. The students will create a working prototype for the same.
  - The PWC should ensure that the projects are selected in such a way that the program outcomes and program specific outcomes are mapped with the themes of the project works.
  - A document consisting of project titles, area of specialization, project guides should be prepared and submitted to the concerned HOD and should be put on the website. The theme of the work may be changed with the consent of the project guide.

C. Continuous monitoring mechanism and evaluation

- Project slots (24 hours per week) should be allocated as per the existing scheme and curriculum.
- A laboratory or a class room should be identified for executing the project works. It is preferred to have a separate laboratory for the purpose of conducting the project works.
- Each project batch is allowed to consult their respective guide to discuss about their Progress during the project slot.
- At the end of every month there will be an overall assessment of each project by the PWC by scheduling project reviews in association with project guides.

- The performance of the students should be evaluated in each review and should be documented.
- Department staff meeting should be conducted to discuss the performance of the students in the projects and should be documented.

D. Methodology to assess individual as well as collective Contribution/understanding of Project:

- The project guide should monitor the presence (attendance) of each student in the project work
- The project guide should ensure that the batch allocated to him is able to understand the objectives of the project. The guide should also identify the requirements (hardware and software) of the project. If a particular software or hardware is not available, same may be communicated to the HOD and may be procured based on the financial and budgetary requirements.
- Evaluation of the project is based on
  1. Understanding the objectives of the project.
  2. Day to day work done by the students (Should be documented)
  3. Partial/Full completion of the project
  4. Students' presentation and demonstration
  5. Results and documentation
- Evaluation is intimated to the students for further improvement

E. Papers published/Awards won/conferences attended

- It is encouraged for every project batch to publish/communicate a paper in any national/ international conference/journal. The project guide may encourage the students so that the work of their batch is published as a research paper.
- Students must be given some awareness/training program for effective writing of a research paper. The research papers should be checked with anti-plagiarism software before the submission to the concerned journal or conference.
- A report should be prepared by the concerned coordinator comprising all the research papers published and should be made available in the library and soft copies must be put on the website for availability to the students.

Bapatla Engineering College

(Autonomous)

Department of Information Technology

Application for Honor/Minor Degree (A.Y: Semester:)

Date:

1. Name of the Candidate :

2. Register Number and Branch :

S.No.	Passed all the subjects in single attempt (Yes/No)	B.Tech / Lateral Entry*	Month and Year	CGPA
01		Semester I		
02		Semester II		
03		Semester III		

*For Lateral entry students, furnish the SGPA from third Semester of B. Tech only

3. Student Mobile Number :

4. Parent Mobile Number :

5. Undertaking by the Candidate :
(To be written by the candidate)

Undertaking: I have read the guidelines for Honor / Minor Degree and I will abide by the same.

Signature of the
Candidate

Signature of the
Mentor

Signature of the
HOD

Signature of the
Principal

Scheme of Instruction and Examination
B.Tech., I Semester
in
Information Technology

Course Code	Type	Course Title	Scheme of Instruction Hours per week				Scheme of Examination (Maximum marks)			Credits
			Lec	Tut	Pra	Tot	CIE	SEE	Tot	
24IT101	BS	Linear Algebra and Ordinary Differential Equations	2	1	0	3	40	60	100	3
24IT102	BS	Semiconductor Physics and Nano materials	3	0	0	3	40	60	100	3
24IT103	ES	Basic Electrical & Electronics Engineering	3	0	0	3	40	60	100	3
24IT104	ES	Introduction to Programming	3	0	0	3	40	60	100	3
24ITL101	ES	Engineering Mechanics & Surveying Lab	1	0	2	3	40	60	100	2
24ITL102	BS	Semiconductor Physics Lab	0	0	2	2	40	60	100	1
24ITL103	ES	Basic Electrical & Electronics Engineering Lab	0	0	3	3	40	60	100	1.5
24ITL104	ES	Introduction to Programming Lab	0	0	3	3	40	60	100	1.5
24ITL105	ES	IT Workshop	0	0	2	2	40	60	100	1
Induction Program	First Three Weeks (Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Familiarization to Dept./Branch & Innovations)									
TOTAL			**12**	**1**	**12**	**25**	**360**	**540**	**900**	**19**

CIE: Continuous Internal Evaluation **SEE:** Semester End Examination
Lec : Lecture **Tut :** Tutorial **Pra :** Practical

Scheme of Instruction and Examination

B.Tech., II Semester

in

Information Technology

Course Code	Type	Course Title	Scheme of Instruction Hours per week				Scheme of Examination (Maximum marks)			Credits
			Lec	Tut	Pra	Tot	CIE	SEE	Tot	
24IT201	BS	Numerical Methods & Advanced Calculus	2	1	0	3	40	60	100	3
24IT202	BS	Engineering Chemistry	3	0	0	3	40	60	100	3
24IT203	HM	Communicative English	2	0	0	2	40	60	100	2
24IT204	ES	Programming for Problem Solving	3	0	0	3	40	60	100	3
24IT205	BS	Discrete Mathematics	3	0	0	3	40	60	100	3
24ITL201	ES	Engineering Graphics Lab	1	0	3	4	40	60	100	2.5
24ITL202	BS	Engineering Chemistry Lab	0	0	2	2	40	60	100	1
24ITL203	HM	English Communication Skills Lab	0	0	2	2	40	60	100	1
24ITL204	ES	Programming for Problem Solving Lab	0	0	3	3	40	60	100	1.5
TOTAL			**14**	**1**	**10**	**25**	**360**	**540**	**900**	**20**

CIE: Continuous Internal Evaluation **SEE:** Semester End Examination

Lec : Lecture **Tut :** Tutorial **Pra :** Practical

Scheme of Instruction and Examination
B.Tech., III Semester
in
Information Technology

Course Code	Type	Course Title	Scheme of Instruction Hours per week				Scheme of Examination (Maximum marks)			Credits
			Lec	Tut	Pra	Tot	CIE	SEE	Tot	
24IT301	BS	Probability and Statistics	3	0	0	3	40	60	100	3
24IT302	ES	Digital Logic Design	3	0	0	3	40	60	100	3
24IT303	PC	Data Structures	3	0	0	3	40	60	100	3
24IT304	PC	Object Oriented Programming	3	0	0	3	40	60	100	3
24IT305	PC	Computer Networks	3	0	0	3	40	60	100	3
24ITL301 /SEC1	SEC	Python Programming	1	0	2	3	40	60	100	2
24ITL302	HM	Design Thinking & Innovation	1	0	2	3	40	60	100	2
24ITL303	PC	Data Structures Lab	0	0	3	3	40	60	100	1.5
24ITL304	PC	Object Oriented Programming Lab	0	0	3	3	40	60	100	1.5
24ITL305	HM	NSS/NCC/SCOUTS & Guides / Community Service	0	0	1	1	0	100	100	0.5
24IT306 /MC01	MC	Environmental Science	2	0	0	2	40	-	40	0
TOTAL			**19**	**0**	**11**	**30**	**400**	**640**	**1040**	**22.5**

CIE: Continuous Internal Evaluation **SEE:** Semester End Examination
Lec : Lecture **Tut :** Tutorial **Pra :** Practical

Scheme of Instruction and Examination
B.Tech., IV Semester
in
Information Technology

Course Code	Type	Course Title	Scheme of Instruction Hours per week				Scheme of Examination (Maximum marks)			Credits
			Lec	Tut	Pra	Tot	CIE	SEE	Tot	
24IT401	PC	Computer Organization	3	0	0	3	40	60	100	3
24IT402	PC	Operating Systems	3	0	0	3	40	60	100	3
24IT403	PC	Front End Web Development	3	0	0	3	40	60	100	3
24IT404	PC	Database Management System	3	0	0	3	40	60	100	3
24IT405	PC	Design & Analysis of Algorithms	2	1	0	3	40	60	100	3
24ITL401 /SEC2	SEC	Linux Essentials	1	0	2	3	40	60	100	2
24ITL402	PC	Front End Web Development Lab	0	0	3	3	40	60	100	1.5
24ITL403	PC	RDBMS Lab	0	0	3	3	40	60	100	1.5
24ITL404	HM	Health & Wellness Yoga & Sports	0	0	1	1	0	100	100	0.5
24IT406 /MC02	MC	Constitution of India	2	0	0	2	40	0	40	0
Total			**17**	**1**	**9**	**27**	**360**	**580**	**940**	**20.5**
24ITH4A 24ITM4A		**Honors Course** **Minor Course**	**3**	**0**	**2**	**5**	**50**	**50**	**100**	**4**

CIE: Continuous Internal Evaluation **SEE:** Semester End Examination
Lec : Lecture **Tut :** Tutorial **Pra :** Practical

Scheme of Instruction and Examination
B.Tech., V Semester
in
Information Technology

Course Code	Type	Course Title	Scheme of Instruction Hours per week				Scheme of Examination (Maximum marks)			Credits
			Lec	Tut	Pra	Tot	CIE	SEE	Tot	
24IT501	PC	Automata Theory & Formal Languages	2	1	0	3	40	60	100	3
24IT502	PC	Machine Learning	3	0	0	3	40	60	100	3
24IT503	PC	Software Engineering	3	0	0	3	40	60	100	3
24IT504 /PE01	PE	Professional Elective - 1	3	0	0	3	40	60	100	3
24IT505 /JOE01	JO	Job Oriented Elective - 1	3	0	0	3	40	60	100	3
24ITL501	HM	Soft Skills	1	0	2	3	40	60	100	2
24ITL502	PC	Machine Learning Lab	0	0	3	3	40	60	100	1.5
24ITL503	JOE	Job Oriented Elective-1 Lab	0	0	3	3	40	60	100	1.5
24ITL504 /INT1	PR	Summer Internship-I*	0	0	0	0	0	100	100	2
24IT506 /MC03	MC	Technical Paper Writing and IPR	2	0	0	2	40	0	40	0
Total			**17**	**1**	**8**	**26**	**360**	**580**	**940**	**22**
20ITH5B 20ITM5B		**Honors Course Minor Course**	**3**	**0**	**2**	**5**	**50**	**50**	**100**	**4**

Professional Elective-I		Job Oriented Elective-I (Theory and Lab)	
1A	Microprocessor and Microcontrollers	1A	Enterprise Programming
1B	Wireless Networks	1B	Data Handling and Visualization
1C	Compiler Design	1C	Mobile Application Development

∗ **To be completed after IV semester during summer vacation and is evaluated in V semester**

Bapatla Engineering College

(Autonomous)

Department of Information Technology

Scheme of Instruction and Examination
B.Tech., VI Semester
in
Information Technology

Course Code	Type	Course Title	Scheme of Instruction Hours per week				Scheme of Examination (Maximum marks)			Credits
			Lec	Tut	Pra	Tot	CIE	SEE	Tot	
24IT601	PC	ANN & Deep Learning	3	0	0	3	40	60	100	3
24IT602	PC	Cloud Programming	3	0	0	3	40	60	100	3
24IT603 /PE02	PE	Professional Elective -2	3	0	0	3	40	60	100	3
24IT604 /PE03	PE	Professional Elective -3	3	0	0	3	40	60	100	3
24IT605 /JOE02	JO	Job Oriented Elective - 2	3	0	0	3	40	60	100	3
24ITL601 /SEC03	SEC	Server Side Technologies	1	0	2	3	40	60	100	2
24ITL602	PC	Deep Learning Lab	0	0	3	3	30	40	60	1.5
24ITL603	PC	Cloud Programming Lab	0	0	3	3	40	60	100	1.5
24ITL604	JOE	Job Oriented Elective - 2 Lab	0	0	3	3	40	60	100	1.5
24IT606 /MC04	MC	Campus Recruitment Training	2	0	0	2	40	0	40	0
Total			**18**	**0**	**11**	**29**	**400**	**540**	**940**	**21.5**
20ITH6_ 20ITM6_	**Honors (Set I) / Minor (Set II) Course**		**3**	**0**	**2**	**5**	**40**	**60**	**100**	**4**

Professional Elective-2		**Professional Elective-3**	
2A	Cryptography & Network Security	3A	Natural Language Processing
2B	Adv. Computer Architecture	3B	Block Chain Technologies
2C	Object Oriented Analysis and Design	3C	Design Patters and Frameworks

Job Oriented Elective-2 (Theory and Lab)	
2A	Middleware Technologies
2B	Big Data Analytics
2C	Industrial IOT

Scheme of Instruction and Examination

B.Tech., VII Semester

Course Code	Type	Course Title	Scheme of Instruction Hours per week				Scheme of Examination (Maximum marks)			Credits
			Lec	Tut	Pra	Tot	CIE	SEE	Tot	
24IT701	HM	Industrial Management & Entrepreneurship Development	3	0	0	3	40	60	100	3
24IT702 /PE04	PE	Professional Elective - 4 MOOC*	3	0	0	3	40	60	100	3
24IT703 /PE05	PE	Professional Elective - 5 MOOC*	3	0	0	3	40	60	100	3
24IT704 /JOE3	JOE	Job Oriented Elective - 3	3	0	0	3	40	60	100	3
24IT705 /OE	OE	Open Elective	3	0	0	3	40	60	100	3
24ITL701 /SEC04	SEC	DevOps	1	0	2	3	40	60	100	2
24ITL702	PC	Advanced Database Management Systems Lab	1	0	2	3	40	60	100	2
24ITL703	JOE	Job Oriented Elective – 3 Lab	0	0	3	3	40	60	100	1.5
24ITL704 /INT2	PR	Summer Internship-II	0	0	0	0	0	100	100	2
Total			**17**	**0**	**7**	**24**	**320**	**580**	**900**	**22.5**
24ITH71_ 20ITM71_	**Honors / Minor MOOC-1**		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**
24ITH72_ 20ITM72_	**Honors / Minor MOOC-2**		**3**	**0**	**0**	**0**	**0**	**0**	**0**	**2**

Professional Elective-4		Professional Elective-5	
4A	Distributed Systems	5A	Immersive Technologies
4B	Digital Forensics	5B	Graph Theory
4C	Semantic Web Technologies	5C	Quantum Computing

Job Oriented Elective-3 (Theory and Lab)	
3A	Generative AI Technologies
3B	Cyber Security
3C	Computer Vision

Scheme of Instruction and Examination

B.Tech., VIII Semester

in

Information Technology

Course Code	Type	Course Title	Scheme of Instruction Hours per week				Scheme of Examination (Maximum marks)			Credits
			Lec	Tut	Pra	Tot	CIE	SEE	Tot	
24IT801	PRJ	Project Work	0	0	24	24	40	60	100	12
Total			**0**	**0**	**24**	**24**	**40**	**60**	**100**	**12**

CIE: Continuous Internal Evaluation **SEE:** Semester End Examination

Lec : Lecture **Tut :** Tutorial **Pra :** Practical

Equivalent courses in R20 regulation for courses in R24 regulation

Table 1: I Semester equivalent courses

R24Course		R20Course	
Code	**Title**	**Code**	**Title**
24IT101	Linear Algebra and Ordinary Differential Equations	20IT101	Linear Algebra and Ordinary Differential Equations
24IT102	Semiconductor Physics & Nano materials	20IT202	Semiconductor Physics & Nano materials
24IT103	Basic Electrical & Electronics Engineering	20IT103	Basic Electrical & Electronics Engineering
24IT104	Introduction to Programming	20IT204	Programming for Problem Solving
24ITL101	Engineering Mechanics & Surveying Lab	-	-
24ITL102	Semiconductor Physics Lab	20ITL201	Semiconductor Physics Lab
24ITL103	Basic Electrical & Electronics Engineering Lab	20ITL103	Basic Electrical & Electronics Engineering Lab
24ITL104	Introduction to Programming Lab	20ITL203	Programming for Problem Solving Lab
24ITL105	IT Workshop	20ITL104	IT Workshop

Table 2: II Semester equivalent courses

R24Course		R20Course	
Code	**Title**	**Code**	**Title**
24IT201	Numerical Methods & Advanced Calculus	20IT201	Numerical Methods & Advanced Calculus
24IT202	Engineering Chemistry	20IT102	Engineering Chemistry
24IT203	Communicative English	20IT203	Communicative English
24IT204	Programming for Problem Solving	-	-
24IT205	Discrete Mathematics	20IT206	Discrete Mathematics
24ITL201	Engineering Graphics Lab	20ITL101	Engineering Graphics
24ITL202	Engineering Chemistry Lab	20ITL102	Chemistry Lab
24ITL203	English Communication Skills Lab	20ITL202	English Communication Skills Lab
24ITL204	Programming for Problem Solving Lab	-	-

Equivalent courses in R20 regulation for courses in R24 regulation

Table 3: III Semester equivalent courses

R24Course		R20Course	
Code	**Title**	**Code**	**Title**
24IT301	Probability and Statistics	20IT401	Probability and Statistics
24IT302	Digital Logic Design	20IT205	Digital Logic Design
24IT303	Data Structures	20IT302	Data Structures
24IT304	Object Oriented Programming	20IT303	Object Oriented Programming
24IT305	Computer Networks	20IT502	Computer Networks
24ITL301 /SEC1	Python Programming	20ITL401	Python Programming
24ITL302	Design Thinking & Innovation	-	-
24ITL303	Data Structures Lab	20ITL302	Data Structures Lab
24ITL304	Object Oriented Programming Lab	20ITL303	Object Oriented Programming Lab
24ITL305	NSS/NCC/SCOUTS & Guides / Community Service	-	-
24ITL306 /MC01	Environmental Science	20IT104	Environmental Studies

Table 4: IV Semester equivalent courses

R24Course		R20Course	
Code	**Title**	**Code**	**Title**
24IT201	Numerical Methods & Advanced Calculus	20IT201	Numerical Methods & Advanced Calculus
24IT202	Engineering Chemistry	20IT102	Engineering Chemistry
24IT203	Communicative English	20IT203	Communicative English
24IT204	Programming for Problem Solving	-	-
24IT205	Discrete Mathematics	20IT206	Discrete Mathematics
24ITL201	Engineering Graphics Lab	20ITL101	Engineering Graphics
24ITL202	Engineering Chemistry Lab	20ITL102	Chemistry Lab
24ITL203	English Communication Skills Lab	20ITL202	English Communication Skills Lab
24ITL204	Programming for Problem Solving Lab	-	-

Table 5: Residual subjects to be completed by the students who migrate from R20 regulation to R24 regulation

Joined R24 regulation in the IV semester		
Semester	**Code**	**Title**
I	24ITL101	Engineering Mechanics & Surveying Lab
III	24IT301	Probability & Statistics
III	24IT305	Computer Networks
III	24ITL301/SEC1	Python Programming
III	24ITL302	Design Thinking & Innovation
III	24ITL305	NSS/NCC/SCOUTS & Guides/ Community Service

List of Courses for B.Tech. Honors program in Information Technology

1. The student can opt for any three courses from the following table.
2. The fourth course is optional; the student may either take two MOOC courses of 2 credits each or choose one course from the following table.
3. Concerned BOS can add or delete the subjects as per their decision.
4. Prerequisites if any, to be defined by the BOS for each course.
5. The list of MOOC courses will be specified every year at the beginning of the odd and even semesters by the Department MOOC Committee.

Table 6: List of Honors Courses

SNo.	Code	Title	Prerequisites
1	A	Advanced Data Structures	Data Structures (24IT303)
2	B	Advanced Database Management Systems	Database Management Systems (24IT404)
3	C	Real Time Operating Systems	Operating Systems (24IT402)
4	D	Quantum Computing	-

List of Courses for B.Tech. Minor program in Web Application Development

1. The student can opt for any three courses from the following table.
2. The fourth course is optional; the student may either take two MOOC courses of 2 credits each or choose one course from the following table.
3. Concerned BOS can add or delete the subjects as per their decision.
4. Prerequisites if any, to be defined by the BOS for each course.
5. The list of MOOC courses will be specified every year at the beginning of the odd and even semesters by the Department MOOC Committee.

Table 7: List of Minor Courses

SNo.	Code	Title	Prerequisites
1	A	Front End Web Technologies	Basic knowledge of Computer Programming
2	B	Server Side Web Technologies	Basic knowledge of Computer Programming
3	C	No SQL Databases	Basic knowledge of Computer Programming
4	D	Mobile Application Development	Basic knowledge of Computer Programming

Linear Algebra and Ordinary Differential Equations
B.Tech – I Semester (24IT101)

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

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- Solve a system of linear homogeneous and non-homogeneous equations, finding the inverse of a given square matrix and also its Eigen values and Eigen vectors
- Identify the type of a given differential equation and select and apply the appropriate Analytical technique for finding the solution of first order ordinary differential equations.
- Create and analyze mathematical models using higher order differential equations to solve application problems that arise in engineering.
- Verify mean value theorems and expand functions of a single variable using Taylor's and Maclaurin's series.

Course Outcomes:

After the successful completion of the course, the 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.

CO	Program Outcomes(POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	-	-	-	-	-	-	-	-	2	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	2	-	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-	2	-	-	-
CO4	2	2	2	-	-	-	-	-	-	-	-	2	-	-	-

UNIT - I **(11 Hours)**

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 **(12 Hours)**

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 $Mdx + Ndy = 0$, $\frac{\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}}{N}$ 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 Radioactive 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 **(12 Hours)**

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 **(11 Hours)**

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*. Khanna, 44 edition, 2017

REFERENCES:

1. Erwin Kreyszig. *Advanced Engineering Mathematics*. John Wiley and Sons, 9 edition
2. N.P.Bali and M.Goyal. *A Text book of Engineering Mathematics*. Laxmi, 2010

Semiconductor Physics and Nano Material

(Common to CS,CM,CB,DS,EC & IT)

B.Tech – I Semester (24IT102)

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

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- to understand the concept of quantum mechanics and its importance to solve and evaluate the properties of materials (conductors and semiconductors).
- to understand the properties of semiconductor materials and their importance in various device fabrications.
- to gain knowledge on various opto-electronic devices and their applications.
- to understand the principles of processing, manufacturing and characterization of nano materials, nano structures and their applications.

Course Outcomes:

After the successful completion of the course, the students will be able to

CO1: Describe the concepts of quantum mechanics and its applications to explain material properties.

CO2: Describe the concept of Fermi level and various semi conductor junctions.

CO3: Explain the working principles of various opto-electronic devices and their applications.

CO4: Describe the importance of nano-materials and their characteristic properties.

CO	Program Outcomes(POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	-	-	-	-	-	-	-	-	-	2	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	2	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	2	-	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-	2	-	-	-

UNIT - I **(11 Hours)**

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, Semi conductors and Insulators.

UNIT - II **(12 Hours)**

Semiconductors and Properties: Introduction to semi conductors, intrinsic and extrinsic semiconductors, Direct and Indirect band gap semiconductors. Density of states, Carrier concentration equations, Fermi level and temperature dependence, Drift and Diffusion currents, Continuity equation, P-N junction diode (V-I characteristics).

UNIT - III **(12 Hours)**

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 **(11 Hours)**

Nano Materials: Introduction to nano technology, Quantum confinement, Surface to volume ratio, Properties of nano materials, Synthesis of nano-materials: CVD, Sol-gel methods, Laser ablation.

Carbon Nano Tubes: Types, Properties, Applications. Characterization of Nano materials: XRD, SEM, Applications of Nano materials.

TEXT BOOKS:

1. Avadhanulu and Kshirsagar. *A Text Book of Engineering Physics*. S.Chand and Co., 2013
2. P.Srinivasa Rao and K.Muralidhar. *Applied physics*

REFERENCES:

1. B.S. Murty, P. Shankar, Baldev Raj, B.B. Rath, and J. Murday. *Text book on Nanoscience and Nanotechnology*. Springer Science and Business Media, 2013
2. T. Wilson and J.F.Hawkes. *Opto Electronics*. PHI

Basic Electrical & Electronics Engineering

B.Tech – I Semester (24IT103)

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

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- Develop a comprehensive understanding of basic electrical circuit principles, including the analysis of DC and AC circuits using laws and theorems
- Analyze the construction, working principles, and applications of various electrical machines like DC machines, transformers, and AC machines.
- Comprehend the fundamental properties and applications of semiconductor materials and devices, focusing on diodes and their practical uses.
- Acquire proficiency in the operation and applications of transistors and operational amplifiers in electronic circuits, including their use in amplification and switching.

Course Outcomes:

After the successful completion of the course, the students will be able to

CO1: Solve and analyze basic DC and AC electrical circuits using fundamental laws and theorems.

CO2: Explain the construction, operation, and applications of different types of electrical machines.

CO3: Acquire an understanding of semiconductor materials and devices and their practical applications in electronic circuits.

CO4: Illustrate and analyze basic electronic circuits involving transistors (BJTs and MOSFETs) and operational amplifiers.

CO	Program Outcomes(POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	2	-	-	-	-	-	-	-	2	-	-	-
CO2	3	3	2	2	-	-	-	-	-	-	-	2	-	-	-
CO3	3	3	2	1	-	-	-	-	-	-	-	2	-	-	-
CO4	3	3	3	1	-	-	-	-	-	-	-	2	-	-	-

UNIT - I **(11 Hours)**

Basic Definitions: Electric charge, Current, Voltage, Power, and Energy, Ohm's Law
DC Circuits: Series and Parallel Circuits their Characteristics and analysis, Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL), Simple problems on circuit analysis. Thevenin's, Norton's and Superposition theorem.
AC Fundamentals: Alternating Current (AC) and Voltage, Peak, RMS, and Average values of AC, form and peak factors, Phasors and phase relationships in AC circuits. AC excitation to R, L, C and their combination (series and parallel), Impedance and Power triangle.
3-Phase Circuits: Star and Delta connections, relation between line and phase values of currents and voltages with derivations.

UNIT - II **(12 Hours)**

DC Machines: Construction and working of DC generator and its emf equation. Types of DC generators. Open circuit characteristic of DC shunt generator. Construction and working of DC motor and its torque equation, load test on DC shunt motor. Applications of DC machines.
Transformers (AC non-rotating): Construction and working of Transformer, Types of transformers, Transformer emf equation, losses and efficiency, Regulation, load test on transformer, Applications.
AC Machines (AC rotating):
Induction Motors: Construction and working of single-phase induction motor. Capacitors start single phase induction motor.
Synchronous Machines: Construction and working of Alternator, Construction and working of Synchronous motor and their applications.

UNIT - III **(12 Hours)**

Diodes and Applications: Difference between Conductors, Insulators, and Semiconductors-Intrinsic and Extrinsic Semiconductors-N-type and P-type semiconductors.
PN Junction Diode: Construction, working, and VI characteristics.
Zener Diode: Construction, working, and VI characteristics, Its application as voltage regulator.
Rectifiers: Half-wave and Full-wave rectifiers, working principles, and efficiency

UNIT - IV **(11 Hours)**

Transistors:
Bipolar Junction Transistor (BJT): Construction, operation, and characteristics in Common Emitter, Common Base, and Common Collector configurations. MOSFET Construction, working principle, characteristics, and applications as amplifier and as switch.
Operational Amplifiers (Op-Amps): Characteristics and parameters, Inverting and Non-inverting Amplifiers, Summing amplifier, Difference amplifier, Integrator, Differentiator with their Circuit diagrams, formulas, and applications.

TEXT BOOKS:

1. S.K. Bhattacharya. *Basic Electrical and Electronics Engineering*. Pearson, 2 edition
2. V.K. Mehta and Rohit Mehta. *Basic Electrical Engineering*. S.Chand, 6 edition, a
3. V.K. Mehta and Rohit Mehta. *Principles of Electronics*. S.Chand, 11 edition, b

REFERENCES:

1. Nagsarkar T K and Sukhija M S. *Basics of Electrical and Electronics Engineering*. Oxford University Press, 3 edition
2. T. Thyagarajan, K.P. Sendur Chelvi, and T.R. Rangaswamy. *Electrical, Electronics and Computer Engineering*. New Age International, 5 edition
3. PV Prasad and S.Sivanagaraju. *Electrical Engineering Concepts and Applications*. Cenage, 1 edition

Introduction to Programming
B.Tech – I Semester (24IT104)

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

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- 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.
- Use conditional branching, looping and Arrays.
- Understand the concepts of functions and recursion in C.

Course Outcomes:

After the successful completion of the course, the students will be able to

CO1: Choose the right data representation formats based on the requirements of the problem and solve the mathematical problems using operators.

CO2: Solve problems which contain multiple decisions using else…if.

CO3: Work with lists and matrices using arrays.

CO4: Solve real time complex problems by decomposition using user defined functions.

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

UNIT - I **(11 Hours)**

Introduction: Computers, Classification of Computers, Software Life Cycle, Algorithms, Flowcharts, Structured Programming, Compilers, Linker, Preprocessor, Standard Input and Output Devices, Popular Features of C.

Variables and Expressions: Introduction, Character Set, Identifiers and Keywords, Variables, Displaying Variables, Reading Variables, Characters and Character Strings, Qualifiers, typedef Statement, Promotion and Typecasting, Value-initialized Variables, Constants, 'const' Qualifier, Operators and Expressions, Operator Precedence and Associativity, Programming Examples.

UNIT - II **(12 Hours)**

Basic Input-Output: Introduction, Single Character Input-Output, String Input and Output, General Output, General Input, Types of Characters in Format Strings, scanf Width Specifier, Search Sets, Assignment Suppression Character, Format Specifiers for scanf, Input Fields for scanf, When scanf Stops Scanning, Programming Examples.

Control Structures: Introduction, if Statement, if-else Statement, Multi-way Decisions, Compound Statements, Loops - for Loop, while Loop, do-while Loop, break Statement, switch Statement, continue Statement, goto Statement, Programming Examples.

UNIT - III **(12 Hours)**

Arrays and Strings: Introduction, How Arrays are Useful? Multidimensional Arrays, Strings, Arrays of Strings, Functions in string.h, Programming Examples.

Scope and Extent: Introduction, Scope, Extent.

UNIT - IV **(11 Hours)**

Functions: Introduction, Function main, Where are Functions Useful? Functions Accepting More than One Parameter, User Defined and Library Functions, Concepts Associated with Functions (Review), Function Parameters, Return Values, Recursion, Comparison of Iteration and Recursion, Variable Length Argument Lists, Programming Examples.

TEXT BOOKS:

1. K R Venugopal and Sudeep R Prasad. *Mastering C*. McGraw Hill

REFERENCES:

1. E.Balaguruswamy. *Programming in ANSI C*. McGraw Hill India, 8 edition, 3 2019. ISBN 978-93-5316-513-0
2. Kernighan BW and Dennis Ritchie M. *The C programming language*. Prentice Hall, 2 edition, 2015. ISBN 987-93-325-4944-9
3. Yashavant P. Kanetkar. *Let us C*. BPB Publications
4. Ashok N.Kamthane and Amit A.Kamthane. *Programming in C*. McGraw Hill India, 3 edition, 2015. ISBN 987-93-325-4355-3

Engineering Mechanics and Surveying Lab

B.Tech – I Semester (24ITL101)

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

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- Verify the laws of force system and determination of C.G for different geometrical laminas.
- Determine the coefficient of static friction and angle of repose for rough surfaces.
- Determine the axial forces in the members of truss.
- Understand the rotational dynamics and the principles governing the motion of rigid bodies.
- Provides the knowledge on the fundamental skills and techniques required for various surveying methods in Civil Engineering.

Course Outcomes:

After the successful completion of the course, the students will be able to

CO1: Examine the Law of Parallelogram of forces and Law of Moment using force polygon, also determines the C.G for laminas

CO2: Determine the coefficient of static friction between a block and a rough surface under and angle of inclination at which a block impending its motion.

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

CO4: Determines the angular acceleration of a rolling disc on an inclined plane. And moment of inertia of a flywheel.

CO5: Determine the area of a plot, elevation difference between two points and horizontal and vertical angles a chain level and theodolite respectively.

CO	Program Outcomes(POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	-	2	-	-	-	-	-	1	-	2	-	-	-
CO2	3	3	-	2	-	-	-	-	-	1	-	2	-	-	-
CO3	3	3	-	2	-	-	-	-	-	1	-	2	-	-	-
CO4	3	3	-	2	-	-	-	-	-	1	-	2	-	-	-
CO5	3	3	-	2	-	-	-	-	-	1	-	2	-	-	-

UNIT - I **(2 Hours)**

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.

List of Experiments

1. Determination of the magnitude of the resultant force using
   - Parallelogram law
   - Triangle law
   - Polygon law
2. Determine 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.

UNIT - II **(2 Hours)**

Friction: Laws of friction – coefficient of friction – angle of repose.

List of Experiments

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

UNIT - III **(2 Hours)**

Truss: Method of analysis.

List of Experiments

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

UNIT - IV **(3 Hours)**

Mass Moment of Inertia & Rotation of a Rigid Body about a fixed Axis: Area moment of inertia – mass moment of inertia – Relation between mass and area moment of inertia, Kinematics of rotation – Equation of motion for a rigid body rotating about a fixed axis – D'Alembert's principle.

List of Experiments

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

Surveying **(5 Hours)**

Surveying – principles of surveying – chain surveying – theodolite surveying – leveling.

List of Experiments

1. Determination of the area of a plot using cross - staff survey.
2. Determination of the elevation difference between two points using leveling and height of ceiling of a building.
3. Determination of the horizontal distance between inaccessible points using theodolite.
4. Determination of the height of an object using theodolite.

TEXT BOOKS:

1. S. Timoshenko and D. H. Young. *Engineering Mechanics*. Mc Graw-Hill
2. K.R.Arora. *Surveying Volume I*

REFERENCES:

1. A. K. Tayal. *Engineering Mechanics Statics and Dynamics*. Umesh publication
2. B.C.Punmia. *Surveying Volume I*

Semiconductor Physics Lab
B.Tech – I Semester (24ITL102)

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

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- 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:

After the successful completion of the course, the 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

CO	Program Outcomes(POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2	-	-	-	-	2	-	-	-	-	-	-
CO2	3	3	2	2	-	-	-	-	2	2	-	-	-	-	-
CO3	3	3	2	2	2	-	-	-	2	-	-	-	-	-	-
CO4	3	2	-	-	-	-	3	-	-	-	-	2	-	-	-

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.

Note: Any three experiments can be done virtually. A minimum of ten (10 no.) experiments are to be done and recorded.

TEXT BOOKS:

1. P.Sreenivasarao and K.Muralidhar. *Engineering Physics laboratory Manual*. Himalaya

Basic Electrical and Electronics Engineering Lab

B.Tech – I Semester (24ITL103)

Lectures	:	0 Hours / Week	Tutorial	:	0	Practical	:	3
CIE Marks	:	40	SEE Marks	:	60	Credits	:	1.5

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- to verify and apply basic electrical laws and theorems.
- to conduct experiments on electrical machines.
- with hands-on experience in analyzing the V-I characteristics of semiconductor devices and their applications.
- to analyze and characterize the operations transistor, MOSFET and Op-Amps.

Course Outcomes:

After the successful completion of the course, the students will be able to

CO1: Verify and apply basic network theorems through practical experimentation, thereby gaining a deep understanding of circuit analysis techniques.

CO2: Demonstrate the ability to perform experiments on electrical machines and interpret their operational characteristics and performance metrics.

CO3: Analyze the V-I characteristics of diodes, and understand their roles in rectifier circuits and enhancing their understanding of semiconductor behavior in practical applications.

CO4: Characterize the performance of BJTs, MOSFETs and designing and analyzing operational amplifier circuits to prepare them for advanced electronic circuit design.

CO	Program Outcomes(POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	3	-	-	-	-	3	2	-	1	-	-	-
CO2	3	3	2	3	-	-	-	-	3	2	-	1	-	-	-
CO3	3	3	2	3	-	-	-	-	3	2	-	1	-	-	-
CO4	3	3	2	3	-	-	-	-	3	2	-	1	-	-	-

List of Experiments

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Verification of Thevenin's theorem
4. Verification of Norton's theorem
5. Parameters of choke coil
6. Open Circuit Characteristics of DC Shunt Generator
7. Load Test on DC Shunt Motor
8. Load Test on Transformer
9. V-I characteristics of PN junction Diode
10. V-I characteristics of Zener Diode
11. Half-Wave Rectifier
12. Full-Wave Rectifier
13. Characteristics of BJT in Common Emitter Configuration
14. Characteristics of MOSFET
15. Summing and Difference Amplifiers using Op-Amps

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

Introduction to Programming Lab
B.Tech – I Semester (24ITL104)

Lectures	:	0 Hours / Week	Tutorial	:	0	Practical	:	3
CIE Marks	:	40	SEE Marks	:	60	Credits	:	1.5

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- to understand basic concepts of C Programming such as: C-tokens, Operators, Input/output, Arithmetic rules.
- to develop problem-solving skills to translate "English" described problems into Programs written using C language.
- to use Conditional Branching, Looping, and Functions.
- to understand basic concepts of C Programming such as: C-tokens, Operators, Input/output, Arithmetic rules.

Course Outcomes:

After the successful completion of the course, the students will be able to

CO1: Choose the right data representation formats based on the requirements of the problem and solve the mathematical problems using operators.

CO2: Solve problems which contain multiple decisions using else…if.

CO3: Work with lists and matrices using arrays.

CO4: Solve real time complex problems by decomposition using user defined functions.

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

List of Experiments

1. a) Write a C program to demonstrate the use of printf statement to print values of variables of different data types.
   b) Write a C program to demonstrate the use of printf and scanf statements to read and print values of variables of different data types.
2. Write a C program to perform addition, subtraction, multiplication, division and modulo division on two integer numbers.
3. Write a C program for electricity bill tacking different categories of users, different slabs in each category. (using nested if else statement).
4. Write a C program to evaluate the following using loops
   a) $1 + x^2/2! + x^4/4! + \cdots$ upto 5 terms
   b) $x + x^3/3! + x^5/5! + \cdots$ upto 5 terms
5. Write a C program to check whether the given number is
   a) Prime or not
   b) Perfect or abundant or deficient
6. Write a C program to print the following patterns
   i) 1
   ii) 1 12 1 2 1 123 1 2 3 2 1 1234 1 2 3 4 3 2 1
7. Write a C program to find the mean, mode, median, and variance of list of values by using one dimensional array.
8. Write a menu driven program to read a list of numbers and perform the following operations
   a) Print the list
   b) Delete duplicates from the list
   c) Reverse the list
9. Write a program to read a list of numbers and search for given number using binary search algorithm and if found display its index otherwise display the message “element not found in the list” using functions.
10. Write a menu driven program to read two matrices and compute their sum and product using functions.
11. Write a menu driven program to read list of student names and perform the following operations using functions.
    a) To print list of names
    b) To sort them in ascending order
    c) To print the list after sorting

12. Write a c program that consists of recursive functions to find

    a) Factorial of a given number
    b) Solve towers of Hanoi with three towers (A,B,C) with three towers initially on tower A.

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

IT Workshop

B.Tech – I Semester (24ITL105)

Lectures	:	0 Hours / Week	Tutorial	:	0	Practical	:	3
CIE Marks	:	40	SEE Marks	:	60	Credits	:	1.5

Prerequisites:

None

Course Objectives:

- To introduce the internal parts, peripherals, and I/O ports of a computer.
- To train the students on installation of operating system and other application software.
- To introduce office tools for word processing, accounting and presentation.
- To introduce AI tools such as ChatGPT, Dialogflow.

Course Outcomes:

After the successful completion of the course, the students will be able to

CO1: Describe the components of a computer.

CO2: Resolve the problems of a computer.

CO3: Use word processing and accounting applications.

CO4: Use AI tools for report generation.

CO	Program Outcomes(POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	3	1	-
CO4	2	2	2	1	2	-	-	-	-	-	-	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:
   (a) PPT using MS-Power Point.
   (b) Design a Project Certificate and Newsletter using MS-Word
6. Implement the following using Excel:
   (a) Create an Excel Work sheet for the six subjects and calculate Total, Average, Grade and Rank.
   (b) 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.

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

TEXT BOOKS:

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

Numerical Methods & Advanced Calculus
B.Tech – II Semester (24IT201)

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

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- 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 and applications.

Course Outcomes:

After the successful completion of the course, the students will be able to

CO1: Solve non-linear equations and system of linear equations with the help of Numerical techniques.

CO2: Solve the first order ordinary differential equations numerically with the given initial condition.

CO3: Find the area and volume of plane and three dimensional figures using multiple integrals.

CO4: Apply vector integral theorems to obtain the solutions of engineering problems involving circulation, flux, and divergence in vector fields.

CO	Program Outcomes(POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	-	-	-	-	-	-	-	-	2	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	2	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	2	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	2	-	-	-

UNIT - I **(11 Hours)**

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 **(12 Hours)**

Finite differences and Interpolation:
Finite differences: Forward differences, Backward differences;
Newton's interpolation formulae: Newton's forward interpolation formula; Newton's backward interpolation formula; Interpolation with unequal intervals; Lagrange's interpolation formula; Divided differences; Newton's divided difference formula; Numerical integration; Trapezoidal rule; Simpson's one-third rule; Simpson's three-eighth rule;
Numerical solution of ODE's: Introduction; Euler's method; Runge-Kutta method.

(Sections: 29.1.1; 29.1.2; 29.6; 29.9; 29.10; 29.11; 29.12; 30.4; 30.6; 30.7; 30.8; 32.1; 32.4; 32.7)

UNIT - III **(12 Hours)**

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 **(11 Hours)**

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:

1. B.S.Grewal. *Higher Engineering Mathematics*. Khanna, 44 edition, 2017

REFERENCES:

1. Erwin Kreyszig. *Advanced Engineering Mathematics*. John Wiley and Sons, 9 edition
2. N.P.Bali and M.Goyal. *A Text book of Engineering Mathematics*. Laxmi, 2010

Engineering Chemistry

(Common to CS,CB,DS & IT)

B.Tech – II Semester (24IT202)

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

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- to familiarize importance of usage of various polymers and fuels in household & industry
- to 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.
- to outline the basics of some advanced concepts like computational chemistry, nanomaterials and liquid crystals.

Course Outcomes:

After the successful completion of the course, the students will be able to

CO1: Explain the preparation, properties, and applications of plastics, elastomers and biodegradable polymers also to explain calorific value, characteristics and applications of conventional and alternative fuels.

CO2: Apply the knowledge of electro chemistry for understanding the working of electrodes and electrochemical energy systems, as well as corrosion theories and protection methods.

CO3: Analyse the methods to produce soft water for industrial use and potable water by economical means and study the principles of different analytical techniques and their applications.

CO4: Demonstrate the knowledge of computational chemistry, and applications of advanced materials in engineering.

CO	Program Outcomes(POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	-	-	2	3	-	-	-	-	2	-	-	-
CO2	3	3	3	-	-	-	2	-	-	-	-	2	-	-	-
CO3	3	3	3	2	-	2	2	-	-	-	-	3	-	-	-
CO4	3	3	2	3	3	-	-	-	-	-	-	2	-	-	-

UNIT - I **(11 Hours)**

Polymers and Fuel Chemistry: Introduction to polymers, functionality of monomers. Thermoplastics and Thermo-setting plastics- Preparation, properties and applications of PVC and Bakelite.
Biodegradable polymers- Preparation, properties and applications of PHB and PHBV
Elastomers-Preparation, properties and applications of Buna S and Buna N
Fuels-Types of fuels, calorific value of fuels-determination by Bomb calorimeter, Liquid Fuels-refining of petroleum, Knocking, Octane and Cetane number, Flue gas analysis by Orsat's apparatus, Introduction to alternative fuels-methanol, ethanol and bio fuel-bio diesel (preparation and applications).

UNIT - II **(12 Hours)**

Electrochemical Cells and Corrosion: Single electrode potential, Reference electrodes- construction and working of standard hydrogen electrode and calomel electrode; Batteries (Li ion battery and zinc air cells), fuel cells (H2-O2, and molten carbonate). Electrochemical sensors-potentiometric sensors and amperometric sensors with examples. Corrosion-Definition, theories of corrosion (chemical and electrochemical), Types of corrosion-galvanic corrosion, differential aeration corrosion, stress corrosion, factors influencing rate of corrosion, corrosion control (cathodic protection), Protective coatings-electroplating (Gold) and electroless plating (nickel).

UNIT - III **(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 - IV **(11 Hours)**

Nano Materials: Advanced Concepts/Materials in Engineering 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, 17 edition, 2017
2. Seshi Chawla. *Engineering Chemistry*. Dhanpat Rai, 13 edition, 2013
3. S.S. Dara. *A Textbook of Engineering Chemistry*. S Chand, 2010

REFERENCES:

1. K. Maheswaramma. *Engineering Chemistry*. Pearson, 2015
2. Fred W. Billmayer Jr. *Textbook of Polymer Science*. 3 edition
3. B. S. Murthy and P. Shankar. *Textbook of Nanoscience and Nanotechnology*. University Press
4. CNR Rao and JM Honig. *Preparation and Characterization of Materials*. Academic Press

Communicative English
B.Tech – II Semester (24IT203)

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

Prerequisites:

None

Course Objectives:

The course aims

- 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
- To enable the students to apply the conventions of academic writing in English

Course Outcomes:

After the successful completion of the course, the 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

CO	Program Outcomes(POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	-	2	2	3	2	2	-	-	-
CO2	-	-	-	-	-	-	-	2	2	3	2	2	-	-	-
CO3	-	-	-	-	-	-	-	2	2	3	2	2	-	-	-
CO4	-	-	-	-	-	-	-	2	2	3	2	2	-	-	-

UNIT - I **(7 Hours)**

Vocabulary Development: Word formation-Formation of Nouns, Verbs & Adjectives from Root words-Suffixes and Prefixes.
Essential Grammar: Prepositions, Articles.
Basic Writing Skills: Punctuation in writing.
Writing Practices: Mind Mapping, Paragraph writing (structure-Descriptive, Narrative, Expository & Persuasive)

UNIT - II **(7 Hours)**

Vocabulary Development: Synonyms and Antonyms.
Essential Grammar: Concord, Conjunctions, Common Errors: Practice
Basic Writing Skills: Coherence in Writing: Jumbled Sentences
Writing Practices: Letter writing

UNIT - III **(7 Hours)**

Vocabulary Development: One word Substitutes
Essential Grammar: Tenses, Modal Verbs, Voices
Basic Writing Skills: Using Phrases and clauses
Writing Practices: Note Making

UNIT - IV **(7 Hours)**

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

TEXT BOOKS:

1. Sanjay Kumar and Pushpa Latha. *Communication Skills*. Oxford University Press, 2011
2. Michael Swan. *Practical English Usage*. Oxford University Press, 1995
3. F.T.Wood. *Remedial English Grammar*. Macmillan, 2007
4. Liz Hamp lyons and Ben Heasley. *Study Writing*. Cambridge University Press, 2006

Programming for Problem Solving
B.Tech – II Semester (24IT204)

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

Prerequisites:

Introduction to Programming (24IT104)

Course Objectives:

The course aims

- to introduce pointers in C for memory management and manipulation, including arrays, strings, functions, and structures.
- to introduce file handling, dynamic memory allocation, and object-oriented programming concepts, including classes, inheritance, and polymorphism.
- to introduce classes and objects, including access control, member functions, and overloading in C++.
- to introduce operator overloading and various forms of inheritance in C++.

Course Outcomes:

After the successful completion of the course, the students will be able to

CO1: Effectively use pointers for advanced data handling, perform pointer arithmetic, and manipulate structures and unions in C.

CO2: Manage files, allocate memory dynamically, and apply object-oriented principles like inheritance and polymorphism in programming.

CO3: Create and manage classes and objects, implement constructors and destructors, and use function overloading and inline functions effectively.

CO4: Overload operators and use different inheritance types, including abstract, multilevel, multiple, hierarchical, and hybrid inheritance.

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

UNIT - I **(11 Hours)**

Pointers: Introduction, Definition and Uses of Pointers, Address Operator &, Pointer Variables, Dereferencing Pointers, void Pointers, Pointer Arithmetic, Pointers to Pointers, Pointers and Arrays, Passing Arrays to Functions, Pointers and Functions, Accessing Arrays Inside Functions, Pointers and Two-dimensional Arrays, Array of Pointers, Pointer Constants, Pointers and Strings, Pointers in Standard String Library Functions, Two-dimensional Array of Characters, Array of Pointers to Strings, More String Library functions, Pointers to Functions.

Structures and Unions: Introduction, Declaring and Using Structures, Structure Initialization, Structure within Structure, Operations on Structures, Array of Structures, Array within Structure, Creating User Defined Data Types, Pointers to Structures, Pointers within Structures, Structures and Functions, Unions, Differences between Structures and Unions, Operations on A union, Scope of A union, Bit Fields in Structures.

UNIT - II **(12 Hours)**

Files: Introduction, End of File, File-handling Functions, File Types, Unbuffered and Buffered Files, Error Handling.

Dynamic Memory Allocation: Introduction, Library Functions for Dynamic Memory Allocation.

Object-Oriented Paradigm: Why new Programming Paradigms?, Evolution of Programming Paradigms, Objects, Classes, Inheritance, Polymorphism, Streams based I/O, Scope Resolution Operator, Variable Definition at the Point of Use, Type Conversion.

UNIT - III **(12 Hours)**

Classes and Objects: Introduction, Class Specification, Class Objects, Accessing Class Members, Defining Member Functions, Outside member functions as inline, Accessing member functions within the Class, Data hiding, Passing objects as arguments, Returning objects from functions, Friend functions and Friend classes, Static data and member functions, Constructors, Destructors.

Overloading: Introduction, Parameters Passing by Reference, Inline Functions, Function Overloading.

UNIT - IV **(11 Hours)**

Operator Overloading: Introduction, Overloadable Operators, Unary Operator Overloading, operator Keyword, Operator return values, Binary Operator Overloading, Arithmetic Operator Overloading, Concatenation of strings, Comparison Operators, Arithmetic Assignment Operators, Overloading with friend functions, Assignment operator Overloading.

Inheritance: Introduction, Derived class declaration, forms of inheritance, inheritance and member accessibility, Constructors in derived classes, Destructors in derived classes, abstract classes, multilevel inheritance, multiple inheritance, hierarchical inheritance, hybrid inheritance, object composition-delegation.

TEXT BOOKS:

1. Byron Gottfried. *Programming with C.* McGraw-Hill, 2 edition
2. John R. Hubbard. *Programming with C++.* McGraw-Hill, 2 edition

REFERENCES:

1. E. Balaguruswamy. *Programming in ANSIC.* McGraw Hill, 5 edition

2. Yashavant P.Kanetkar. *Let us C*. BPB Publications, 14 edition
3. Kernighan BW and Dennis Ritchie M. *C programming language*. Prentice Hall, 2 edition

Discrete Mathematics

B.Tech – II Semester (24IT205)

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

Prerequisites:

None

Course Objectives:

The course aims

- to introduce operations on discrete structures such as sets, functions, and relations. Formulate short proofs using methods of proof of an implication. Verify the correctness of an argument using propositional logic and truth tables. Construct mathematical arguments using logical connectives and quantifiers.
- to enable the student to verify the correctness of an argument using rules of inference for quantified propositions. Apply algorithms and use definitions to solve problems to prove statements in elementary number theory. Understand counting and indirect counting techniques and combinatory in the context of discrete probability.
- to introduce sequences, generating functions, and recurrence relations. and enable student to compute coefficients for generating functions and solve homogeneous and inhomogeneous recurrence relations.
- to introduce the properties of binary relations, partial orderings and lattices. Construct graphs and adjacency matrices for binary relations.

Course Outcomes:

After the successful completion of the course, the students will be able to

CO1: describe the basic principles of sets, relations, functions and inference rules for validating arguments.

CO2: prove that the given statement is valid by using mathematical induction and utilize a variety of counting strategies to solve computational problems.

CO3: solve different types of recurrence relations.

CO4: describe operations and representations of a binary relation.

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

UNIT - I **(11 Hours)**

Foundations: Sets, Relations and Functions, Fundamentals of Logic, Logical Inferences, Methods of Proof of an implication, First order Logic & Other methods of proof.

UNIT - II **(12 Hours)**

Rules of Inference for Quantified propositions, Mathematical Induction.

Elementary Combinatorics: Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with repetitions, Enumerating Permutation with Constrained repetitions.

UNIT - III **(12 Hours)**

Recurrence relations: Generating functions of sequences, Calculating Coefficients of Generating Functions.

Recurrence Relations: Solving recurrence relations by substitution and generating functions, the methods of finding characteristic roots.

UNIT - IV **(11 Hours)**

Recurrence Relations: Solutions of inhomogeneous recurrence relations.

Relations: Special properties of binary relations, Operations on relation. Ordering relations, Lattice, Paths and Closures, Directed Graphs and Adjacency Matrices.

TEXT BOOKS:

1. Toe L.Mott, Abraham Kandel, and Theodore P.Baker. *Discrete Mathematics for Computer Scientists and Mathematicians*. PHI, 2 edition, 2012

REFERENCES:

1. C.L. Liu. *Elements of Discrete Mathematics*. McGraw-Hill, 2 edition
2. Rosen. *Discrete Mathematics*. McGraw-Hill, 8 edition

Engineering Graphics Lab
B.Tech – II Semester (24ITL201)

Lectures	:	1 Hours / Week	Tutorial	:	0	Practical	:	3
CIE Marks	:	40	SEE Marks	:	60	Credits	:	2.5

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- to understand the importance of engineering graphics in the field of engineering
- to improve drawing skills and to follow Bureau of Indian Standards
- to give an idea about geometric constructions and orthographic projections
- to improve imagination skills about orientation of points, surfaces and solids
- to learn drafting skills of AutoCAD

Course Outcomes:

After the successful completion of the course, the 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.

CO	Program Outcomes(POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	1	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	1	2	1	-	-	-	-	-	-	-	-	-	-	-	-

UNIT - I **(15 Hours)**

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 projection: Principles of projection, First angle and third angle projections, projections of points, projections of straight lines inclined to one plane only.

UNIT - II **(15 Hours)**

Projections of Planes: Projections of plane figures: circle, triangle, pentagon, hexagon and rhombus.

UNIT - III **(15 Hours)**

Projections of Solids: Projections of solids like square, pentagonal, hexagonal prisms and pyramids, axis inclined to one plane only.

UNIT - IV **(15 Hours)**

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

TEXT BOOKS:

1. Dhananjay M. Kulkarni. *Engineering Drawing with AutoCAD*. PHI publication, revised edition, 2018
2. N.D. Bhatt and V.M. Panchal. *Engineering Drawing (First angle projection)*. Charotar Publishing House, 43 edition, 2014

REFERENCES:

1. Dhananjay A Jolhe. *Engineering Drawing*. Tata McGraw Hill, revised edition, 2019

Engineering Chemistry Lab
B.Tech – II Semester (24ITL202)

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

Prerequisites:

None

Course Objectives:

The course aims

- To enable the students familiarize 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 successful completion of the course, the students will be able to

CO1: Determine water quality parameters such as alkalinity and hardness.

CO2: Conduct volumetric titrations to estimate the concentration of chemical substances.

CO3: Apply instrumental methods such as pH metry and conductometry for titration experiments and colorimetry for verification of Beers law.

CO4: Synthesize and characterize common organic compounds like soap, resins, and aspirin.

CO	Program Outcomes(POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	3	-	3	-	-	-	-	-	2	-	-	-
CO2	3	3	2	2	-	3	-	-	-	-	-	2	-	-	-
CO3	3	3	2	3	3	-	-	-	-	-	-	2	-	-	-
CO4	2	-	-	3	-	2	-	-	-	-	-	-	-	-	-

List of Experiments

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. K.Mukkanti. *Practical Engineering Chemistry*. B.S. Publicaitons, 2009
2. Vogel. *Inorganic Quantitative Analysis*. Longman group Ltd, 5 edition, 1979

REFERENCES:

1. R.N. Goyal and Harrmendra Goel. *Text Book of Engineering Chemistry*
2. S.S. Dara. *A Text Book on Experiments and Calculations-Engineering Chemistry*
3. Chatwal Anand. *Instrumental Methods of Chemical Analysis*. Himalaya Publications

English Communication Skills Lab
B.Tech – II Semester (24ITL203)

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

Prerequisites:

None

Course Objectives:

The course aims

- 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:

After the successful completion of the course, the 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

CO	Program Outcomes(POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	-	-	2	3	-	2	-	-	-
CO2	-	-	-	-	-	-	-	-	2	3	-	2	-	-	-
CO3	-	-	-	-	-	-	-	-	2	3	-	2	-	-	-
CO4	-	-	-	-	-	-	-	-	2	3	-	2	-	-	-

UNIT - I **(7 Hours)**

Introduction to Communication Skills- Importance-Process-Types
Barriers to Communication & Strategies for effective Communication
Listening Skills; Importance – Purpose- Process- Types
Barriers to Listening & Strategies for Effective Listening

UNIT - II **(8 Hours)**

Phonetics; Introduction to Consonant, Vowel and Diphthong sounds
Syllable & Stress
Rhythm & Intonation

UNIT - III **(8 Hours)**

Interpersonal Communication in English
Conversational Practice in English

UNIT - IV **(7 Hours)**

JAM Session
Debates

TEXT BOOKS:

1. Sanjay Kumar and Pushpa Lata. *Communication Skills*. Oxford University Press, 2011
2. J.D. O Connor. *Better English Pronunciation*. Cambridge University Press, 1984
3. Jack C Richards. *New Interchange*. Cambridge University Press, 4 edition, 2015
4. Grant Taylor. *English Conversation Practice*. McGraw Hill, 2001

REFERENCES:

1. Digital Language Lab. *iTell*. Orell
2. *Buzzers for conversations*. New Interchange series

Programming for Problem Solving Lab
B.Tech – II Semester (24ITL204)

Lectures	:	0 Hours / Week	Tutorial	:	0	Practical	:	3
CIE Marks	:	40	SEE Marks	:	60	Credits	:	1.5

Prerequisites:

Introduction to Programming (24IT104)

Course Objectives:

The course aims

- to enable students apply pointers in C for memory management and manipulation, including arrays, strings, functions, and structures.
- to introduce file handling, dynamic memory allocation, and object-oriented programming concepts, including classes, inheritance, and polymorphism.
- to introduce classes and objects, including access control, member functions, and overloading in C++.
- to introduce operator overloading and various forms of inheritance in C++.

Course Outcomes:

After the successful completion of the course, the students will be able to

CO1: Effectively use pointers for advanced data handling, perform pointer arithmetic, and manipulate structures and unions in C.

CO2: Manage files, allocate memory dynamically, and apply object-oriented principles like inheritance and polymorphism in programming.

CO3: Create and manage classes and objects, implement constructors and destructors, and use function overloading and inline functions effectively.

CO4: Overload operators and use different inheritance types, including abstract, multilevel, multiple, hierarchical, and hybrid inheritance.

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

List of Experiments

1. Write C programs for the following using pointers and functions:
   (a) Declare the array of 20 integer numbers. Find and display the average of only even numbers by using pointers.
   (b) Write a program to reverse the string using pointers.
   (c) Calculate the addition of two 4 X 4 matrices using pointers. Take the input from user.
2. A Bookshop maintains the inventory of books that are being sold at the shop. The list includes details such as author, title, price, publisher and stock position. Whenever a customer wants a book the sales person inputs the title and the author, and the system searches the list and displays whether it is available or not. If it is not, an appropriate message is displayed, if it is, then the system displays the book details and request for the number of copies required, if the requested copies are available the total cost of the requested copies is displayed otherwise the message "required copies not in stock" is displayed. Write a program for the above in structures with suitable functions.
3. Write a program in C to merge two files and write them to another file.
4. Write a C program to read a data file of students' records with fields (Regno, Name, M1, M2, M3, M4, M5) and write the successful students data (percentage > 40%) to a data file.
5. Write a C++ program with a class to represent a bank account. Include the following members:
   Data Members: 1.Name of the depositor 2.Account Number 3.Type of account 4.Balance amount in the account.
   Member functions: 1.To assign initial values 2.To deposit an amount 3.To withdraw an amount after checking the balance 4.To display name and Balance.
6. Create a class called 'TIME' that has
   - three integer data members for hours, minutes and seconds
   - constructor to initialize the object to zero
   - constructor to initialize the object to some constant value
   - member function to add two TIME objects
   - member function to display time in HH:MM:SS format Write a main function to create two TIME objects, add them and display the result in HH:MM:SS format.
7. Write a C++ program to illustrate static member functions.
8. Write a C++ program to implement function overloading in order to compute power(m,n) where i) m is double and n is int ii) m and n are int. Use a default value of 2 for n to make the function to calculate squares when this argument is omitted.
9. Create a 'STRING' class which overloads '==' operator to compare two STRING objects using a) friend function b) without using friend function.
10. Write a C++ program to overload '++' and '–' operators to convert a string to uppercase and lowercase respectively.
11. Write a C++ program on Composition.
12. Write a C++ program on Inheritance.

Probability and Statistics

(Common to all branches)

B.Tech – III Semester (24IT301)

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

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- to employ discrete and continuous probability distributions to analyze and solve real world problems in Engineering fields.
- to 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
- to apply various sample tests like F-test and χ^2-test for decision making regarding the population based on sample data.
- to 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 the successful completion of the course the students will be able to

CO1 Apply discrete and continuous probability distributions to various problems arising in Engineering applications.

CO2 Perform Test of Hypothesis for a population parameter for single sample.

CO3 Perform Test of Hypothesis for population parameters for multiple samples.

CO4 Interpret the results of correlation, regression and one way ANOVA for the given data.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	-	-	-	-	-	-	-	-	2	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	2	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	2	-	-	-
CO4	3	3	3	-	-	-	-	-	-	-	2	-	-	-

UNIT - I (11 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 - II (11 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 - III (11 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 - IV (11 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).
(Sections 10.1, 10.2, 10.3, 11.1, 11.3, 11.4, 11.6, 12.1, 12.2)

TEXT BOOKS:

1. Richard A. Johnson. *Miller and Freund's Probability and Statistics for Engineers*. PHI, 8 edition, 2011

REFERENCES:

1. R.E Walpole, R.H. Myers, and S.L. Myers. *Probability & Statistics for Engineers and Scientists*. PHI, 6 edition
2. Murray R Spiegel, John J. Schiller, and R. AluSrinivasa. *Probability & Statistics*. Schaums Outline Series

ON-LINE RESOURCES:

1. G.Srinivasan. *Probability and Statistics*. IIT Madras, 2019. URL `https://youtu.be/0t4LROuEVnw?list=PLwdnzlV3ogoXgNjr_oe5cWQIbf72ZY4Zf`

Digital Logic Design

B.Tech – III Semester (24IT302)

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

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- Apply various simplification methods to simplify the Boolean expressions
- Design and analysis of combinational circuits.
- Design and analysis of sequential circuits.
- Design various counters, registers and Programmable Logic Devices

Course Outcomes:

After the successful completion of the course the students will be able to

CO1 Explain digital number system, boolean algebra, circuit design and minimization.

CO2 Design the combinational circuits

CO3 Analyze synchronous sequential circuits

CO4 Design registers, counters and memories.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-	3	-	-

UNIT - I **(11 Hours)**

Digital Systems and Binary Numbers: Digital System, Binary Numbers, Number base Conversions, Octal and Hexadecimal Numbers, Complements of Numbers, Signed Binary Numbers, Binary Codes, Binary Storage and Registers, Binary Logic, Error Detection and Correction: 7 bit Hamming Code.
Boolean Algebra & Logic Gates: Introduction, Basic definitions, Axiomatic definition of Boolean algebra, Basic theorems and properties of Boolean algebra, Boolean functions, Canonical and Standard Forms, Other Logic Operations, Digital logic gates.
Gate-Level Minimization: Introduction, The map method, Four-variable K-Map, Product-of-Sums Simplification, Don't-Care Conditions.

UNIT - II **(11 Hours)**

Minimization: The Tabulation method, Determination of prime implicants, Selection of prime-implicants.
Combinational Logic: Introduction, Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adders - Subtractor, Decimal Adder, Magnitude Comparator, Decoders, Encoders, Multiplexers.

UNIT - III **(11 Hours)**

Synchronous Sequential Logic: Introduction, Sequential Circuits, Storage Elements - Latches, Storage Elements -Flip Flops. **Analysis of Clocked Sequential Circuits:** State Equations, State Table, State Diagram, Flip Flop Input Equations, Analysis with D, JK and T Flip Flops; State reduction and Assignment, Design Procedure.

UNIT - IV **(11 Hours)**

Registers and Counters: Registers, Ripple Counters, Synchronous Counters.
Memory and Programmable Logic: Introduction, Random Access Memory: Read and Write Operations, Types of Memories; Read Only Memory, Programmable Logic Devices: PROM, PLA, PAL.

TEXT BOOKS:

1. M. Morris Mano and Michael D. Ciletti. *Digital Design*. Prentice Hall, 5 edition, 1 2013. ISBN 978013277420

REFERENCES:

1. John F. Wakerly. *Digital Design: Principles and Practices*. Pearson, 4 edition, 2006. ISBN 9780131863897
2. Brain Holdsworth and Clive Woods. *Digital Logic Design*. Elsevier Publisher, 4 edition, 2002. ISBN 978-0080477305
3. R. H. Katz and G. Borriello. *Contemporary Logic Design*. Pearson, 2 edition, 2005. ISBN 9780201308570

ON-LINE RESOURCES:

1. S.Srinivasan. *Digital Circuits & Systems*. IIT Madras, 2007. URL `https://youtu.be/CeD2L6KbtVM?list=PL803563859BF7ED8C`

Data Structures

B.Tech – III Semester (24IT303)

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

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- To Understand the role of Data structures in structuring and analysis procedure of an algorithm.
- To Learn the concept of Stack, Queue and various Sorting techniques.
- To Understand the concept of Binary Tree, Binary Search Tree, AVL tree, Heap Data Structures.
- To Learn the concept of Hashing and Graph traversals.

Course Outcomes:

After the successful completion of the course the students will be able to

CO1 Analyze the concepts of algorithm evolution and compute their time & space complexities. To elaborate various lists along with their operations.

CO2 Solve various real time problems using stack and queue data structures. Develop algorithms and programs for various sorting techniques.

CO3 Analyze the concepts of trees, binary trees , AVL trees and priority queues.

CO4 Analyze various hashing techniques and Graph traversals.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	3	-	-	-	-	-	-	-	-	3	3	-
CO2	3	3	3	-	-	-	-	-	-	-	-	3	3	-
CO3	3	3	3	-	-	-	-	-	-	-	-	3	3	-
CO4	3	3	3	-	-	-	-	-	-	-	-	3	3	-

UNIT - I **(11 Hours)**

Introduction: Algorithm, Importance of Algorithm Analysis, Complexity of an Algorithm, Asymptotic Analysis and Notations. Data Structure, Classification of Data Structures.
Lists: Abstract Data Types, The List ADT, Singly Linked List ADT, Doubly Linked List ADT, Circular Linked List ADT, Polynomial ADT: addition, multiplication operations.

UNIT - II **(11 Hours)**

Stacks and Queues: The Stack ADT and its applications such as Infix to Postfix expression conversions, Evaluation of Postfix expressions. The Queue ADT, Queue Application-Radix sort.
Basic Sorting Techniques: Bubble sort, Selection sort, Insertion sort, Shell sort.

UNIT - III **(11 Hours)**

Trees: Preliminaries, Binary Trees, The Search Tree ADT, Binary Search Trees, Implementations, AVL Trees-Single Rotations, Double rotations, Implementations.
Priority Queues (Heaps): Model, Simple implementations, Binary Heap, Heap Sort.

UNIT - IV **(11 Hours)**

Graphs: Prelimineries and Representation of graphs, Graph traversals:BFS and DFS.
Hashing: General Idea, Hash Function, Separate Chaining, Open Addressing.

TEXT BOOKS:

1. Mark Allen Weiss. *Data Structures and Algorithm Analysis in C*. Pearson Education, 2 edition, 2013. ISBN 978-81-7758-358-8

REFERENCES:

1. Y.Langsam, M.J.Augeustein, and A.M.Tenenbaum. *Data Structures Using C*. Pearson Education Asia, 2 edition, 2006. ISBN 81-203-1177-9
2. Behrouz A. Forouzan Richard F.Gilberg. *Data Structures – A Pseudocode Approach with C*. ThomsonBrooks / COLE, 2 edition, 1998. ISBN 978-0-534-39080-8
3. J.E. Hopcroft Alfred Aho and J.D. Ullman. *Data Structures and Algorithms*. Pearson Education Asia, 1 edition, 1983. ISBN 978-0201000238

ON-LINE RESOURCES:

1. Dr.Naveen Garg. *Introduction to Data Structures and Algorithms*. IIT Delhi, 2008. URL `https://youtu.be/zWg7U0OEAoE?list=PLBF3763AF2E1C572F`

Object Oriented Programming
B.Tech – III Semester (24IT304)

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

Prerequisites:

None

Course Objectives:

- To understand the fundamentals of Object-Oriented Programming (OOP) and its advantages over Procedural-Oriented Programming, including concepts such as variables, operators, control statements, arrays, classes, and objects.
- To explore and implement key OOP features, including inheritance, exception handling, interfaces, packages, and string manipulation using String and StringBuffer.
- To develop programs using advanced Java concepts, such as collections, multithreading, and input/output operations.
- To design and implement graphical user interface (GUI) applications using JavaFX.

Course Outcomes:

After the successful completion of the course the students will be able to

CO1 Apply object-oriented programming (OOP) principles and demonstrate their advantages over structured programming approaches.

CO2 Design and implement programs using inheritance and polymorphism to promote code reusability and flexibility.

CO3 Analyze and develop solutions using exception handling, multithreading, and input/output operations for robust and efficient applications.

CO4 Create interactive applications using event handling mechanisms and JavaFX for enhanced user interface design.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	3	-	-	-	-	-	-	-	-	3	3	2
CO2	3	2	3	-	-	-	-	-	-	-	-	3	3	2
CO3	3	2	3	-	-	-	-	-	-	-	-	3	3	2
CO4	3	2	3	-	2	-	-	-	-	-	-	3	3	2

UNIT - I (11 Hours)

Introduction to Java: History, Java Byte Code, Java Buzzwords. Data Types, Variables and Arrays. Operators, Control Statements. Introducing Classes, A Closer Look at Methods and Classes.

UNIT - II (11 Hours)

Inheritance
Exception Handling
Packages and Interfaces
Strings: String Constructors, Any 10 String class methods, StringBuffer class, Any 10 StringBuffer class methods.

UNIT - III (11 Hours)

Type Wrappers, Autoboxing/Unboxing.
Collections: Collections Overview, Names of Collection Interfaces, Collection Classes: LinkedList, Array List.
Multithreaded Programming: Introduction, Life Cycle, Thread creation – Thread Class, Runnable Interface, Thread Priority, Synchronization, Inter thread Communication.
I/O: I/O Basics, Reading Console Input, Writing Console Output, The Print Writer class, Reading and Writing Files, Automatically Closing a File.

UNIT - IV (11 Hours)

Introducing JavaFX GUI Programming: JavaFX Basic Concepts, A JavaFX Application Skeleton, Compiling and Running a JavaFX Program, The Application Thread, A Simple JavaFX Control: Label, Using Buttons and Events, Drawing Directly on a Canvas.
Exploring JavaFX Controls: Using Image and ImageView, ToggleButton, RadioButton, CheckBox, ListView, ComboBox, TextField, ScrollPane, TreeView.
Introducing JavaFX Menus: Menu Basics, An Overview of MenuBar, Menu, and MenuItem, MenuBar, Menu, MenuItem, Create a Main Menu, Add Mnemonics and Accelerators to Menu Items, Add Images to Menu Items, Use RadioMenuItem and CheckMenuItem, Create a Context Menu, Create a Toolbar, Put the Entire MenuDemo Program Together, Continuing Your Exploration of JavaFX.

TEXT BOOKS:

1. Herbert Schildt and Danny Coward. *Java The Complete Reference*. Mc Graw Hill, 13 edition, 2024. ISBN 9781265062705

REFERENCES:

1. Cay Horstmann. *Big Java: Early Objects*. Wiley, 7 edition, 2020. ISBN 978-1119740209
2. H.M.Dietel and P.J.Dietel. *Java How to Program (Early Objects)*. Pearson Education, 11 edition, 2018. ISBN 978-0134743356

ON-LINE RESOURCES:

1. Debasis Samanta. *Object Oriented Programming With Java*. IIT Kharagpur, 2019. URL `https://youtu.be/OjdT2l-EZJA?list=PLfn3cNtmZdPOe3R_wO_h540QNfMkCQOho`

Computer Networks

B.Tech – IV Semester (24IT305)

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

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- Understand the basic concepts of data communication, layered model, protocols and OSI & TCP layers
- Understand the basic concepts of Data Link control, Network Layer Design Issues, Routing Algorithms & Congestion.
- Understand the basic concepts of Quality of service, Network Layer & Transport Layer
- Understand the basic concepts of TCP, UDP & Application Layer

Course Outcomes:

After the successful completion of the course the students will be able to

CO1 Describe the fundamentals of networks, network reference models and various error correction and detection techniques

CO2 Explain error control, flow control mechanisms used at data link layer and various routing and congestion control protocols in network design

CO3 Demonstrate the basic principles of IPV4 and its addressing mechanisms, elements of transport protocols in transport layer

CO4 Discuss the underlying protocols in transport layer and application layer.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	1	2	2	-	1	-	1	-	2	3	-	1	2	1
CO2	1	-	2	-	1	1	-	1	-	-	1	1	1	2
CO3	-	-	2	1	1	-	-	-	1	1	1	1	2	1
CO4	1	2	2	2	1	-	-	-	1	1	-	1	2	1

UNIT - I (11 Hours)

Data Communications & Networking Overview: A Communications Model, Data Communications, Data Communication Networking.

Protocol Architecture: The Need for a Protocol Architecture, A Simple Protocol Architecture, OSI, The TCP/IP Protocol Architecture.

Digital Data Communication Techniques: Asynchronous & Synchronous Transmission, Types of Errors, Error Detection, Error Correction.

UNIT - II (11 Hours)

Data Link Control: Flow Control, Error Control, HDLC

Network Layer: Network Layer Design Issues, Store-and-Forward Packet Switching, Services Provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection-Oriented Service, Comparison of Virtual-Circuit & Datagram Subnets.

Routing Algorithms: The Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing.

Congestion Control Algorithms: General Principles of Congestion Control, Congestion Prevention Policies, Congestion Control in Virtual-Circuit Subnets, Congestion Control in Datagram Subnets, Load Shedding, Jitter Control.

UNIT - III (11 Hours)

Quality of Service: Requirements, Techniques for Achieving Good Quality of Service

The Network Layer in the Internet: The IP Protocol, IP Addresses, Internet Control Protocols.

The Transport Layer, Transport Service: Services Provided to the Upper Layers, Transport Service Primitives.

Elements of Transport Protocols: Addressing, Connection Establishment, Connection Release.

UNIT - IV (11 Hours)

The Internet Transport Protocol (UDP): Introduction to UDP, Remote Procedure Call, The Real-Time Transport Protocol.

The Internet Transport Protocol (TCP): Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, Modeling TCP Connection Management, TCP Transmission Policy, TCP Congestion Control, TCP Timer Management.

Application Layer: The Domain Name System(DNS): The DNS Name Space, Resource Records, Name Servers.

TEXT BOOKS:

1. Behrouz A Forouzan. *Data Communications and Networking*. TMH, 4 edition
2. Tanenbaum. *Computer Networks*. Pearson, 5 edition, 2011

REFERENCES:

1. Wayne Tomasi. *Introduction to Data Communications and Networking*. PHI
2. GodBole. *Data Communications and Networking*. TMH
3. Kurose and Ross. *Computer Networks a Topdown Approach Featuring The Internet*. Pearson
4. Leon Gartia and Indra Widjaja. *Communication Networks Fundamental Concepts and Key Architectures*. TMH
5. Nader F. Mir. *Computer and Communication Networks*. PHI

ON-LINE RESOURCES:

1. Soumya Kanti Ghosh and Sandip Chakraborty. *Computer Networks and Internet Protocol*. IIT Kharagpur, 2018. URL `https://youtu.be/0--rkQNKqls?list=PLEAYkSg4uSQ2NMmzNNsEK5RVbhxqx0BZF`

Python Programming

B.Tech – IV Semester (24ITL301/SEC1)

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

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- to identify the syntax and semantics of Python
- to write python scripts for solving real time problems
- to enhance the object oriented programming skills of the students
- to perform file i/o operations in python

Course Outcomes:

After the successful completion of the course the students will be able to

CO1 Use the basic python constructs for problem solving

CO2 Apply lists, dictionaries and tuples to organize the data in real world problems

CO3 Apply lists, dictionaries, tuples and file operations to organize the data in real world problems

CO4 Implement the problems in terms of real world objects using object oriented and database concepts

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	3	-	-	-	2	-	2	-	3	3	3	3
CO2	3	3	3	-	-	-	2	-	2	-	3	3	3	3
CO3	3	3	3	-	-	-	2	-	2	-	3	3	3	3
CO4	3	3	3	-	-	-	2	-	2	-	3	3	3	3

UNIT - I **(11 Hours)**

Introduction to Python: Syntax, Operators, Control Structures, Functions: lambda, reduce, filter and map functions.

Strings: Operators overloaded for String objects, String comparison, String methods, Parsing strings.

Regular expressions: Character matching in regular expressions, extracting data using regular expressions, combining search and extraction, escape character.

UNIT - II **(11 Hours)**

Lists: Characteristics of List objects, Operators overloaded for List objects, List comprehension, Methods of List objects.

Dictionaries: Characteristics of Dictionary objects, Operators overloaded for Dictionary objects, List comprehension, Methods of Dictionary objects.

Tuples: Characteristics of Tuple objects, Operators overloaded for Tuple objects, Methods of Tuple objects.

UNIT - III **(11 Hours)**

Object-Oriented Programming: Classes and Objects, Classes and Functions, Classes and Methods, Inheritance.

UNIT - IV **(11 Hours)**

Files I/O: persistence, opening files, text files and lines, reading files, searching through a file, letting the user choose the file name, using try except and open, writing files.

LIST OF EXPERIMENTS

1. Operators, Control structures:
   (a) Write a Python program to input two numbers and display their sum, difference, product, and quotient of division. (Covers variables, expressions, operators, input/output).
   (b) Write a Python program to check if a number is positive, negative, or zero. (Covers if, elif, else).
   (c) Write a Python program to find the largest of three numbers using nested if. (Covers nested conditionals).
   (d) Write a Python program to print the Fibonacci sequence up to n terms using a loop. (Covers loops, updating variables).
   (e) Write a Python program to find the factorial of a number using a while loop. (Covers while loop and loop control).
2. Functions:
   (a) Write a Python program to define a function that checks whether a number is prime. (Covers user-defined functions, return values).
   (b) Write a Python program using built-in functions like len(), type(), int() and random.randint() to demonstrate their usage. (Covers built-in and standard library functions).
   (c) Write a Python single line script to create a list of squares of even numbers in a range of numbers using comprehension.
   Sample Input: [1, 2, 3, 4, 5, 6]
   Expected Output: [4, 16, 36]

(d) Write a Python Program to create a lambda function to add two numbers.

(e) Write a Python single line script to filter odd numbers from a list using lambda and filter functions.
Sample Input: [1, 2, 3, 4, 5, 6]
Expected Output: [1, 3, 5]

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

3. Strings:

(a) Write a Python program to count the number of vowels, consonants, digits, and special characters in a string. (Covers string traversal, conditions, in operator).

(b) Write a Python program to extract the domain name from an email address. (Covers slicing, find(), string methods)

(c) Write a python single line script to convert a list of numbers to strings and join them with any special character.
Sample Input: [1, 2, 3, 4, 5, 6]
Expected Output1: 1+2+3+4+5+6
Expected Output2: “1” “2” “3” “4” “5” “6”
Expected Output3: 123456
Expected Output4: 1-2-3-4-5-6
Expected Output5: 1^2 ^3 ^4 ^5 ^6

4. Lists:

(a) Write a Python program to remove duplicates from a list and sort it. (Covers list methods and operations).

(b) Write a Python program to split a list every Nth element.
Sample Input: list1 = [’a’, ’b’, ’c’, ’d’, ’e’, ’f’, ’g’, ’h’, ’i’, ’j’, ’k’, ’l’, ’m’, ’n’]
Expected Output: output_list = [[’a’, ’d’, ’g’, ’j’, ’m’], [’b’, ’e’, ’h’, ’k’, ’n’], [’c’, ’f’, ’i’, ’l’]]

(c) Write a Python program to compute the similarity between two lists.
Sample Input: Colors1 = [“red”, “orange”, “green”, “blue”, “white”] Colors2 = [“black”, “yellow”, “green”, “blue”]

Expected Output: Colors1-Colors2 = [’white’, ’orange’, ’red’] Colors2-Colors1 = [’black’, ’yellow’]

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

(e) Write a Python program to join the list elements using join function.
Sample Input: [’Department’, ’of’, ’Information’, ’Technology’]
Expected Output1: DepartmentofInformationTechnology
Expected Output2: Department of Information Technology
Expected Output3: Department-of-Information-Technology
Expected Output4: Department@-of@-Information@-Technology
Expected Output5: Department+of+Information+Technology

(f) Write a Python single line script to double the list values using map and anonymous function.
Sample Input: [1, 2, 3, 4, 5, 6]
Expected Output: [2, 4, 6, 8, 10, 12]

(g) Write a Python single line program to get the transpose of a 2D matrix using nested list comprehension.
Sample Input: matrix = [[1, 2, 3], [4, 5, 6]]
Expected Output: [[1, 4], [2, 5], [3, 6]]

(h) Write a Python single line script to assign grades based on marks using conditional logic in list. Where student_grade = 'A' if student_marks >= 90, student_grade = 'B' if student_marks >= 75, student_grade = 'C' if student_marks >= 50, else student_grade = 'F'.
Sample Input: student_marks = [95, 67, 80, 45, 76]
Sample Output: student_grades = ['A', 'C', 'B', 'F', 'B']

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

- Given a list of numbers, return the list of squares
  Sample Input: numbers = [1, 2, 3, 4, 5]
  Sample Output: squares = [1, 4, 9, 16, 25]
- Convert a list of string numbers to actual integers
  Sample Input: string_numbers = ['1', '2', '3', '4', '5']

(j) Write a Python single line script to flatten a nested list of two dimension into a single dimension list using list comprehension.
Sample Input: nested_list = [[1, 2], [3, 4], [5, 6], [7], [8, 9, 10]]
Sample Output: flat_list = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

5. Dictionaries:

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

(b) Write a Python program to combine two dictionaries by adding values for common keys.
Sample Input: dict1 = 'a': 100, 'b': 200, 'c':300, dict2 = 'a': 300, 'b': 200, 'd':400
Sample output: Combined_dict = 'a': 400, 'b': 400, 'd': 400, 'c': 300

(c) Write a Python single line program to sort a dictionary by values using lambda function.
Sample Input: 'S1': 88, 'Stu2': 72, 'Stu3': 91, 'S4': 90, 'S5': 79
Expected Output: 'Stu2': 72, 'S5': 79, 'S1': 88, 'S4': 90, 'Stu3': 91

(d) Write a Python single line script to join dictionary keys into a single special character separated string using join function.
Sample Input: 'name': 'John', 'age': 20, 'grade': 'A'
Sample Output: name, age, grade

6. Tuples:

(a) Write a Python program to replace last value of tuples in a list.
Sample Input: list1 = [(10, 20, 40), (40, 50, 60), (70, 80, 90)]
Expected Output: new_list = [(10, 20, 100), (40, 50, 100), (70, 80, 100)]

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

(c) Write a Python single line script to sort a list of tuples using lambda on the second element of the tuple.
Sample Input: [('apple', 3), ('banana', 1), ('cherry', 2)]
Sample Output: Sorted Tuples: [('banana', 1), ('cherry', 2), ('apple', 3)]

7. Object-Oriented Programming:

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

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

8. Files I/O:

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

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

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

TEXT BOOKS

1. Dave Kuhlman. *A Python Book: Beginning Python, Advanced Python and Python Exercises*. Wiley. doi: https://www.davekuhlman.org/python_book_01.html

2. Wes Mc Kinney. *Python for Data Analysis*. Oreilly

REFERENCES

1. Joel Grus. *Python Data Science Handbook-Essential Tools for Working with Data Science from Scratch*. Orelly

Design Thinking & Innovation

B.Tech – III Semester (24ITL302)

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

Prerequisites:

None

Course Objectives:

- Provide an overview of design thinking.
- Engage students to allow them to the components of design thinking 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:

After the successful completion of the course the 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 POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	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 - I **(11 Hours)**

Introduction to Design Thinking: Characteristics of design thinking, Expert and novice design characteristics, Opportunities for student to learn skills needed for the development of expertise.

Case study for design thinking success: Creating a culture of design learning, Gathering information from users, Rapid prototyping.

UNIT - II **(11 Hours)**

Users and community partners: Understanding users, identifying users, creating tools for understanding users.

Requirements and specifications: Defining specifications, State of the art comparisons, Testing requirements.

UNIT - III **(11 Hours)**

Prototyping: Prototypes for technology, Prototypes for communication Ideation and concept generation: Brainstorming, Concept generation, Functional decomposition.

Testing and design to prevent failures: Testing of designs, Design for Failure Modes and Effects Analysis (DFMEA), Delivery to users.

UNIT - IV **(11 Hours)**

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. Idris Mootee. *Design Thinking for Strategic Innovation*. John Wiley & Sons, 2013. ISBN 9781118620120
2. Tim Brown. *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation*. Harper Business, 2009. ISBN 9780061766084

3. *Design Thinking: The Guide Book*. The Royal Civil Service Commission, b
4. George E Dieter. *Engineering Design*

REFERENCES:

1. Vijay Kumar. *101 Design Methods: A Structured Approach for Driving Innovation in Your Organization*. Wiley, 2012. ISBN 9781118083468
2. IDEO. *The Field Guide to Human Centered Design*. IDEO, 1 edition, 2015. ISBN 9780991406319

ON-LINE RESOURCES:

1. a. URL `https://www.interaction-design.org`

Data Structures Lab
B.Tech – III Semester (24ITL303)

Lectures	:	0 Hours / Week	Tutorial	:	0	Practical	:	3
CIE Marks	:	40	SEE Marks	:	60	Credits	:	1.5

Prerequisites:

None

Course Outcomes:

After the successful completion of the course the students will be able to

CO1 Solve computational problems using the Linked List Abstract Data Type

CO2 Solve computational problems using the Stack and Queue ADTs.

CO3 Solve computational problems using the Binary Search Trees and AVL Tree ADTs.

CO4 Implement various Hashing techniques and Graph Traversal Methods(BFS & DFS).

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	3	-	3	-	2	-	2	-	3	3	3	3
CO2	3	3	3	-	3	-	2	-	2	-	3	3	3	3
CO3	3	3	3	-	3	-	2	-	2	-	3	3	3	3
CO4	3	3	3	-	3	-	2	-	2	-	3	3	3	3

List of Experiments

1. Write a program to perform the following operations on an ArrayList.
   (a) Creation
   (b) Insertion
   (c) Deletion
   (d) Search
   (e) Display
2. Write a program to perform the following operations on a Singly Linked List.

(a) Creation
(b) Insertion
(c) Deletion
(d) Search
(e) Display

3. Write a program to perform the following operations on a Circular Single Linked List.

(a) Creation
(b) Insertion
(c) Deletion
(d) Search
(e) Display

4. Write a program to perform addition and multiplication of two polynomials using a Single Linked List.
5. Write a program to implement stack operations using a linked list.
6. Write a program to convert a given infix expression to postfix notation and then evaluate the resulting postfix expression using a stack.
7. Write a program to implement queue operations using a linked list.
8. Write a program that performs Radix sort on a given set of elements using a queue.
9. Write a program to sort the array elements using the following techniques.

(a) Bubble Sort
(b) Selection Sort
(c) Insertion Sort
(d) Shell Sort

10. Write a program to perform Binary Search tree operations.

(a) Creation
(b) Insertion
(c) Deletion
(d) Search
(e) Traversals

11. Write a program to implement an AVL tree that interactively allows

(a) Insertion
(b) Find_min
(c) Find_max

12. Write a program to sort the array elements using Heap Sort.
13. Write a program to perform the following hashing techniques.
    (a) Linear Probing
    (b) Quadratic Probing
14. Write a program to implement the following graph traversal methods.
    (a) DFS
    (b) BFS.

TEXT BOOKS:

1. Mark Allen Weiss. *Data Structures and Algorithm Analysis in C*. Pearson Education, 2 edition, 2013. ISBN 978-81-7758-358-8

REFERENCES:

1. Y.Langsam, M.J.Augeustein, and A.M.Tenenbaum. *Data Structures Using C*. Pearson Education Asia, 2 edition, 2006. ISBN 81-203-1177-9
2. Behrouz A. Forouzan Richard F.Gilberg. *Data Structures – A Pseudocode Approach with C*. ThomsonBrooks / COLE, 2 edition, 1998. ISBN 978-0-534-39080-8
3. J.E. Hopcroft Alfred Aho and J.D. Ullman. *Data Structures and Algorithms*. Pearson Education Asia, 1 edition, 1983. ISBN 978-0201000238

ON-LINE RESOURCES:

1. Dr.Naveen Garg. *Introduction to Data Structures and Algorithms*. IIT Delhi, 2008. URL `https://youtu.be/zWg7U0OEAoE?list=PLBF3763AF2E1C572F`

Object Oriented Programming Lab
B.Tech – III Semester (24ITL304)

Lectures	:	0 Hours / Week	Tutorial	:	0	Practical	:	3
CIE Marks	:	40	SEE Marks	:	60	Credits	:	1.5

Prerequisites:

None

Course Objectives:

- To understand the fundamentals of Object-Oriented Programming (OOP) and its advantages over Procedural-Oriented Programming, including concepts such as variables, operators, control statements, arrays, classes, and objects.
- To explore and implement key OOP features, including inheritance, exception handling, interfaces, packages, and string manipulation using String and StringBuffer.
- To develop programs using advanced Java concepts, such as collections, multithreading, and input/output operations.
- To design and implement graphical user interface (GUI) applications using JavaFX.

Course Outcomes:

After the successful completion of the course the students will be able to

CO1 Apply object-oriented programming (OOP) principles and demonstrate their advantages over structured programming approaches.

CO2 Design and implement programs using inheritance and polymorphism to promote code reusability and flexibility.

CO3 Analyze and develop solutions using exception handling, multithreading, and input/output operations for robust and efficient applications.

CO4 Create interactive applications using event handling mechanisms and JavaFX for enhanced user interface design.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	3	-	-	-	-	-	-	-	-	3	3	2
CO2	3	2	3	-	-	-	-	-	-	-	-	3	3	2
CO3	3	2	3	-	-	-	-	-	-	-	-	3	3	2
CO4	3	2	3	-	2	-	-	-	-	-	-	3	3	2

List of Experiments

1. Write a Java program to declare, initialize and access the elements of single-dimensional Arrays and multi-dimensional Arrays. Display the array elements using loops.
2. Develop a Java program to demonstrate the use of static variables, static methods, and static blocks.
3. Create a Java program that demonstrates method overloading (Compile-time Polymorphism) and method overriding (Runtime Polymorphism) using inheritance.
4. Write a Java program to illustrate the concept of multiple inheritance through the implementation of multiple interfaces.
5. Develop a Java program that demonstrates the use of all exception handling keywords: try, catch, throw, throws, and finally.
6. Write a Java program to create and handle one or more user-defined exceptions with meaningful messages.
7. Design a Java program to demonstrate the creation and use of packages. Include at least two classes from different packages.
8. Implement a Java program to demonstrate inter-thread communication using wait(), notify(), and notifyAll() methods.
9. Write a Java program to copy the contents of one file to another using FileInputStream and FileOutputStream. Demonstrate the use of try-with-resources for automatic resource management.
10. Design a JavaFX application that enables users to draw directly on a Canvas using mouse events.
11. Create a JavaFX application to demonstrate handling action events with appropriate UI components.
12. Develop a JavaFX application to demonstrate the usage of list-based controls with event handling.
13. Design a JavaFX application that demonstrates the creation and use of menus with event handling.

NSS/NCC/Scouts & Guides/Community Service

(Common to all branches)

B.Tech – III Semester (24ITL305)

Lectures	:	0 Hours / Week	Tutorial	:	0	Practical	:	1
CIE Marks	:	0	SEE Marks	:	100	Credits	:	0.5

Prerequisites:

None

Course Objectives:

The objectives of this course are

- to impart discipline, character, fraternity, teamwork, social consciousness among the students.
- to engage the students in selfless service

Course Outcomes:

After the successful completion of the course the students will be able to

CO1 develop 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 extend their help through leadership skills and civic responsibilities to the fellow beings and downtrodden people.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	-	-	-	-	-	-	-	-	-	2	3	-	-	-
CO2	-	-	-	-	-	-	-	-	-	2	3	-	-	-
CO3	-	-	-	-	-	-	-	-	-	2	3	-	-	-
CO4	-	-	-	-	-	-	-	-	-	2	3	-	-	-

UNIT - I **(4 Hours)**

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities and career guidance.

Activities:

1. Conducting -ice breaking sessions-expectations from the course-knowing personal talents and skills
2. Conducting orientations programs for the students -future plans-activities-releasing road map etc.
3. Displaying success stories-motivational biopics-award winning movies on societal issues etc.
4. Conducting talent show in singing patriotic songs-paintings-any other contribution.

UNIT - II **(5 Hours)**

Nature & Care

Activities:

1. Best out of waste competition.
2. Poster and signs making competition to spread environmental awareness.
3. Recycling and environmental pollution article writing competition.
4. Organising Zero-waste day.
5. Digital Environmental awareness activity via various social media platforms.
6. Virtual demonstration of different eco-friendly approaches for sustainable living.
7. Write a summary on any book related to environmental issues.

UNIT - III **(5 Hours)**

Community Service

Activities:

1. 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.
2. Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS.
3. Conducting consumer Awareness. Explaining various legal provisions etc.
4. 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 and Surajit Majumder. *A Text Book of National Service Scheme, Vol. I.* Vidya Kutir Publication, 2021. ISBN 978-81-952368-8-6

Environmental Science

(Common to all branches)

B.Tech – III Semester (24IT306/MC01)

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

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- understand and learn about ecosystem and biodiversity existing in nature.
- know about the natural resources and sustainability
- understand different types of pollutions present in Environment
- know the global environmental problems with case studies

Course Outcomes:

After the successful completion of the course the students will be able to

CO1 develop a strong understanding of ecosystems, biodiversity and the importance of their conservation

CO2 gain an understanding of the protection of natural resources for environmental protection and sustainability.

CO3 describe 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 POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	-	-	-	3	3	-	-	-	-	-	-	-
CO2	3	2	-	-	-	3	3	2	-	-	-	-	-	-
CO3	3	2	-	-	-	3	3	2	-	3	-	-	-	-
CO4	3	2	-	-	-	3	3	-	-	-	-	-	-	-

UNIT - I (7 Hours)

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 (7 Hours)

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 (7 Hours)

Pollution: Definition; Causes, effects and control of air, water pollution.
Solid Waste Management: 3R approach, composting and vermicomposting.
Environmental acts: Water and air (Prevention and Control of pollution) acts, Environmental protection act, Forest Conservation act.

UNIT - IV (7 Hours)

Environmental issues: Global warming, Ozone layer depletion, Acid rains.
Case Studies: Bhopal Tragedy, Mathura Refinery and TajMahal.

TEXT BOOKS:

1. Benny Joseph. *Environmental Science and Engineering*. Tata McGraw-Hill
2. Anjaneyulu Y. *Introduction to Environmental Science*. B S Publications
3. JP Sharma. *Comprehensive Environmental Studies*. Laxmi Publications

REFERENCES:

1. R.Rajagopalan. *Environmental Studies*. Oxford University Press
2. Jr. G. Tyler Miller. *Environmental Science*. Thomson Series, 11 edition
3. Erach Bharucha. *Text Book of environmental Studies*

Computer Organization

B.Tech – IV Semester (24IT401)

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

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- Represent the data, micro-operations, and hardware implementation of arithmetic, logic and shift unit.
- Know about the instruction codes and generation of control signals using hardwired and micro-programmed approaches.
- Learn about the different types of instructions and arithmetic operations.
- Understand the organization of the memory and I/O units.

Course Outcomes:

After the successful completion of the course the students will be able to

CO1 Describe the basic structure of computer and analyze the concepts of machine instructions.

CO2 Illustrate the various arithmetic operation and learn about basic processing time.

CO3 Draw flowcharts for the arithmetic operations, using the basic computer instruction set.

CO4 Describe the I/O and memory organizations.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-	3	-	-

UNIT - I **(11 Hours)**

Computer Data Representation: Introduction to Computer Organization, Data Types, Complements, Fixed-Point Representation, Floating-Point Representation.

Register Transfer Language and Micro-operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro Operations, Logic micro operations, Shift Micro Operations, Arithmetic Logic Shift Unit.

UNIT - II **(11 Hours)**

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt, Design of Accumulator Logic.

Micro Programmed Control: Control Memory, Address Sequencing, Microprogram Example, Design of Control Unit.

UNIT - III **(11 Hours)**

Central Processing Unit: General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer vs Complex Instruction Set Computers.

Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms, Division Algorithms.

UNIT - IV **(11 Hours)**

The Memory System: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory.

Input-Output Organization: Peripheral Devices, Input-Output Interface, Modes of Transfer, Priority Interrupt, Direct Memory Access.

TEXT BOOKS:

1. M. Morris Mano. *Computer System Architecture*. Pearson/PHI, 3 edition, 5 2004. ISBN 978-9332585607

REFERENCES:

1. Carl Hamcher, ZvonksVranesic, and SafeaZaky. *Computer Organization*. McGraw Hill, 5 edition
2. William Stallings. *Computer Organization and Architecture*. Pearson/PHI, 6 edition

ON-LINE RESOURCES:

1. S.Raman. *Computer Organization*. IIT Madras, 2008. URL `https://youtu.be/leWKvuZVUE8?list=PL1A5A6AE8AFC187B7`

Operating Systems

B.Tech – IV Semester (24IT402)

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

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- Learn the mechanism of OS to handle Processes & Threads and their communication.
- Learn the algorithms involved in CPU scheduling.
- Gain knowledge on concepts that includes Dead locks and Main Memory
- Know the concepts related to Virtual Memory, File Access Methods & Mass Storage structure.

Course Outcomes:

After the successful completion of the course the students will be able to

CO1 Analyze the structure of OS and basic architectural components involved in OS design.

CO2 Develop various process scheduling algorithms for a given specification of CPU utilization, throughput, TAT, WT & RT.

CO3 Articulate the causes and effects of deadlocks and comprehend memory management concepts.

CO4 Comprehend virtual memory management, Design and implement various file allocation methods and Disk Scheduling Algorithms.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-	3	-	-

UNIT - I **(11 Hours)**

Introduction: What OSs Do, Computer System Organizations and Operations.
Operating System Structures: OS Services, User and Operating System Interface, System Calls, Types of System Calls, Linkers and Loaders, OS Structures.
Processes: Process Concept, Process Scheduling, Operations on Processes.
Inter-process Communication: IPC in Shared Memory, IPC in Message Passing. **Threads & Concurrency:** Overview, Multicore Programming, Multithreading Models

(Sections: 1.1,1.2,1.4,2.1,2.2,2.3,2.5,2.8.1 to 2.8.4,3.1,3.2,3.3,3.4,3.5,3.6,4.1,4.2,4.3)

UNIT - II **(11 Hours)**

CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms.
Synchronization Tools: Background, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores.
Synchronization Examples: Classic Synchronization Problems.

(Sections:5.1,5.2,5.3,6.1,6.2,6.3,6.4,6.5,6.6,6.7,7.1)

UNIT - III **(11 Hours)**

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Avoidance, Detection and Recovery.
Main Memory: Background, Contiguous Memory Allocation, Non-Contiguous Memory Allocation: Paging, Hierarchical Paging.
Virtual-Memory: Background, Demand Paging, Page Replacement, Thrashing.

(Sections:8.1,8.3,8.4,8.5,8.6,8.7,8.8,9.1,9.2,9.3,9.4.1,10.1,10.2,10.4.1 to 10.4.4,10.6)

UNIT - IV **(11 Hours)**

Mass Storage Structure: Overview of Disk Structure, Disk Scheduling, Disk Storage Management, RAID Levels
File System Interface: File Concept, Access Methods, Directory Structure.
File System Implementation: Allocation Methods
Protection: Goals of Protection, Principles of Protection, Domain of Protection- Domain Structure, Access Matrix.

(Sections:11.1.1,11.2,11.5,11.8.1 to 11.8.3,13.1,13.2,13.3,14.4,17.1,17.2,17.4,17.5)

TEXT BOOKS:

1. Greg Gagne Avil Silberschatz, Peter Baer Galvin. *Operating system Concepts*. John Wiley and Sons, 10 edition, 2018. ISBN 9781118063330

REFERENCES:

1. William Stallings. *Operating System : Internals and Design Principles*. Pearson, 9 edition, 2018. ISBN 9789352866717

2. Charles Crowley. *Operating Systems: A Design-Oriented Approach*. Tata McGraw Hill, 2019. ISBN 9780074635513

ON-LINE RESOURCES:

1. Chester Rebeiro. *Introduction to Operating Systems*. IIT Madras, 2016. URL `https://youtu.be/jciGIvn7UfM?list=PLyqSpQzTE6M9SYI5RqwFYtFYab94gJpWk`

Frontend Web Technologies

B.Tech – IV Semester (24IT403)

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

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- To acquire skills for creating standards-compliant web pages using semantic elements of HTML5.
- To apply CSS3 and DHTML features for creating dynamic and interactive web pages.
- To use JavaScript Objects, DOM and ES6 features.
- To acquire the knowledge of React.js front-end framework basics.

Course Outcomes:

After the successful completion of the course the students will be able to

CO1 To develop basic HTML5 web applications using standard and semantic elements, formatting, Arranging Text, Multimedia and Forms.

CO2 To apply CSS3 styling concepts and basic JavaScript Functions, arrays and Events to create dynamic and interactive web pages.

CO3 To Build dynamic web pages using JavaScript Objects, DOM, and ES6 features.

CO4 To develop React applications using Props, State, handling Events, Forms and React Router.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	3	1	2	1	-	-	-	-	-	3	2	-
CO2	3	3	3	2	3	1	-	-	-	-	-	3	3	-
CO3	3	3	3	2	3	1	-	-	-	-	-	3	3	-
CO4	2	2	2	2	3	2	-	-	-	-	-	3	3	-

UNIT - I **(11 Hours)**

HTML 5: Fundamentals of HTML.
Formatting Text: Physical style elements, Logical style elements and Character entities
Organizing Text: Preformatted Text, DIV, SPAN, Creating Tables, Lists, Working with Links and URLs.
Working with Images, Colors and Canvas
Working with Forms and Multimedia

UNIT - II **(11 Hours)**

CSS3: Overview of Styles, Exploring the Box model, Font and Text styles. Displaying, Positioning and Floating an Element, Flexbox and Grid layouts
Dynamic HTML: Overview of Java Script, JavaScript Functions, Arrays and Events.

UNIT - III **(11 Hours)**

JavaScript Objects: Understanding the Array Object, String Object, Math Object and Document Object.
DOM (Document Object Model): Understanding DOM nodes, Node interface, Document interface and Element interface and Modifying DOM elements
Form Validation: Client side validation techniques.
ES6 Features: Arrow functions, let and const, template literals, spread and rest.

UNIT - IV **(11 Hours)**

Introduction to React: React Benefits, Disadvantages, Basic React App, JSX, Components, Props, State, Functional Components and Class Components, Handling Events in React, Forms in React. **Project:** Menu Component. **Routing in React:** React Router Basics. **Tools, Deployment and Best Practices:** Version control with Git and Git Hub. NPM and Web Pack (Introductory Concepts).

TEXT BOOKS:

1. *HTML5 Black Book: Covers CSS3, JavaScript, XML, XHTML, Ajax, PHP and Jquery*. Dreamtech Press, 7 edition, 2011. ISBN 9789350040959
2. Alex Banks and Eve Porcello. *Learning React*. O'Reilly, 2 edition, 2020. ISBN 9781492051718
3. Mariot Tsitoara. *Begining Git and GitHub: A comprehensive guide to version control, project management and team work for new developer*. Apress, 1 edition, 2019. ISBN 9781484253120

REFERENCES:

1. Harvey M.Deitel and Paul J. Deitel. *Internet and World Wide Web How to Program*. Pearson Education, 4 edition, 2007. ISBN 9780136085645
2. Jason Cranford Teague. *Visual Quick Start Guide CSS, DHTML and AJAX*. Pearson Education, 4 edition, 2006. ISBN 9780321443250

Database Management Systems

B.Tech – IV Semester (24IT404)

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

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- Familiarize with fundamental concepts of database and various database architectures and Design relations for Relational databases using conceptual data modeling.
- Implement formal relational operations in relational algebra and SQL.
- Identify the Indexing types and normalization process for relational databases
- Use mechanisms for the development of multi user database applications.

Course Outcomes:

After the successful completion of the course the students will be able to

CO1 Apply knowledge of database design methodology which give a good formal foundation in relational data model and Understand and apply the principles of data modeling using ER Model.

CO2 Create relational algebra expressions, relational calculus, and SQL for queries and be familiar with relational database theory

CO3 Design database schema and Identify and solve the redundancy problem in database tables using normalization.

CO4 Learn about transaction processing and concurrency control techniques.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	3	-	-	-	-	-	-	-	-	3	2	1
CO2	3	3	2	2	2	-	-	-	-	-	-	3	3	2
CO3	3	3	3	2	-	-	-	-	-	-	-	3	3	2
CO4	3	3	2	3	2	-	-	-	-	-	-	3	3	3

UNIT - I **(11 Hours)**

Databases and Database Users: Introduction - An Example, Characteristics of the Database Approach, Actors on the Scene, Workers behind the Scene, Advantages of Using the DBMS Approach.

Database System Concepts: DataModels, Schemas and Instances ,Three-Schema Architecture and Data Independence, Database Languages and Interfaces and Classification of Database Management Systems.

Data Modelling Using the Entity-Relationship (ER) Model: Using High-Level Conceptual Data Models for Database Design, An Example Database Application, Entity Types, Entity Sets, Attributes, and Keys - Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, Refining the ER Design for the COMPANY Database - ER Diagrams, Naming Conventions, and Design Issues.

UNIT - II **(11 Hours)**

The Relational Algebra and Relational Calculus: Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations: JOIN and DIVISION, Additional Relational Operations, The Tuple Relational Calculus, The Domain Relational Calculus.

Schema Definition, Constraints, Queries, and Views: SQL Data Definition and Data Types, Specifying Constraints in SQL, Schema Change Statements in SQL, Basic Queries in SQL, More Complex SQL Queries, INSERT, DELETE, and UPDATE Statements in SQL , Views (Virtual Tables) in SQL.

UNIT - III **(11 Hours)**

Indexing Structures for Files: Types of Single-Level Ordered Indexes, Multilevel Indexes - Dynamic Multilevel Indexes using B+-Trees.

Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys - General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form.

Relational Database Design Algorithms and Further Dependencies: Properties of Relational Decompositions -Lossless Join Decomposition and Dependency Preserving Decomposition, Algorithms for Relational Database Schema Design, Multi-valued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form.

UNIT - IV **(11 Hours)**

Introduction to Transaction: Transaction, ACID properties and States of a Transaction.

Transaction Problems: Lost update and dirty read problem, unrepeatable read and phantom problem and incorrect summary problem.

Schedules: Number of schedules, types of schedules : serial schedule, complete schedule, recoverable schedule, cascading aborts, cascade-less schedule, strict schedule

Serializability: Conflict Serializability, View Serializability, comparison between Conflict and View Serializability.

Concurrency Control Protocols: Locks, 2-phase locking protocol, strict 2Phase Locking protocol, rigorous 2Phase Locking protocol, conservative 2Phase Locking protocol and example of strict 2Phase Locking protocol.

Graph & Timestamp Protocols: Graph-based protocol, timestamp ordering protocol, examples on timestamp ordering protocol, Thomas Write Rule.

TEXT BOOKS:

1. Ramez Elmasri and Navate. *Fundamentals of Database Systems*. Pearson Education, 6 edition, 2017. ISBN 978-0-136-08620-8

REFERENCES:

1. C.J.Date. *Introduction to Database Systems*. Pearson Education, 8 edition, 2006. ISBN 978-8177585568
2. Johannes Gehrke Raghurama Krishnan. *Data base Management Systems*. Tata McGraw Hill, 3 edition, 2014. ISBN 978-8131769591
3. Silberschatz and Korth. *Database System Concepts*. McGraw hill, 6 edition, 2013. ISBN 978-9332901384

ON-LINE RESOURCES:

1. D.Janakiram. *Introduction to Database Management System*. IIT Madras, 2008. URL `https://youtu.be/EUzsy3W4I0g?list=PL9426FE14B809CC41`

Design and Analysis of Algorithms
B.Tech – IV Semester (24IT405)

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

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- Understand about designing and the effectiveness of an algorithm, and applying the Master Theorem to find the complexity.
- Strengthen the divide and conquer paradigms and know the optimal solution finding with the greedy method.
- Acquaintance with algorithm design strategies of Dynamic programming and easily know the significant graph algorithms and their analyses.
- Get the ability to backtrack and branch with bound values and NP problems.

Course Outcomes:

After the successful completion of the course the students will be able to

CO1 Analyze algorithms' performance using various strategies and apply the Master theorem to estimate the complexity of divide-and-conquer algorithms.

CO2 Apply the divide-and-conquer and greedy techniques to solve problems and perform complexity analysis.

CO3 Articulate on graph problems and identify the applicability of the dynamic programming paradigm for designing solutions to problems.

CO4 Utilize the backtracking and branch and bound algorithms to find every potential solution to combinatorial and optimization issues. In addition, classify the P and NP complicated problems.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	3	-	-	-	-	-	-	-	3	3	3	-
CO2	3	3	3	-	-	-	-	-	-	-	3	3	3	-
CO3	3	3	3	-	-	-	-	-	-	-	3	3	3	-
CO4	3	3	3	-	-	-	-	-	-	-	3	3	3	-

UNIT - I (11 Hours)

Introduction: Algorithm, Pseudo code for expressing algorithms, Performance Analysis- Space complexity, Time complexity, Asymptotic Notation.

Master Theorem: Introduction, Generic Form- Case1, Case2, Case3, Inadmissible equations, Application to standard algorithms.

UNIT - II (11 Hours)

Divide and conquer : General method , applications - Quick sort, Merge sort, Strassen's matrix multiplication.

Greedy method : General method, applications-Job sequencing with deadlines, Fractional knapsack problem, Minimum cost spanning trees - Prims, Kruskal, Single source shortest path problem - Dijkstra Algorithm.

UNIT - III (11 Hours)

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

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

UNIT - IV (11 Hours)

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

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

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

TEXT BOOKS:

1. E. Horowitz, S. Sahni, and S.Rajsekran. *Fundamentals of Computer Algorithms*. Orient Longman, 2 edition, 2018. ISBN 9788173716126

REFERENCES:

1. T. H. Cormen, Leiserson, Rivest, and Stein. *Introduction to Computer Algorithms*. The MITPress
2. Sara Basse and A.V. Gelder. *Computer Algorithms: Introduction to Design & Analysis*. Pearson, 3 edition

ON-LINE RESOURCES:

1. Abhiram Ranade. *Design and Analysis of Algorithms*. IIT Bombay, 2008. URL `https://youtu.be/5Y8Lfsreeck?list=PLbMVogVj5nJSUpKllt0btml02Zsc9U1VU`

Linux Essentials

B.Tech – III Semester (24ITL401/SEC2)

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

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- to organize and manipulate files and directories and Use the vi text editor to create and modify files.
- to use SED command for insertion, deletion, and search and replace (substitution) and Understand pattern scanning and processing using AWK.
- to create structured shell programming which accept and use positional parameters and exported variables.
- to understand File management system calls to provide I/O support for storage device types and multiple users.

Course Outcomes:

After the successful completion of the course the students will be able to

CO1 Write basic commands for data processing

CO2 Apply filter commands on data files

CO3 Develop shell script programs for applications

CO4 Develop programs on file management system calls for applications

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	2	2	2	-	-	-	3	2	2	3	2	2
CO2	3	2	2	2	2	-	-	-	3	2	2	3	2	2
CO3	3	2	2	2	2	-	-	-	3	2	2	3	2	2
CO4	3	2	2	2	2	-	-	-	3	2	2	3	2	2

UNIT - I (11 Hours)

Directory commands: pwd, cd, mkdir, rmdir commands. The dot (.) and double dots (..) notations to represent present and parent directories and their usage in relative path names.
File related commands: Editing with vi, cat, mv, rm, cp, wc. File attributes and permissions and knowing them. The ls command with options. Changing file permissions: (chmod) the relative and absolute permissions changing methods. Recursively changing file permissions. Directory permissions.
Other Basic commands: cal, date, df, du, find, jobs, kill, less and more, ps, set, wc, who.

Work Sheet

1. Obtain the following results (i) To print the name of operating system (ii) To print the login name (iii) To print the host name.
2. Find out the users who are currently logged in and find the particular user too.
3. Display the calendar for (i) Jan 2000 (ii) Feb 1999 (iii) 9th month of the year 7 A.D (iv) For the current month (v) Current Date Day Abbreviation , Month Abbreviation along with year.
4. Display the time in 12-Hour and 24 Hour Notations.
5. Display the Current Date and Current Time.
6. Display the message “GOOD MORNING” in enlarged characters.
7. Display the name of your home directory.
8. Create a directory SAMPLE under your home directory.
9. Create a subdirectory by name TRIAL under SAMPLE.
10. Change to SAMPLE.
11. Change to your home directory.
12. Change from home directory to TRIAL by using absolute and relative pathname.
13. Remove directory TRIAL.
14. Create a directory TEST using absolute pathname.

15. Using a single command change from current directory to home directory.
16. Remove a directory using absolute pathname.
17. Create files my file and your file under Present Working Directory.
18. Display the files my file and your file.
19. Append more lines in the my file and your file files.
20. How will you create a hidden file?.
21. Copy myfile file to emp.
22. Write the command to create alias name for a file.
23. Move yourfile file to dept.
24. Copy emp file and dept file to TRIAL directory
25. Compare a file with itself.
26. Compare myfile file and emp file.

UNIT - II **(11 Hours)**

The Stream Editor(sed): Line addressing, multiple instructions, context addressing, writing selected lines to a file, text editing, substitution, basic regular expressions.
File Handling and Text Processing utilities: grep, egrep, fgrep.
AWK: sample awk filtering, splitting a line into fields, formatting output, variables and expressions, comparison operators, number processing, storing awk programs in a file, the BEGIN and END sections, Built in variables and arrays, control structures.

Work Sheet

1. **Create the following file as sed.lab: unix is great os. unix is open source. unix is free os. learn operating system. Unix linux which one you choose.(Each sentence in a line)**

   - Replace ’unix’ with ’linux’.
   - Replace only the third (3rd) instance of ’unix’ with ’linux’.
   - Try sed ’s/unix/linux/g’ sed.lab.
   - Replace ’unix’ with ’linux’ but only on line 3.
   - Add a new line, ’Actually Windows is best’ after the second line.

2.
   - Viewing a range of lines of a document
   - Viewing the entire file except a given range
   - Viewing non-consecutive lines and ranges
   - Replacing words or characters inside a range

- Using regular expressions
- Viewing lines containing with a given pattern
- Inserting spaces in files
- Performing two or more substitutions at once

3.
- Design a command **"wishme"** that will great you —good morning‖,‖good Afternoon‖, according to current time.
- Design a command **"fags"** thats will list the files and their ages, to date.
- Design a command **"word-freq"** that will print the words and number of Occurrences of that word in the given text.

UNIT - III **(11 Hours)**

Shell programming: shell,functions of shell,meta characters,input redirections and output redirections,pipes, shell as a programming language,shell variables,predefined local variables,predefined environment variables,arithmetic and conditional expressions ,control structures,positional parameters,passing command line arguments,built in shell comands,shell programs,functions and arrays.

Work Sheet

1.
- Design a command **" which"** that prints the path of the command given as Argument
- Design a command **"filelist[-c <char>]"** which prints all file names beginning with The charter specified as argument to the command ,if the position is not specified It should print all the file names.
- Design a command **getline[-f <filename> -n <line number>]** which prints the line number lineno in the file specified with -f option.If the line number is not specified it should list all the lines in the given file
- Design a command **monthly-file[-m <month>]** which list the files created in a given month where month is argument to be command. If the options is not specified it list the files in all the months.

2.
- Design a command **list lines[-f <file name> -v <varname>]** which prints the line from the given file file name ,which containing the variable varname.if arname Is not specified it should list ,all the lines.
- Design a command **avg[-n <colon> -f <file name>]** which prints the average of the given column in a file where colon and file name are arguments to the commands

UNIT - IV **(11 Hours)**

File management System calls: Regular File management system calls: open(), read(), write(), lseek(), COse(), unlink(), stat(), getdents().

Work Sheet

1. Write a C program to copy data from source file to destination file, where the file names are provided as command-line arguments.

2. Write a C program that reads every 100th byte from the file, where the file name is given as command-line argument.
3. Write a C program to display information of a given file which determines the type of file and inode information, where the file name is given as command-line arguments.

TEXT BOOKS:

1. Sumitabha Das. *UNIX Concepts and Applications*. Tata McGraw Hill, 4 edition, 2019. ISBN 9780040635463
2. Graham Glass and King Ables. *UNIX for programmers and users*. Pearson, 3 edition, 2003. ISBN 9780130465535

REFERENCES:

1. Maurice J.Bach. *The Design of UNIX operating System*. PHI, 1 edition, 2015. ISBN 9789332549579
2. W Richard Stevens. *Advanced programming in the UNIX environment*. Pearson, 3 edition, 2013. ISBN 9780321637734
3. Sumitabha Das. *Your UNIX/Linux the ultimate guide*. TMH, 3 edition, 2013. ISBN 9780073376202

ON-LINE RESOURCES:

1. Anand Iyer. *Linux Programming & Scripting*. IIT Madras, 2008. URL `https://youtu.be/leWKvuZVUE8?list=PL1A5A6AE8AFC187B7`

Frontend Web Technologies Lab

B.Tech – IV Semester (24ITL402)

Lectures	:	0 Hours / Week	Tutorial	:	0	Practical	:	3
CIE Marks	:	40	SEE Marks	:	60	Credits	:	1.5

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- To introduce the structure and function of the web.
- To design static and dynamic web pages using HTML, CSS, and JavaScript.
- To build interactive web applications using modern front-end frameworks.
- To explore tools, best practices, and deployment techniques in front-end development.

Course Outcomes:

After the successful completion of the course the students will be able to

CO1 Design responsive web interfaces using HTML5 and CSS3.

CO2 Develop interactive web features using JavaScript and DOM.

CO3 Create dynamic front-end applications using React.js.

CO4 Utilize version control systems and deploy web applications online.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	3	1	2	1	-	-	-	-	-	3	2	-
CO2	3	3	3	2	3	1	-	-	-	-	-	3	3	-
CO3	3	3	3	2	3	1	-	-	-	-	-	3	3	-
CO4	3	2	2	2	3	2	-	-	-	-	-	3	3	-

List of Experiments

1. Design an HTML5 webpage using fundamental elements, organizing text, Links, URLs and Tables.
2. Design an HTML5 webpage using Images, Colors and Forms.
3. Design a page layout using CSS flexbox. Style different sections of a webpage using custom classes.
4. Develop a JavaScript application covering Functions and Arrays.
5. Implement a simple JavaScript calculator using events.
6. Create a Student Registration Form using HTML, CSS and JavaScript with features Local Storage of registration details with validation and display in tabular form.
7. Develop a JavaScript application that demonstrates DOM manipulation.
8. Write a program to demonstrate ES6 features.
9. Set up a React App using create-react-app. Create a component-based UI for a simple profile page.
10. Develop a React App to display a Counter and a dynamic list of tasks using Props and State.
11. Develop a React App using Forms and handle Events.
12. Initialize a project repository with Git. Push changes to GitHub and manage branches.

TEXT BOOKS:

1. *HTML5 Black Book: Covers CSS3, JavaScript, XML, XHTML, Ajax, PHP and Jquery*. Dreamtech Press, 7 edition, 2011. ISBN 9789350040959
2. Alex Banks and Eve Porcello. *Learning React*. O'Reilly, 2 edition, 2020. ISBN 9781492051718
3. Mariot Tsitoara. *Begining Git and GitHub: A comprehensive guide to version control, project management and team work for new developer*. Apress, 1 edition, 2019. ISBN 9781484253120

REFERENCES:

1. Harvey M.Deitel and Paul J. Deitel. *Internet and World Wide Web How to Program*. Pearson Education, 4 edition, 2007. ISBN 9780136085645
2. Jason Cranford Teague. *Visual Quick Start Guide CSS, DHTML and AJAX*. Pearson Education, 4 edition, 2006. ISBN 9780321443250

ON-LINE RESOURCES:

1. *W3Schools*. URL `https://www.w3schools.com`
2. *React*. URL `https://react.dev`

RDBMS Lab

B.Tech – IV Semester (24ITL403)

Lectures	:	0 Hours / Week	Tutorial	:	0	Practical	:	3
CIE Marks	:	40	SEE Marks	:	60	Credits	:	1.5

Prerequisites:

None

Course Objectives:

Analyze the students on database languages.

Interpret the Knowledge on database design.

Determine the knowledge on key constraints and Normalization.

Determine the knowledge on procedures and functions.

Course Outcomes:

After the successful completion of the course the students will be able to

CO1 Implement DDL, DML, DCL Commands using SQL.

CO2 Implement Advanced queries using SQL.

CO3 Apply key constraints to get a normalized database.

CO4 Implement procedures and functions using PL/SQL

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	3	3	3	-	2	-	2	-	3	3	3	3
CO2	3	3	3	3	3	-	2	-	2	-	3	3	3	3
CO3	3	3	3	3	3	-	2	-	2	-	3	3	3	3
CO4	3	3	3	3	3	-	2	-	2	-	3	3	3	3

List of Experiments

I. DDL, DML and DCL commands

1. Create a table EMPLOYEE with following schema:
   (Emp_no, E_name, E_address, E_ph_no, Dept_no, Dept_name, Job_id , Salary)
   a. Add a new column; HIREDATE to the existing relation.
   b. Change the datatype of JOB_ID from char to varchar2.
   c. Change the name of column/field Emp_no to E_no.
   d. delete E_ph_no column.
2. Create DEPARTMENT table with the following structure.
   Name Type Deptno Number, Deptname Varchar2(10), location Varchar2(10)
   a. Add column designation to the department table.
   b. Insert values into the table.
   c. Update the record where deptno is 9.
   d. Delete any column data from the table.
3. Create a table called CUSTOMER
   Name Type Cust_name Varchar2(20), Cust_street Varchar2(20), Cust_city Varchar2(20)
   a. Insert records into the table
   b. Add salary column to the table.
   c. Alter the table column domain.
   d. Drop salary column of the customer table.
   e. Delete the rows of customer table whose cust_city is “hyd”.

II. Simple Queries on Employee Table-selection, projection, sorting

Table 8: Emp Table

EMPNO	ENAME	JOB	MGR	HIREDATE	SALARY	DNO
7839	KING	PRESIDENT		17-Nov-81	5000	10
7698	BLAKE	MANAGER	7839	1-May-81	2850	30
7782	CLARK	MANAGER	7839	9-Jun-81	2450	10
7566	JONES	MANAGER	7839	2-Apr-81	2975	20
7654	MARTIN	SALESMAN	7698	28-Sep-81	1250	30
7499	ALLEN	SALESMAN	7698	20-Feb-81	1600	30
7844	TURNER	SALESMAN	7698	20-Feb-81	1500	30
7900	JAMES	CLERK	7698	3-Dec-81	950	30
7521	WARD	SALESMAN	7698	22-Feb-81	1250	30
7902	FORD	ANALYST	7782	3-Dec-81	3000	20
7369	SMITH	CLERK	7788	17-Dec-80	800	20
7788	SCOTT	ANALYST	7782	9-Dec-82	3000	20
7876	ADAMS	CLERK	7788	12-Jan-83	1100	20
7934	MILLER	CLERK	7788	23-Jan-82	1300	10

Table 9: Department Table

DNO	DNAME	LOCATION
10	ACCOUNTING	NEW YORK
20	RESEARCH	DALLAS
30	SALES	CHICAGO
40	OPERATIONS	BOSTON

- List empno, empname and salary.
- List the names of all MANAGERS.
- list all clerks in deptno. 30.
- List the employees to who manager is 7698.
- List jobs in dept 20.
- List employee names whose salary is between 2000 and 3000.
- List employees in the departments 10, 20.
- List employee names which begin with S.
- List employee names having ‘A’ in their names.
- List employees who have joined in JAN.
- List employees who have joined in the year 81.
- List all distinct jobs.
- List employee names in alphabetical order.
- List employee names alphabetically department wise.
- List employee names alphabetically job wise.
- List employee numbers, name sal, DA(15
- List employee names having an experience more than 15 years.
- List employee names whose commission is NULL.
- list employees who do not report to anybody.
- List maximum sal, minimum sal, average sal.
- List the numbers of jobs.
- List the numbers of people and average salary in deptno 30.
- List maximum sal and minimum sal in the designations SALESMAN and CLERK.
- List the numbers of people and average salary of employees joined in 81, 82 and 83.
- List jobs that are unique to deptno 20 set operations (Add more problems).
- Display today’s date and present time.
- List employee names and their joining date in the following formats
  - SMITH 17th DEC NINETEEEN EIGHTY
  - SMITH SEVENTEENTH DEC NINETEEN EIGHTY

  - SMITH Weekday of joining
  - SMITH 17/12/80
- List employee names and their experience in years
- List employee names who joined in DEC and on Monday or Friday.
- Display a given date as a string in different formats.

III. Advanced SQL Queries on Employee Table – Dynamic Relations, EXISTS, NOT EXISTS, Aggregate Functions (COUNT, SUM, AVG, MAX and MIN), Conversion Functions & String Functions

- List employee names and their hire dates sorted in the order of their experience.
- List managers names and their joining dates completely spelled in alphabetical order of names.
- List employee names and their experience in years with names arranged in descending order.
- List the employees' names having minimum of 2years of experience sorted on experience
- List employee names with all capital letters, with all small letters and with first letter only as capital.
- List employee names with length of the name sorted on length.
- List employee names appending Sri to the beginning and Garu to the end.
- List employee names and month names of joining.
- List employee names and year of joining in words.
- List employee's names, job and salary with 5 hyphens in between.
- List employee names and position of first occurrence of I in their name.
- List employee names and the string without first character and last character in their name.
- List employees who joined between Apr 81 and Apr 82.
- List max sal, min sal and average sal of depts. 10, 30.
- List the designation in dept 30 but not in 20.
- List the number of employees in each department along with dept numbers.
- List number of employees joined year wise.
- List number of employees job wise.
- List max sal, min sal, average salary dept wise.
- List max sal, min sal, average salary job wise.
- List max sal, min sal for the jobs MANAGER and CLERK.
- List max sal, min sal AND average salary of the depts. Having a minimum 3 employees.
- List the number of employees in each job in each department.
- MGR and the number of employees report to them in the sorted order.
- List emp numbers of employees to whom a minimum of 3 people report.
- List dept numbers having a minimum of 3 persons.
- List names of jobs having a minimum of 3 persons in that job.
- List names of months in which a minimum of 3 persons joined.

- List hiredates of employees having 2 or more employees having the same hiredate.
- List departments having minimum of 3 people having a minimum of 28 years of experience.

IV. Advanced queries -JOIN OPERATIONS

Structure of the database(Suppliers-Parts-Projects database):

S: (S#, SNAME, STATUS, CITY) PRIMARY KEY(S#)
P: (P#, PNAME, COLOR, WEIGHT, CITY) PRIMARY KEY(P#)
J: (J#, JNAME, CITY) PRIMARY KEY(J#)
SPJ: (S#, P#, J#, QTY)

PRIMARY KEY(S#,P#,J#)
FOREIGN KEY(S#) REFERENCESS FOREIGN KEY(P#) REFERENCESP FOREIGN KEY(J#) REFERENCES J

Table 10: S Table

S	SNAME	STATUS	CITY
S1	Smith	20	London
S2	Jones	10	Paris
S3	Blake	30	Paris
S4	Clark	20	London
S5	Adams	30	Athens

Table 11: P Table

P	PNAME	COLOR	WEIGHT	CITY
P1	Nut	Red	18	London
P2	Bolt	Green	17	Paris
P3	Screw	Blue	17	Rome
P4	Screw	Red	14	London
P5	Cam	Blue	12	Paris
P6	Cog	Red	19	London

Table 12: J Table

J	JNAME	CITY
J1	Sorter	Paris
J2	Display	Rome
J3	OCR	Athens
J4	Console	Athens
J5	Raid	London
J6	EDC	Oslo
J7	Tape	London

Table 13: SPJ Table

S#	P#	J#	QTY
S1	P1	J1	200
S1	P1	J4	700
S2	P3	J1	400
S2	P3	J2	200
S2	P3	J3	200
S2	P3	J4	500
S2	P3	J5	600
S2	P3	J6	400
S2	P3	J7	800
S2	P5	J2	100
S3	P3	J1	200
S3	P4	J2	500
S4	P6	J3	300
S4	P6	J7	300
S5	P2	J2	200
S5	P2	J4	100
S5	P5	J5	500
S5	P5	J7	100
S5	P6	J2	200
S5	P1	J4	100
S5	P3	J4	200
S5	P4	J4	800

Note: Here in subsequent exercises, the term "all" is to be taken to mean "all currently represented in the Database", not "all possible".

- Get full details of all projects.
- Get full details of all Projects in London
- Get supplier numbers for Suppliers who supply Project J1.
- Get all shipments where the quantity is in the range 300 to 700.
- Get all part-color/part-city combinations.
- Get all Supplier-number/part-number/Project-number triples such that the indicated Supplier part and Project are collocated.
- Get all supplier-number/part-number/project-number triples such that the indicated supplier, part and project are not all collocated.
- Get all supplier-number/part-number/ project-number triples such that the indicated supplier, part and project are collocated.
- Get part numbers for parts supplied by a supplier in London.
- Get part numbers for parts supplied by a supplier in London to a project in London.
- Get all pairs of city names such that a supplier in the first city supplies a project in the second city.
- Get part numbers for parts supplied to any project by a supplier in the same city as that project.
- Get project numbers for projects supplied by at least one supplier not in the same city.
- Get all pairs of part numbers such that some supplier supplies both the indicated parts.
- Get the total number of projects supplied by supplier S1.
- Get the total quantity of part P1 supplied by suppliers S1.
- For each part being supplied to some project get the part number, the project numbers and the corresponding total quantity.
- Get part numbers of parts supplied to some project in an average quantity of more than 320.
- Get project names for projects supplied by supplier S1.
- Get colors of parts supplied by supplier S1.
- Get parts numbers for parts supplied to any project in London.
- Get project numbers for projects using at least one part available from supplier S1.
- Get supplier numbers for suppliers supplying at least one part supplied by at least one supplier who supplies at least one red part.
- Get supplier numbers for suppliers with a status lower than that of supplier S1.
- Get project numbers for projects whose city is first in the alphabetic list

V. Working with LOOPS using PL/SQL

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

VI. Working with Functions Using PL/SQL

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

VII. Working with Stored Procedures

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

VIII. Working with CURSORS

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

TEXT BOOKS:

1. Benjamin Rosenzweig and Elena Silvestrova. *Oracle PL/SQL by Example*. Pearson, 3 edition. ISBN 9788131715512
2. Scott Urman. *Oracle Database Logic PL/SQL Programming*. Tata Mc-Graw Hill, 2 edition. ISBN 9780078823053
3. P.S.Deshpande. *SQL and PLSQL for Oracle 10g Black Book*. Dreamtech, 7 edition. ISBN 9788177227109

Health and Wellness Yoga and Sports

B.Tech – IV Semester (24ITL404)

Lectures	:	0 Hours / Week	Tutorial	:	0	Practical	:	1
CIE Marks	:	0	SEE Marks	:	100	Credits	:	0.5

Prerequisites:

None

Course Objectives:

The course aims to enable the students

- to maintain their mental and physical wellness by balancing emotions in their life.
- to acquire essential traits required for the development of the personality

Course Outcomes:

After the successful completion of the course, the 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 POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	-	-	-	-	-	-	-	-	-	2	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	2	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	2	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	2	-	-	-	-

UNIT - I **(5 Hours)**

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:

1. Organizing health awareness programmes in community
2. Preparation of health profile
3. Preparation of chart for balance diet for all age groups

UNIT - II **(5 Hours)**

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 **(4 Hours)**

1. 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.
2. Practising cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

TEXT BOOKS:

1. Gordon Edlin and Eric Golanty. *Health and Wellness*. Jones and Bartlett Learning, 14 edition, 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 and John Lofty. *SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere*. William Morrow Paperbacks, 2014
2. Thomas Hanlon. *The Sports Rules Book, Human Kinetics*. 2014

Constitution of India

(Common to all branches)

B.Tech – IV Semester (24IT406/MC02)

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

Prerequisites:

None

Course Objectives:

The course aims to

- To provide basic information about fundamental law of the country.
- To educate the student about fundamental Rights and fundamental duties of citizens.
- To educate the students about Government organs, methods of functioning
- To motivate students to leave narrow selfish outlook and inculcate broad national, human outlook.

Course Outcomes:

After the successful completion of the course, the students will be able to

CO1 Describe the importance of the constitution in a Democratic Society

CO1 Describe the fundamental rights and duties of a citizen

CO1 Discuss about judicial supremacy and independence of judiciary and fight for his legitimate rights through court of law.

CO1 Applying the principles to participate in the democratic process of governance and in nation building activities.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	1	2	2	-	1	-	-	-	3	-	3	-	-	-
CO2	-	-	1	1	1	-	-	-	-	-	3	-	-	-
CO3	-	-	1	-	1	-	2	-	-	-	3	-	-	-
CO4	3	1	2	-	-	-	-	-	3	-	1	-	-	-

UNIT - I (7 Hours)

Meaning of the constitution law and constitutionalism
Historical perspective of the Constitution of India.
Salient features and characteristics of the constitution of India.
Preamble, union and its territory and citizenship.

UNIT - II (7 Hours)

Fundamental rights principles.
Directive principles of state policy.
Fundamental duties.
The government of the union, The President, The Prime Minister, and the council of ministers, The parliament of India, The supreme court, The union judiciary

UNIT - III (7 Hours)

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

UNIT - IV (7 Hours)

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

TEXT BOOKS:

1. D.D.Basu and Lexisnexis. *Introduction to constitution of India*. Universal, 26 edition, 2020. ISBN 9780321564085

2. P. M. Bhakshi. *The constitution of India*. Universal law publishing, 18 edition, 2021. ISBN 9780321564085

REFERENCES:

1. M V Pylee. *Constitutional Government in India*. Asia Publishing House, 2004
2. D C Dasgupta. *Indian Government and Politics*. Vikas Publishing House, 2007
3. Sujit Chowdary, Madhav Khosla, and Pratapabhem Mehla. *The Oxford Hand Book of the Indian Constitution*. Oxford University Press, 2016
4. *Laws Relating to Women*. National Commission For Women, 2020

Advanced Data Structures and Algorithms
(24ITH4A)

Lectures	:	3 Hours / Week	Tutorial	:	0	Practical	:	2
CIA Marks	:	50	SEE Marks	:	50	Credits	:	4

Prerequisites:

Data Structures(24IT303)

Course Objectives:

The course aims to enable the students

- to understand the advanced concepts of efficient Binary Search Trees and Hashing.
- to learn various priority queues, and efficient disjoint-set data structures for solving large-scale data management problems.
- to apply advanced graph algorithms to solve computational problems optimally.
- to develop and analyze the randomized algorithms, and efficient string searching techniques.

Course Outcomes:

After the successful completion of the course, the students will be able to

CO1 Construct the various efficient binary search trees and analyze the advanced hashing techniques such as cuckoo and extendible hashing.

CO2 Implement Binomial Heaps and Apply union–find operations to find cycles in a graph.

CO3 Solve complex problems using graph algorithms.

CO4 Employ randomized algorithms, and implement efficient string searching methods.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	2	2	2	-	-	-	-	1	-	3	3	2
CO2	3	3	2	3	2	-	-	-	-	1	-	3	3	2
CO3	3	3	3	3	2	-	-	-	-	1	1	3	3	3
CO4	3	3	2	3	2	-	-	-	-	1	1	3	3	3

UNIT - I **(17 Hours)**

Efficient Binary Search Trees & B-Trees- Red-Black Trees, Splay Trees, 2-3 Trees, 2-3-4 Trees – Properties, Rotations, Insertion, Deletion.

Hashing: Double hashing, Rehashing, Cuckoo hashing, Extendible Hashing.

Hands-on exercises:

1. Implement the following operations on a 2-3 Tree:
    - Insertion
    - Search
    - Traversal
2. Implement the following operations on a Red-Black Tree:
    - Insertion with recolouring and rotations
    - Search
    - Inorder traversal
3. Implement the following operations on a Splay Tree:
    - Splay (Zig, Zig-Zig, Zig-Zag)
    - Insert
    - Search
    - Delete

UNIT - II **(17 Hours)**

Priority Queues (Heaps): – Binomial Heaps, Fibonacci Heaps, Structure of Fibonacci heaps, Mergeable-heap operations, decreasing a key and deleting a node, Bounding the maximum degree.

Disjoint Sets: Disjoint-set operations, Linked-list representation of disjoint sets, Equivalence Relations, The Dynamic Equivalence Problem, Applications.

Hands-on exercises:

1. Implement the following operations on a Binomial Heap:
    - Insert
    - Merge
    - Find-min
    - Delete-min
2. Program to find number of cycles in an undirected graph using Disjoint Sets.

UNIT - III **(18 Hours)**

Dictionaries: Definition, Dictionary Abstract Data Type, Implementation of Dictionaries using Linked lists and Hash Tables.

Graph Algorithms: Topological Sort, Network Flow Algorithm, Bipartite Graphs.

Hands-on exercises:

1. Consider the telephone book database of N clients. Make use of a Hash Table implementation to quickly look up client's telephone number.
2. Implement all the functions of Dictionary ADT using hashing.
3. Implement Topological Sort.

UNIT - IV **(18 Hours)**

Randomized Algorithms Random-Number Generators, Skip Lists, Primality Testing.
String Searching Algorithms: Brute-Force Algorithm, Rabin-Karp Algorithm, Knuth-Morris-Pratt Algorithm.
Hands-on exercises:

1. Program to search for the pattern in a given string using Naïve String-matching Algorithm.
2. Program to search for the pattern in a given string using Robin-Karp Algorithm.

TEXT BOOKS:

1. Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. *Introduction to Algorithms*. The MIT Press, 4 edition, 2022. ISBN 9780262046305
2. Reema Thareja and S. Rama Sree. *Advanced Data Structures*. Oxford University Press, 2018. ISBN 9780199487172

REFERENCES:

1. Michael T. Goodrich and Roberto Tamassia. *Algorithm Design and Applications*. Wiley, 2 edition, 2014. ISBN 9781118335918
2. Mark Allen Weiss. *Data Structures and Algorithm Analysis in C++*. Pearson, 4 edition, 2014. ISBN 9780132847377

Advanced Database Management Systems
(24ITH5B)

Lectures	:	3 Hours / Week	Tutorial	:	0	Practical	:	2
CIA Marks	:	50	SEE Marks	:	50	Credits	:	4

Prerequisites:

Database Management Systems(24IT404)

Course Objectives:

- To introduce students to legacy non-relational paradigms and their structural principles for organizing data.
- To develop understanding of object-oriented principles and their integration into database systems for complex data handling.
- To explore modern non-relational paradigms that address scalability, flexibility, and big data requirements.
- To expose students to advanced database models tailored for temporal, spatial, multimedia, and blockchain-based applications.

Course Outcomes:

After the successful completion of the course, the students will be able to

CO1 Design and query hierarchical and network database schemas for real-world applications.

CO2 Implement object-oriented and object-relational features to manage multimedia and nested data structures.

CO3 Students will be able to design and deploy applications using key-value, document, column-family, and graph-based NoSQL databases.

CO4 Students will be able to apply specialized database techniques to solve problems in domains such as GIS, IoT, and secure data management.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	2	2	2	-	-	-	-	1	-	3	3	2
CO2	3	3	2	3	2	-	-	-	-	1	-	3	3	2
CO3	3	3	3	3	2	-	-	-	-	1	1	3	3	3
CO4	3	3	2	3	2	-	-	-	-	1	1	3	3	3

UNIT - I (17 Hours)

Hierarchical & Network Database Models:
Hierarchical model: structure, parent-child relationships, advantages and limitations.
Network model: CODASYL DBTG, records, sets and pointers.
Comparison with relational model
Use cases in legacy systems and enterprise applications.

Hands-on Exercises:

1. Design a hierarchical database schema for an organization chart
2. Implement a network model using a simulation tool or graph-based representation
3. Query traversal exercises (navigating parent-child and set relationships)

UNIT - II (17 Hours)

Object-Oriented & Object-Relational Models:

Object-oriented databases: classes, objects, inheritance and encapsulation.

Persistent objects and object identity

Object-relational extensions: user-defined types, nested tables, multimedia data.

Advantages in handling complex data: CAD/CAM, multimedia, scientific applications.

Hands-on Exercises:

1. Model a multimedia library using an object-oriented database (e.g., db4o, ObjectDB)
2. Implement object-relational features in PostgreSQL (custom data types, arrays, JSON)
3. Write queries involving nested structures and inheritance

UNIT - III (18 Hours)

NoSQL Database Models:

Motivation for NoSQL: scalability, flexibility, big data.
Key-value stores: Redis, DynamoDB.
Document stores: MongoDB, CouchDB.
Column-family stores: Cassandra, HBase.
Graph databases: Neo4j, OrientDB.
CAP theorem and BASE properties

Hands-on Exercises:

1. Build a key-value store application using Redis
2. Create a document database for an e-commerce catalog in MongoDB
3. Model a social network using Neo4j (nodes, edges, Cypher queries)
4. Compare query performance between SQL and NoSQL systems

UNIT - IV **(18 Hours)**

Emerging & Specialized Database Models:
Temporal databases: time-stamped data, valid time vs transaction time
Spatial and geographic databases: GIS, spatial indexing (R-trees)
Multimedia databases: image, audio, video storage and retrieval
Cloud-native databases: serverless, distributed storage, consistency models
Case studies: IoT data management, blockchain-based databases

Hands-on exercises:

1. Implement a temporal database schema for employee history tracking
2. Use PostGIS (extension of PostgreSQL) for spatial queries (e.g., nearest hospital)
3. Store and query multimedia data in a specialized DBMS
4. Explore a blockchain-based database (e.g., BigchainDB) for immutable records

TEXT BOOKS:

1. Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. *Introduction to Algorithms*. The MIT Press, 4 edition, 2022. ISBN 9780262046305
2. Reema Thareja and S. Rama Sree. *Advanced Data Structures*. Oxford University Press, 2018. ISBN 9780199487172

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1. Michael T. Goodrich and Roberto Tamassia. *Algorithm Design and Applications*. Wiley, 2 edition, 2014. ISBN 9781118335918
2. Mark Allen Weiss. *Data Structures and Algorithm Analysis in C++*. Pearson, 4 edition, 2014. ISBN 9780132847377

Real Time Operating System
(24ITH5B)

Lectures	:	3 Hours / Week	Tutorial	:	0	Practical	:	2
CIA Marks	:	50	SEE Marks	:	50	Credits	:	4

Prerequisites:

Operating Systems(24IT402)

Course Objectives:

The course aims to enable the students

- to understand the architecture and core concepts of a RTOS.
- to gain knowledge of process and thread management, including synchronization techniques.
- to explore inter-process communication (IPC) methods and their applications in RTOS.
- to Understand hardware programming concepts, including interrupt handling and memory access.
- to build and configure boot/OS images for embedded systems.

Course Outcomes:

After the successful completion of the course, the students will be able to

CO1 Describe the RTOS architecture and its microkernel-based design.

CO2 Apply process/thread management and synchronization techniques.

CO3 Implement inter-process communication methods for RTOS.

CO4 Configure and build RTOS boot/OS images for specific hardware platforms.

Mapping of Course Outcomes with POs and Program Specific Outcomes(PSOs):

COs	Program Outcomes(POs)											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	2	-	-	-	-	-	-	-	-	3	3	3
CO2	2	3	2	-	-	-	-	-	-	-	-	3	3	3
CO3	2	3	2	-	-	-	-	-	-	-	-	3	3	3
CO4	3	3	2	-	-	-	-	-	-	-	-	3	3	3

UNIT - I **(17 Hours)**

Overview of QNX OS architecture: Microkernel, Process manager, and standards. Protected address spaces, process/thread model, and scheduling. Introduction to inter-process communication (IPC) and synchronization. Resource managers and shared objects.
Process management: creation, termination, and memory protection.

UNIT - II **(17 Hours)**

Thread management: creation, termination, and synchronization.
Synchronization techniques: mutexes, semaphores, and condition variables.
Hands-on exercises: process/thread creation and synchronization.
Overview of IPC methods in QNX: message passing, pulses, and shared memory.

UNIT - III **(18 Hours)**

Comparing IPC methods: advantages and disadvantages. Practical implementation of IPC in QNX.
Hands-on exercises: message passing and shared memory.
Hardware access methods: IO-mapped and memory-mapped IO. Interrupt handling and DMA-safe memory allocation.

UNIT - IV **(18 Hours)**

Timing architecture: periodic timing, one-shot timing, and timeouts.
Hands-on exercises: interrupt handling and timing mechanisms.
Overview of QNX boot/OS image structure: Components of a boot image: startup code, kernel, drivers, and scripts. Building and loading boot images onto target hardware.

TEXT BOOKS:

1. *QNX Neutrino RTOS User's Guide*. QNX Software Systems, f
2. Michael Barr. *Programming for Embedded Systems*. O'Reilly
3. Brian Amos. *Hands-on RTOS with Microcontrollers*. Packt, 2020
4. Abraham Silberschatz, Peter B.Galvin, and Greg Gagne. *Operating System Concepts*. Wiley, 9 edition, 2018

ON-LINE RESOURCES:

1. *QNX Every where page*. a. URL `https://blackberry.qnx.com/en/products/qnx-everywhere`
2. *QNX Git lab page*. b. URL `https://gitlab.com/qnx`
3. *QNX on Reddit*. c. URL `https://www.reddit.com/r/QNX/`
4. *QNX on Stack Overflow*. d. URL `https://stackoverflow.com/questions/tagged/qnx`
5. *QNX on YouTube*. e. URL `https://www.youtube.com/qnxcam`