

ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABI
OF
COMPUTER SCIENCE AND ENGINEERING
(DATA SCIENCE)
FOR
B.TECH REGULAR FOUR YEAR DEGREE PROGRAM
(For the batches admitted from 2020-2021)
&
FOR B.TECH LATERAL ENTRY PROGRAM
(For the batches admitted from 2021-2022)
CHOICE BASED CREDIT SYSTEM



SREE VIDYANIKETHAN ENGINEERING COLLEGE (AUTONOMOUS)
(Affiliated to JNTUA, Ananthapuramu, Approved by AICTE, Programs Accredited by NBA,
Accredited by NAAC with 'A' grade)
SREE SAINATH NAGAR, A. Rangampet -517102:: NEAR TIRUPATI (A.P)

VISION

To be one of the Nation's premier Engineering Colleges by achieving the highest order of excellence in Teaching and Research.

MISSION

- To foster intellectual curiosity, pursuit and dissemination of knowledge.
- To explore students' potential through academic freedom and integrity.
- To promote technical mastery and nurture skilled professionals to face competition in ever increasing complex world.

QUALITY POLICY

Sree Vidyanikethan Engineering College strives to establish a system of Quality Assurance to continuously address, monitor and evaluate the quality of education offered to students, thus promoting effective teaching processes for the benefit of students and making the College a Centre of Excellence for Engineering and Technological studies.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

VISION

To become a Centre of Excellence in Computer Science and Engineering by imparting high quality education through teaching, training and research

MISSION

- The Department of Computer Science and Engineering is established to provide undergraduate and graduate education in the field of Computer Science and Engineering to students with diverse background in foundations of software and hardware through a broad curriculum and strongly focused on developing advanced knowledge to become future leaders.
- Create knowledge of advanced concepts, innovative technologies and develop research aptitude for contributing to the needs of industry and society.
- Develop professional and soft skills for improved knowledge and employability of students.
- Encourage students to engage in life-long learning to create awareness of the contemporary developments in computer science and engineering to become outstanding professionals.
- Develop attitude for ethical and social responsibilities in professional practice at regional, National and International levels.

PROGRAM EDUCATIONAL OBJECTIVES

After few years of graduation, the graduates of B.Tech.CSE(DS) will be:

1. Pursuing higher studies in Computer Science and Engineering and related disciplines.
2. Employed in reputed Computer and I.T organizations and Government or have established start-up companies.
3. Able to demonstrate effective communication, engage in teamwork, exhibit leadership skills, ethical attitude, and achieve professional advancement through continuing education.

PROGRAM OUTCOMES

On successful completion of the Program, the graduates of B. Tech. CSE(DS) Program will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

On successful completion of the Program, the graduates of B.Tech.CSE(DS) program will be able to:

- PSO1:** Use mathematical methodologies to model real-world problems, employ modern tools, platforms and hardware for efficient design and development of computer-based systems.
- PSO2:** Apply suitable statistical models, tools and techniques to perform data analysis and visualization for effective decision making.
- PSO3:** Apply adaptive algorithms and techniques to develop intelligent systems for solving problems from inter-disciplinary domains.
- PSO4:** Use appropriate Computer networking models, design and develop secured information systems using appropriate algorithms, standards and principles for efficient data security and communication.



SREE VIDYANIKETHAN ENGINEERING COLLEGE

(AUTONOMOUS)

(Affiliated to J.N.T. University Anantapur, Ananthapuramu)

ACADEMIC REGULATIONS (SVEC-20) CHOICE BASED CREDIT SYSTEM

**B.Tech. Regular Four Year Degree Program
(For the batches admitted from the academic year 2020–21)**

and

**B.Tech. (Lateral Entry Scheme)
(For the batches admitted from the academic year 2021-22)**

For pursuing four year undergraduate Degree Program B.Tech offered by Sree Vidyanikethan Engineering College under Autonomous status and herein after referred to as SVEC:

1. Applicability:

All the rules specified herein, approved by the Academic Council, shall be in force and applicable to students admitted from the academic year 2020-2021 onwards. Any reference to "College" in these rules and regulations stands for SVEC.

2. Extent:

All the rules and regulations, specified hereinafter shall be read as a whole for the purpose of interpretation and as and when a doubt arises, the interpretation of the Chairman, Academic Council is final. It shall be ratified by the Academic Council in the forthcoming meeting. As per the requirements of statutory bodies, Principal, Sree Vidyanikethan Engineering College shall be the Chairman, Academic Council.

3. Admission:

3.1. Admission into First Year of Four Year B.Tech. Degree Program in Engineering:

3.1.1. Eligibility: A candidate seeking admission into the First Year of four year B.Tech. Degree Program should have:

Passed either Intermediate Public Examination (I.P.E.) conducted by the Board of Intermediate Education, Andhra Pradesh, with Mathematics, Physics and Chemistry as optional courses (or any equivalent examination recognized by JNTUA, Ananthapuramu) for admission as per the guidelines of Andhra Pradesh State Council of Higher Education (APSCHE).

3.1.2. Admission Procedure: Admissions shall be made into the first year of four year B.Tech. Degree Program as per the stipulations of APSICHE, Government of Andhra Pradesh:

- (a) By the Convener, EAMCET, (for Category-A Seats).
- (b) By the Management (for Category-B Seats).
- (c) By the Management (for 15% Supernumerary Quota) for Persons of Indian Origin (PIO)/Foreign Nationals (FN)/ Children of Indian Workers in Gulf Countries/ Overseas Citizen of India (OCI)

3.2. Admission into the Second Year of Four year B.Tech Degree Program in Engineering (Lateral Entry).

3.2.1. Eligibility: A candidate seeking admission into the Second Year of four year B.Tech. Degree Program (Lateral Entry) should have:

- (i) Passed Diploma in Engineering in the relevant branch conducted by the Board of Technical Education, Andhra Pradesh (or equivalent Diploma recognized by JNTUA, Ananthapuramu).
- (ii) Candidates qualified in ECET and admitted by the Convener, ECET. In all such cases for admission, when needed, permissions from the statutory bodies are to be obtained.

3.2.2. Admission Procedure: 10% of the sanctioned strength in each Program of study as lateral entry students or as stipulated by APSICHE shall be filled in by the Convener, ECET.

4. Programs of study offered leading to the award of B.Tech. Degree:

Following are the four year undergraduate Degree Programs of study offered in various branches in SVEC leading to the award of B.Tech (Bachelor of Technology) Degree:

- 1) Civil Engineering
- 2) Electrical and Electronics Engineering
- 3) Mechanical Engineering
- 4) Electronics and Communication Engineering
- 5) Computer Science and Engineering
- 6) Electronics and Instrumentation Engineering
- 7) Information Technology
- 8) Computer Science and Systems Engineering
- 9) Computer Science and Business Systems
- 10) Computer Science and Engineering (Artificial Intelligence)

- 11) Computer Science and Engineering (Data Science)
- 12) Computer Science and Engineering (Artificial Intelligence & Machine Learning)
- 13) Computer Science and Engineering (Internet of Things)
- 14) Computer Science and Engineering (Cyber Security)
- 15) Computer Science and Design

5. Duration of the Program:

5.1. Minimum Duration: The program shall extend over a period of four years leading to the Degree of Bachelor of Technology (B.Tech) of the JNTUA, Ananthapuramu. The four academic years shall be divided into eight semesters with two semesters per year. Each semester shall normally consist of 22 weeks having - Continuous Internal Evaluation (CIE) and Semester End Examination (SEE), Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as suggested by UGC and Curriculum/ Course Structure as suggested by AICTE/APSCHE are followed. Provision is made for lateral entry admission of students into the Second Year of the program in all the branches of study and they shall be required to satisfy the conditions of admissions thereto prescribed by the JNTUA, Ananthapuramu and Government of Andhra Pradesh.

5.2. Maximum Duration:

The student shall complete all the passing requirements of the B.Tech degree program within a maximum duration of 8 years (6 years for lateral entry), these durations reckoned from the commencement of the semester to which the student was first admitted to the program.

6. Structure of the Program:

Each Program of study shall consist of:

- (i) HS (Humanities and Social Sciences) Courses
- (ii) BS (Basic Sciences) Courses
- (iii) ES (Engineering Sciences) Courses
- (iv) PC (Professional Core) Courses
- (v) PE (Professional Electives)
- (vi) OE (Open Electives) Courses
- (vii) SO (Skill Oriented) Courses
- (viii) Mandatory Courses (MC)
- (ix) Audit Courses (AC)
- (x) Projects (PR) (Internships, Project Work)

S.No	Course Category	Course Type
1.	HS – Humanities and Social Sciences	Humanities, Social Sciences and Management.
2.	BS – Basic Sciences	Mathematics, Physics and Chemistry Courses, etc.
3.	ES – Engineering Sciences	Fundamental Engineering courses.
4.	PC – Professional Core	Core courses related to the Parent Discipline/ Branch of Engineering.
5.	PE – Professional Electives	Elective courses related to the Parent Discipline/ Branch of Engineering.
6.	OE – Open Electives	Electives from other technical and /or emerging courses
7.	SO (Skill Oriented) Courses	Basic and advanced skills related to the domain courses, soft skills course
8.	PR - Projects	Summer Internships, Internship, Project Work
9.	MC - Mandatory Courses	Induction Program, Environmental Science, Universal Human Values
10.	AC - Audit Courses	Value Added Courses.

Contact Periods:

The contact periods per week are assigned depending on the complexity and volume of the course.

7. Credit Courses:

All Courses are to be registered by a student in a Semester to earn Credits. Credits shall be assigned to each Course in a L: T: P: C (Lecture Hours: Tutorial Hours: Practical Hours: Credits) Structure, based on the following general pattern.

- **Theory Courses:** One Lecture Hour (L) per week in a semester: 01 Credit
- **Practical Courses:** One Practical Hour (P) Per week in a semester: 0.5Credit
- **Tutorial:** One Tutorial Hour (T) Per week in a semester: 01 Credit
- **Mandatory Courses:** No **CREDIT** is awarded.
- **Audit Courses:** No **CREDIT** is awarded.

Student activities like Sports, Study Tour and Guest Lecture etc. shall not carry ANY Credits.

For Summer Internships, Internship and Project Work, where formal contact periods are not specified, credits are assigned based on the complexity of the work to be carried out.

The four year curriculum of any B. Tech Program of study shall have a total of **160** credits. However the curriculum for students admitted under lateral entry shall have a total of **121** credits.

8. Choice Based Credit System (CBCS):

Choice Based Credit System (CBCS) is introduced in line with UGC guidelines in order to promote:

- Student centred learning
- Students to learn courses of their choice
- Interdisciplinary learning

A Student has a choice of registering for courses comprising program core, professional electives, open electives, value added, Skill oriented courses etc. Besides, choice is also offered to students for registering courses to earn Minor in Engineering/Honors degree.

9. Course Enrollment and Registration

- 9.1.** Each student, on admission shall be assigned to a Faculty Advisor (Mentor) who shall advice and counsel the student about the details of the academic program and the choice of courses considering the student's academic background and career objectives.
- 9.2.** Each student on admission shall register for all the courses prescribed in the curriculum in the student's first and second Semesters of study. The student shall enroll for the courses with the help of the student's Faculty Advisor (Mentor). The enrollment for the courses from II B.Tech I Semester to IV B.Tech I Semester shall commence 10 days prior to the last instructional day of the preceding semester for registration process. If the student wishes, the student may drop or add courses (vide clause 8) 10 days prior to commencement of the concerned semester and complete the registration process duly authorized by the Chairman, Board of Studies of concerned department.
- 9.3.** If any student fails to register the courses in a semester, he shall undergo the courses as per the program structure.
- 9.4.** After registering for a course, a student shall attend the classes, satisfy the attendance requirements, earn Continuous Assessment marks and appear for the Semester-end Examinations.
- 9.5.** Elective courses shall be offered by a Department only if a minimum of 40 students register for that course.

10. Break of Study from a Program (Gap Year)

- 10.1.** A student is permitted to go on break of study for a maximum period of two years either as two breaks of one year each or a single break of two years.
- 10.2.** In case, a student wishes to extend the gap year for one more consecutive year, he shall be permitted with the prior approval of the Principal on the recommendations of the Head of the Department prior to the beginning of the semester in which he has taken break of study.
- 10.3.** The student shall apply for break of study in advance, in any case, not later than the last date of the first assessment period in a semester. The gap year concept is introduced for start-up (or) incubation of an idea, National/International Internships, and professional Volunteering. The application downloaded from the website and duly filled in by the student shall be submitted to the Principal through the Head of the department. A committee shall be appointed by the Principal in this regard. Based on the recommendations of the committee, Principal shall decide whether to permit the student to avail the gap year or not.
- 10.4.** The students permitted to rejoin the program after break of study shall be governed by the Curriculum and Regulations in force at the time of rejoining.

The students rejoining in new regulations shall apply to the Principal in the prescribed format through Head of the Department, at the beginning of the readmitted semester for registering additional/equivalent courses to comply with the curriculum in-force.
- 10.5.** The two years period of break of study shall not be counted for the maximum Period of graduation (i.e the maximum period of graduation is 10 years for Regular admitted students and 8 years for Lateral Entry admitted students availing Gap Year).
- 10.6.** If a student has not reported to the college after completion of the approved period of break of study he is deemed to be detained in that semester. Such students are eligible for readmission into the semester when offered next.

11. Examination System:

- 11.1** All components in any Program of study shall be evaluated through internal evaluation and/or an external evaluation conducted as Semester-end examination.

Sl. No.	Course	Marks	Examination and Evaluation		Scheme of examination
1.	Theory	70	Semester-end examination for 3 hours duration (External evaluation)		<p>The examination question paper in theory courses shall be for a maximum of 70 marks.</p> <p>The question paper shall be of descriptive type with FIVE EITHER/OR type questions, ONE EITHER/OR type question from each unit [totally ten questions from Q. No. 1 to 10]] of which student has to answer one from each EITHER/OR type question and shall be evaluated each for 14 marks.</p>
		30	10	Assignments (Internal evaluation)	One Assignment shall be given to the student for 10 marks during the semester.
			20	Mid-term Examination of 2 hours duration (Internal evaluation)	<p>Two mid-term examinations each for 20 marks shall be conducted. For a total of 20 marks, 80% of better one of the two and 20% of the other one are added and finalized, any fraction shall be rounded off to the higher integer number.</p> <p>The examination shall be conducted and evaluated for 40 marks and scaled down to 20 marks, any fraction shall be rounded off to the higher integer number.</p> <p>Mid-I: After first spell of instruction (I & II Units).</p> <p>Mid-II: After second spell of instruction (III, IV & V Units).</p> <p>The question paper shall be of descriptive type with two parts i.e., Part-A and Part-B. Part-A shall contain 5 short answer questions [Q. No. 1 (a) to (e)] and evaluated each for 2 marks. Part-B shall contain three EITHER/OR type questions [totally six questions from Q. No. 2 to 7]] of which student has to answer one from each EITHER/OR type question and shall be evaluated each for 10 marks. Further, in the case of Part-B of Mid-I, one EITHER/OR type question from each unit and third either or type question from both the units; and for Mid-II, one EITHER/OR type question from each unit.</p>
2.	Laboratory	70	Semester-end Lab Examination for 3 hours duration (External evaluation)		The examination shall be conducted by the faculty member handling the laboratory (Examiner-2) and another faculty member (Examiner-1) appointed by the Chief Controller of Examinations.
		30	20	Day-to-Day evaluation for Performance in laboratory experiments and Record. (Internal evaluation)	Two laboratory examinations each for 30 marks which include Day-to-Day evaluation and Practical examination shall be evaluated by the faculty member. For a total of 30 marks 80% of better one of the two and 20% of the other one are added and finalized, any fraction shall be rounded off to the higher integer number.
			10	Practical Examination (Internal evaluation)	<p>Mid-I: Shall be conducted just before FIRST mid-term theory examinations.</p> <p>Mid-II: Shall be conducted just before SECOND mid-term theory examinations.</p>

Sl. No.	Course	Marks	Examination and Evaluation		Scheme of examination
3.	Mandatory courses	30	Internal Evaluation		Shall be evaluated as given in 11.2.1
4.	Audit Courses	-	-		As detailed in 11.2.2
5.	MOOC	100	-		The student has to submit MOOC certificate with percentage of Score earned to the Head of the Department at the end of the semester. Based on the score the equivalent Grade Point and Credits will be assigned as given in 11.3.
6.	Summer Internship	100	Semester-end evaluation		The evaluation shall be done by the Internship Evaluation Committee (IEC) at the end of the semester as given in 11.4.
7.	Internship	-	-		At the end of semester the student should submit an internship completion certificate as given in 11.5
8.	Project Work	200	100	Internal evaluation	Continuous evaluation shall be done by the Project Evaluation Committee (PEC) as given in 11.6.1
			100	Semester-end evaluation	Project Work Viva-Voce Examination shall be conducted by a Committee at the end of the semester as given in 11.6.2

11.2 Mandatory Course/ Audit Course Evaluation:

11.2.1. Mandatory Courses:

Mandatory courses carry **"ZERO"** credits. There shall be **NO Semester-end** examination. However, ATTENDANCE in Mandatory courses shall be considered while calculating aggregate attendance in a semester. The mid-term examination shall be conducted and evaluated similar to the THEORY courses. The student shall be declared to have passed the mandatory courses only when HE secures **40% marks in the internal evaluation**. If the student FAILS, a re-examination shall be conducted for FAILED candidates in the CONSECUTIVE semester. The performance of the student shall be indicated in the grade sheets **"SATISFACTORY" (or) "NOT SATISFACTORY"** as given in 14.1. The student should pass all the mandatory courses, for the award of B.Tech degree.

11.2.2. Audit Courses:

Audit courses carry **"ZERO"** credits. There shall be **NO mid-term** and **Semester-end examination**. However, ATTENDANCE in Audit courses shall be considered while calculating aggregate attendance in a semester. The student should study all the audit courses, and it shall be indicated in the GRADE Sheet.

11.3 Massive Open Online Course (MOOC)

MOOC is a web-based learning aimed at unlimited participation and open access.

- 11.3.1** A Student shall be permitted to pursue **two elective courses** under MOOC during the program of study. The duration of the MOOC shall be for a minimum period of 08 weeks.
- 11.3.2** The student shall confirm registration by enrolling the course within 10 days prior to the last instructional day of the current Semester of study along with regular courses.
- 11.3.3** The list of courses along with MOOC service providers shall be identified, approved and notified by the Chairman, BOS and Head of the Department.
- 11.3.4** The student has to submit MOOC certificate with percentage of Score earned to the Head of the Department at the end of the semester. Based on the score earned, the equivalent Grade Point and Credits will be assigned.
- 11.3.5** Attendance is not applicable for MOOC Course and also attendance will not be monitored.
- 11.3.6** If the student fails to submit the MOOC certificate at the end of the semester, his performance in MOOC will be shown as "Fail" in the Grade sheet. Then the student shall register for the supplementary examinations and submit the MOOC certificate.

11.4. Summer Internship

- 11.4.1** Students shall undergo mandatory two summer internships each with a minimum of Four weeks duration, at the end of second and third year of the Programme. The internship can be done by the students at Govt. Organizations, construction agencies, Industries, Research Centres, MNC, Academic Institutes, etc.
- 11.4.2** The progress of the Internship is monitored by the supervisor periodically. Evaluation of the summer internships shall be conducted by the Internship Evaluation Committee (IEC) at the end of semester. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the IEC. The report and the oral presentation shall carry 40% and 60% weightage respectively.
- 11.4.3** If any student fails to complete summer internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the summer internship.

11.5. Internship

11.5.1 In the final semester of program of study, the student should mandatorily undergo internship for the entire semester and parallelly work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate. A student shall also be permitted to submit project report on the work carried out during the internship.

11.5.2 If any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.

11.6 Project Work:

11.6.1 Internal Evaluation: The Internal Evaluation shall be made by the Project Evaluation Committee (PEC) consisting of concerned supervisor and two senior faculty members, on the basis of TWO project reviews on the topic of the project. Each review shall be conducted for a maximum of "100" marks. For a total of 100 marks, 80% of better one of the two and 20% of the other one are added and finalized. The PEC is constituted by the Principal on the recommendations of the Head of the Department.

11.6.2 Semester-end Evaluation: The Semester-end Project Work Viva-Voce Examination shall be conducted by a Committee consisting of External examiner (nominated by the Chief Controller of Examinations), HOD and concerned Supervisor. The evaluation of project work shall be done at the end of the IV B.Tech II Semester.

Three copies of the dissertation certified in the prescribed format by the concerned Supervisor and HOD shall be submitted to the Department. One copy is to be submitted to the Chief Controller of Examinations. The examiner shall be nominated by the Chief Controller of the Examinations from the panel of SIX examiners submitted by the Department.

11.7. Eligibility to appear for the Semester-End Examination (SEE):

11.7.1. A student shall be eligible to appear for semester-end examinations if he acquires a minimum of 40% in each subject and 75% of attendance in aggregate of all the courses in a semester.

11.7.2. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.

11.7.3. Shortage of Attendance below 65% in aggregate **shall in no case be condoned.**

11.7.4. Students whose shortage of attendance is not condoned in any semester are not eligible to take their semester-end examinations of that class and their registration shall stand cancelled.

11.7.5. A student shall not be promoted to the next semester unless he satisfies the attendance requirements of the current semester, as applicable. The student may seek readmission for the semester when offered next. He shall not be allowed to register for the courses of the semester while he is in detention. A student detained due to shortage of attendance, shall have to repeat that semester when offered next.

11.7.6. A stipulated fee shall be payable to the College towards Condonation of shortage of attendance.

11.7.7. For the calculation of a student attendance in any semester, the total number of classes conducted shall be counted as scheduled in the class-work time table.

11.8. Evaluation:

Following procedure governs the evaluation.

11.8.1. Marks for components evaluated internally by the faculty shall be submitted to the Controller of Examinations one week before the commencement of the Semester-end examinations. The marks for the internal evaluation components shall be added to the external evaluation marks secured in the Semester-end examinations, to arrive at the total marks for any course in that semester.

11.8.2. Performance in all the courses is tabulated course-wise and shall be scrutinized by the Results Committee and moderation is applied if needed and course-wise marks are finalized. Total marks obtained in each course are converted into letter grades.

11.8.3. Student-wise tabulation shall be done and individual grade Sheet shall be generated and issued to the student.

11.9. Recounting /Revaluation/Personal Verification/ Challenging Evaluation:

Students shall be permitted to apply for **Recounting /Revaluation/Personal Verification/ Challenging Evaluation** of the Semester-end examination answer scripts within a stipulated period after payment of the prescribed fee. After completion of the process of **Recounting /Revaluation/Personal**

Verification/ Challenging Evaluation, the records are updated with changes if any, and the student shall be issued a revised grade sheet. If there are no changes, the student shall be intimated the same through a notice.

11.10. Supplementary Examination:

In addition to the regular semester-end examinations conducted, the College may also schedule and conduct supplementary examinations for all the courses of other semesters when feasible for the benefit of students. Such of the candidates writing supplementary examinations may have to write more than one examination per day.

12. Academic Requirements for promotion/completion of regular B.Tech Program of study:

The following academic requirements have to be satisfied in addition to the attendance requirements for promotion/completion of regular B.Tech Program of study.

For students admitted into B.Tech. (Regular) Program:

- 12.1.** A student shall be deemed to have satisfied the minimum academic requirements for each theory course, laboratory course, Internship and project work, if he secures not less than 35% of marks in the Semester-end examination and a minimum of 40% of marks in the sum total of the internal evaluation and Semester-end examination taken together.
- 12.2.** A student shall be promoted from second year to third year of Program of study only if he fulfills the academic requirement of securing 40% credits (rounded off to lower integer number) from the following examinations (Irrespective of whether or no the candidate appears for the semester-end examinations as per the normal course of study):
 - a. **One** regular and **two** supplementary examinations of I B.Tech I Semester.
 - b. **One** regular and **one** supplementary examinations of I B.Tech II Semester.
 - c. **One** regular examination of II B.Tech I Semester.
- 12.3.** A student shall be promoted from third year to fourth year of Program of study only if he fulfills the academic requirements of securing 40% credits (rounded off to lower integer number) from the following examinations (Irrespective of whether or not the candidate appears for the semester-end examinations as per the normal course of study):
 - a. **One** regular and **four** supplementary examinations of I B.Tech I Semester.
 - b. **One** regular and **three** supplementary examinations of I B.Tech II Semester.
 - c. **One** regular and **two** supplementary examinations of II B.Tech I Semester.

d. **One** regular and **one** supplementary examinations of II B.Tech II Semester.

e. **One** regular examination of III B.Tech I Semester.

* In case of getting detained for want of credits by sections 12.2 and 12.3 above, the student may make up the credits through supplementary examinations.

12.4. A student shall register for all the 160 credits and earn all the 160 credits. Marks obtained in all the 160 credits shall be considered for the calculation of the CLASS based on CGPA.

12.5. A student who fails to earn 160 credits as indicated in the course structure within eight academic years from the year of their admission shall forfeit his seat in B.Tech. Program and his admission stands cancelled.

For Lateral Entry Students (batches admitted from the academic year 2021-2022):

12.6. A student shall be deemed to have satisfied the minimum academic requirements for each theory course, laboratory course, Internship and project work, if he secures not less than 35% of marks in the Semester-end examination and a minimum of 40% of marks in the sum total of the internal evaluation and Semester-end examination taken together.

12.7. A student shall be promoted from third year to fourth year of Program of study only if he fulfills the academic requirements of securing 40% credits (rounded off to lower integer number) from the following examinations (Irrespective of whether or not the candidate appears for the semester-end examinations as per the normal course of study):

a. **One** regular and **Two** supplementary examinations of II B.Tech I Semester.

b. **One** regular and **One** supplementary examinations of II B.Tech II Semester.

c. **One** regular examination of III B.Tech I Semester.

Irrespective of whether or not the candidate appears for the semester-end examination as per the normal course of study and in case of getting detained for want of credits the student may make up the credits through supplementary examinations.

12.8. A student shall register for all 121 credits and earn all the 121 credits. Marks obtained in all the 121 credits shall be considered for the calculation of the CLASS based on CGPA.

12.9. A student who fails to earn 121 credits as indicated in the course structure within six academic years from the year of their admission shall forfeit his seat in B.Tech Program and his admission stands cancelled.

13. NCC/NSS Activities:

All students should register for NCC/NSS activities. A student will be required to participate in an activity for two hours in a week for one semester. Student shall register during Fourth or Fifth semester of the program of study. Grade shall be awarded as Satisfactory or Unsatisfactory in the mark sheet on the basis of participation, attendance, performance and behavior. If a student gets an unsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.

14. Minor Degree in a discipline:

The concept of Minor degree is introduced in the curriculum of all B. Tech. programs offering a Major degree. The main objective of Minor degree in a discipline is to provide additional learning opportunities for academically motivated students and it is an optional feature of the B.Tech. Program. In order to earn a Minor degree in a discipline, a student has to earn **20** extra credits (By studying Six Theory Courses) from the core courses of the minor discipline.

- a. Students having a CGPA of 8.0 or above up to II B.Tech I-Semester without any backlogs shall be permitted to register for Minor degree by paying the requisite fee.
- b. An SGPA and CGPA of 7.5 has to be maintained in the subsequent semesters without any backlog subjects in order to keep the Minor Degree registration live or else it shall be cancelled.
- c. Students aspiring for a Minor degree must register from III B.Tech I-Semester onwards and must opt for a **Minor in a discipline other than the discipline** he is registered in.
- d. A Student shall register for a Minor with **Eight** credits in III B.Tech I-Semester (**TWO** theory courses), **Six** credits in III B.Tech II-Semester (**TWO** theory courses- one from the pool of courses offered and other one through MOOC) and **Six** credits in IV B.Tech I-Semester (**TWO** theory courses- one from the pool of courses offered and other one through MOOC).
- e. The evaluation pattern of the courses offered (for 16 credits) shall be similar to the regular program courses evaluation. However, the remaining 4 credits must be acquired through two MOOCs, which shall be domain specific each with 2 credits and with minimum duration of 08 weeks each.

- f. The list of courses along with MOOC service providers shall be identified, approved and notified by the Chairman, BOS and Head of the Department.
- g. The student has to submit MOOC certificate with percentage of Score earned to the Head of the Department at the end of the semester. Based on the score earned, the equivalent Grade Point and Credits will be assigned. Attendance is not applicable for MOOC Course and also attendance will not be monitored.
- h. Minimum strength required for offering a **Minor in a** discipline is 40 students.
- i. **A student registered for Minor degree shall pass in all subjects that constitute the requirement for the Minor** degree program. No class/division (i.e., second class, first class and distinction, etc.) shall be awarded for **Minor** degree program.
- j. The **Minor degree** shall be mentioned in the degree certificate as Bachelor of Technology in XXX with Minor in YYY. For example, Bachelor of Technology in Computer Science & Engineering with Minor in Title of the Minor Pursued This shall also be reflected in the transcripts, along with the list of courses taken for **Minor degree** program with CGPA mentioned separately.
- k. Separate course/class work and time table shall be arranged for the various Minor degree programs. Attendance regulations for these Minor discipline programs shall be as per regular courses.

NOTE: Interested meritorious students shall be permitted to register either for Minor degree in a discipline (or) Honors Degree in a discipline only, **but not both.**

15. Honors Degree in a discipline:

The concept of Honors degree is introduced in the curriculum for all B. Tech. programs. The main objective of Honors degree is to provide additional learning opportunities for academically motivated students in the same or allied discipline and it is an optional feature of the B. Tech. program. In order to earn Honors degree in a discipline, a student has to earn **20** extra credits (By studying SIX Theory Courses).

- a. Students having a CGPA of 8.0 and above up to II B.Tech I-Semester without any backlogs shall be permitted to register for Degree with Honors by paying the requisite fee.
- b. An SGPA and CGPA of 7.5 has to be maintained in the subsequent semesters without any backlog subjects in order to keep the Honors Degree registration live or else it shall be cancelled.
- c. Students aspiring for a Honors degree must register from III B.Tech I-Semester onwards.
- d. A Student shall register for a Honors with **Eight** credits in III B.Tech I-Semester

(**TWO** theory courses), **Six** credits in III B.Tech II-Semester (**TWO** theory courses- one from the pool of courses offered and other one through MOOC) and **Six** credits in IV B.Tech I-Semester (**TWO** theory courses- one from the pool of courses offered and other one through MOOC).

- e. The evaluation pattern of the courses offered (16 credits) shall be similar to the regular program courses evaluation. However, the remaining 4 credits must be acquired through two MOOCs, which shall be domain specific each with 2 credits and with minimum duration of 8 weeks.
- f. The list of courses along with MOOC service providers shall be identified, approved and notified by the Chairman, BOS, and Head of the Department.
- g. The student has to submit MOOC certificate with percentage of Score earned to the Head of the Department at the end of the semester. Based on the score earned, the equivalent Grade Point and Credits will be assigned.
- h. Attendance is not applicable for MOOC Course and also attendance will not be monitored
- i. Minimum strength required for offering a **Honors in a** discipline is 10% of the sanctioned intake.
- j. **A student registered for Honors degree shall pass in all subjects that constitute the requirement for the Honors** degree program. No class/division (i.e., second class, first class and distinction, etc.) shall be awarded for **Honors** degree program.
- k. The **Honors degree** shall be mentioned in the degree certificate as Bachelor of Technology (Honors) in XXX. Example, Bachelor of Technology (Honors) in Computer Science & Engineering. This shall also be reflected in the transcripts, along with the list of courses taken for **Honors degree** program with CGPA mentioned separately.
- l. Separate course/class work and time table shall be arranged for the various Honors degree programs. Attendance regulations for these Honors discipline programs shall be as per regular courses.

NOTE: Interested meritorious students shall be permitted to register either for Minor degree in a discipline (or) Honors Degree in a discipline only, **but not both.**

16. Transitory Regulations:

Students who got detained for want of attendance (or) who have not fulfilled academic requirements (or) who have failed after having undergone the Program in earlier regulations (or) who have discontinued and wish to continue the Program are eligible for admission into the unfinished semester from the date of

commencement of class work with the same (or) equivalent courses as and when courses are offered and they shall be in the academic regulations into which they are presently readmitted.

A regular student has to satisfy all the eligibility requirements within the maximum stipulated period of eight years and a lateral entry student within six years for the award of B.Tech Degree.

17. Grades, Semester Grade Point Average and Cumulative Grade Point Average:

17.1. Grade System: After all the components and sub-components of any course (including laboratory courses) are evaluated, the final total marks obtained shall be converted into letter grades on a "10 point scale" as described below.

% of Marks obtained	Grade	Description of Grade	Grade Points (GP)
≥90	A+	Outstanding	10
≥80 to <90	A	Excellent	9
≥70 to < 80	B	Very Good	8
≥ 60 to < 70	C	Good	7
≥ 50 to < 60	D	Fair	6
≥ 40 to < 50	E	Satisfactory	5
< 40	F	Fail	0
Absent	N	Absent	0
For Mandatory Courses			
≥40	P	Satisfactory	-
<40	I	Not Satisfactory	-
For NCC/NSS Activities			
Participated	P	Satisfactory	-
Not Participated	I	Not Satisfactory	-
For Internship			
Submission of Certificate	P	Completed	
Non-Submission of Certificate	I	Incomplete	

Pass Marks:

A student shall be declared to have passed theory course, laboratory course, and project work if he secures minimum of 35% marks (Rounded off to lower integer number) in external examination, and a minimum of 40% marks in the sum total of internal evaluation and external examination taken together. Otherwise, he shall be

awarded fail grade - 'F' in such a course irrespective of internal marks. 'F' is considered as a fail grade indicating that the student has to pass the Semester-End Examination in that course in future and obtain a grade other than 'F' and 'N' for passing the course.

For the Mandatory Courses, if the student obtained 40% or more marks, then his performance shall be indicated as "P" (SATISFACTORY), otherwise the performance shall be indicated as "I" (NOT SATISFACTORY) in the grade sheet.

For the NCC/NSS Activities, if the student participate in the activities, then his performance shall be indicated as "P" (SATISFACTORY), otherwise the performance shall be indicated as "I" (NOT SATISFACTORY) in the grade sheet.

For the Internship, if the student submit Certificate, then his performance shall be indicated as "P" (COMPLETED), otherwise the performance shall be indicated as "I" (INCOMPLETE) in the grade sheet.

17.2. Semester Grade Point Average (SGPA): SGPA shall be calculated as given below on a "10 point scale" as an index of the student's performance:

$$SGPA = \frac{\sum(C \times GP)}{\sum C}$$

Where "C" denotes the "credits" assigned to the courses undertaken in that semester and "GP" denotes the "grade points" earned by the student in the respective courses.

Note: SGPA is calculated only for the candidates who appeared in the semester-end regular examinations in a particular semester:

17.3. Cumulative Grade Point Average (CGPA):

The CGPA shall be calculated for a candidate who appeared in the Semester-end examination (including Regular & Supplementary) till that semester. The CGPA shall be displayed in the Grade sheet of the Regular Semester-end examinations and also in the consolidated Grade Sheet issued at the end of the program. The CGPA is computed on a 10 point scale as given below:

$$CGPA = \frac{\sum(C \times GP)}{\sum C}$$

Where, C denotes the credits assigned to courses undertaken up to the end of the Program and GP denotes the grade points earned by the student in the respective courses.

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

As per AICTE regulations, conversion of CGPA into equivalent percentage as follows:

$$\text{Equivalent Percentage} = (\text{CGPA} - 0.50) \times 10$$

18. Grade Sheet: A grade sheet (Marks Memorandum) shall be issued to each student indicating the SGPA and CGPA, provided if he passed all the courses registered in the regular semester-end examinations.

19. Consolidated Grade Sheet: After successful completion of the entire Program of study, a Consolidated Grade Sheet indicating performance of all academic years shall be issued as a final record. Duplicate Consolidated Grade Sheet shall also be issued, if required, after payment of requisite fee.

20. Award of Degree: The Degree shall be conferred and awarded by Jawaharlal Nehru Technological University Anantapur, Ananthapuramu on the recommendations of the Chairman, Academic Council, SVEC (Autonomous).

20.1. Eligibility: A student shall be eligible for the award of B.Tech Degree if he fulfills all the following conditions:

- Registered and successfully completed all the components prescribed in the Program of study to which he is admitted.
- Successfully acquired the minimum required credits as specified in the curriculum corresponding to the branch of study within the stipulated time.
- Obtained CGPA greater than or equal to 4.0 (Minimum requirement for declaring as passed).
- Has NO DUES to the College, Hostel, Library etc. and to any other amenities provided by the College.
- No disciplinary action is pending against him.

20.2. Award of Class: Awarding of Class is based on CGPA.

Awarding of Class

CGPA Secured	Class Awarded
≥7.5	First Class with Distinction
≥6.5 and <7.5	First Class
≥5.5 and <6.5	Second Class
≥5.0 and <5.5	Pass Class

21. Additional Academic Regulations:

- 21.1.** A student may appear for any number of supplementary examinations within the stipulated time to fulfill regulatory requirements for award of the degree.
- 21.2.** In case of malpractice/improper conduct during the examinations, guidelines shall be followed as given in the ANNEXURE-I.
- 21.3.** When a student is absent for any examination (Mid-term or Semester-end) he shall be awarded zero marks in that component (course) and grading shall be done accordingly.
- 21.4.** When a component is cancelled as a penalty, he shall be awarded zero marks in that component.

22. Withholding of Results:

If the candidate has not paid dues to the College/University (or) if any case of indiscipline is pending against him, the result of the candidate shall be withheld and he shall not be allowed/promoted to the next higher semester.

23. Re-Registration for Improvement of Internal Marks:

Following are the conditions to avail the benefit of improvement of internal marks.

- 23.1.** The candidate should have completed the 4 years of B.Tech course work and obtained examinations results from I B.Tech I Semester to IV B.Tech II semester.
- 23.2.** Out of the courses the candidate has failed in the examinations due to internal evaluation marks secured being less than 40%, the candidate shall be given a chance for improvement of internal evaluation marks in the failed theory courses.
- 23.3.** This provision is only for Theory courses. The candidate has to register for the chosen courses and fulfil the academic requirements (i.e. a student has to attend the classes regularly and appear for the mid-examinations and satisfy the attendance requirements to become eligible for appearing at the semester-end examinations).
- 23.4.** For each course, the candidate has to pay a fee of Rs. 10,000/- and the amount is to be remitted in the form of D.D. in favor of the Principal, Sree Vidyanikethan Engineering College payable at Tirupati along with the requisition through the concerned Head of the Department.
- 23.5.** In the event of availing the provision of Improvement of Internal evaluation marks, the internal evaluation marks as well as the Semester-end Examinations marks secured in the previous attempt(s) for the re-registered courses shall stand cancelled.

24. Amendments to Regulations:

The Academic Council of SVEC(Autonomous) reserves the right to revise, amend or change the Regulations, Scheme of Examinations, and / or Syllabi or any other

policy relevant to the needs of the society or industrial requirements etc., with the recommendations of the concerned Board(s) of Studies.

25. General:

The words such as "he", "him", "his" and "himself" shall be understood to include all students irrespective of gender connotation.

Note: Failure to read and understand the regulations is not an excuse.

ANNEXURE-I

GUIDELINES FOR DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

Rule No.	Nature of Malpractices/Improper conduct	Punishment
	<i>If the candidate:</i>	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the 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 candidate 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.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that Semester. The Hall Ticket of the candidate is to be cancelled.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred for four consecutive semesters from class work and all Semester-end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the courses of the examination (including labs and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester. The candidate is also debarred for four consecutive semesters from class work and all Semester-end examinations, if his involvement is established. Otherwise, The candidate is debarred for two consecutive semesters from class work and all Semester-end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the

		courses of that semester. The candidate is also debarred for two consecutive semesters from class work and all Semester-end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course only.
6.	Refuses to obey the orders of the Chief Controller of Examinations/Controller of Examinations/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 Controller of Examinations 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 Controller of Examinations, 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 the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester. If the candidate physically assaults the invigilator/Controller of the Examinations, then the candidate is also debarred and forfeits his/her seat. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The candidate is also debarred for two consecutive semesters from class work and all Semester-end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess 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 the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The candidate is also debarred and forfeits the seat.

Note: Whenever the performance of a student is cancelled in any course(s) due to Malpractice, he has to register for Semester-end Examinations in that course(s) consequently and has to fulfill all the norms required for the award of Degree.

SVEC20 CURRICULUM

Course Structure for B.Tech. Program
(Effective from the Academic year 2020-21 onwards)

COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

Mandatory Induction Program	03 weeks duration
Induction program offered before commencement of the I-Semester course work	Physical activity
	Creative Arts
	Universal Human Values
	Literary
	Proficiency Modules
	Lectures by Eminent People
	Visits to local Areas
	Familiarization to Department/Branch and Innovations

COURSE STRUCTURE

I B.Tech. – I Semester

Sl. No.	Course Code	Course Title	Contact Periods per week				C	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1.	20BT1BS01	Differential Equations and Multivariable Calculus	3	-	-	3	3	30	70	100
2.	20BT1BS03	Engineering Physics	3	-	-	3	3	30	70	100
3.	20BT1HS01	Communicative English	3	-	-	3	3	30	70	100
4.	20BT11201	Programming for Problem Solving	3	-	-	3	3	30	70	100
5.	20BT10201	Basic Electrical and Electronics Engineering	3	-	-	3	3	30	70	100
6.	20BT1BS32	Engineering Physics Lab	-	-	3	3	1.5	30	70	100
7.	20BT1HS31	Communicative English Lab	-	-	3	3	1.5	30	70	100
8.	20BT11231	Programming for Problem Solving Lab	-	-	3	3	1.5	30	70	100
9.	20BT1MC01	Universal Human Values (Mandatory Course)	2	-	-	2	-	30	-	30
Total:			17	-	09	26	19.5	270	560	830

I B.Tech. – II Semester

Sl. No.	Course Code	Course Title	Contact Periods per week				C	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1.	20BT2BS01	Transformation Techniques and Linear Algebra	3	-	-	3	3	30	70	100
2.	20BT1BS02	Engineering Chemistry	3	-	-	3	3	30	70	100
3.	20BT20501	Digital Logic Design	3	-	-	3	3	30	70	100
4.	20BT21501	Object Oriented Programming through Java	3	-	-	3	3	30	70	100
5.	20BT10331	Computer Aided Engineering Drawing	-	1	4	5	3	30	70	100
6.	20BT1BS31	Engineering Chemistry Lab	-	-	3	3	1.5	30	70	100
7.	20BT10332	Engineering Workshop	-	-	3	3	1.5	30	70	100
8.	20BT21531	Object Oriented Programming through Java Lab	-	-	3	3	1.5	30	70	100
9.	20BT1HSAC	Spoken English (Audit Course)	2	-	-	2	-	-	-	-
Total:			14	1	13	28	19.5	240	560	800

II B. Tech. – I Semester

Sl. No.	Course Code	Course Title	Contact Periods per week				C	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1.	20BT3BS01	Numerical Methods, Probability and Statistics	3	-	-	3	3	30	70	100
2.	20BT30501	Computer Organization	3	-	-	3	3	30	70	100
3.	20BT30502	Data Structures	3	-	-	3	3	30	70	100
4.	20BT30503	Python Programming	3	-	-	3	3	30	70	100
5.	20BT12901	Discrete Mathematical Structures	3	-	-	3	3	30	70	100
6.	20BT30531	Data Structures Lab	-	-	3	3	1.5	30	70	100
7.	20BT30532	Python Programming Lab	-	-	3	3	1.5	30	70	100
8.	20BT30533	Workshop in Computer Science	-	-	3	3	1.5	30	70	100
9.	20BT30534	Programming through C++ Lab	-	1	2	3	2	30	70	100
10.	20BT315AC	Design Thinking	2	-	-	2	-	-	-	-
Total:			17	01	11	29	21.5	270	630	900

II B. Tech. – II Semester

Sl. No.	Course Code	Course Title	Contact Periods per week				C	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1.	20BT50501	Computer Networks	3	-	-	3	3	30	70	100
2.	20BT40501	Database Management Systems	3	-	-	3	3	30	70	100
3.	20BT31501	Operating Systems	3	-	-	3	3	30	70	100
4.	20BT43201	Foundations of Data Science	3	-	-	3	3	30	70	100
5.	Open Elective-2		3	-	-	3	3	30	70	100
6.	20BT40531	Database Management Systems Lab	-	-	3	3	1.5	30	70	100
7.	20BT31531	Operating Systems Lab	-	-	3	3	1.5	30	70	100
8.	20BT43231	Foundations of Data Science Lab	-	-	3	3	1.5	30	70	100
9.	20BT3HS31	Soft Skills Lab	-	1	2	3	2	30	70	100
10.	20BT3MC01	Environmental Science	2	-	-	2	-	30	-	30
11.	20BT4NS01	NCC/NSS Activities	-	-	-	-	-	-	-	-
Total:			17	01	11	29	21.5	300	630	930

III B. Tech. – I Semester

Sl. No.	Course Code	Course Title	Contact Periods per week				C	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1.	20BT5HS01	Organizational Behavior	3	-	-	3	3	30	70	100
2.	20BT31201	Software Engineering	3	-	-	3	3	30	70	100
3.	20BT41501	Theory of Computation	3	-	-	3	3	30	70	100
4.	Open Elective-1		3	-	-	3	3	30	70	100
5.	Professional Elective-1		3	-	-	3	3	30	70	100
	20BT71201	Mobile Application Development								
	20BT53201	Real Time Data Streaming								
	20BT53202	Information Retrieval Techniques								
	20BT43101	Artificial Intelligence								
	20BT60504	Cryptography and Network Security								
6.	20BT31231	Software Engineering Lab	-	-	3	3	1.5	30	70	100
7.	20BT53231	Web Programming Lab	-	-	3	3	1.5	30	70	100
8.	20BT53131	Algorithm Analysis Lab	-	1	2	3	2	30	70	100
9.	20BT53232	Summer Internship-I	-	-	-	-	1.5	-	100	100
10.	20BT5MC01	Professional Ethics	2	-	-	2	-	30	-	30
Total:			17	01	08	26	21.5	270	660	930

III B. Tech. – II Semester

Sl. No.	Course Code	Course Title	Contact Periods per week				C	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1.	20BT5HS02	Principles of Business Economics and Accountancy	3	-	-	3	3	30	70	100
2.	20BT60501	Machine Learning	3	-	-	3	3	30	70	100
3.	20BT51201	Data Warehousing and Data Mining	3	-	-	3	3	30	70	100
4.	Professional Elective-2		3	-	-	3	3	30	70	100
	20BT51204	Linux Programming								
	20BT63201	Pattern Mining								
	20BT63202	Data Visualization								
	20BT60503	Soft Computing								
	20BT63203	Machine Learning for Cyber Security								
5.	Professional Elective-3		3	-	-	3	3	30	70	100
	20BT60502	Compiler Design								
	20BT63204	Graph Algorithms								
	20BT63205	Data Preparation and Analysis								
	20BT51503	Natural Language Processing								
	20BT61241	IoT Architecture and Protocols								
6.	Interdisciplinary Elective-1		3	-	-	3	3	30	70	100
	20BT60314	Optimization Techniques								
	20BT60441	Microprocessors and Interfacing								
	20BT60343	Robotics and Automation								
	20BT60406	Image Processing								
7.	20BT51231	Data Warehousing and Data Mining Lab	-	-	3	3	1.5	30	70	100
8.	20BT60531	Machine Learning Lab	-	-	3	3	1.5	30	70	100
9.	20BT51551	Internet of Things Lab	-	1	2	3	2	30	70	100
10.	20BT503AC	Foundations of Entrepreneurship	2	-	-	2	-	-	-	-
Total:			20	01	08	29	23	270	630	900

IV B. Tech. – I Semester

Sl. No.	Course Code	Course Title	Contact Periods per week				C	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1.	20BT61201	Cloud Computing	3	-	-	3	3	30	70	100
2.	20BT71203	Big Data Technologies	3	-	-	3	3	30	70	100
3.	Professional Elective-4		3	-	-	3	3	30	70	100
	20BT70502	Full Stack Development								
	20BT71503	High Performance Computing								
	20BT71504	Deep Learning								
	20BT73102	Applied Text Analytics								
	20BT73201	Malware Data Science								
4.	Professional Elective-5		3	-	-	3	3	30	70	100
	20BT71206	Game Development								
	20BT70504	Augmented Reality and Virtual Reality								
	20BT73202	Predictive Analytics								
	20BT73203	Business Intelligence								
	20BT70505	Blockchain Technologies								
5.	Interdisciplinary Elective-2		3	-	-	3	3	30	70	100
	20BT70401	Embedded Systems								
	20BT70406	Speech Processing								
	20BT70315	Industrial Internet of Things								
	20BT71501	System Simulation and Modeling								
6.	20BT61231	Cloud Computing Lab	-	-	3	3	1.5	30	70	100
7.	20BT63231	Big Data Technologies Lab	-	-	3	3	1.5	30	70	100
8.	20BT73232	NoSQL Databases Lab	-	1	2	3	2	30	70	100
9.	20BT73233	Summer Internship-II	-	-	-	-	1.5	-	100	100
10.	20BT705AC	Free and Open Source Software	2	-	-	2	-	-	-	-
Total:			17	01	08	26	21.5	240	660	900

IV B.Tech. – II Semester

S. No.	Course Code	Course Title	Contact Periods per Week				Credits (C)	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1.	20BT83231	Project Work	-	-	-	-	12	100	100	200
2.	20BT83232	Internship	-	-	-	-	-	-	-	-
Total			-	-	-	-	12	100	100	200

LIST OF COURSES FOR OPEN ELECTIVE-1 AND OPEN ELECTIVE-2

Course Code	Open Elective -1	Course Code	Open Elective -2
20BT4BS01	Material Science	20BT4HS01	Banking and Insurance
20BT4HS02	Business Communication and Career Skills	20BT4HS03	Cost Accounting and Financial Management
20BT4HS04	Entrepreneurship for Micro, Small and Medium Enterprises	20BT4HS05	Gender and Environment
20BT4HS06	German Language	20BT4HS07	Indian Economy
20BT4HS08	Indian History	20BT4HS09	Life Skills
20BT4HS10	Personality Development	20BT4HS11	Indian Tradition and Culture
20BT4HS12	Women Empowerment	20BT4HS13	Constitution of India
20BT40205	Reliability and Safety Engineering	20BT50106	Disaster Mitigation and Management
20BT40105	Environmental Pollution and Control	20BT50107	Sustainable Engineering
20BT40106	Planning for Sustainable Development	20BT50108	Contract Laws and Regulations
20BT40107	Rural Technology	20BT50310	Global Strategy and Technology
20BT40305	Human Resource Management	20BT50311	Management Science
20BT50506	Ethical Hacking	20BT40502	Cyber Laws and Security
20BT51205	AI in Healthcare	20BT50206	Intellectual Property Rights
20BT51501	Bioinformatics	20BT50406	Green Technologies

I B. Tech. - I Semester

(20BT1BS01) DIFFERENTIAL EQUATIONS AND MULTIVARIABLE CALCULUS

(Common to All Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Ordinary Differential Equations; Partial Differential Equations; Multivariable Calculus (Differentiation); Multivariable Calculus (Integration); Multivariable Calculus (Vector Calculus).

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

- CO1. Solve the higher order linear differential equations and identify solutions by analytical methods related to various engineering problems involving electrical circuits.
- CO2. Formulate and solve partial differential equations for engineering problems.
- CO3. Determine maxima and minima of functions of two variables and analyze their behaviour at extreme values.
- CO4. Evaluate and apply multiple integrals to determine areas of plane curves.
- CO5. Identify solenoidal and irrotational vector fields and apply vector integral theorems in evaluating areas and volumes.

DETAILED SYLLABUS:

UNIT-I: ORDINARY DIFFERENTIAL EQUATIONS (09 Periods)

Ordinary Differential Equation: Order and Degree of Differential Equation; Second and higher order linear differential equations with constant coefficients: Non-Homogeneous equations with R.H.S terms of the type e^{ax} , $\sin ax$, $\cos ax$, polynomials in x , $e^{ax}V(x)$ and $xV(x)$; method of variation of parameters; Equations reducible to linear differential equations with constant coefficients: Cauchy's homogeneous and Legendre's linear equations; Applications to L-C-R Circuit problems.

UNIT-II: PARTIAL DIFFERENTIAL EQUATIONS (09 Periods)

Formation of PDE, solutions of first order linear PDEs, Solution to homogenous and non-homogenous linear partial differential equations of second and higher order by complimentary function and particular integral method, method of Separation of variables in Cartesian coordinates.

UNIT-III: MULTIVARIABLE CALCULUS (DIFFERENTIATION) (09 Periods)

Partial derivatives, Chain rule, Total derivative, Jacobian, Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.

UNIT- IV: MULTIVARIABLE CALCULUS (INTEGRATION) (09 Periods)

Evaluation of Double integrals (Cartesian and polar coordinates), Change of order of integration (Cartesian form only); Evaluation of Triple integrals; Change of variables: double integration from Cartesian to polar coordinates, Triple integration from Cartesian

to spherical polar coordinates; Areas enclosed by plane curves.

UNIT- V: MULTIVARIABLE CALCULUS (VECTOR CALCULUS) (09 Periods)

Vector Differentiation: Scalar and Vector fields: Gradient of a scalar field, directional derivative, divergence of a vector field, solenoidal vector, curl of a vector field, irrotational vector, Laplacian operator. **Vector Integration:** Line integral - circulation-work done, Surface integral and Volume integral; Vector integral theorems: Theorems of Green, Gauss and Stokes (without proofs)-Problems related to theorems.

Total Periods: 45

Topics for Self-study are provided in the Lesson Plan

TEXT BOOKS:

1. T. K. V. Iyengar, B. Krishna Gandhi, S. Ranganatham and M. V. S. S. N. Prasad, *Engineering Mathematics, vol-1*, S. Chand and Company, 13th edition, 2014.
2. B. S. Grewal, *Higher Engineering Mathematics*, Khanna publishers, 44th edition, 2017.

REFERENCE BOOKS:

1. Dennis G. Zill and Warren S. Wright, *Advanced Engineering Mathematics*, Jones and Bartlett, 6th edition, 2011.
2. R. K. Jain and S. R. K. Iyengar, *Advanced Engineering Mathematics*, Alpha Science International Ltd., 6th edition, 2017.
3. Erwin kreyszig, *Advanced Engineering Mathematics*, John Wiley & Sons, 9th edition, 2006.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2			1											
CO2	3	3			1											
CO3	2	3			1											
CO4	2	3			1											
CO5	3	2			1											

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

I B. Tech. – I Semester
(20BT1BS03)ENGINEERING PHYSICS
(Common to EEE, ECE, EIE, CSE(AI),CSE(DS) and CSE(AI&ML))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES:-

COURSE DESCRIPTION:Wave Optics; Electromagnetic Waves; Fiber Optics; Semiconductors; Optoelectronic Devices; Dielectrics; Magnetic materials; Superconductors and Nanomaterials.

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

- CO1. Apply the knowledge of light waves to interpret the concepts of Interference, Diffraction and Polarization.
- CO2. Demonstrate the concepts of electromagnetic wave propagation in Optical fibers.
- CO3. Apply the basic knowledge of semiconductors to understand the functioning of various optoelectronic devices.
- CO4. Demonstrate the basic knowledge of dielectric and magnetic properties to understand the various dielectric polarizations and magnetic materials.
- CO5. Understand the concepts of superconductors and nanomaterials to familiarize their applications in relevant fields.

DETAILED SYLLABUS:

UNIT-I: WAVE OPTICS (09 Periods)

Interference: Introduction- Interference of light - Theory of interference fringes - Conditions for sustained interference - Interference in thin films (reflected light) - Newton's rings - Determination of wavelength.

Diffraction: Fraunhofer diffraction - Single slit diffraction (qualitative) - Double slit diffraction (qualitative) - Diffraction grating.

Polarization: Polarization by reflection, refraction and double refraction - Nicol's prism - Half wave and Quarter wave plate - Engineering applications of interference, diffraction and polarization.

UNIT – II: ELECTROMAGNETIC WAVES AND FIBER OPTICS (09 Periods)

Divergence, Curl of Electric and Magnetic Fields - Maxwell's Equations (qualitative) - Electromagnetic wave propagation through non conducting medium

Introduction to fiber optics - Total Internal Reflection - Critical angle of propagation - Acceptance angle, Acceptance cone - Numerical Aperture - Classification of fibers based on Refractive index profile, modes - Propagation of electromagnetic wave through optical fiber - Block diagram of fiber optic communication - Applications of an optical fiber - Fiber optic Sensors (temperature, displacement).

UNIT- III: SEMICONDUCTORS AND OPTOELECTRONIC DEVICES (10 Periods)

Introduction - Intrinsic semiconductors - Density of electrons in intrinsic semiconductor - Density of holes in intrinsic semiconductor (qualitative) - Intrinsic carrier concentration - Fermi energy - Electrical conductivity of intrinsic semiconductors - Extrinsic semiconductors - Density of charge carriers in Extrinsic semiconductors (qualitative) - Drift and Diffusion currents -Direct and Indirect band gap semiconductors - Hall effect, Hall coefficient and Applications - pn junction

Optoelectronic devices : Light Emitting Diode(LED), Photodiode and Semiconductor diode laser.

UNIT- IV: DIELECTRICS AND MAGNETIC MATERIALS (09 Periods)

Introduction - Electric polarization - Dielectric polarizability, susceptibility and dielectric constant - Types of polarizations (qualitative) - Frequency dependence of polarization - Lorentz (internal) field - Dielectric break down - Piezoelectricity - Applications of dielectrics.

Introduction - Magnetic dipole moment, magnetization, magnetic susceptibility and permeability - Origin of magnetic moment - Classification of magnetic materials - Hysteresis loop - Soft and hard magnetic materials - Applications.

UNIT-V: SUPERCONDUCTORS AND NANOMATERIALS (08 Periods)

Introduction – Properties of Superconductors - Critical parameters of Superconductors - Meissner effect - Penetration depth - Types of Superconductors - BCS Theory - Josephson effect (AC & DC) - High T_c Superconductors – Applications of Superconductors.

Basic principles of nanomaterials - Synthesis of nanomaterials by Ball Milling and Pulsed Laser Deposition(PLD) methods - Properties of nanomaterials (Physics, Electrical, Magnetic, Mechanical and Optical) - Applications of nanomaterials.

Total Periods: 45

Topics for Self-study are provided in the Lesson Plan

TEXT BOOKS:

1. M.N. Avadhanulu, P.G.Kshirsagar& T.V.S Arun Murthy, A Text book of Engineering Physics, S. Chand Publications, 11th edition, 2019.
2. P. K. Palaniswamy, Engineering Physics, Scitech Publications India Private Limited, 2ndedition, 2009.

REFERENCE BOOKS:

1. K. Thyagarajan, *Engineering Physics*, McGraw-Hill Education (India) Pvt. Ltd, 2016.
2. R.K. Gaur and S.L. Gupta, *Engineering Physics*, Dhanpat Rai Publications (P) Ltd, 2015.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2														
CO2	3	2														
CO3	3	2														
CO4	3	2														
CO5	3	2														

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

I B. Tech. - I Semester

(20BT1HS01) COMMUNICATIVE ENGLISH

(Common to CSE, CSSE, IT, CSE(AI), CSE(DS), CSBS, CSE(AI&ML) and CSE(CS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES:-

COURSE DESCRIPTION: Introduction to Communication; Active Listening; Effective Speaking; Reading and Technical Writing.

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

- CO1. Demonstrate knowledge of English language, examining and applying the aspects of Process of communication, Paralinguistic features, Skimming, Scanning, and Elements of style in writing.
- CO2. Analyze the modes and techniques of listening, speaking, reading, writing and apply them appropriately to communicate effectively with the engineering community and society.
- CO3. Apply reading and writing techniques in preparing documents by examining SQ3R Technique, Writer's Block, and Précis Writing.
- CO4. Communicate effectively in Conferences, Symposia, Seminars and in formal and real time situations by applying appropriate speaking techniques learnt by examining different communication styles used in similar contexts.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO COMMUNICATION (09 Periods)

Introduction – Language as a Tool of Communication – Communicative Skills (Listening, Speaking, Reading and Writing) – Effective Communication – Modes of Communication – Barriers to Communication (classification).

UNIT-II: ACTIVE LISTENING (09 Periods)

Introduction – Traits of a Good Listener – Listening Modes – Types of Listening – Barriers to Effective Listening – Listening for General Content and Specific Information.

UNIT-III: EFFECTIVE SPEAKING (09 Periods)

Introduction – Achieving Confidence, Clarity and Fluency – Paralinguistic Features – Barriers to Speaking – Types of Speaking – Conferences; significance, planning and preparation and procedure – Symposia and Seminars - Persuasive Speaking.

UNIT-IV: READING (09 Periods)

Introduction – Reading and Interpretation – Intensive and Extensive Reading – Critical Reading – Techniques for Good Comprehension – SQ3R Reading Technique – Study Skills.

UNIT-V: TECHNICAL WRITING**(09 Periods)**

Introduction – Language – Elements of Style – Techniques for Good Technical Writing – Paragraphs Construction – Essays: types, Steps to Essay Writing and Checklist – Précis Writing.

Total Periods: 45**Topics for Self-study are provided in the Lesson Plan****TEXT BOOKS:**

1. Meenakshi Raman & Sangeetha Sharma, *Technical Communication*, Oxford University Press, New Delhi, 2012.
2. Ashraf Rizvi, *Effective Technical Communication*, McGraw-Hill Education (India) Pvt. Ltd., New Delhi, 2018.

REFERENCE BOOKS:

1. Sanjay Kumar & Pushp Lata, *Communication Skills*, Oxford University Press, New Delhi, 2013.
2. Rajendra Pal and J. S. Korlahalli, *Essentials of Business Communication*, Sultan Chand and Son, New Delhi, 2010.

ADDITIONAL LEARNING RESOURCES:

- <https://www.skillsyouneed.com/ips/active-listening.html>: A useful summary of what active listening skills are.
- https://en.wikipedia.org/wiki/Active_listening: Wikipedia entry about active listening.
- <https://www.forbes.com/sites/womensmedia/2012/11/09/10-steps-to-effective-listening/#4b27a2503891>: Ten steps to Active Listening (by Forbes magazine).
- <https://goo.gl/t1Uqrt>: 20 tips for organizing a conference.
- <https://goo.gl/kPMr9u>: 10 important issues for speakers at a conference.
- <https://goo.gl/C5bDvv>: Wikihow guide to organizing a conference.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2															
CO2	1	3														
CO3	1	1			2											
CO4	1	1			2				3		1					

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

I B. Tech. – I Semester

(20BT11201) PROGRAMMING FOR PROBLEM SOLVING

(Common to CSE, CSSE, IT, CSE (AI), CSE (DS), CSBS, CSE(AI&ML), CSE(IOT), CS&D and CSE(CS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: A Course on Basic Mathematics.

COURSE DESCRIPTION: Introduction to C Programming; Operators and Expressions; Input and Output Functions; Control Structures; Problem Solving Aspects; Arrays and Strings; Functions; Pointers; Structures and Unions; File Handling.

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

- CO1. Demonstrate knowledge on C programming constructs to develop programs.
- CO2. Design algorithms using problem-solving techniques for given problems.
- CO3. Apply functions and Arrays to enhance reusability and data manipulation.
- CO4. Use pointers to manage the memory effectively.
- CO5. Apply Structures, Unions and File handling concepts to develop societal applications.

DETAILED SYLLABUS:

UNIT I - INTRODUCTION TO C PROGRAMMING (09 Periods)

Basics of C Programming: Introduction, Structure of a C program, Concept of a variable, Data types in C, Program statement, Declaration, Storing the data in memory, Tokens, Operators and expressions, Lvalues and Rvalues, Type conversion in C.

Input and Output: Basic screen and keyboard I/O in C, Non-formatted input and output, formatted input and output functions.

UNIT II - CONTROL STATEMENTS AND INTRODUCTION TO PROBLEM SOLVING

(08 Periods)

Control Statements: Specifying test condition for selection and iteration, Writing test expression, Conditional execution and selection, Iteration and repetitive execution, goto statement, Special control statements, Nested loops.

Introduction to Problem Solving: Algorithms, Flowcharts, Problem solving aspect, Top-down design, Implementation of algorithms, program verification and efficiency of algorithms.

UNIT III - ARRAYS AND STRINGS, FUNCTIONS (10 Periods)

Arrays and Strings: One-dimensional array – Declaration, Initialization, Accessing elements, operations; Multi-dimensional arrays – Declaration, Initialization, Working with 2D arrays; Strings – Declaration, Initialization, Printing strings, String input, Character manipulation, String manipulation; Arrays of strings – Initialization, manipulating string arrays.

Functions: Concept of function, Using functions, Call by value mechanism, working with functions, passing arrays to functions, Scope and extent, Storage classes, Recursion.

UNIT IV – POINTERS

(08 Periods)

Pointers in C: Understanding memory addresses, Address operator (&), Pointer – declaration, Initialization, Indirection operator and dereferencing, Void and Null pointers, Use of pointers, Arrays and pointers, Pointers and strings, Pointer arithmetic, Pointers to pointers, Array of pointers, Pointers to an array, Two-dimensional arrays and pointers, Pointers to functions, Dynamic memory allocation.

UNIT V - USER-DEFINED DATA TYPES AND FILES

(10 Periods)

User-Defined Data Types: Structures - Declaration, Accessing the members, Initialization, typedef and its use, Arrays of structures, Arrays within structure, Structures and pointers, Structures and functions; Unions, Enumeration types, Bitfields.

Files in C: Using files in C, Working with text and binary files, Direct File Input and Output, Files of records, Random access to files of records.

Total Periods: 45

Topics for Self-study are provided in the Lesson Plan

TEXT BOOKS:

1. Pradipt Dey and Manas Ghosh, *Programming in C*, Second Edition, Oxford University Press, New Delhi, 2013.
2. R. G. Dromey, *How to Solve it by Computer*, First Edition, Pearson Education, 2013.

REFERENCE BOOKS:

1. Byron S Gottfried and Jitender Kumar Chhabra, *Programming with C*, Fourth Edition, McGraw Hill Education, 2019.
2. Yashavant Kanetkar, *Let Us C*, Fifteenth Edition, BPB Publications, 2017.
3. E. Balagurusamy, *Programming in C*, Seventh Edition, McGraw Hill Education Pvt, Ltd, New Delhi, 2017.
4. Behrouz A. Forouzan and Richard F. Gilberg, *Computer Science: A Structured Programming Approach Using C*, Third Edition, Cengage Learning, 2008.

ADDITIONAL LEARNING RESOURCES:

- Learn C Programming - <https://www.programiz.com/c-programming>
- Learn C Programming - <https://www.tutorialspoint.com/cprogramming/index.htm>
- C Programming Exercises, Practice, Solution - <https://www.w3resource.com/c-programming-exercises/>
- Basic programming exercises and solutions in C- <https://codeforwin.org/2015/05/basic-programming-practice-problems.html>

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2											3			
CO2	3	2	2	3									3			
CO3	3	2	3										3			
CO4	2	2	2	2	3								3			
CO5	3	2	2	3	2	3							3			

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

I B. Tech. – I Semester

(20BT10201) BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

(Common to ME, EEE, ECE, EIE, CSE, CSSE, IT, CSE(AI), CSE(DS), CSE(AI&ML), CSE(IOT), CS&D and CSE(CS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Principles of Electrical Systems; AC & DC Machines; Semiconductor Devices and Op-Amps.

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

- CO1. Analyze electrical circuits by applying the conceptual knowledge of circuit concepts.
- CO2. Demonstrate knowledge on various generation technologies, protection devices, safety procedures and BEE standards.
- CO3. Demonstrate knowledge on characteristics and applications of transformers and AC machines.
- CO4. Demonstrate knowledge on characteristics and applications of diode, BJT and Op-amps.

DETAILED SYLLABUS:

UNIT – I: PRINCIPLES OF ELECTRICAL SYSTEMS-I (09 Periods)

Basic electrical sources: DC-Battery, AC sources–Single loop generator; Single phase and three phase supply; Electrical circuit elements (R, L and C), Ohm's law, Kirchhoff's laws, Representation of sinusoidal waveforms, peak and RMS values, phasor representation, reactive power, apparent power, real power, energy and power factor.

UNIT – II: PRINCIPLES OF ELECTRICAL SYSTEMS-II (09 Periods)

Significance of Power factor and power factor correction, most economical power factor. Typical layout of electrical grid; Typical layout and operation of Hydro, Thermal and Solar Power Plants; Fuse, circuit breaker (MCB, MCCB, RCCB, ELCB), relay (elementary treatment); Inverter and UPS. Energy Efficiency (Star rating) standards by BEE.

UNIT-III: TRANSFORMERS AND MACHINES (10 Periods)

Construction and working of a single phase transformer, EMF Equation; Construction, working and applications of Permanent Magnet DC Motor, Brushless DC Motor, three phase induction motor; construction, working and applications of stepper motor, resistor start & capacitor start and run single phase induction motor.

UNIT – IV: SEMICONDUCTOR DEVICES (09 Periods)

PN Junction diode, Characteristics, applications - half wave and full wave rectifier. Zener diode, characteristics, application – Regulator. BJT - operation, configurations, characteristics.

UNIT-V: OP-AMPS**(08 Periods)**

Operational Amplifier: Block diagram of Op-Amp, equivalent circuit, Op-Amp AC and DC Characteristics, Inverting and Non-Inverting modes. Applications - Adder, Comparator, Integrator and Differentiator.

Total Periods: 45**Topics for Self-study are provided in the Lesson Plan****TEXT BOOKS:**

1. Ashfaq Hussain, Fundamentals of Electrical Engineering, Dhanpatrai & Co. (P) Ltd., 3rd edition, New Delhi, 2009.
2. R. L. Boylestad and Louis Nashelsky, Electronics Devices and Circuits, PHI, 11th edition, 2009.

REFERENCE BOOKS:

1. M.S. Naidu, S. Kamakshiah, Introduction to Electrical Engineering, Tata McGraw-Hill Education, New Delhi, 2007.
2. D. Roy Chowdhury, Linear Integrated Circuits, New Age International Pvt. Ltd., 4th edition, 2011.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3														
CO2	2						2									
CO3	2					2										
CO4	2					2										

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

I B.Tech. - I Semester
(20BT1BS32)ENGINEERING PHYSICS LAB
(Common to EEE, ECE, EIE, CSE(AI),CSE(DS) and CSE(AI&ML))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE-REQUISITES:-

COURSE DESCRIPTION: Estimation of thickness of the wire using wedge shape method; Wavelength of monochromatic light source by diffraction grating; Newton's ring method; numerical aperture and acceptance angle of optical fiber; Characteristics of p-n junction diode; Photodiode and LED; Experimental determination of carrier concentration and energy gap of a semiconductor material; Determination resistivity of semiconductor by Four probe method and magnetic field along axial line of a current carrying coil.

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

- CO1. Apply the basic knowledge of light waves and semiconductors to demonstrate the functioning of optoelectronic devices.
- CO2. Understand the experimental procedures to calculate the thickness of a thin film, Hall coefficient, and acceptance angle of an optical fiber.
- CO3. Determine the experimental values of magnetic field induction, wave length of a light source, energy gap of a semiconductor.
- CO4. Apply skills to plot characteristic curves to determine the various parameters of semiconductor diodes.
- CO5. Work independently and in teams to solve problems with effective communication.

A minimum of any **Ten** experiments are to be conducted among the following:

LIST OF EXPERIMENTS:

1. Determine the thickness of the wire using wedge shape method.
2. Determination of wavelength of light source by Newton's ring method.
3. Determination of wavelength by plane diffraction grating using spectrometer by minimum deviation method
4. Estimation of magnetic field along the axis of a circular coil carrying current.
5. Determination the numerical aperture of a given optical fiber and hence to estimate its acceptance angle.
6. Determination of number of charge carriers and Hall coefficients of a given semiconductor using Hall Effect.
7. Determine the energy gap of a semiconductor.
8. Study the I-V characteristics of pn junction diode.
9. Estimation of threshold voltages of different LED's.
10. Study the characteristics of Photodiode.
11. Determination of wavelength of laser by using diffraction grating.
12. Determine the resistivity of semiconductor by Four probe method.

TEXT BOOK:

1. Engineering Physics Lab Manual (SVEC-20).

REFERENCE BOOKS:

1. S. Balasubramaniam and M.N. Srinivasan, A Text book of practical physics, S Chand Publications, 2017.
2. <http://vlab.amrita.edu/index.php> - Virtual Labs, Amrita University

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3														
CO2	3	3														
CO3	3	3														
CO4	3	3														
CO5								2	2	2						

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

I B.Tech. - I Semester

(20BT1HS31) COMMUNICATIVE ENGLISH LAB

(Common to CSE, CSSE, IT, CSE(AI), CSE(DS), CSBS, CSE(AI&ML) and CSE(CS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE-REQUISITES: -

COURSE DESCRIPTION: Just a Minute, Elocution/Impromptu; Phonetics; Vocabulary Building; Grammar; Giving Directions; Role Plays; Public Speaking; Letter Writing; Describing Objects; Listening Comprehension; Information Transfer and Reading Comprehension.

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

- CO1. Demonstrate knowledge of Phonetics by examining and applying sounds of English through Phonetics.
- CO2. Analyze sentence structures by applying and demonstrating knowledge of Vocabulary and Grammar.
- CO3. Apply appropriate listening and reading skills by analyzing the context, and demonstrate through listening comprehension and reading comprehension.
- CO4. Function effectively as an individual and as a member in diverse teams examining and applying speaking skills in Just A Minute and Role Play.
- CO5. Communicate effectively applying appropriate writing and speaking techniques by examining and demonstrating knowledge through Describing Objects, Information Transfer and Letter Writing in formal and real time situations.

FIRST TEN EXERCISES ARE MANDATORY AMONG THE FOLLOWING:

LIST OF EXERCISES:

1. Just a Minute, Elocution/Impromptu

Steps to be followed – Useful tips – Dos & Don'ts – Preparation – Examples

2. Phonetics

Sounds of English – Consonants – Vowels – Speech Organs – Phonetic Transcription – Word Accent – Basics of Intonation

3. Vocabulary Building

Prefixes & Suffixes – Synonyms & Antonyms – Phrasal verbs – Idioms – One word substitutes – Words often confused

4. Grammar

Tenses – Nouns – Word order and error correction

5. Giving Directions

Useful phrases – Sample conversations – Exercises

6. Role Plays

Useful tips – Dos & Don'ts – Exercises – Role Plays for practice

7. Public Speaking

Stage presence – Voice control – Body Language – Rehearsals – Audience – Delivery
- Dos & Don'ts – Project Submission

8. Letter Writing

Introduction – Objective – Formats – Types – Exercises

9. Describing Objects

Jargon – Useful Phrases – Do's & Don'ts – Exercises

10. Listening Comprehension

Introduction – Types of listening – Practice – Benefits of listening – Exercises

11. Information Transfer

Tables – Pie Charts – Venn Diagrams – Graphs – Flow Charts – Steps to be followed
– Exercises

12. Reading Comprehension

Introduction – Types of reading – Inferring – Critical analysis – Exercises

TEXT BOOK:

1. Communicative English Lab, SVEC.

REFERENCE BOOKS:

1. D. Sudha Rani, *A Manual for English Language Laboratories*, Pearson, Noida, 2010.
2. Nira Kumar, *English Language Laboratories*, PHI Learning Pvt. Ltd., New Delhi, 2011.

SUGGESTED SOFTWARES:

1. SoftX
2. Speech Solutions
3. English Pronunciation Dictionary by Daniel Jones
4. Learning to Speak English 8.1, The Learning Company – 4 CDs.
5. Mastering English: Grammar, Punctuation and Composition.
6. English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
7. Dorling Kindersley Series of Grammar.
8. Language in Use 1, 2 & 3
9. Cambridge Advanced Learner's Dictionary - 3rd Edition
10. Centronix – Phonetics
11. Let's Talk English, Regional Institute of English South India.

ADDITIONAL LEARNING RESOURCES:

- <https://goo.gl/IjE45p>: Amazon India site – with thousands of different product descriptions
- <https://goo.gl/3ozeO6>: 15 ways to calm your nerves before giving a presentation.
- <https://goo.gl/p20ttk>: useful site for more language about introducing yourself.
- <https://goo.gl/svMHZ1>: information and advice about describing line graphs
- <https://goo.gl/NqFJuc>: an informative presentation about using line graphs

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2															
CO2	2	3														
CO3	1	1			1											
CO4	1	1			2				1							
CO5	1	2			2					3		1				

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

I B. Tech. – I Semester

(20BT11231) PROGRAMMING FOR PROBLEM SOLVING LAB

(Common to CSE, CSSE, IT, CSE (AI), CSE (DS), CSBS, CSE(AI&ML), CSE(IOT), CS&D and CSE(CS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE-REQUISITES: A Course on "Programming for Problem Solving".

COURSE DESCRIPTION: Hands on practice in developing and executing programs using C Programming concepts include control statements, arrays, functions, strings, pointers structures and file handling.

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

- CO1. Analyse problems to design suitable algorithmic solutions.
- CO2. Apply C programming constructs to develop solutions to the engineering problems.
- CO3. Work effectively as an individual to develop solutions based on the user requirements.
- CO4. Write and present a substantial technical report/document effectively.

LIST OF EXERCISES:

1. a) Write a C program to perform the arithmetic operations on two integer numbers.
b) Write a program to evaluate the following expressions by reading the necessary values from the keyboard.
 - i. $(ax + b)/(ax - b)$
 - ii. $2.5 \log x + \cos 32^\circ + |x^2 + y^2|$
 - iii. $ax^5 + bx^3 + c$
 - iv. ae^{kt}
2. a) Write a C program to find the roots of a quadratic equation.
b) In a town, the percentage of men is 52. The percentage of total literacy is 48 and the total percentage of literate men is 35 of the total population. Write a C program to find the total number of illiterate men and women if the population of the town is 7000.
c) The total distance travelled by a vehicle in t seconds is given by the distance $ut + at^2/2$ where u and a are the initial velocity (m/sec.) and acceleration (m/sec²). Write C program to find the distance travelled at regular intervals of time given the values of u and a . The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of u and a .

3. a) Write a C Program to compute an electricity bill based on the following slab rates.

Consumption units	Rate (in Rupees/unit)
0-100	4.0
101-150	4.6
151-200	5.2
201-300	6.3
Above 300	8.0

(**Hint:** Take current and old meter readings from the user to get consumption units)

- b) An insurance company computes the premium amount based on the following;
 If a person's health is excellent and the person is between 25 and 35 years of age and lives in a city, and is a male then the premium is Rs.4 per thousand and the policy amount cannot exceed Rs.2 lakhs.
 If a person satisfies all the above conditions and is female then the premium is Rs.3 per thousand and the policy amount cannot exceed Rs.1 lakh.
 If a person's health is poor and the person is between 25 and 35 years of age and lives in a village and is a male then premium is Rs.6 per thousand and the policy cannot exceed Rs. 10000.
 In all other cases the person is not insured.

Write a C program to determine whether the person should be insured or not, his/her premium rate and maximum amount for which he/she can be insured.

- c) Write a C Program to find the grade for a student using a Switch case. The user needs to enter a subject score (varies from 0 to 100)and then display the grade as described below.

Score	Grade	Score	Grade
> = 90	O	>=50 to < 60	D
>=80 to < 90	A	>=40 to < 50	E
>=70 to < 80	B	< 40	Fail
>=60 to < 70	C		

4. a) A Fibonacci sequence is defined as follows:
 The first and second terms in the sequence are 0 and 1. Sub-sequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
 b) Write a C program to find the sum of individual digits of a positive integer.
 c) Write a C program to read two numbers x and n , and then compute the sum of the geometric progression: $1+x+x^2+x^3+\dots+x^n$. Show appropriate error message for $n<0$. (Example: if n is 3 and x is 5, then the sum is: $1+5+25+125$)
 d) Write a C program to print the following pattern.

```

          1
        1 2 1
      1 2 3 2 1
    1 2 3 4 3 2 1
  1 2 3 4 5 4 3 2 1
  
```

5. a) Write a C program to generate all the prime numbers between 1 and n , where n is a value entered by the user. Define a separate function to generate prime numbers.
- b) Write C program that uses recursive function to find the following.
 - i) Factorial of a given integer
 - ii) GCD of two given integers
6. a) Write a C program to find both the largest and smallest numbers in a list of integers.
- b) Write a C program that uses function to perform the following:
 - i) Addition of Two Matrices
 - ii) Multiplication of Two Matrices
7. a) Write a C program to insert a sub-string in to a main string at a given position.
- b) Write a C program to count the lines, words and characters in a given text.
8. a) Write a C program to print the elements of an array in reverse order using pointers.
- b) Write a C program to count the number of vowels and consonants in a string using pointers.
- c) Write a C program to store n elements in an array and print the elements in sorted order using pointers.
9. a) Write a C program that performs the following operations:
 - i. Reading a complex number
 - ii. Writing a complex number
 - iii. Addition of two complex numbers
 - iv. Multiplication of two complex numbers

(**Note:** Represent complex number using a structure.)
- b) Define a structure to store employee details include *Employee-Number*, *Employee-Name*, *Basic-pay*, *Date-of-Joining*. Write a C program for the following.
 - i. A function to store 10 employee details.
 - ii. A function to implement the following rules while revising the basic pay.
 - If $\text{Basic-pay} \leq \text{Rs.}5000$ then increase it by 15%.
 - If $\text{Basic-pay} > \text{Rs.}5000$ and $\leq \text{Rs.}25000$ then it increase by 10%.
 - If $\text{Basic-pay} > \text{Rs.}25000$ then there is no change in Basic-pay.

A function to print the details of employees who have completed 20 years of service from the Date-of-Joining.
- 10 a) Write a C program to reverse the first n characters of a given text file.
- b) Write a C program to merge two files into a new file.

REFERENCE BOOKS:

1. Byron S Gottfried and Jitender Kumar Chhabra, *Programming with C*, Fourth Edition, McGraw Hill Education, 2019.
2. Yashavant Kanetkar, *Let Us C*, Fifteenth Edition, BPB Publications, 2017.
3. E. Balagurusamy, *Programming in C*, Seventh Edition, McGraw Hill Education Pvt, Ltd, New Delhi, 2017.
4. Pradip Dey and Manas Ghosh, *Programming in C*, Second Edition, Oxford University Press, New Delhi, 2013.

5. Behrouz A. Forouzan and Richard F. Gilberg, *Computer Science: A Structured Programming Approach Using C*, Third Edition, Cengage Learning, 2008.

SOFTWARE/TOOLS USED:

1. Turbo C++/Dev C++

ADDITIONAL LEARNING RESOURCES:

- C Programming Exercises, Practice, Solution - <https://www.w3resource.com/c-programming-exercises/>
- Basic programming exercises and solutions in C- <https://codeforwin.org/2015/05/basic-programming-practice-problems.html>

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	3	3	2								3			
CO2	2	3	3	3	2	2							3			
CO3									3							
CO4										3						

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

I B. Tech. - I Semester
(20BT1MC01) UNIVERSAL HUMAN VALUES
(Mandatory Course)

(Common to CSE,CSSE, IT, CSE(AI), CSE(DS), CSBS, CSE(AI&ML) and CSE(CS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	-	30	2	-	-	-

PRE-REQUISITES:-

COURSE DESCRIPTION: Value education; Human being and self; Family, the society and the nations; Harmony with the nature and Harmony with professional ethics.

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

- CO1. Understand Values and skills for sustained happiness and prosperity.
- CO2. Analyse realistic implications of a Holistic understanding of ethical human conduct, trustful and mutually fulfilling human behaviour.
- CO3. Apply holistic approach in personal life and profession through a positive understanding of the Human reality and existence.

DETAILED SYLLABUS:

UNIT- I: VALUE EDUCATION (06 Periods)

Human Values-Introduction; Self-Exploration - Natural Acceptance; Human Aspirations-Right understanding- the current scenario: understanding and living in harmony.

UNIT - II: HUMAN BEING AND SELF (06 Periods)

Understanding human being - I' and the material 'Body'; needs of Self ('I') and 'Body'-happiness and physical facility; Body as an instrument of 'I' - characteristics and activities of 'I' and harmony in 'I'; harmony of I with the Body.

UNIT - III: FAMILY, THE SOCIETY AND THE NATIONS (06 Periods)

Values in human relationship (nine universal values) - foundational values of relationship; Difference between intention and competence; Difference between respect and differentiation; harmony in the society; Universal harmonious order in society.

UNIT - IV: HARMONY WITH THE NATURE (06 Periods)

Harmony in the Nature; Interconnectedness and mutual fulfilment - the four orders of nature - Recyclability and Self-regulation; Existence as Co-existence; Holistic perception of harmony and existence.

UNIT - V: HARMONY WITH PROFESSIONAL ETHICS(06 Periods)

Acceptance of human values; Ethical Human Conduct; Basis for Humanistic Education; Competence in professional ethics; Case studies: Holistic technologies, Management Models and Production Systems; Socially and ecologically responsible engineers, technologists and managers - enriching institutions and organizations.

Total Periods: 30

Topics for Self-study are provided in the Lesson Plan

TEXT BOOK:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.

REFERENCE BOOK:

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2					3	2									
CO2	3					3	3									
CO3	3					3	3	2								

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

I B. Tech. - II Semester

(20BT2BS01) TRANSFORMATION TECHNIQUES AND LINEAR ALGEBRA

(Common to All Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES:--

COURSE DESCRIPTION: Fourier Series and Fourier Transforms; Laplace Transforms; Inverse Laplace Transforms; Linear Algebra-I (Matrices); Linear Algebra-II (Vector Spaces).

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

- CO1. Construct the Fourier series for periodic functions and demonstrate the use of Fourier series and Fourier transform to connect the frequency and time domain systems.
- CO2. Solve initial and boundary value problems in engineering fields through Laplace Transform techniques.
- CO3. Apply the matrix theory in solving system of linear equations and determine the Eigen values and Eigen vectors.
- CO4. Demonstrate the knowledge of Linear Transformations to intelligent systems.

DETAILED SYLLABUS:

UNIT-I: FOURIER SERIES AND FOURIER TRANSFORMS (09 Periods)

Fourier series: Determination of Fourier coefficients, Euler's formulae, convergence of Fourier series (Dirichlet's conditions), Fourier series in $(0, 2\pi)$, $(-\pi, \pi)$; Fourier series of even and odd functions; Half-range Fourier sine and cosine expansions in $(0, \pi)$; Fourier integral theorem (statement only), Fourier sine and cosine integrals; Fourier transforms, Fourier sine and cosine transforms, Inverse Fourier transforms.

UNIT-II: LAPLACE TRANSFORMS (09 Periods)

Definition of Laplace transforms, existence conditions, Laplace transforms of standard functions, Properties of Laplace transforms (without proofs), Laplace transforms of derivatives, Laplace transforms of integrals, multiplication by t^n , division by t , Laplace transforms of periodic functions, Laplace transforms of unit step function and unit impulse function.

UNIT- III: INVERSE LAPLACE TRANSFORMS (09 Periods)

Inverse Laplace transforms by different methods; Convolution theorem (without proof), inverse Laplace transforms by convolution theorem; Applications of Laplace transforms to ordinary differential equations of first and second order with constant coefficients.

UNIT- IV: LINEAR ALGEBRA-I (MATRICES) (09 Periods)

Rank of a matrix: echelon form; Linear systems of equations: solving system of Homogeneous and Non-Homogeneous equations; Eigen values and Eigen vectors of a

matrix and properties (without proofs), Diagonalization of a matrix by orthogonal transformation.

UNIT-V: LINEAR ALGEBRA-II (VECTOR SPACES)

(09 Periods)

Vector spaces, Linear dependence and independence of vectors, basis, dimension, Linear transformations (maps), range and kernel of a linear map, rank and nullity, inverse of a linear transformation, rank-nullity theorem (without proof).

Total Periods: 45

Topics for Self-study are provided in the Lesson Plan

TEXT BOOKS:

1. T. K. V. Iyengar, B. Krishna Gandhi, S. Ranganatham and M. V. S. S. N. Prasad, *Engineering Mathematics-II*, S. Chand & Company, 10th edition, 2016.
2. B. S. Grewal, *Higher Engineering Mathematics*, Khanna publishers, 44th edition, 2017.
3. David Poole, *Linear Algebra: A Modern Introduction*, Brooks/Cole, 2nd edition, 2005.

REFERENCE BOOKS:

1. B. V. Ramana, *Higher Engineering Mathematics*, Tata McGraw hill, 1st edition, 2017.
2. V. Krishna Murthy, Mainra and Arora: *An Introduction to Linear Algebra*, Affiliated East-West Press, 1993.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3			1											
CO2	3	3			1											
CO3	3	2			1											
CO4	3	2			1											

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

I B. Tech. - II Semester
(20BT1BS02) ENGINEERING CHEMISTRY
(Common to EEE, ECE, EIE, CSE(AI), CSE(DS) and CSE(AI&ML))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Water Treatment; Atomic Structure and Bonding Theories; Electrochemistry and Applications; Corrosion; Instrumental Methods and Applications; Fuel chemistry and Lubricants.

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

- CO1. Analyze and solve problems associated with hardness of water, boiler troubles and address the societal, health and safety issues related to quality of water.
- CO2. Apply the basic knowledge of quantum mechanical approach to atomic structure and bonding theories to identify shapes of different molecules
- CO3. Apply the basic knowledge of corrosion phenomenon to identify solutions for control of corrosion and demonstrate competency in the basic concepts of electrochemical cells.
- CO4. Demonstrate the basic knowledge of instrumental methods and their applications in the structural analysis of materials.
- CO5. Apply the basic knowledge of fuel chemistry and lubricants to identify the quality of fuels and lubricants.

DETAILED SYLLABUS:

UNIT-I: WATER TREATMENT

(10 Periods)

Introduction, types of water, Impurities in water and their consequences. Hardness of water, units of hardness, disadvantages of hardness, measurement of hardness by EDTA method, numerical problems on measurement of hardness of water; Boiler troubles; softening of water– Ion exchange process, zeolite process, desalination of brackish water by reverse osmosis, specifications of potable water as per WHO and BIS standards. Fluoride in ground water: Effects on human health, defluoridation method – Nalgonda method; merits and demerits of various defluoridation methods.

UNIT-II: ATOMIC STRUCTURE AND BONDING THEORIES

(09 Periods)

Quantum-mechanical model of atom, Schrodinger wave equation, significance of Ψ and Ψ^2 , applications to particle in a box; Molecular orbital theory – bonding in homo and hetero nuclear diatomic molecules – energy level diagrams of N_2 , O_2 , NO and CO; Π -molecular orbitals of butadiene and benzene; VSEPR theory and molecular shapes.

UNIT-III: ELECTROCHEMISTRY AND APPLICATIONS

(09 Periods)

Introduction, Electrode potential, Nernst equation, reference electrode-Calomel electrode, electrochemical cell; Battery– Leclanche cell, lithium ion batteries; Fuel cells- Hydrogen-oxygen fuel cell, Solid-oxide fuel cell.

Corrosion: Introduction, Definition, types of corrosion- wet (galvanic corrosion, concentration cell corrosion) and dry corrosion, Factors influencing corrosion, control of corrosion- sacrificial anodic protection, Impressed current cathodic protection, electroplating method (Nickel).

UNIT-IV: INSTRUMENTAL METHODS AND APPLICATIONS (09 Periods)

Introduction to spectroscopy–types of energy present in molecules, types of spectra, UV-Vis spectroscopy – principle (Beer-lamberts Law), types of electronic transitions, chromophore, auxochrome, Bathochromic shift, Hypsochromic shift, Instrumentation of UV-Vis spectrophotometer, applications; Infrared spectroscopy – principle, types of vibrational modes, group frequencies, Instrumentation of IR spectrophotometer, applications; principle and applications of physicochemical methods (SEM, TEM, X-ray diffraction).

UNIT-V: FUEL CHEMISTRY AND LUBRICANTS (08 Periods)

Fuel chemistry: Types of fuels, calorific value, numerical problems based on calorific value; Liquid fuels - cracking of oils (Thermal and Fixed-bed catalytic cracking), knocking and anti-knock agents, Octane and Cetane values, Synthetic petrol: Fischer-Tropsch method and Bergius process.

Lubricants: Definition, functions of lubricants, mechanism of lubrication, classification of lubricants and their applications, properties of lubricants – viscosity and viscosity index , flash and fire points, cloud and pour points, Aniline points, neutralization number and mechanical strength.

Total Periods: 45

Topics for Self-study are provided in the Lesson Plan

TEXT BOOKS:

1. P. C. Jain & Monika Jain, *Engineering Chemistry*, DhanpatRai Publishing Company (P) Ltd, New Delhi, 16th edition, 2013.
2. K.N. Jayaveera, G.V. Subba Reddy and C. Ramachandriah, *Engineering Chemistry*, McGraw Hill Publishers, New Delhi.

REFERENCE BOOKS:

1. J. D. Lee, *Concise Inorganic Chemistry*, Oxford University Press, 5th edition 2010.
2. Skoog and West, *Principles of Instrumental Analysis*, Thomson, 6th edition, 2007.
3. Peter Atkins, Julio de Paula and James Keelar, *Atkins' Physical Chemistry*, Oxford University Press, 10th edition, 2010.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2				2	1									
CO2	3	1														
CO3	3	1				1										
CO4	3				1											
CO5	3	1				1										

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

I B. Tech. – II Semester

(20BT20501) DIGITAL LOGIC DESIGN

(Common to CSE, CSSE, IT, CSE(AI), CSE(DS), CSE(AI&ML), CSE(IOT), CS&D and CSE(CS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES:-

COURSE DESCRIPTION: Foundation in design and analysis of the operation of digital gates; Concepts of Boolean algebra, Minimization of logic circuits; Design and implementation of combinational and sequential logic circuits; Analysis and design of flip-flops, registers, and counters and comparison of their behavior and characteristics; Design digital systems using Programmable logic.

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

- CO1. Apply knowledge of binary systems, logic gates and Boolean functions to represent a given problem using Boolean logic.
- CO2. Minimize and implement Boolean functions to build combinational logic circuits.
- CO3. Design combinational and sequential logic circuits for digital systems.
- CO4. Design digital systems using programmable logic to solve engineering problems.

DETAILED SYLLABUS:

UNIT- I: BINARY SYSTEMS AND BOOLEAN ALGEBRA (10 Periods)

Introduction, Binary Numbers, Number Base Conversions, Error Detection and Correction, Complements of Numbers, Signed Binary Numbers, Binary Codes, Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Digital Logic Gates.

UNIT-II: GATE LEVEL MINIMIZATION (09 Periods)

The Map Method, Four Variable K-Map, Product-of-Sums and Sum-of-Products Simplification, Don't Care Conditions, NAND and NOR Implementations, Other Two Level Implementations, Exclusive-OR function.

UNIT-III: COMBINATIONAL LOGIC (09 Periods)

Combinational Circuits, Analysis of Combinational Circuits, Design Procedure, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, De-Multiplexers.

UNIT-IV: SEQUENTIAL LOGIC (10 Periods)

Latches, Flip-Flops, Analysis of Clocked Sequential Circuits, Design of Synchronous Sequential Circuits, Registers, Shift Registers, Ripple Counters, Synchronous Counters, Ring Counter and Johnson Counter.

UNIT – V: PROGRAMMABLE LOGIC**(07 Periods)****Programmable Memories** – RAM, ROM, Programmable Logic Array, Programmable Array Logic, Sequential Programmable Devices.**Total Periods: 45****Topics for self-study are provided in the lesson plan****TEXT BOOK:**

1. M. Morris Mano, Michael D. Ciletti, *Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog*, 6th edition, Pearson, 2018.

REFERENCE BOOKS:

1. A.Anand Kumar, *Switching Theory and Logic Design*, 3rd edition, PHI Learning Private Limited, India, 2016.
2. Charles H. Roth, Jr. and Larry L. Kinney, *Fundamentals of Logic Design*, 7th edition, Cengage Learning, 2015.
3. Alan B. Marcovitz, *Introduction to Logic Design*, 3rd edition, McGraw Hill, 2010.

ADDITIONAL LEARNING RESOURCES:

- <https://nptel.ac.in/courses/106/108/106108099/>
- Donald P Leach, Albert Paul Malvino, Goutam Saha, *Digital Principles and Applications*, 8th Edition, McGraw Hill, 2014.
- Brock J. LaMeres, *Introduction to Logic Circuits & Logic Design with VHDL*, Springer, 2015.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2											3			
CO2	3	2											3			
CO3	3	3	3										3			
CO4	3	3	3	2									3			

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

I B. Tech. – II Semester

(20BT21501) OBJECT ORIENTED PROGRAMMING THROUGH JAVA

(Common to CSE, CSSE, IT, CSE(AI), CSE(DS), CSBS, CSE(AI&ML), CSE(IOT), CS&D and CSE(CS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: A course on "Programming for Problem Solving".

COURSE DESCRIPTION: Introduction to Object Oriented Programming, Classes and Objects; Inheritance, Packages, Interfaces; Exception handling, Multithreading; Collection Classes; Swings, Event handling.

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

- CO1. Apply object oriented programming constructs to solve programming problems.
- CO2. Design solutions to the problems by using control statements, interfaces, utility classes and Packages.
- CO3. Solve real time problems using object oriented programming features— polymorphism, inheritance, exception handling and multithreading.
- CO4. Apply multithreading mechanism to enhance the performance of a system.
- CO5. Develop user interfaces using GUI programming techniques.

DETAILED SYLLABUS:

UNIT-I:INTRODUCTION

(09 Periods)

Introduction to Object Oriented Programming, Java Buzzwords, Java Environment, Java Components, Programming Paradigms, Naming Conventions.

Classes and Objects: Introduction to classes, objects, Constructors, Garbage Collection, this keyword, Access Control, Features of Object Oriented Programming.

UNIT- II: DATA TYPES, CONTROL STATEMENTS, POLYMORPHISM (09 Periods)

Data Types, Variables, Type Conversions (Boxing and Unboxing/Wrapping and Unwrapping) and Casting, Arrays, Operators, Decision Making Statements, Looping Statements, Methods, Recursion, Method Overloading, Constructor Overloading, Parameter Passing, String Class, Final Keyword.

Utility Classes: String Tokenizer, Scanner, Random, Bit Set.

UNIT- III: INHERITANCE, PACKAGES, INTERFACES

(10 Periods)

Inheritance: Introduction, Classification, Abstract Classes, Final keyword with Inheritance.

Packages: Basics, Creating and Accessing a package, CLASSPATH, Importing packages.

Lambda Package: Lambda Expression Fundamentals, Functional Interfaces, Block Lambda Expressions, Generic Functional Interfaces, Passing Lambda Expression as Arguments.

Interfaces: Definition, Implementing Interfaces, Extending Interfaces, Nested Interfaces, Applying Interfaces, Variables in Interfaces.

**UNIT- IV:EXCEPTION HANDLING, MULTITHREADING, COLLECTION FRAMEWORK
(09 Periods)**

Exception Handling: Exception, Types of Exception, Keywords: try, catch, throw, throws and finally, Built-in Exceptions, User Defined Exceptions.

Multithreading: Process, Thread, Thread Model, Creating a thread, Priorities, Thread Synchronization, Inter-thread Communication.

Collection Framework: FrameworkHierarchy, ArrayList, LinkedList, HashSet.

UNI- V: SWINGS, EVENT HANDLING (08 Periods)

Swings: Introduction, Features, Hierarchy, Swing GUI Components, Packages in Swings, Swing Control Classes and Methods.

Event Handling: Event Classes, Event Listener Interfaces - Mouse and Key, Adapter Classes.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOK:

1. Herbert Schildt, *Java the Complete Reference*, 9th edition, Oracle Press, 2014.

REFERENCE BOOKS:

1. SachinMalhotra and SaurabChoudhary, *Programming in Java*, 2nd edition, Oxford University press, 2014.
2. Y. Daniel Liang, *Introduction to Java Programming*, Pearson Education.
3. T. Budd, *Understanding Object-Oriented Programming with Java*, Pearson Education.

ADDITIONAL LEARNING RESOURCES:

- <https://docs.oracle.com/javase/tutorial/index.html>

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2		1								3			
CO2	3	2	3		1								3			
CO3	2	3	3	2	1	1							3			
CO4	2	2			1								3			
CO5	3	2	3		1								3			

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

I B. Tech. – II Semester

(20BT10331) **COMPUTER AIDED ENGINEERING DRAWING**

(Common to CSE, CSSE, IT, CSE(AI), CSE(DS), CSE(AI&ML) and CSE(CS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	1	4	3

PRE-REQUISITES:-

COURSE DESCRIPTION: Engineering drawing conventions; Importance of engineering drawing; fundamental concepts of sketching; computer aided drafting and different types of projections of geometric entities (both 2D and 3D) through computer aided drafting packages.

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

- CO1. Apply the principles of engineering drawing, Methods and CAD tools to draw the Geometries, Curves and Orthographic projections used to communicate in engineering field.
- CO2. Develop lateral surfaces of solids and draw Isometric views of given objects for engineering communication using principles of engineering drawing and CAD tools.
- CO3. Work independently / in groups & communicate effectively in oral and written forms.

DETAILED SYLLABUS:

Introduction to Engineering Graphics and Design:

Principles, significance -Conventions in drawing-lettering - BIS conventions-Dimensioning principles and conventional representations.

Exercises:

1. Practice exercise on Basic Lettering and Dimensioning
2. Practice exercise on Conventional representations

Introduction to AutoCAD: Basic drawing and editing commands: line, circle, rectangle, erase, view, undo, redo, snap, object editing, moving, copying, rotating, scaling, mirroring, layers, templates, polylines, trimming, extending, stretching, fillets, arrays, dimensions.

Exercises:

1. Practice exercise using basic drawing commands
2. Practice exercise using editing commands

CONICS, CURVES, PROJECTION OF POINTS, LINES AND PLANES

Conics & Special Curves: Conic sections including the rectangular hyperbola-eccentricity method only; Cycloid, Epicycloid and Hypocycloid, Involutives.

Exercises:

1. Practice exercises on Ellipse, Parabola, Hyperbola and Rectangular Hyperbola
2. Practice exercises on Cycloid, Epicycloid, Hypocycloid and Involutives

Projection of points, lines and planes: Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line, Projections of regular plane surfaces.

Exercises:

1. Practice exercises on Projection of points
2. Practice exercises on projection of lines inclined to one plane
3. Practice exercises on projection of lines inclined to both planes
4. Practice exercises on Projections of regular plane surfaces

PROJECTION OF SOLIDS AND SECTION OF SOLIDS

Projection of solids: Projection of regular solids inclined to one plane.

Sections of solids: Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone, True shapes of the sections.

Exercises:

1. Practice exercises on Projections of regular solids
2. Practice exercises on Sections of solids

DEVELOPMENT OF SURFACES

Development of surfaces: Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts.

Exercises:

1. Practice exercises on Development of surfaces of right regular solids

ORTHOGRAPHIC AND ISOMETRIC PROJECTIONS

Orthographic Projections: Systems of projections, conventions and application to orthographic projections.

Isometric Projections: Principles of isometric projection- Isometric scale; Isometric views: lines, planes, simple solids.

Exercises:

1. Practice exercises on Orthographic Projections
2. Practice exercises on Isometric Projections

TEXTBOOKS:

1. D. M. Kulkarni, A. P. Rastogi, A. K. Sarkar, *Engineering Graphics with AutoCAD*, PHI Learning Private Limited, New Delhi, Revised edition, 2010.
2. N. D. Bhatt and V. M. Panchal, *Engineering Drawing*, Charotar Publishing House, Gujarat, 51st edition, 2013.

REFERENCE BOOKS/LABORATORY MANUALS:

1. Sham Tickoo, *AutoCAD 2013 for Engineers and Designers*, Dreamtech Press, 2013.
2. M. H. Annaiah&Rajashekar Patil, *Computer Aided Engineering Drawing*, New Age International Publishers, 4th edition, 2012.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	1	3	1										
CO2	3	3	2	1	3	1										
CO3									3	3						

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

I B.Tech. - II Semester
(20BT1BS31) ENGINEERING CHEMISTRY LAB
(Common to EEE, ECE, EIE, CSE(AI), CSE(DS) and CSE(AI&ML))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE-REQUISITES: -

COURSE DESCRIPTION: Estimation of hardness ground water sample, alkalinity, dissolved oxygen of water samples, Iron, residual chlorine in drinking water and Strength of an acid in Pb-Acid battery by volumetric methods; Instrumental methods like conductivity meter, potentiometer, P^H meter and colorimeter; Measurement of viscosity of lubricants; and Determination of the influence of pH on metallic corrosion.

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

- CO1. Apply analytical skills for the quantitative estimation of materials through volumetric methods of analysis and address the societal, health issues related to quality of water.
- CO2. Develop analytical skills for the quantitative estimation of materials through instrumental methods of analysis.
- CO3. Work independently and in teams to solve problems with effective communication.

A minimum of any **Ten** experiments are to be conducted among the following:

LIST OF EXPERIMENTS:

1. Determination of hardness of ground water sample
2. Determination of alkalinity of Water sample
3. Estimation of Dissolved Oxygen in water by Winkler's method.
4. Estimation Fe (II) by Dichrometry
5. Estimation of residual chlorine in drinking water
6. Conductometric titration of strong acid Vs strong base
7. Estimation of Ferrous ion by Potentiometry
8. Determination of percentage of Iron in Cement sample by colorimetry
9. Determination of strength of acid by pHmetric method
10. Determination of Viscosity of liquids by Ostwald's viscometer
11. Determination of Strength of an acid in Pb-Acid battery
12. Determination of the influence of pH on metallic corrosion

TEXT BOOK:

1. Engineering Chemistry lab Manual (SVEC-20).

REFERENCE BOOKS:

1. K. Mukkanti, *Practical Engineering Chemistry*, BS Publications, 2013.
2. K.N. Jayaveera, K.B. Chandra Sekhar, *Chemistry laboratory manual*, S.M. Enterprises Limited, 2013.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3				2	1									
CO2	3	3			2											
CO3								2	2	2						

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

I B. Tech. – II Semester

(20BT10332) ENGINEERING WORKSHOP

(Common to CSE, CSSE, IT, CSE(AI), CSE(DS), CSE(AI&ML) and CSE(CS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE-REQUISITES: -

COURSE DESCRIPTION: Knowledge on various workshop hand and power tools; hands on experience in different manufacturing trades such as fitting, carpentry, sheet metal forming and foundry; Demonstration on dismantling and assembling of various two wheeler parts, power tools in machining and metal joining, basics of plumbing and working of 3D printer.

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

- CO1. Design and model various basic prototypes in the trade of fitting such as square/half round mating, V- mating and dovetail mating from the given MS work pieces using fitting tools.
- CO2. Develop different prototypes in the carpentry trade such as cross lap joint, dovetail / bridle joints and Mortise and Tenon joint using carpentry tools.
- CO3. Design and model different prototypes in the sheet metal forming trade such as rectangular tray, square vessel/cylinder, Funnel as per the dimensions using sheet metal forming tools.
- CO4. Develop sand mould using single piece pattern and split piece pattern in the foundry trade using foundry tools.
- CO5. Develop electric circuits for series and stair case connections.
- CO6. Demonstrate the knowledge on power tools, plumbing operation, 3D printing technology involved in different engineering applications.
- CO7. Work independently / in groups & communicate effectively in oral and written forms.

DETAILED SYLLABUS:

FITTING: Conduct a detailed study on various aspects in fitting trade which includes the details of fitting operations, safety precautions, types of tools, tool holders, miscellaneous tools, care and maintenance of hand tools, marking and measurement tool, and finishing tool.

List of Exercises :

1. Make a square/half round mating from the given MS work pieces
2. Make a V- mating from the given MS work pieces

CARPENTRY: Conduct a detailed study on various aspects in carpentry trade which includes the details of types of wood, carpentry tools, wood working techniques, types of joints, safety precautions, and care and maintenance of tools.

List of Exercises:

1. Prepare a cross lap joint
2. Prepare dovetail / bridle joints

SHEET METAL FORMING: Conduct a detailed study on various aspects in sheet metal forming which includes the details of sheet materials, hand tools, sheet metal fabrication, and safety and precautions

List of Exercises:

1. Fabricate a rectangular tray as per the dimensions
2. Fabricate square vessel/cylinder as per the dimensions

FOUNDRY: Conduct a detailed study on various aspects in foundry which includes the details of moulding sand, properties of moulding sand, types of patterns and pattern, materials, foundry tools, and safety and precautions

List of Exercises:

1. Prepare a sand mould, using the given single piece pattern (stepped pulley/cube)
2. Prepare a sand mould, using the given split piece pattern (pipe bent/dumbbell)

Electrical wiring: Prepare electrical wiring with associated devices such as switches, distribution boards, sockets, and light fittings in a structure considering safety standards for design and installation.

List of Exercises:

1. Prepare electrical circuits with Series.
2. Prepare electrical circuits with Stair case connections.

DEMONSTRATION:

1. Demonstrate the usage of power tools.
2. Demonstrate the plumbing operation and identify the essential tool and materials required for plumbing.
3. Demonstrate the working of 3D printer

Note: Student shall perform any **Twelve Exercises**

REFERENCE BOOKS/LABORATORY MANUALS:

1. P. Kannaiah and K. L. Narayana, Workshop Manual, SciTech Publishers, 2009.
2. K. Venkata Reddy, Workshop Practice Manual, BS Publications, 2008.
3. V. Ramesh Babu, Engineering Workshop Practice, V R B Publishers Private Limited, 2009.

ADDITIONAL LEARNING RESOURCES:

- R. K. Jain, *Production Technology*, Khanna Publishers, 17th edition, 2012.
- Kalpakjian, Serope, *Manufacturing Engineering and Technology*, Pearson Education, 7th edition, 2014.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	1		1										
CO2	3	3	3	1		1										
CO3	3	3	3	1		1										
CO4	3	3	3	1	1	1										
CO5	3	3	3	1		1										
CO6	3	1	1	1	1	1										
CO7									3	3						

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

I B. Tech. – II Semester

(20BT21531) **OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB**
(Common to CSE, CSSE, IT, CSE(AI), CSE(DS), CSBS, CSE(AI&ML), CSE(IOT),
CS&D and CSE(CS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE-REQUISITES: A course on "Object Oriented Programming through Java".

COURSE DESCRIPTION: Hands-on experience on Polymorphism; Inheritance and Interfaces; Exception Handling; Multithreading; Event Handling; swings.

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

- CO1. Apply syntactic constructs of JAVA to solve logic based problems
- CO2. Develop application programs using object oriented programming features.
- CO3. Solve real time problems using interfaces, packages, Exception Handling, Collection framework and Multithreading.
- CO4. Develop GUI Applications using Swings, Event handling mechanisms.
- CO5. Work independently and in team to solve problems with effective communication.

LIST OF EXERCISES:

COMMAND-LINE ARGUMENTS:

1. Demonstrate the following programs using command line arguments:
 - a) Write a program that computes the sum of all its integer arguments.
 - b) Write a program to input n integers and perform sorting between them.

RECURSIVE FUNCTIONS AND OVERLOADING:

2.
 - a) The Fibonacci sequence is defined by the following rule. The first 2 values in the sequence are 0, 1. Every subsequent value is the sum of the 2 values preceding it. Write a Java program that uses both recursive and non-recursive functions to print the nth value of the Fibonacci sequence?
 - b) Write and test overloaded methods to find sum of three integers, sum of three double values and sum of four integers.
 - c) Write a program to define a class student with name, registration number and marks for three subjects as instance variables and describe a constructor to initialize them. Also define a method display to print all the values.

DATA TYPES (ARRAYS AND STRINGS):

3.
 - a) Write a program to print the element of an array that has occurred highest number of times.

- b) Write a program to count tokens- number of words and characters in a string.

SCANNER AND ABSTRACT CLASSES:

- 4. a) Write a program that displays a menu with options 1. Add 2. Sub. Based on the options chosen, read 2 numbers and perform the relevant operation. After performing the operation, the program should ask the user if he wants to continue. If the user presses y or Y, then the program should continue displaying the menu else the program should terminate. [Use Scanner class].
- b) Write a program to create an abstract class named Shape that contains an empty method named numberOfSides (). Provide three classes named Trapezoid, Triangle and Hexagon such that each one of the classes extends the class Shape. Each one of the classes contains only the method number of Sides() that shows the number of sides in the given geometrical figures.

PACKAGES AND INTERFACES:

- 5. a) Write a program that imports the User-defined package P1 and access the member variables and methods of classes that contained in the package P1.
- b) Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box.

INTERACTIVE DRIVER CLASS:

- 6. A University awards some grace marks to students who participate in the Inter University games. Therefore, total marks awarded = Exam_Marks +Sports_Grace_Marks. If total marks scored are greater than maximum marks, then the final marks awarded will be equal to the maximum marks. An Object Oriented based implementation will contain a class called Results, which extends a class called Exam, which itself extends a class called Student. It will also contain an interface called Sports, which is implemented by the Results class. The Results class will be responsible for computing the final marks scored by the students. Write a Java program along with an interactive driver class.

EXCEPTION HANDLING:

- 7. a) Write a program to handle Arithmetic Exception, Array Out Of Bounds Exception using try and multiple catch statements.
- b) Write a java program to throw a user defined exception called Negative, if the entered input is a negative number.

MULTI-THREADING:

8. a) Write a Java program that creates three threads. First thread displays - Good Morning for every one second, the second thread displays - Hello for every two seconds and the third thread displays - Welcome for every three seconds.
- b) Write a Java program that correctly implements producer consumer problem using the concept of inter-thread communication.
- c) Write a java program to implement multithreading using lambda expression.

HASHSET (COLLECTION FRAMEWORK):

9. Write a program create a class "Book" with name, id, author, publisher and quantity as instance variables and a constructor to initialize them. Create a HashSet object of type Book and three Book instances b1, b2 and b3. Add these instances into HashSet and display them.

EVENT HANDLING:

10. a) Write a java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green. When a radio button is selected, the light is turned on, and only one light can be on at a time No light is on when the program starts.
- b) Write a java program that handles all mouse and key events and shows the event name at the center of the window when mouse event is fired (Use Adapter classes).

REFERENCE BOOKS:

1. Herbert Schildt, *Java the Complete Reference*, Ninth Edition, Oracle Press, 2014.
2. SachinMalhotra and SaurabChoudhary, *Programming in Java*, Second Edition, Oxford University Press, 2014.

SOFTWARES/TOOLS USED:

1. Java SE 12.0.1

ADDITIONAL LEARNING RESOURCES:

1. Problems to be considered from Hackerearth and CodeChef platforms

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3		1								3			
CO2	2	2	3		1								3			
CO3	2	3	3	2	1	1							3			
CO4	3	2	3		1								3			
CO5									3	3	2					

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

I B.Tech. - II Semester
(20BT1HSAC) SPOKEN ENGLISH
(Audit Course)

(Common to CSE, CSSE, IT, CSE(AI), CSE(DS), CSBS, CSE(AI&ML) and CSE(CS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	2	-	-	-

PRE-REQUISITES: -

COURSE DESCRIPTION: Grammar; Functional English; Paragraph writing; Letter writing and Email writing.

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

- CO1. Demonstrate knowledge of grammar and vocabulary in writing effective formal letters and e-mails.
- CO2. Communicate effectively by applying appropriate speaking and writing techniques by examining and applying functional English.

DETAILED SYLLABUS:

UNIT-I: GRAMMAR (06 Periods)

Active voice and Passive voice – Auxiliary modals – Question Forms:Wh-word, Embedded, Yes/No – Disjunctive/Tags – Spotting Errors.

UNIT-II: FUNCTIONAL ENGLISH (06 Periods)

Vocabulary Building: (Vegetables, groceries, fruits, Parts of human body, relations) Greetings – Introduction – Self and others – Story telling – Speaking Activities.

UNIT-III: PARAGRAPH WRITING (06 Periods)

Topic sentence – cohesion and coherence – Unity – adequate development – Introduction to types – Compare-Contrast – Problem & Solution, Cause & Effect, Classification & Illustrative.

UNIT-IV: LETTER WRITING (06 Periods)

Components of an Effective Letter – Communication in everyday life – Personal Correspondence, Internal Communication – Career and Employment Letters

UNIT-V: EMAIL WRITING (06 Periods)

Do's & Don'ts – Tips for email effectiveness – Email Jargon – Sample Emails

Total Periods: 30

Topics for Self-study are provided in the Lesson Plan

TEXT BOOKS:

1. L. Adinarayana and V. Prakasam, *Spoken English*, Neelkamal Publications Pvt. Ltd., New Delhi, 2008
2. Ram Bhasker Raju, *The Complete Book on Spoken English*, Goutham Buddha Publications, Hyderabad, 2002.

REFERENCE BOOKS:

1. Sabina Pillai, *Spoken English for my World*, Oxford University Press, New Delhi, 2016.
2. K. R. Lakshminarayanan, *Speak in English*, Scitech Publications, Chennai, 2009.

ADDITIONAL LEARNING RESOURCES:

1. <https://www.britishcouncil.in/programmes/english-partnerships/state/skills-projects/AP-English-Skills>.
2. <https://www.fluentu.com/blog/english/websites-to-learn-english/>

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1			1					1						
CO2	2	3			1					2						

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

II B. Tech. – I Semester

(20BT3BS01) NUMERICAL METHODS, PROBABILITY AND STATISTICS

(Common to CSE, CSE(AI), CSE(DS), CSBS, CSSE, IT, CE and ME)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Numerical solutions of equations and interpolation; Numerical differentiation and integration; Random variables and mathematical expectations; Probability distributions; Test of hypothesis.

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

- CO1. Provide solutions for equations, derivatives and integrals through numerical methods for the given data.
- CO2. Identify the types of random variables and determine their probabilities & mathematical expectation.
- CO3. Apply the concept of probability distributions to solve engineering problems.
- CO4. Analyze the hypothesis by applying statistical testing methods.

DETAILED SYLLABUS:

UNIT-I: NUMERICAL SOLUTIONS OF EQUATIONS AND INTERPOLATION

(8 periods)

Solutions of algebraic and transcendental equations: Regula-falsi method, Newton-Raphson method; Interpolation: Forward and backward differences, interpolation using Newton's forward and backward difference formulae, Lagrange's interpolation formula, partial fractions using Lagrange's interpolation formula.

UNIT- II: NUMERICAL DIFFERENTIATION AND INTEGRATION

(9 Periods)

Numerical differentiation using Newton's forward and backward interpolation formulae; Numerical integration using Simpson's $1/3^{\text{rd}}$ and $3/8^{\text{th}}$ rules; Numerical solutions of first order ordinary differential equations by Taylor's series and fourth order Runge-Kutta methods.

UNIT-III: RANDOM VARIABLES AND MATHEMATICAL EXPECTATION (8 Periods)

Random Variables: Discrete and continuous random variables, distribution function of random variables, properties, probability mass function, probability density function; mathematical expectation, properties of mathematical expectation, mean and variance.

UNIT-IV: PROBABILITY DISTRIBUTIONS

(9 Periods)

Discrete probability distributions: Binomial and Poisson distributions - mean, variance, standard deviation (derivations are not required); Continuous probability distributions: Normal, uniform and exponential distributions- mean, variance, standard deviation (derivations are not required), area under the normal curve.

UNIT-V: TEST OF HYPOTHESIS**(11 Periods)**

Population and sample, parameter and statistic, null and alternative hypothesis, Type I and Type II errors, level of Significance, critical region, degrees of freedom; Large sample test: Tests of significance for proportions and means; Small sample test: Student's t-test- single mean, difference of means, F-test for equality of population variances, Chi-Square test for independence of attributes.

Total Periods: 45**Topics for self-study are provided in the lesson plan****TEXT BOOKS:**

1. T. K. V. Iyengar, B. Krishna Gandhi, S. Ranganatham and M. V. S. S. N. Prasad, *Mathematical Methods*, S. Chand & Company, 8th edition, 2013.
2. T. K. V. Iyengar, B. Krishna Gandhi, S. Ranganatham and M. V. S. S. N. Prasad, *Probability and Statistics*, S. Chand & Company, 5th edition, 2016.

REFERENCE BOOKS:

1. B. S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, 44th edition, 2017.
2. P. Kandasamy, K. Thilagavathy, K. Gunavathi, *Numerical Methods*, S. Chand and Company, 2nd edition, Reprint 2012.
3. S. C. Gupta and V. K. Kapoor, *Fundamentals of Mathematical Statistics*, Sultan Chand and Sons Publications, 11th edition, 2012.

ADDITIONAL LEARNING RESOURCES:

- <https://nptel.ac.in/courses/111/107/111107105/> (Numerical Methods)
- <https://perhuaman.files.wordpress.com/2014/07/metodos-numericos.pdf> (Numerical Methods)
- <https://nptel.ac.in/courses/111/105/111105090/> (Probability and Statistics)
- <https://nptel.ac.in/courses/111/105/111105041/> (Probability and Statistics)
- https://www.vfu.bg/en/e-Learning/Math--Soong_Fundamentals_of_probability_and_statistics_for_engineers.pdf (Probability and Statistics)

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2			1											
CO2	3	2														
CO3	3	2			1											
CO4	2	3		1	1											

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

II B. Tech. – I Semester
(20BT30501) COMPUTER ORGANIZATION
 (Common to CSE, CSE(AI), CSE(DS), CSSE and CSBS)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: A course on “Digital Logic Design”.

COURSE DESCRIPTION: Basic structure and operation of a digital computer; Organization and functional principles of the arithmetic and logic unit, control unit, memory unit and I/O unit; Concepts of pipelining and parallel processing techniques; Multicore computers.

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

- CO1. Analyze computer arithmetic algorithms for fixed-point and floating-point binary operations.
- CO2. Analyze the architecture, organization and functions of the components of a digital computer.
- CO3. Design digital circuits for the given functional description of micro operations and memory elements.
- CO4. Investigate the performance of memory systems, I/O systems, pipelined processors and multiprocessors to evaluate the cost-performance trade-offs.

DETAILED SYLLABUS:

UNIT-I: COMPUTER ARITHMETIC, REGISTER TRANSFER AND MICROOPERATIONS (9 Periods)

Computer Arithmetic: Fixed point representation, Floating point representation, Addition and subtraction, Binary multiplication algorithms.

Register Transfer and Microoperations: Register transfer, Bus and memory transfers, Arithmetic microoperations, Logic microoperations, Shift microoperations, Arithmetic logic shift unit.

UNIT- II: BASIC COMPUTER ORGANIZATION AND DESIGN (8 Periods)

Instruction codes, Computer registers, Computer instructions, Instruction formats, Addressing modes, Timing and control, Instruction cycle, Input-Output and Interrupt.

UNIT-III: MICRO PROGRAMMED CONTROL AND INPUT-OUTPUT ORGANIZATION (10 Periods)

Micro Programmed Control: Control memory, Address sequencing, Design of control unit, Hardwired control, Micro programmed control.

Input-Output Organization: Peripheral devices, Input-Output interface, Modes of transfer, Priority interrupt – Daisy chaining priority, Parallel priority interrupt, Priority encoder; Direct Memory Access, Input-Output Processor – CPU-IOP communication; PCI Express - PCI physical and logical architecture.

UNIT- IV: THE MEMORY SYSTEM**(9 Periods)**

Semiconductor RAM memories – Internal organization, Static memories, Dynamic RAMs, Synchronous and Asynchronous DRAMs, Structure of larger memories; Read-only memories, Cache memories – Mapping functions; Nonvolatile Solid-State Memory Technologies, Solid state drives.

UNIT-V: PIPELINE AND VECTOR PROCESSING, MULTIPROCESSORS, MULTICORE COMPUTERS**(9 Periods)**

Pipeline and Vector Processing: Parallel processing, Pipelining, Instruction pipeline, Vector processing, Array processors.

Multiprocessors: Characteristics of multiprocessors, Interconnection structures, Inter-processor arbitration.

Multicore Computers: Hardware performance issues, Software performance issues, Multicore organization, Intel Core i7-990X.

Total Periods: 45**Topics for self-study are provided in the lesson plan****TEXT BOOKS:**

1. M. Morris Mano, Rajib Mall, *Computer System Architecture*, Revised 3rd Edition, Pearson Education, 2017.
2. Carl Hamacher, Zvonko Vranesic, SafwatZaky, Naraig Manjikian, *Computer Organization and Embedded Systems*, 6th Edition, McGraw Hill, 2012.

REFERENCE BOOKS:

1. William Stallings, *Computer Organization and Architecture: Designing for Performance*, 11th Edition, Pearson Education, 2018.
2. Andrew S. Tanenbaum, Todd Austin, *Structured Computer Organization*, 6th Edition, Pearson, 2016.

ADDITIONAL LEARNING RESOURCES:

- <https://nptel.ac.in/courses/106105163/>
- Bilkent Online Courses, Bilkent University, Lectures by William Sawyer, <https://www.youtube.com/watch?v=CDO28Esqmcg>

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2											3			
CO2	3	3											3			
CO3	1	2	3										3			
CO4	3	2											3			

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

II B. Tech. – I Semester
(20BT30502) DATA STRUCTURES
(Common to CSE, CSE(AI), CSE(DS) and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: A course on "Object Oriented Programming through Java"

COURSE DESCRIPTION: Introduction to data structures; Linked Lists; Types of lists; Stacks; Queues; Trees; Binary search trees; AVL trees; Red-Black Trees; Searching algorithms; Sorting algorithms; Graphs; Minimum spanning trees; Hashing.

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

- CO1. Analyze linear data structures such as arrays, linked lists, stacks, queues for efficient data organization and manipulation.
- CO2. Analyze data structures such as trees, graphs, hash tables for efficient search and retrieval of data.
- CO3. Select and apply appropriate techniques for searching and sorting problems.
- CO4. Apply knowledge to select appropriate data structures for modeling information in data.

DETAILED SYLLABUS:

UNIT- I: LINKED LISTS (7 Periods)

Overview of data structures and algorithms, Linear and non-linear data structures, Big O notation, Linked lists – Definition, Operations; Single linked lists, Circular linked lists, Doubly linked lists, Sorted lists, Linked lists efficiency, Applications of linked lists.

UNIT- II: STACKS AND QUEUES (9 Periods)

Stacks: Definition, Operations, Implementation using arrays and linked lists, Applications – Reversing a word, Delimiter matching, Parsing arithmetic expressions.

Queues: Definition, Operations, Applications, Implementation using arrays and linked lists, Circular queue, Double-ended queues, Priority queues.

UNIT- III: BINARY TREES AND SEARCH TREES (11 Periods)

Tree terminology, Binary trees, Trees represented as arrays, Binary search trees - Concepts, Advantages, Operations, Finding maximum and minimum values, Efficiency; Balanced and unbalanced trees, AVL search trees – Concepts, Operations; Red-Black trees – Concepts, Rotations, Inserting a node, Efficiency.

UNIT- IV: SEARCHING AND SORTING (9 Periods)

Searching: Linear search, Binary search.

Sorting: Bubble sort, Selection sort, Insertion sort, Sorting objects, Shell sort, Partitioning, Quick sort, Merge sort, Heap sort.

UNIT- V: GRAPHS AND HASHING**(9 Periods)****Graphs:** Concepts, Representation, Operations, Depth-first search, Breadth-first search, Minimum spanning trees.**Hashing:** Introduction, Open addressing, Separate chaining, Characteristics of good hash functions – Quick computation, Random and Non-random keys, Folding; Hashing efficiency.**Total Periods: 45****Topics for self-study are provided in the lesson plan****TEXT BOOK(S):**

1. Robert Lafore, *Data Structures & Algorithms in Java*, 2nd Edition, Pearson, 2007.

REFERENCE BOOKS:

1. Goodrich, Tamassia, Goldwasser, *Data structures & Algorithms in Java*, 6th Edition, Wiley, 2014.
2. John R. Hubbard, *Programming with Java*, 2nd Edition, McGraw Hill, 2009.
3. Debasis Samanta, *Classic Data Structures*, 2nd Edition, Prentice Hall, 2009.

ADDITIONAL LEARNING RESOURCES:

- <http://www.nptel.ac.in/courses/106102064>
- <http://nptel.ac.in/courses/106106127/>
- <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-006-introduction-to-algorithms-fall-2011/lecture-videos>

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3										2		3	
CO2	3	3	3										2		3	
CO3	3	3											2		3	
CO4	2	3	3										2		3	

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

II B. Tech. – I Semester
(20BT30503) PYTHON PROGRAMMING
(Common to CSE, CSE(AI) and CSE(DS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: A course on “Object Oriented Programming through Java”

COURSE DESCRIPTION: Basics of Python programming, Control structures, Lists, Tuples, Strings, Sets, Dictionaries, Regular expressions, Functions, File handling, Object-oriented programming, Exception handling.

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

- CO1. Demonstrate knowledge on Python constructs, sequences, sets and dictionaries to solve basic computational problems.
- CO2. Apply the concepts of regular expressions for searching patterns in strings.
- CO3. Develop and use Python modules to provide solutions to problems.
- CO4. Apply the knowledge of file operations in Python for file processing.
- CO5. Design applications using object-oriented programming features – encapsulation, inheritance, polymorphism and exception handling.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO PYTHON PROGRAMMING (7 periods)

Introduction to Python, Tokens, Variables, Literals, Identifiers, Keywords, Special symbols, Operators, Fundamental datatypes, Expressions, Type conversions, Handling Input and output in Python.

UNIT-II: CONTROL STRUCTURES (8 periods)

Selection Statements: if statement, if-else statement, if-elif-else statement, nested-if statement.

Iterative Statements: while loop, for loop, break statement, continue statement, pass and else statements used with loops.

UNIT-III: SEQUENCES, SETS, DICTIONARIES AND REGULAR EXPRESSIONS

(11 periods)

Sequences: Lists and operations – Creating, Inserting elements, Updating elements, Deleting elements, Searching and sorting, List comprehensions, Nested lists; Tuples – Creating, Searching and sorting, Nested tuples; Strings – Initializing a string and string operations, String handling methods, String formatting.

Sets: Set creation, Set operations.

Dictionaries: Operations on dictionaries, Dictionary methods, Sorting elements using lambdas.

Regular Expressions: Regular expressions, Sequence characters in regular expressions, Quantifiers in regular expressions, Special characters in regular expressions.

UNIT-IV: FUNCTIONS AND FILE HANDLING (9 periods)

Functions: Need for functions, Function definition, Function call, Variable scope and lifetime, Return statement, Positional arguments, Keyword arguments, Default arguments and variable length arguments, Recursive functions, Lambda functions, Generators.

File Handling: Types of files, Opening and closing files, Reading and writing data.

UNIT-V: OBJECT ORIENTED PROGRAMMING AND EXCEPTION HANDLING (10 periods)

Object Oriented Programming: Introduction to object-oriented programming, Classes and objects, Inheritance and polymorphism, Abstract Classes and interfaces.

Exception Handling: Errors in a python program, Exceptions, Exception handling, Types of exceptions, Except block, Assert statement, User defined exceptions.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOK:

1. R. Nageswara Rao, *Core Python Programming*, 2nd Edition, Dreamtech Press, 2018.

REFERENCE BOOKS:

1. Reema Thareja, *Python Programming using Problem Solving Approach*, 1st Edition, Oxford University Press, 2017.
2. Charles Dierbach, *Introduction to Computer Science using Python: A Computational Problem Solving Focus*, Wiley India, 2016.

ADDITIONAL LEARNING RESOURCES:

- https://onlinecourses.nptel.ac.in/noc19_cs41/preview
- <https://www.coursera.org/specializations/python>
- <https://www.coursera.org/learn/python-for-applied-data-science-ai>

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2			3								3			
CO2	3	2			3								3			
CO3	3	3	3	3	3								3			
CO4	3	2	2	2	3								3			
CO5	3	3	3	3	3								3			

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

II B. Tech. – I Semester

(20BT12901) DISCRETE MATHEMATICAL STRUCTURES

(Common to CSE, CSE(AI), CSE(DS) and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: A Course on “Transformation Techniques and Linear Algebra”.

COURSE DESCRIPTION: Mathematical Logic; Predicates; Relations; Algebra Structures; Mathematical Reasoning; Recurrence Relations; Graphs; Graph Theory and its Applications.

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

- CO1. Demonstrate knowledge on mathematical logic and predicates.
- CO2. Analyze sets using functions and relations.
- CO3. Analyze properties of different algebraic structures.
- CO4. Apply mathematical reasoning, recurrence relations, permutations and combinations to solve computational problems.
- CO5. Apply concepts of graph theory and trees to implement computer applications.

DETAILED SYLLABUS:

UNIT-I: MATHEMATICAL LOGIC AND PREDICATES (10 Periods)

Mathematical Logic: Statements and notations, Connectives, Well-formed formulae, Truth tables, Tautology, Equivalence of formulae, Normal forms.

Predicates: Predicate calculus, Free and Bound variables, Rules of inference, Consistency, Proof of contradiction and Automatic Theorem Proving.

UNIT-II: FUNCTIONS AND RELATIONS (9 Periods)

Relations: Properties of binary relations, Equivalence relations, Compatibility relations, Partial ordering relations, Hasse diagram and related applications, Lattice and its Properties.

Functions: Inverse Functions, Composition of functions, Recursive functions.

UNIT-III: ALGEBRAIC STRUCTURES (7 Periods)

Algebraic System: Examples and General Properties, Semi Groups and Monoids, Groups, Subgroups, Homomorphism and Isomorphism.

UNIT-IV: MATHEMATICAL REASONING AND RECURRENCE RELATIONS (10 Periods)

Mathematical Reasoning: Methods of Proof, Mathematical Induction, Basics of counting, The Inclusion-Exclusion Principle, The Pigeon hole principle, Permutations and Combinations, Generalized Permutations and Combinations.

Recurrence Relations: Generating Functions of Sequences, Calculating coefficients of generating function, Recurrence relation, solving recurrence relations by substitution and Generating functions, Methods of Characteristic Roots, Solutions of Inhomogeneous Recurrence Relation.

UNIT-V: GRAPH THEORY AND ITS APPLICATION (9 Periods)

Graphs: Introduction to Graphs, Types of Graphs, Graph basic terminology and Special types of simple graphs, Representation of Graphs and Graph Isomorphism, Euler Paths and Circuits, Hamiltonian Paths and Circuits, Planar Graphs, Euler's Formula and Graph Coloring.

Trees: Introduction to Trees, Properties of Trees, Applications of Trees, Spanning Trees, Counting trees, Depth-First Search, Breadth-First Search, Minimum Spanning Trees.

Total Periods: 45

Topics for Self-study are provided in the Lesson Plan

TEXT BOOKS:

1. J.P. Trembly and R. Manohar, *Discrete Mathematical Structures with Applications to Computer Science*, Tata McGraw Hill, Thirty Seventh Edition, 2017
2. Kenneth H. Rosen, *Discrete Mathematics and its Applications*, Tata McGraw Hill, Sixth Edition, 2007.

REFERENCE BOOKS:

1. Joe L. Mott and Abraham Kandel, *Discrete Mathematics for Computer Scientists and Mathematicians*, Prentice Hall of India Private Limited, Second Edition, 2004.
2. Ralph P. Grimaldi and B.V.Ramana, *Discrete and Combinatorial Mathematics- an Applied Introduction*, Pearson Education, Fifth Edition, 2006.

ADDITIONAL LEARNING RESOURCES:

- <https://www.maa.org/press/ebooks/resources-for-teaching-discrete-mathematics>.
- <https://www.quora.com/>

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3												3			
CO2	2	3											3			
CO3	2	3											3			
CO4	1	2	3										3			
CO5	1	2	3										3			

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

II B. Tech. – I Semester
(20BT30531) DATA STRUCTURES LAB
(Common to CSE, CSE(AI), CSE(DS) and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE-REQUISITES: A course on "Data Structures".

COURSE DESCRIPTION: Hands on practice on implementation of Linked lists; Arrays; Stacks; Queues; Search algorithms; Sorting algorithms; Binary search tree representation and operations; Graph representation and operations; Hashing functions.

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

- CO1. Implement linear data structures such as arrays, linked lists, stacks, queues for efficient data organization and manipulation.
- CO2. Develop solutions using data structures such as trees, graphs, heaps, hash tables for efficient search and retrieval of data.
- CO3. Select and apply appropriate techniques for searching and sorting problems.
- CO4. Work independently and communicate effectively in oral and written forms.

LIST OF EXERCISES:

1. A college has N number of students and the following details of all the students are maintained – register number, name, branch, phone number. Write a program to store the details of the students using a singly linked list. Develop functions to perform the following operations on the data.
 - a) Insert new student's details
 - b) Display the details of the students
 - c) Display the total number of students
 - d) Delete a given student's information
2. Department of CSE has readers club named 'Aalochana'. Students can be granted membership in readers club on their request. Similarly, one may cancel their membership of the club. Members of the club can rent books from the club. Write a program to create data structure to maintain readers club members information (Hall ticket number, name) using singly linked list. In singly linked list, the header node should store details of head of readers club and last node should store details of in-charge of readers club. Develop functions to perform the following operations on the data.
 - a) Store details of head and in-charge of the readers club
 - b) Grant and cancel memberships of students
 - c) Display total number of members
 - d) Display the details of the members
 - e) Display the sorted list of details of the members (sort based on their names in alphabetical order)

3. A company has N number of employees and it maintains the following details of each of its employees: ID, department, salary, phone number. Develop a menu driven program using doubly linked list to store the employees' data. Develop functions to perform the following operations on the data.
 - a) Add and delete employees
 - b) Display total number of employees
 - c) Display details of employees with salary more than Rs. 50,000
 - d) Display the phone number of the employee given the ID
4. a) Develop a menu driven program to perform the following operations on a stack of integers (Array and linked list implementations of stack with maximum size MAX)
 - i) Push an element
 - ii) Pop an element
 - iii) Display the status
 - iv) Demonstrate overflow and underflow situations (in array implementation)
 b) Write a program to check whether a string is palindrome or not using stack data structure.
 c) Mostly syntax errors in a computer program arise due to unbalanced braces (such as (), {}, []). Write a program using stack to check whether a given expression has balanced braces or not.
5. a) Develop a menu driven program to perform the following operations on a queue of characters (Array and linked list implementations of queue with maximum size MAX)
 - i) Insert an element
 - ii) Delete an element
 - iii) Display the status
 - iv) Demonstrate overflow and underflow situations (in array implementation)
 b) A restaurant based on its human resources can accept a maximum of N number of food orders. The food orders are served in first come first serve basis. The food orders once placed cannot be cancelled. Write a program to simulate the food ordering and serving system in the restaurant using circular queue.
6. Write a program to perform the following operations on the binary search tree.
 - a) Construct binary search tree by inserting the values {6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2} in the given order.
 - b) Display the nodes of the tree using inorder, preorder and postorder traversal techniques.
 - c) Display the smallest number stored in the tree.
 - d) Search the tree for a given number.
7. There are train paths between cities. If there is a train between city A and city B then there is a route between the cities. The cost of the route is the distance between city A and city B. Represent the train travel route information as a graph. The node can be represented by the name of the city. Write a program to perform the following operations.

- a) Store the details of train travel route information using adjacency list or adjacency matrix representation.
 - b) Traverse the graph and display the details of all trains between the cities along with the cost using breadth-first method.
 - c) Traverse the graph and display the details of all trains between the cities along with the cost using depth-first method.
8. Store register numbers of students who attended placement training program in a random order in an array. Write a function to search whether a student has attended placement training program or not using
 - a) Linear search
 - b) Binary search
 9. Write a program to sort a given set of integers using
 - a) Quick sort
 - b) Shell sort
 10. a) Write a program to sort a given set of integers using merge sort.
b) Write a program to read the marks obtained by students in a mathematics examination and store the data using a heap data structure. Find out the maximum and minimum marks obtained by the students.
 11. Write a program to implement the following hashing functions.
 - a) Separate Chaining Method
 - b) Open Addressing Method
 12. Consider an online movie ticket booking system through which customers can book tickets to watch movies at theatres. The database stores the details of each transaction of ticket booking with the details - ID, customer name, customer phone number, movie name, theatre name, date of show, time of show, number of tickets booked, starting seat number, total amount. Write a menu driven program to perform create the database and given an ID, display a client's phone number. Use a hash table implementation to quickly search through the database.

REFERENCE BOOKS:

1. Robert Lafore, *Data Structures & Algorithms in Java*, 2nd Edition, Pearson, 2007.
2. Goodrich, Tamassia, Goldwasser, *Data structures & Algorithms in Java*, 6th Edition, Wiley, 2014.

SOFTWARE/TOOLS USED:

- Software: J2SDK 1.7
 - Eclipse or Net bean
- Java compatible web browser

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	3	3	3								2		3	
CO2	2	3	3	3	3								2		3	
CO3	2	2	3	3	3								2		3	
CO4									3	3						

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

II B. Tech. – I Semester
(20BT30532) PYTHON PROGRAMMING LAB
 (Common to CSE, CSE(AI) and CSE(DS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE-REQUISITES: A Course on "Python Programming".

COURSE DESCRIPTION: Hands on practice on python programming for problem solving, Sequences, Sets, Dictionaries, Regular expressions, Functions, File handling, Object-oriented concepts through Python, Exception handlings.

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

- CO1. Demonstrate practical knowledge on Python constructs, sequences, sets and dictionaries to solve basic computational problems.
- CO2. Apply the concepts of regular expressions for searching patterns in strings.
- CO3. Develop and use Python modules to provide solutions to problems.
- CO4. Apply the knowledge of file operations in Python for file processing.
- CO5. Design applications using object-oriented programming features – encapsulation, inheritance, polymorphism and exception handling.
- CO6. Work independently to solve problems with effective communication.

LIST OF EXERCISES:

- 1)
 - a) Write a python script to read two integer numbers and perform arithmetic operations.
 - b) Write a python script to evaluate following expressions by considering necessary inputs.
 i) $ax^2 + bx + c$ ii) $ax^5 + bx^3 + c$ iii) $(ax + b) / (ax - b)$ iv) $x - a / b + c$
- 2)
 - a) Write a python script to convert a given decimal number into octal, hexadecimal and binary.
 - b) Write a python script to read four integer values separated with commas and display the sum of those four numbers.
 - c) Write a python script to print "SVEC" with prefix of ten spaces by using format().
- 3)
 - a) Write a python script to calculate electricity bill based on following slab rates.

<u>Consumption units</u>	<u>Rate (in Rupees/Unit)</u>
0-100	4
101-150	4.6
151-200	5.2
201-300	6.3
Above 300	8

(Hint: To get Consumption units take current meter reading and old meter reading from the user as input)

b) Print the following pattern using python script.

```

          1
        1 2 1
      1 2 3 2 1
    1 2 3 4 3 2 1
  1 2 3 4 5 4 3 2 1
```

4) a) Write a python script to check whether the given number (N) can be expressed as Power of Two (2) or not. For example, 8 can be expressed as 2^3 .

b) Write a python script to perform following sets operations.

i) update () ii) discard() iii) issuperset() iv) isdisjoint()
v) symmetric_difference ()

5) a) Given an integer tuple, for each element in the tuple check whether there exists a smaller element on the next immediate position of the tuple. If it exists print the smaller element. If there is no smaller element on the immediate next to the element then print -1.
Example: Input: 4 2 1 5 3 Output: 2 1 -1 3 -1

b) Write a Python program to print the number of times the string "SVEC" can be formed for the given input string.

Example: Input: acdfksekfevskdjfs Output: 1

6) a) Write a python script to read details of N students – name, roll number, branch and age. Sort the student details based on their names and display.

b) Write a python script to delete duplicate strings from a list of strings. (Insertion order should be maintained after deleting duplicate string).

c) Write a python script to read details of N students into nested list and convert it into a nested dictionary.

7) a) Design a function that can perform sum of two or three or four numbers.

b) Write a python script to implement Towers of Hanoi problem.

c) Write a python script to print the numbers that do not appear in the Fibonacci series of n numbers where n is given by the user. (Hint: If n is 8 then up to 8 Fibonacci numbers has to be printed Ex: 1 1 2 3 5 8 13 21 and in this series missing numbers should be traced and printed, Ex: missing numbers are: 4 6 7 9 10 11 12 14 15 16 17 18 19.

8) a) Write a python script to create a regular expression to extract all words with 5 characters length from a given string.

b) Write a python script to create a regular expression to extract the phone number from a given text.

9) a) Write a python script to copy the content of one file into another file.

b) Write a python script to read all the strings from the text file and display them.

10) a) Write a Python program for the following problem: Create a base class Basic_Info with data members name, rollno, gender and two member functions getdata() and display(). Derive a class Physical_Fit from Basic_Info which has data members height and weight and member functions getdata() and display(). Display all the information using object of derived class.

b) Define a class REPORT with the following specification:

Private members:

Adno: 4-digit admission number

Name:20 characters
 Marks: A list of 5 floating point values
 Average: average marks obtained
 GETAVG () a function to compute the average obtained in five subjects.

Public members:

READINFO () function to accept values for adno, name, marks. Invoke the function GETAVG ().

DISPLAYINFO () function to display all data members of report on the screen. You should give function definitions. Write driver code to demonstrate all the functions.

- 11) a) Write a python script to handle following set of exceptions:
 i) ArithmeticError ii) ImportError iii) IndexErro iv) KeyError
 b) Write a python script to throw a user defined exception called Negative, if the entered input is a negative number.

REFERENCE BOOKS:

1. R. Nageswara Rao, *Core Python Programming*, 2nd Edition, Dreamtech Press, 2018.
2. Reema Thareja, *Python Programming using Problem Solving Approach*, 1st Edition, Oxford University Press, 2017.
3. Charles Dierbach, *Introduction to Computer Science using Python: A Computational Problem Solving Focus*, Wiley India, 2016.

ADDITIONAL LEARNING RESOURCES:

- https://onlinecourses.nptel.ac.in/noc19_cs41/preview
- <https://www.coursera.org/specializations/python>
- <https://www.coursera.org/learn/python-for-applied-data-science-ai>

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2			3								3			
CO2	3	2			3								3			
CO3	3	3	3	3	3								3			
CO4	3	2	2	2	3								3			
CO5	3	3	3	3	3								3			
CO6								3	3							

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

II B. Tech. – I Semester
(20BT30533) WORKSHOP IN COMPUTER SCIENCE
(Common to CSE, CSE(AI) and CSE(DS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE-REQUISITES: A Course on "Python Programming".

COURSE DESCRIPTION: Hands on practice sessions on MS Office, Cloud productivity and collaboration tools, AI Tools, GitHub.

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

- CO1. Use office suite for effective documentation, data analysis and presentations.
- CO2. Use Cloud-based tools for effective collaboration and data sharing.
- CO3. Use AI tools for speech recognition, language detection and object detection.
- CO4. Use online code hosting platforms such as GitHub for hosting and collaborating software projects.
- CO5. Work independently to solve problems with effective communication.

LIST OF EXERCISES:

MS-Office:

1. MS Word
 - a) Introduction to MS-Word, Importance of Word as Word Processor, Overview of toolbars, Saving, Accessing files, Using help and resources. Create a word document using the features: Formatting fonts, Drop cap, Applying text effects, Using character spacing, Borders and shading, Inserting headers and footers, Using date and time option.
 - b) Create a word document in MS-Word using the features: Inserting tables, Bullets and numbering, changing text direction, Hyperlink, Images from files and Clipart, Drawing toolbar and Word art and create an invitation using Mail Merge in MS-Word.
2. MS Power Point
 - a) Introduction to MS-Power Point, Utilities, Overview of toolbars, PPT orientation, slide layouts, Types of views. Create a Power Point Presentation using the features: Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows.
 - b) Create a Power Point Presentation using the features: Auto content wizard, Hyperlinks, Inserting images, Clip art, Audio, Video, Custom animation, Slide hiding, Tables and Charts.
3. MS Excel
 - a) Introduction to MS-Excel as a Spreadsheet tool, Overview of toolbars, accessing, Saving excel files, Using help and resources. Create a spreadsheet using the features: Gridlines, Format cells, Summation, Auto fill, Formatting text, Formulae in Excel Charts.

- b) Create a spreadsheet using the features: Split cells, Sorting, Conditional formatting, Freeze panes, Pivot tables, Data validation.

Cloud Based Productivity and Collaboration Tools:

4. Introduction to Google drive, Google Backup & Sync, Google Forms.
 - a) Store, sync, and share files in the cloud using Google Drive, Google Backup & Sync tools.
 - b) Create Google forms to manage event registrations/surveys/quizzes and analyze responses.

AI Tools:

5. Speech Recognition: Read an audio file with Python and use the Google speech recognition API to perform conversion of Speech to Text.
6. Language Detection: Detect the language of the text using language detection library (langdetect) ported from Google's language-detection.
7. Object Detection: Detect multiple objects present in an image using Detectron-Facebook's API.

GitHub:

8.
 - a) Introduction to GitHub basic concepts and Flow.
 - b) GitHub Installation and Setup.
 - c) Create a "Hello World" project on GitHub by performing the following operations
 - Create and use a repository
 - Create and manage a new branch
 - Perform and commit changes to a file
 - Open and merge pull requests

SOFTWARE/TOOLS USED:

- MS Office
- Google Cloud based productivity and collaboration tools
- Google speech recognition API, Google's language-detection API, Detectron-Facebook's API
- Github

ADDITIONAL LEARNING RESOURCES:

- <https://gsuite.google.com/learning-center/products/#!/>
- <https://pypi.org/project/langdetect/>
- <https://cloud.google.com/translate/docs>
- <https://ai.facebook.com/tools/detectron/>

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1					3					3			2			
CO2					3								2			
CO3	2	3	3	3	3	2								3		
CO4					3	2							3			
CO5									3	3						

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

II B. Tech. – I Semester
(20BT30534) PROGRAMMING THROUGH C++ LAB
 (Skill Oriented Course)
 (Common to CSE, CSE(AI) and CSE(DS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	1	2	2

PRE-REQUISITES: A Course on "Programming for Problem Solving".

COURSE DESCRIPTION: Hands-on experience on programming through C++, Control statements, Arrays, Strings, Functions, Classes and objects, Polymorphism, Inheritance, Exception Handling, Standard Template Library.

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

- CO1. Apply syntactic constructs of C++ programming language to solve logic-based problems.
- CO2. Develop application programs using object-oriented programming features.
- CO3. Design general algorithms using generic programming through Standard Template Library.
- CO4. Work independently to solve problems with effective communication.

LIST OF EXERCISES:

Object-Oriented Programming concepts, Fundamental Datatypes, Constants, Variables, Input and Output Streams, Operators, Control Flow statements, Arrays, Functions, Strings.

1.
 - a) Write a C++ program to perform basic arithmetic operations.
 - b) Given an integer variable "days" that contains a number of days, write a C++ program that displays
 - i) the number of whole weeks corresponding to days. For example, if days contains 23, then the number of whole weeks is 3.
 - ii) the number of days remaining after taking the whole weeks out of the value in days. For example, if days contains 23, then the number of days remaining after 3 whole weeks is 2.
2.
 - a) Write a C++ program that determines the median of three input numbers. The median is the middle number when the three numbers are arranged in order by size. However, the user can input the values in any order.
 - b) Write an interactive C++ program which takes input of a series of n temperatures entered by the user, calculates the average temperature.
3.
 - a) ROT13 (rotate by 13 places) is a simple letter substitution cipher that is an instance of a Caesar cipher developed in ancient Rome and used by Julius Caesar who used it in his private correspondence. ROT13 replaces a letter with the letter 13 letters after it in the alphabet. The following example demonstrates the translation in ROT13:
 A → N B → O C → P D → Q
 Thus, the translation of the word JULIUS using ROT13 would be WHYVHF.

Write a C++ program that inputs a sentence and outputs the corresponding translated sentence using the ROT13 encoding scheme above.

- b) Write a C++ program that displays a checkerboard pattern made of stars and blanks, as shown below. A checkerboard is of size eight squares by eight squares.

```

      *   *   *   *
    *   *   *   *
      *   *   *   *
    *   *   *   *
      *   *   *   *
    *   *   *   *
      *   *   *   *
    *   *   *   *

```

4. a) Write a C++ program that reads time in numeric form and displays it in English. The time is input as hours and minutes, separated by a space. Hours are specified in 24-hour time (15 is 3 P.M.), but the output should be in 12-hour A.M./P.M. form. Note that noon and midnight are special cases. Here are some examples:

Input1: Enter Time: 12 00

Output1: Noon

Input2: Enter time: 0 00

Output2: Midnight

Input3: Enter time: 6 44

Output3: Six forty four AM

Input4: Enter time: 18 11

Output4: Six eleven PM

- b) Beautiful String - Claudia is playing with strings. She has two strings and she wanted both of them to be beautiful. According to Claudia, both the strings are beautiful if one of the strings is a permutation of the other. Write a C++ program to determine whether the two given strings are beautiful or not.

Input Format: contains two string S and P.

Output Format: Print "YES" (without quotes) if the given strings are beautiful else print "NO" (without quotes).

Examples:

Input1: hello olelh Output1: YES

Input2: jgec cgec Output2: NO

5. a) An array A of N integers is given where every element appears twice except for two elements, which appears exactly one time. Write a C++ program to find those numbers which appear only once.

Input Format: First line of input contains a single integer N - denoting number the integers. Second line contains N space separated integers.

Output Format: Print the two elements which appear exactly once in increasing order.

Example: Input: 6
 1 2 1 3 3 5
 Output: 2 5

- b) Write a C++ program to reverse the given input string by keeping its special characters at the same place.

Example: Input: intell#ect Output: tcelle#tni

Classes and objects, Inheritance, Virtual Functions, Polymorphism, Exceptions and Overloading Operators.

6. a) Write a C++ program for the following problem:
 Create a base class Basic_Info with data members name, rollno, gender and two member functions getdata() and display(). Derive a class Physical_Fit from Basic_Info which has data members height and weight and member

functions `getdata()` and `display()`. Display all the information using object of derived class.

- b) Write a C++ program to overload binary + operator.
 - c) Write a C++ program for the following problem: Create three classes Person, Professor and Student. The class Person should have data members – name and age, pure virtual functions – `getdata()` and `putdata()`. The classes Professor and Student should inherit from the class Person. The class Professor should have integer member: `num_publications`. There will be two member functions: `getdata()` and `putdata()`. The function `getdata()` should get the input from the user: name, age and number of publications of the professor. The function `putdata()` should print the name, age, publications of the professor. The class Student should have data member: `marks`. It has two member functions: `getdata()` and `putdata()`. The function `getdata()` should get the input from the user: name, age, and the marks of the student. The function `putdata()` should print the name, age, marks of the student. Create one object each for the classes Professor and Student, read and display the data of a professor and a student.
7. a) Write a C++ program to monitor network access points in a building. Each building has a specified number of floors, a certain number of rooms per floor, and some number of network access points in a room. Each network access point is labeled with its state as being on or off and if it is on it has the month it was turned on. Design, implement, and test classes that represent buildings, floors, and network access points. The classes should provide suitable observer methods that allow to determine how many floors are in a building, how many rooms are on a floor, how many access points are in a room, and if an access point is on or off and which month it was turned on. Also provide mutator methods that allow to turn a network access point on or off and to set the month if it is turned on. Use composition as a key strategy in designing these classes—thus, a building should contain floors, floors should contain rooms, and rooms should contain network access points.
- b) Design, implement, and test a class in C++ that represents an amount of time in minutes and seconds. The class should provide a constructor that sets the time to a specified number of minutes and seconds. The default constructor should create an object for a time of zero minutes and zero seconds. The class should provide observers that return the minutes and the seconds separately, and an observer that returns the total time in seconds ($\text{minutes} \times 60 + \text{seconds}$). Boolean comparison observers should be provided that test whether two times are equal, one time is greater than the other, or one time is less than the other. A function should be provided that adds one time to another, and another function that subtracts one time from another. The class should not allow negative times (subtraction of more time than is currently stored should result in a time of 0:00).

Template Classes, Generic Functions, Standard Template Library (STL) - vector, stack, priority_queue, map, bitsets and iterators.

8. a) Write a function using templates that returns the sum of all the elements in a one-dimensional array. The array elements can be of any simple numeric type, and the function has two parameters: the base address of the array and the number of elements in the array.
- b) Write a C++ program to implement linear search algorithm. Use vector STL to store N integers.

9. a) Write a C++ program using priority_queue STL to display the given N integers in descending order.
- b) Write a C++ program to validate the given input string for balanced parenthesization using stack STL.
10. a) Count Set Bit
Given a non-negative integer N, write a C++ program to count the number of set bits for every integer i in the range $1 \leq i \leq N$.
Input Format: Input contains a single integer N.
Output Format: Print N space separated integers where the ⁱth integer denotes the number of set bit of i.
Example: Input: 5 Output: 1 1 2 1 2
- b) Write a C++ program to display count of each character with in a given string using maps.

REFERENCE BOOKS:

1. John R Hubbard, *Programming with C++*, 3rd Edition, McGraw Hill, 2010.
2. Nicolai M. Josuttis, *The C++ Standard Library: A Tutorial and Reference*, 2nd Edition, Pearson Education, 2012.
3. Steven Halim, Felix Halim, *Competitive Programming 3: The New Lower Bound of Programming Contests*, 2013.

ADDITIONAL LEARNING RESOURCES:

- https://onlinecourses.nptel.ac.in/noc19_cs38/preview
- <https://www.coursera.org/specializations/hands-on-cpp>

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	3								3			
CO2	3	3	3	3	3								3			
CO3	3	3	3	3	3								3			
CO4									3	3						

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

II B. Tech. – I Semester
(20BT315AC) DESIGN THINKING
(Audit Course)

(Common to CSE, CSE(AI), CSE(DS), CSBS, CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	2	-	-	-

PRE-REQUISITES: --

COURSE DESCRIPTION: Design thinking process, Design thinking phases, empathy tools; Idea generation, visualizing and empathizing; Fidelity for prototypes, prototyping; prototyping for physical products.

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

- CO1: Analyze design thinking concepts and principles to perform human centered design process for creative problem solving.
- CO2: Create empathy maps to visualize user attitudes and behavior for gaining insights of customers.
- CO3: Develop innovative products or services for a customer base using ideation techniques.
- CO4: Build prototypes for complex problems using gathered user requirements.
- CO5: Apply design thinking tools techniques to produce good design and relevant products or services for a specific target market.
- CO6: Improve prototype by testing it with a specific set of users for making it sustainable by following ethics.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO DESIGN THINKING (6 Periods)

Design Thinking Process: Types of the thinking process, Common methods to change the human thinking process, Design thinking: Definition, Origin of design thinking, Importance of design thinking, Design vs Design thinking, Problem solving, Understanding design thinking and its process model, Design thinking tools.

UNIT-II: EMPATHIZE (6 Periods)

Design thinking phases, How to empathize, Role of empathy in design thinking, purpose of empathy maps, Things to be done prior to empathy mapping, Activities during and after the session, Understanding empathy tools: Customer Journey Map, Personas.

UNIT-III: IDEATION (6 Periods)

Challenges in idea generation, need for systematic method to connect to user, Visualize, Empathize, and Ideate method, Importance of visualizing and empathizing before ideating, Applying the method, Ideation Tools: How Might We? (HMW), Story board, Brainstorming.

UNIT-IV: PROTOTYPING**(6 Periods)**

What is a prototype? - Prototyping as a mindset, prototype examples, prototyping for products; Why we prototype? Fidelity for prototypes, Process of prototyping- Minimum Viable prototype

UNIT-V: TESTING PROTOTYPES**(6 Periods)**

Prototyping for digital products: What's unique for digital, Preparation; Prototyping for physical products: What's unique for physical products, Preparation; Testing prototypes with users.

Total Periods: 30**Topics for Self-Study are provided in the Lesson Plan****TEXT BOOKS:**

1. S. Salivahanan, S. Suresh Kumar, D. Praveen Sam, "Introduction to Design Thinking", Tata McGraw Hill, First Edition, 2019.
2. Kathryn McElroy, "Prototyping for Designers: Developing the best Digital and Physical Products", O'Reilly, 2017.

REFERENCE BOOKS:

1. Michael G. Luchs, Scott Swan, Abbie Griffin, "Design Thinking - New Product Essentials from PDMA", Wiley, 2015.
2. Vijay Kumar, "101 Design Methods: A Structured Approach for Driving Innovation in Your Organization", 2012.

ADDITIONAL LEARNING RESOURCES:

- <https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process>
- <https://www.ibm.com/design/thinking/page/toolkit>
- <https://www.interaction-design.org/literature/article/define-and-frame-your-design-challenge-by-creating-your-point-of-view-and-ask-how-might-we>
- <https://www.culturepartnership.eu/en/article/ten-tools-for-design-thinking>
- <https://nptel.ac.in/courses/109/104/109104109/>
- <https://nptel.ac.in/courses/110106124/>

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1		3	2												
CO2	1	3														
CO3	1			3	1											
CO4		3		3												
CO5					1	2	3									
CO6	1	3	1				1	1								

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

II B. Tech. – II Semester
(20BT50501) COMPUTER NETWORKS
(Common to CSE(AI) and CSE(DS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: A course on "Operating Systems".

COURSE DESCRIPTION: Introduction to computer networks; Protocols of physical layer, data link layer, medium access control sub layer, network layer, transport layer, application layer.

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

- CO1. Analyze the types of network topologies, layers and protocols.
- CO2. Evaluate subnetting and routing algorithms for finding optimal paths in networks.
- CO3. Solve problems related to flow control, error control and congestion control in data transmission.
- CO4. Assess the impact of wired and wireless networks in the context of network protocols Like DNS, SMTP, HTTP, and FTP.
- CO5. Apply ethical principles and standards for developing network-based solutions.

DETAILED SYLLABUS:

UNIT- I: INTRODUCTION AND PHYSICAL LAYER (9 Periods)

Network hardware, Network software, Reference models - OSI, TCP/IP; Example networks – Internet; Wireless LANs - 802.11.

Physical Layer - Guided transmission media, Wireless transmission, Switching - Circuit switching, Packet switching.

UNIT- II: DATA LINK LAYER AND MEDIUM ACCESS CONTROL SUBLAYER (9 Periods)

Data Link Layer: Data link layer design issues, Error detection and correction - CRC, Hamming codes; Elementary data link protocols, Sliding window protocols.

Medium Access Control Sub layer: ALOHA, Carrier sense multiple access protocols, Collision free protocols, Ethernet, Data link layer switching - Repeaters, Hubs, Bridges, Switches, Routers, Gateways.

UNIT- III: NETWORK LAYER (9 Periods)

Network layer design issues, Routing algorithms - Shortest path algorithm, Flooding, Distance vector routing, Link state routing, Hierarchical routing, Broadcast routing, Multicast routing, Anycast routing; Congestion control algorithms, Network layer in the internet - The IP version 4 protocol, IP addresses, IP version 6, Internet control protocols, OSPF, BGP.

UNIT- IV: TRANSPORT LAYER**(9 Periods)**

UDP – Segment header, Remote procedure call, Real-time transport protocols; TCP – service model, Protocol, Segment header, Connection establishment, Connection release, Sliding window, Timer management, Congestion control.

UNIT- V: APPLICATION LAYER**(9 Periods)**

Domain Name System (DNS) - Name space, Domain resource records, Name servers; Electronic mail - Architecture and services, User agent, Message formats, Message transfer, Final delivery; The World Wide Web - Architectural overview, HTTP, FTP.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOK(S):

1. Andrew S. Tanenbaum and David J. Wetherall, *Computer Networks*, Pearson, 5th Edition, 2015.

REFERENCE BOOKS:

1. Behrouz A. Forouzan, *Data Communications and Networking*, McGraw Hill, 5th Edition, 2013.
2. James F. Kurose and Keith W. Ross, *Computer Networking: A Top-Down Approach*, Pearson, 7th Edition, 2017.

ADDITIONAL LEARNING RESOURCES:

- <https://www.cisco.com/c/en/us/solutions/small-business/resourcecenter/networking/networking-basics.html>
- <https://memberfiles.freewebs.com/00/88/103568800/documents/Data.And.Computer.Communications.8e.WilliamStallings.pdf>

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2													3
CO2	3	2		3												3
CO3	3	2		2												3
CO4						2										3
CO5								3								3

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

II B. Tech. – II Semester
(20BT40501) DATABASE MANAGEMENT SYSTEMS
(Common to CSE, CSE(AI), CSE(DS), CSBS, CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: A course on "Data Structures".

COURSE DESCRIPTION: Introduction to database systems; Database design; Relational model; Relational algebra; SQL queries; Constraints and triggers; PL/SQL; Schema refinement and normal forms; Transaction management; Concurrency control; Overview of storage and indexing.

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

- CO1. Apply the concepts of ER-modeling and normalization to design viable data models for a given problem.
- CO2. Formulate relational database schemas, apply suitable integrity constraints, for querying databases.
- CO3. Use SQL to store, query, and manipulate data in relational databases.
- CO4. Develop PL/SQL blocks to centralize database applications for maintainability and reusability.
- CO5. Analyze transaction processing, concurrency control and storage methods for database management.

DETAILED SYLLABUS:

UNIT- I: INTRODUCTION TO DATABASE SYSTEMS AND DATABASE DESIGN

(08 Periods)

Introduction to Database Systems: Database system applications, Purpose of database systems, View of data - Data abstraction, Instances and schemas, Data models; Database languages - Data Definition Language, Data Manipulation Language; Database architecture, Database users and administrators.

Introduction to Database design: Database design and ER diagrams, Entities, attributes and entity sets, Relationships and relationship sets, Additional features of ER model, Conceptual Design with ER model.

UNIT- II: RELATIONAL MODEL AND RELATIONAL ALGEBRA

(08 Periods)

Relational Model: Creating and modifying relations, Integrity constraints over relations, Enforcing integrity constraints, Querying relational data, Logical database design, Introduction to views, Destroying/altering tables and views.

Relational Algebra: Preliminaries, Relational Algebra operators.

UNIT- III: SQL AND PL/SQL

(10 Periods)

SQL: Form of basic SQL query, Nested queries, Aggregate operators, Null values, Complex integrity constraints in SQL, Triggers and active databases.

PL/SQL: Generic PL/SQL block, PL/SQL data types, Control structure, Procedures and functions, Cursors, Database triggers.

UNIT- IV: SCHEMA REFINEMENT AND TRANSACTIONS (10 Periods)

Schema Refinement: Problems caused by redundancy, Decompositions, Problems related to decomposition, Functional dependencies, Reasoning about FDs, First normal form, Second normal form, Third normal form, Boyce-Codd normal form, Multivalued dependencies, Fourth normal form, Join dependencies, Fifth normal form.

Transactions: Transaction concept, Transaction atomicity and durability, Concurrent Executions – Serializability, Recoverability, Implementation of isolation, Testing for serializability.

UNIT- V: CONCURRENCY CONTROL, STORAGE AND INDEXING (09 Periods)

Concurrency Control: Lock Based Protocols, Timestamp Based Protocols, Validation Based Protocols, Multiple Granularity, Deadlock Handling.

Storage and Indexing: Data on external storage, File organizations and indexing – Clustered indexes, Primary and secondary indexes; Index data structures – Hash based indexing, Tree based indexing; Comparison of file organizations.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Raghu Ramakrishnan, Johannes Gehrke, *Database Management Systems*, McGraw Hill, 3rd Edition, 2014.
2. Abraham Silberschatz, Henry. F. Korth, S. Sudarshan, *Database System Concepts*, McGraw Hill, 7th edition, 2019.

REFERENCE BOOKS:

1. Ivan Bayross, *SQL, PL/SQL: The Programming Language of Oracle*, BPB publications, 4th Edition, 2017.
2. Ramez Elmasri, Shamkant B. Navathe, *Fundamentals of Database Systems*, 7th Edition, Pearson, 2015.

ADDITIONAL LEARNING RESOURCES:

- https://swayam.gov.in/nd1_noc19_cs46/preview
- <https://www.classcentral.com/course/swayam-introduction-to-database-systems-17660>

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	3												3	
CO2	1	2											2		3	
CO3	3	2											1		3	
CO4	1	2	3	2									3		2	
CO5	3	3											2		3	

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

II B. Tech. – II Semester
(20BT31501) OPERATING SYSTEMS
(Common to CSE, CSE(AI) and CSE(DS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES:--

COURSE DESCRIPTION: Operating Systems Operations; Process Scheduling; Process Synchronization, Deadlocks; Paging and Segmentation, Disk Scheduling; File Concepts, I/O Interface; Concepts of Protection and Security.

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

- CO1. Analyze performance of CPU scheduling algorithms.
- CO2. Design solutions for process synchronization problems by using semaphores and monitors.
- CO3. Devise solutions for deadlocks using deadlock handling mechanisms.
- CO4. Solve memory management problems using page replacement and disk scheduling algorithms.
- CO5. Identify efficient file allocation methods for optimal disk utilization.
- CO6. Analyze services of I/O subsystems and mechanisms of security & protection.

DETAILED SYLLABUS:

UNIT I: INTRODUCTION TO OPERATING SYSTEM AND PROCESS MANAGEMENT

(8 periods)

Introduction: Definition, Operating System Structure and Services, System Calls.

Process Management: Process Scheduling, Process Control Block, Inter Process Communication, Threads, Multithreading Models, CPU Scheduling Criteria, Scheduling Algorithms, Multiprocessor Scheduling.

UNIT II: PROCESS SYNCHRONIZATION AND DEADLOCKS

(10 periods)

Process Synchronization: Critical Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Synchronization Problems, Monitors.

Deadlocks: System Model, Deadlock characterization, Methods for handling deadlocks, Prevention, Detection, Avoidance, Recovery from deadlock.

UNIT III: MEMORY MANAGEMENT AND SECONDARY STORAGE

(10 periods)

Memory Management: Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging.

Virtual Memory: Demand Paging, Page Replacement Algorithms, Copy-on-Write, Thrashing.

Secondary Storage Structure: Overview of Mass Storage Structure, Disk Structure, Disk Scheduling, Disk Management.

UNIT IV: FILE AND I/O SYSTEMS**(8 periods)****File System:** File concept, Access Methods, Directory Structure, File System Structure, i-node, File System Implementation, Directory Implementation, Allocation Methods.**I/O System:** I/O Hardware, Application I/O Interface, Kernel I/O subsystem**UNIT V: PROTECTION AND SECURITY****(9 periods)****Protection:** Goals, Principles, Domain of Protection, Access Matrix, Implementation of Access Matrix, Access Control, Revocation of Access Rights.**Security:** Security Problem, Program Threats, System and Network Threats, User Authentication, Implementing Security Defenses, Firewalling to Protect Systems and Networks, Computer-Security Classifications.**Total Periods: 45****Topics for Self Study are provided in the Lesson Plan****TEXT BOOK:**

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, *Operating System Concepts*, Wiley India Edition, 9th Edition, 2016.

REFERENCE BOOKS:

1. William Stallings, *Operating Systems, Internals and Design Principles*, Pearson Education, 7th Edition, 2013.
2. Andrew S. Tanenbaum, *Modern Operating Systems*, PHI, 3rd Edition, 2009.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	2	2								3			
CO2	2	2	3		2								3			
CO3	2	2	3		2								3			
CO4	2	2	3		2										3	
CO5	3	3													3	
CO6	2	3		3									3			

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

II B.Tech.II Semester
(20BT43201) FOUNDATIONS OF DATA SCIENCE

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Courses on "Transformation Techniques and Linear Algebra", "Numerical Methods", "Probability and Statistics", "Python Programming".

COURSE DESCRIPTION:

Basic Terminologies of data science, Computation using NumPy, Data exploration using Pandas, Data transformation, Data wrangling, Plotting and visualization using Matplotlib, Data aggregation, Time series analysis.

COURSE OBJECTIVES:

- To impart knowledge on basics of data science, data manipulation and exploratory data analysis concepts that is vital for data science.
- To develop skills for applying tools and techniques to analyze, visualize and interpret data.

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

- CO1. Demonstrate knowledge on the concepts of data science to perform mathematical computations using efficient storage and data handling methods in NumPy.
- CO2. Apply Data Preparation and Exploration methods using Pandas to perform data manipulation.
- CO3. Create data visualization using charts, plots and histograms to identify trends, patterns and outliers in data using Matplotlib and Seaborn.
- CO4. Develop methods to analyze and interpret time series data to extract meaningful statistics.

DETAILED SYLLABUS:

UNIT I- INTRODUCTION TO DATA SCIENCE

(9 periods)

Basic terminologies of data science, Types of data, Five steps of data science, Arrays and vectorized computation using NumPy - The NumPy ndarray: A multidimensional array object, Universal functions: Fast element-wise Array functions, Array-oriented Programming with arrays, File input and output with arrays, Linear algebra, pseudorandom number generation.

UNIT II – DATA EXPLORATION WITH PANDAS

(9 periods)

Process of exploring data, Pandas data structures – Series, Data frame, Index objects; Essential functionality, Summarizing and computing descriptive statistics - Correlation and covariance, Unique values, Value counts and membership; Data loading, Storage, and file formats - Reading and writing data in text format , Binary data formats , Interacting with web APIs, Interacting with databases.

UNIT III – DATA CLEANING, PREPARATION AND DATA WRANGLING (9 periods)

Handling missing data, Data transformation, String manipulation - String object methods, Regular expressions, Vectorized string functions in Pandas; Data wrangling: join, Combine and reshape - Hierarchical indexing, Combining and merging datasets, Reshaping and pivoting.

UNIT IV – DATA VISUALIZATION WITH MATPLOTLIB (10 periods)

Plotting and visualization- A brief matplotlib API primer, Plotting with Pandas and Seaborn, Other python visualization tools; Data aggregation and Group operations- GroupBy mechanics, Data aggregation, Apply: General split-apply-combine, Pivot tables and Cross-tabulation.

UNIT V – TIME SERIES ANALYSIS (8 periods)

Date and time data types and tools, Time series basics, Date ranges, Frequencies, and shifting. Time zone handling, Periods and period arithmetic, Resampling and frequency Conversion – Downsampling, upsampling and interpolation, Resampling with periods; Moving window functions.

Total Periods: 45

Topics for self-study shall be included in the lesson plan

TEXT BOOKS:

1. Wes McKinney, Python for Data Analysis, O'Reilly, 2nd Edition, 2017.

REFERENCE BOOKS:

1. Sinan Ozdemir, Principles of Data Science, Packt Publishers, 2nd Edition, 2018.
2. Rachel Schutt, Cathy O'Neil, *Doing Data Science: Straight Talk from the Frontline*, O'Reilly, 2014.

ADDITIONAL LEARNING RESOURCES:

- https://swayam.gov.in/nd1_noc19_cs60/preview
- <https://towardsdatascience.com/>
- <https://www.w3schools.com/datascience/>
- <https://github.com/jakevdp/PythonDataScienceHandbook>
- <https://www.kaggle.com>

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	1	3									3		
CO2	3	3	2	2	3									3		
CO3	3	3	2	3	3									3		
CO4	3	3	2	3	3									3		

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

II B.Tech. – II Semester
(20BT4HS01) **BANKING AND INSURANCE**
(Open Elective - 2)
(Common to CSE, CSE(AI), CSE(DS), CSBS, CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE REQUISITES: --

COURSE DESCRIPTION: Introduction to Banking; Bank-Customer Relationship; Electronic Payment System and Business Models; Introduction To Risk And Insurance; Insurance Overview.

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

- CO1: Demonstrate the importance of Banking and functions of Reserve Bank of India and its role in sustainable development of the country.
- CO2: Demonstrate the role, relationships and operations between Banker and Customer.
- CO3: Demonstrate the online Banking system, various types of Electronic Payments and Business models.
- CO4: Demonstrate concept of risk and principles, functions, types of Insurance companies.

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION TO BANKING (09 periods)

Meaning - Importance of banking- Functions of banking - **Reserve Bank of India:** Functions – Role of RBI in sustainable development.

UNIT-II: BANK-CUSTOMER RELATIONSHIP (09 periods)

Debtor-creditor relationship, deposit products or services, payment and collection of cheques. Accounts – Types of accounts, procedure for opening and closing an account - Loans and Advances- principles of lending.

UNIT-III: ELECTRONIC PAYMENT SYSTEM&BUSINESS MODELS (09 periods)

Introduction to Online Banking - types of e-payment system, e-cash, NEFT, RTGS, Credit cards, Electronic Wallet and Debit cards. **Business models-** B2B, B2C, C2C, and B2G.

UNIT-IV: INTRODUCTION TO RISK AND INSURANCE (09 periods)

Concept of risk, risk Vs uncertainty. **Insurance:** Definition, Insurance as risk mitigation mechanism, elements of insurance.

UNIT-V: INSURANCE OVERVIEW**(09 periods)**

Principles of insurance - insurance types - LIC & GIC – insurance functions, IRDA - Insurance Players in India.

Total Periods: 45**Topics for Self-study are provided in the Lesson Plan****TEXT BOOKS:**

1. RanganadhaChary. A.V. and Paul, R.R., *Banking and Financial system*, Kalyani Publisher, New Delhi, 3rd edition, 2016.
2. Sharma. R.K., Shashi K. Gupta and Jagwant Singh, *Banking and Insurance*, Kalyani Publishers, New Delhi, 17th edition, 2014.

REFERENCES BOOKS:

1. *Indian Institute of Banking & Finance, Digital Banking*, Taxmann Publications Pvt. Ltd., 2016 edition, 2016.
2. Jyotsna Sethi and Nishwan Bhatia, *Elements of Banking and Insurance*, PHI Learning Pvt. Ltd., 2nd edition, 2012.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3										2					
CO2	3										2					
CO3	3															
CO4	3															

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

II B.Tech. – II Semester

(20BT4HS03) **COST ACCOUNTING AND FINANCIAL MANAGEMENT**

(Open Elective - 2)

(Common to CSE, CSE(AI), CSE(DS), CSBS, CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Cost accounting; cost sheet & preparation of cost sheet; standard costing & variance analysis; financial management & ratio analysis; introduction to investment.

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

- CO1: Demonstrate the concepts of Cost Accounting and Management Accounting and the elements of costing.
- CO2: Determine the Cost of Production for pricing decisions.
- CO3: Apply the Standard Costing and Variance techniques for the control of cost of production.
- CO4: Analyze the Profitability and financial condition of an organization using Ratios.
- CO5: Apply the Capital Budgeting techniques for making investment decisions in an organization.

DETAILED SYLLABUS:

UNIT-I: COST ACCOUNTING (9 Periods)

Meaning of Cost and Cost Accounting, Objectives, Scope, Advantages and disadvantages – Cost Accounting Vs Management Accounting – Elements of Costing – Installation of costing system – Material Control, Labor Control, Overhead Control.

UNIT-II: COST SHEET & PREPARATION OF COST SHEET (9 Periods)

Analysis of Cost – Preparation of cost sheet, estimate, tender and quotation (Simple problems) – Importance of Costing while pricing the products.

UNIT-III: STANDARD COSTING & VARIANCE ANALYSIS (9 Periods)

Introduction to Standard Costing & Variances – Variance Analysis: Material variances, Labor variances (Simple Problems).

UNIT-IV: FINANCIAL MANAGEMENT & RATIO ANALYSIS (9 Period)

Meaning, Objectives - Nature and Scope, Importance of FM – **Ratio Analysis:** Types of Ratios: Solvency Ratios, Liquidity Ratios, Turnover Ratios and Profitability Ratios - Financial Statement Analysis through Ratios (Simple Problems).

UNIT-V: INTRODUCTION TO INVESTMENT**(9 Periods)**

Investment - Meaning and Definition- concept of risk and returns - Capital budgeting techniques – Security Analysis and Portfolio Management (Basic concepts).

Total Periods: 45**Topics for Self-study are provided in the Lesson Plan****TEXT BOOKS:**

1. S.P. Jain and K.L. Narang: *Cost Accounting*, Kalyani Publishers, Ludhiana, 10th edition, 2016.
2. I.M. Pandey, *Financial Management*, Vikas Publishing House Pvt. Ltd., 14th edition, 2016.

REFERENCE BOOKS:

1. The Institute of Company Secretaries of India, *Cost and Management Study Material*, New Delhi.
2. CA Saravana Prasath, *Cost Accounting and Financial management*, Wolters Kluwer India Pvt. Ltd., New Delhi, 2018 edition, 2018.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3															
CO2		3	1							1						
CO3		3	2							2						
CO4	1	3	2							2						
CO5		3	2							2						

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

II B.Tech. – II Semester
(20BT4HS05) GENDER AND ENVIRONMENT
 (Open Elective - 2)
 (Common to CSE, CSE(AI), CSE(DS), CSBS, CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Gender and the environment relationship, Gendered Roles in the family & community, Gender and sustainable development, Gender in environmental justice, Gender & environmental security.

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

- CO1: Apply the knowledge of gender & environmental connections by analyzing key issues and topics within global environmental politics in environmental decision-making.
- CO2: Demonstrate the knowledge of the concepts of gender and sustainable development through debates and policy documents.
- CO3: Analyze the concept of environmental security and justice by identifying the sources of insecurity.

DETAILED SYLLABUS:

UNIT-I: GENDER AND ENVIRONMENT RELATIONSHIP (9 Periods)

Introduction – Gender and Environment – Development of gender roles – Society, gender & environment – Understanding environmental politics – Gender-environment connections–Eco-feminism – Cultural eco-feminism – Social eco-feminism – Feminist political ecology

UNIT-II: GENDERED ROLES IN THE FAMILY & COMMUNITY (9 Periods)

Organization of the household – Domestic division of labour – Food: growing, harvesting, shopping, preparing, and cooking
 Gender & Power – Planning – Politics – NGO – Gendering of environmental protest – Environmental decision-making

UNIT-III: GENDER AND SUSTAINABLE DEVELOPMENT (9 Periods)

Concept of sustainability & its achievement – Concept of sustainable development – Ecological Modernization – Gender & sustainability debates – Gender & sustainable development debates - Gender in policy documents – Gender, poverty & equity in sustainable development

UNIT-IV: GENDER IN ENVIRONMENTAL JUSTICE (9 Periods)

Normative Concerns (Fairness, Inequality & Justice) –Making sense of Environmental justice – Ecological debt, Transnational harm, & human rights – Ecological justice –

Gender & Environmental Justice – Gender, Vulnerability & risk – Women in environmental justice movements – Knowledge & participation – Gender, sustainability & justice as guiding concepts.

UNIT- V: GENDER AND ENVIRONMENTAL SECURITY (9 Periods)

Connections between security & the environment – **Gender, environment & security:** Sustainability as security – poverty & insecurity – Insecurity as injustice – Competing ways of thinking security – Reflecting on sources of insecurity – **Case Study** – Food Security -**Case Study** – The impacts of natural disasters.

Total Periods: 45

Topics for Self-study are provided in the Lesson Plan

TEXT BOOKS:

1. Nicole Detraz. *Gender and the Environment*. Polity Press, Cambridge, UK. 2017
2. Susan Buckingham- Hatfield. *Gender and Environment*. Routledge, London. 2000

REFERENCE BOOKS:

1. Promillakapur ed. *Empowering Indian Women*. Publication Division, Government of India, New Delhi. 2000.
2. Ronnie Vernooy, Ed. *Social and Gender Analysis Natural Resource Management: Learning Studies and Lessons from Asia*. Sage, New Delhi. 2006
3. Swarup Hemlata and Rajput, Pam. "Gender Dimensions of Environmental and Development Debate: The Indian Experience" In Sturat S. Nagel, (ed). *India's Development and Public Policy*. Ashgate, Burlington. 2000.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1				3	3									
CO2	3					2	3	1		2						
CO3	3	1				3	3					2				

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

II B.Tech. – II Semester
(20BT4HS07) INDIAN ECONOMY

(Open Elective - 2)

(Common to CSE, CSE(AI), CSE(DS), CSBS, CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Introduction; Elementary Economic Analysis; Economic Planning; Time Value of Money; Value Analysis/Value Engineering.

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

CO1: Understand the basic concepts of economics, economic analysis, economic planning and strata.

CO2: Demonstrate knowledge in capital budgeting, evaluation of engineering projects, depreciation policy and familiarize with the concepts of value analysis vs value engineering.

CO3: Analyze and apply financial information for the evaluation of finance.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION (9 Periods)

Economics-Flow in an Economy, Law of Supply and Demand; Micro and Macro Economics; Relationship between Science, Engineering, Technology and Economic Development; Concept of Engineering Economics-Types of Efficiency, Definition and Scope of Engineering Economics.

UNIT-II: ELEMENTARY ECONOMIC ANALYSIS (9 Periods)

Economic Analysis – Meaning, Significance, Simple Economic Analysis; Material Selection for a Product, Substitution of Raw Material; Design Selection for a Product; Material Selection-Process Planning, Process Modification.

UNIT-III: ECONOMIC PLANNING (9 Periods)

Introduction - Need For Planning in India, Five year plans(1951-2012), NITI Aayog (from 2014 onwards); Inclusive Growth-Meaning, Significance, Need for inclusive growth in India, Strategy for more inclusive growth, Challenges and Prospects; Employment and Inclusive Growth in India, Role of engineers in sustaining inclusive growth.

UNIT-IV: TIME VALUE OF MONEY (12 Periods)

Concepts and Application; Capital Budgeting-Traditional and Modern Methods; Simple and Compound Interest, Cash Flow Diagram, Principle of Economic Equivalence; Evaluation of Engineering Projects - Present Worth Method, Future Worth Method, Annual Worth Method, Internal Rate of Return Method, Cost-benefit Analysis in Public

Projects; Depreciation Policy-Depreciation of Capital Assets, Causes of Depreciation, Straight Line Method and Declining Balance Method.

UNIT-V: VALUE ANALYSIS/VALUE ENGINEERING (6 Periods)

Introduction-Value Analysis, Value Engineering, Functions, Aims; Value Analysis vs Value Engineering; Value Engineering Procedure- Advantages, Application Areas.

Total Periods: 45

Topics for Self-study are provided in the Lesson Plan

TEXT BOOKS:

1. Panneerselvam. R., *Engineering Economics*, PHI Learning Private Limited, New Delhi, 2nd edition, 2013.
2. Jain. T. R., V. K. Ohri, O. P. Khanna., *Economics for Engineers*. VK Publication, 1st edition, 2015.

REFERENCE BOOKS:

1. Dutt Rudar & Sundhram K. P. M., *Indian Economy*, S. Chand, New Delhi, 62nd revised edition, 2010.
2. Misra, S. K. & V. K. Puri., *Indian Economy: Its Development Experience*, Himalaya Publishing House, Mumbai, 32nd edition, 2010.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3					2										
CO2	3					2						2				
CO3	3					2						2				

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

II B.Tech. – II Semester
(20BT4HS09) LIFE SKILLS

(Open Elective - 2)

(Common to CSE, CSE(AI), CSE(DS), CSBS, CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Positive attitude; Self-discovery and Interpersonal relationships; Cross-cultural communication; Core thinking, Problem solving and Decision making; Business presentations and Public speaking.

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

- CO1: Demonstrate knowledge of strategies involved in developing positive attitude, improving self-discovery by SWOT analysis techniques and managing effective inter personal relationships.
- CO2: Apply appropriate speaking styles and techniques by analysing and demonstrating effective cross-cultural communication in different situations.
- CO3: Analyse problem solving strategies in decision making by developing core thinking skills.
- CO4: Analyse and demonstrate presentation and public speaking skills effectively in business and professional arena.

DETAILED SYLLABUS:

UNIT-I: POSITIVE ATTITUDE (9 Periods)

Introduction–Features of attitudes–Formation of attitudes–Ways of changing attitude in a person– Attitude in a work place–Developing positive attitude–Obstacles in developing positive attitude–Measuring attitude.

UNIT-II: SELF DISCOVERY AND INTERPERSONAL RELATIONSHIPS (9 Periods)

Importance of knowing yourself–Process of knowing yourself–SWOT Analysis–Elements of attitude in interpersonal relationships–Methods to deal with different types of interpersonal relationship skills.

UNIT III: CROSS-CULTURAL COMMUNICATION (9 Periods)

Different communication styles – Cultural variables – Communication sensitivity and variables of national culture – Individual cultural variables – Cross-cultural communication Strategies – Potential hot spots in cross-cultural communication – Cross-cultural communication – Basic Tips.

UNIT IV: CORE THINKING, PROBLEM SOLVING AND DECISION MAKING

(9 Periods)

Process of developing core thinking skills–Categories of thinking: Critical & Creative - understanding problem solving–Cause of problems–Stages of problem solving–Methods of problem solving–Types of decision making.

UNIT V: BUSINESS PRESENTATIONS AND PUBLIC SPEAKING

(9 Periods)

Business presentations and speeches– Structuring the material–Types of delivery–Guidelines for delivery–Effective sales presentation–Controlling nervousness and stage fright.

Total Periods: 45

Topics for self-study are provided in lesson plan

TEXT BOOKS:

1. Dr. K. Alex (2018) *Soft Skills*, S. Chand and Company Limited, New Delhi.
2. Manmohan Joshi (2017) *Soft Skills*, www.bookboon.com, Bangalore.

REFERENCE BOOKS:

1. Meenakshi Raman and Prakash Singh (2015) *Business Communication*, Oxford University Press, New Delhi.
2. Jeff Butterfield (2011) *Soft Skills for Everyone*, Cengage Learning India Private Limited, Delhi.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1			3					2	3					
CO2	1	2			3					3						
CO3	1	3			2											
CO4	1	2								3						

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

II B.Tech. – II Semester
(20BT4HS11) INDIAN TRADITION AND CULTURE
(Open Elective - 2)
(Common to CSE, CSE(AI), CSE(DS), CSBS, CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Basic traits of Indian Culture; Humanistic Reforms under Jainism and Buddhism; Culture in the medieval period; Socio Religious reforms in Indian Culture; Reform movements for harmonious relations.

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

CO1: Demonstrate knowledge in Vedic and Upanishadic culture and society to consider human aspirations, values and theories.

CO2: Understand the contributions of Buddhism and Jainism to Indian culture.

CO3: Examine the cultural conditions and achievements of India under Mouryas and Guptas.

CO4: Analyze social religious reforms and reform movements.

DETAILED SYLLABUS:

UNIT-I: BASIC TRAITS OF INDIAN CULTURE (9 Periods)

Meaning and definition and various interpretations of culture - Culture and its features - The Vedic and Upanishad culture and society - Human aspirations and values in these societies - Chaturvidha purushardhas, Chaturashrma and Chaturvarna theory.

UNIT-II: HUMANISTIC REFORMS UNDER JAINISM AND BUDDHISM (9 Periods)

Salient features of Jainism - contributions of Jainism to Indian culture - Contributions of Aachaarya and Mahaapragya - Buddhism as a humanistic culture - The four noble truths of Buddhism - Contributions of Buddhism to Indian culture.

UNIT-III: CULTURE IN THE MEDIEVAL PERIOD (9 Periods)

Unifications of India under Mouryas and Guptas and their cultural achievements - Cultural conditions under satavahanas - Contributions to pallavas and cholas to art and cultural achievements of vijayanagara rulers.

UNIT-IV: SOCIO RELIGIOUS REFORMS IN INDIAN CULTURE (9 Periods)

Western impact on India - Introduction of western education - social and cultural awakening and social reform movements of Rajaramohan Roy - Dayanandha Saraswathi - Anne Besant (theosophical society).

UNIT-V: REFORM MOVEMENTS FOR HARMONIOUS RELATIONS (9 Periods)

Vivekananda, Eswarchandrayasagar and Veeresalingam - emancipation of women and struggle against caste - Rise of Indian nationalism - Mahatma Gandhi – Non-violence and satyagraha and eradication of untouchability.

Total Periods: 45

Topics for self-study are included in the lesson plan

TEXT BOOK:

1. Valluru Prabhakaraiah, *Indian Heritage and Culture*, Neelkamal Publications Pvt. Ltd. Delhi, 1/e, reprint 2015.

REFERENCE BOOKS:

1. L. P. Sharma, *History of Ancient India*, Konark Publishers, Pvt. Ltd. New Delhi, 2010.
2. L. P. Sharma, *History of Medieval India*, Konark Publishers, Pvt. Ltd. New Delhi, 2010.
3. The Cultural Heritage of India Vol-I, II, III, IV, V, The Ramakrishna Mission Institute of Culture, Calcutta

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3					1										
CO2	3					1						2				
CO3	2					3										
CO4	2					3						2				

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

II B.Tech. – II Semester
(20BT4HS13) CONSTITUTION OF INDIA
(Open Elective - 2)
(Common to CSE, CSE(AI), CSE(DS), CSBS, CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Preamble and its Philosophy; Union Legislature; Federalism in India; Judiciary and Public Services; Nation Building

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

- CO1. Demonstrate knowledge in the Parliamentary proceedings, Election Commission, Public Services and Foreign Policy of India.
- CO2. Apply the reasoning informed by the various aspects of the Constitution and its provisions to assess societal issues and the consequent responsibilities relevant to the professional engineering practice.

DETAILED SYLLABUS:

UNIT-I: PREAMBLE AND ITS PHILOSOPHY (9 Periods)

Introduction to Indian Constitution; Evolution of Indian Constitution; preamble and its philosophy

UNIT-II: UNION LEGISLATURE (9 Periods)

The Parliament, Parliamentary Structure, Process of Legislation; President of India – Powers and Functions; Prime Minister and Council of Ministers; Constitution Amendment Procedure.

UNIT-III: FEDERALISM IN INDIA (9 Periods)

Centre-State Administrative Relationship; Governors - Powers and Functions; State Legislature - Composition and powers; Chief Ministers - Powers and Functions; The Election Commission – Powers and Functions.

UNIT-IV: JUDICIARY AND PUBLIC SERVICES (9 Periods)

The Union Judiciary - Supreme Court and High Court; Fundamental Rights and Duties All India Services - Central Civil Services -State Services - Local Services.

UNIT-V: INTERNATIONAL PARTICIPATION (9 Periods)

Foreign Policy of India; International Institutions Influence: UNO, WTO, WHO, SAARC, International Summits: BRICS, NSS, UNEP – India's Role in International Negotiations; Environmentalism in India.

Total Periods: 45

Topics for Self-study are provided in the Lesson Plan

TEXT BOOK:

1. Brijji Kishore Sharma, *Introduction to the Constitution of India*, Prentice Hall of India, 2005.

REFERENCE BOOKS:

1. Mahendra Pal Singh, V. N. Shukla's, *Constitution of India*, Eastern Book Company, 2011.
2. Pandey J. N., *Constitutional Law of India* - Central Law Agency, 1998.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1					3	2									
CO2	2					3		3								

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

II B.Tech. – II Semester
(20BT50106) DISASTER MITIGATION AND MANAGEMENT
(Open Elective - 2)
(Common to CSE, CSE(AI), CSE(DS), CSBS, CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Disasters; Earthquakes; Floods; Cyclones; Droughts; Landslides; Disaster management.

COURSE OBJECTIVES:

- To impart knowledge on disasters, their vulnerability, mitigation and management.
- To develop skills in analysis, design, problem solving, team spirit, communication and economics in disaster mitigation and management, using appropriate tools and techniques.
- To inculcate an attitude of responsibility and lifelong learning in solving disaster issues considering society, environment and sustainability.

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

- CO1. CO1. Analyze the vulnerability of an area to natural and man-made disasters/hazards as per the guidelines to solve complex problems using appropriate techniques ensuring safety, environment and sustainability.
- CO2. Propose appropriate mitigation strategies for earthquake and tsunami impacts as per code of practice using suitable techniques ensuring safety, environment and sustainability besides communicating effectively in graphical form.
- CO3. Analyze the causes and impacts of floods, cyclones and droughts using appropriate tools and techniques and suggest mitigation measures ensuring safety, environment and sustainability besides communicating effectively in graphical form.
- CO4. Analyze the causes and impacts of landslides using appropriate tools and techniques and suggest mitigation measures ensuring safety, environment and sustainability.
- CO5. Design disaster management strategies to solve pre, during and post disaster problems using appropriate tools and techniques following the relevant guidelines and latest developments ensuring safety, environment and sustainability besides communicating effectively in graphical form.

DETAILED SYLLABUS:

UNIT- I: DISASTERS

(09 Periods)

Types of disasters - Natural disasters; Impact of disasters on environment, infrastructure and development; Concepts of hazards and vulnerability analysis, Hazard Assessment, Guidelines for hazard assessment and vulnerability analysis, Basic principles and elements of disaster mitigation.

UNIT- II: EARTHQUAKES

(09 Periods)

Introduction to earthquake, Intensity scale (MSK-64), Seismic zones and activity in India, Action plan for earthquake disaster preparedness, Elements at risk, Recovery and rehabilitation after earthquake, Concepts of Earthquake resistant design and construction of buildings; Tsunami – Onset, Types and causes, Warning, Elements at risk, Typical effects, Specific preparedness and mitigation strategies, Case studies.

UNIT- III: FLOODS, CYCLONES AND DROUGHTS (11 Periods)

Floods and Cyclones: Onset, Types, Causes, Warnings, Elements at risk, Typical effects, Indian floods and cyclones, Hazard zones, Potential for reducing hazards, Mitigation strategies and community based mitigation, Case studies.

Droughts: Onset, Types and warning; Causes, Impact, Early warning and response mechanisms, Mitigation strategies, Droughts in India, Case studies.

UNIT- IV: LANDSLIDES (08 Periods)

Onset, Types and warning; Causes, Elements at risk, Indian landslides, Hazards zones, Typical effects, Mitigation strategies and community based mitigation, Case studies.

UNIT- V: DISASTER MANAGEMENT (08 Periods)

Disaster management organization and methodology, Disaster management cycle, Disaster management in India – Typical cases and Cost-benefit analysis, Disaster management programs implemented by NGOs and Government of India, Usage of GIS and Remote sensing techniques in disaster management, Leadership and Coordination in Disaster management, Emerging trends in disaster management.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Sharma, V. K., *Disaster Management*, Medtech Publishing, 2nd Edition, 2013.
2. Anand S. Arya, Anup Karanth, and Ankush Agarwal, *Hazards, Disasters and Your Community: A Primer for Parliamentarians*, GOI-UNDP Disaster Risk Management Programme, Government of India, National Disaster Management Division, Ministry of Home Affairs, New Delhi, Version 1.0, 2005.

REFERENCE BOOKS:

1. Donald Hyndman and David Hyndman, *Natural Hazards and Disasters*, Cengage Learning, 3rd Edition, 2011.
2. *Disaster Management in India*, A Status Report, Ministry of Home Affairs, Govt. of India, May 2011.
3. Rajendra Kumar Bhandari, *Disaster Education and Management: A Joyride for Students, Teachers, and Disaster Managers*, Springer India, 2014.
4. Singh, R. B., *Natural Hazards and Disaster Management*, Rawat Publications, 2009.

ADDITIONAL LEARNING RESOURCES:

- Tushar Bhattacharya, *Disaster Science and Management*, McGraw Hill, 2014.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3		2	2	2	2	2								
CO2	3	3	3	3	2	2	1	2		2						
CO3	3	3		2	2	2	2			2						
CO4	3	3		3	2	2	2									
CO5	3	2	3	2	2	2	1	2		1	3	2				

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

II B.Tech. – II Semester
(20BT50107) SUSTAINABLE ENGINEERING
(Open Elective - 2)
(Common to CSE, CSE(AI), CSE(DS), CSBS, CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Principles of sustainability; Sustainability metrics and assessment tools; Sustainable engineering practices; Sustainable engineering applications; Sustainable urbanization and industrialization.

COURSE OBJECTIVES:

- To impart knowledge on principles of sustainability, sustainability metrics and assessment tools, sustainable engineering practices, sustainable engineering applications, sustainable urbanization and industrialization.
- To develop analysis, design, problem solving, communication, economics and management skills in sustainable engineering to solve complex environmental problems using appropriate tools and techniques.
- To inculcate ethics and lifelong learning in sustainable engineering practice considering society, health, safety and environment.

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

- CO1 Analyze the principles of sustainability to solve complex environmental problems following relevant standards/protocols considering society, health, safety and environment.
- CO2 Analyze sustainability metrics and assessment tools to solve complex environmental problems following relevant standards and emerging trends considering society, health, safety, environment and economics besides communicating effectively in graphical form.
- CO3 Analyze sustainable engineering practices to solve complex environmental problems using appropriate tools and techniques following relevant standards considering society, health, safety, environment, economics and management besides communicating effectively in graphical form.
- CO4 Design sustainable engineering applications to solve complex environmental problems using appropriate tools and techniques following relevant standards considering society, health, safety, environment, economics and management besides communicating effectively in graphical form.
- CO5 Analyze sustainable urbanization and industrialization principles to solve complex environmental problems using appropriate tools and techniques following relevant standards considering society, health, safety, environment, economics and management besides communicating effectively in graphical form.

DETAILED SYLLABUS:

UNIT – I: PRINCIPLES OF SUSTAINABILITY

(09 periods)

Emerging challenges, Sustainability and sustainable engineering; Environmental concerns; Social, economic and legal issues; Availability and depletion of natural resources, Disaster resiliency; Multilateral environmental agreements – Basel convention, Clean development mechanism (CDM), Montreal and Kyoto protocols.

UNIT – II: SUSTAINABILITY METRICS AND ASSESSMENT TOOLS (09 periods)

Sustainability indicators, metrics and assessment tools; Material flow analysis and material budget, Carbon footprint analysis, Life cycle assessment, Streamlined life-cycle assessment (SLCA), Economic input output-life cycle analysis, Environmental health risk assessment, Other emerging assessment tools.

UNIT – III: SUSTAINABLE ENGINEERING PRACTICES

(09 periods)

Sustainable energy engineering, Sustainable waste management, Green and sustainable buildings and infrastructure, Sustainable civil infrastructure, Sustainable remediation of contaminated sites, Climate geoengineering.

UNIT – IV: SUSTAINABLE ENGINEERING APPLICATIONS

(09 periods)

Environmental and chemical engineering projects, Materials engineering projects, Infrastructure engineering projects – Background, Methodology, Goal and Scope, Study area, Technical design, Environmental sustainability, Life cycle assessment, Economic sustainability, Social sustainability, Rating systems – ENVISION, LEED, GRIHA, IGBC; Conclusions.

UNIT – V: SUSTAINABLE URBANIZATION AND INDUSTRIALIZATION

(09 periods)

Sustainable urbanization and industrialization, United Nations sustainable development goals – Right to education, Poverty eradication, Social and technological changes; Industrial Processes - Material selection, Energy efficiency, Pollution prevention and control techniques, Industrial Ecology, Industrial symbiosis.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Reddy, K.R., Cameselle, C., and Adams, J.A., *Sustainable Engineering: Drivers, Metrics, Tools, and Applications*, John Wiley & Sons, Inc., Hoboken, New Jersey, 2019.
2. Allen, D. T. and Shonnard, D. R., *Sustainability Engineering: Concepts, Design and Case Studies*, Pearson Education, 1st Edition, 2012.

REFERENCE BOOKS:

1. Bradley. A.S; Adebayo, A. O., Maria, P., *Engineering Applications in Sustainable Design and Development*, Cengage Learning, 1st Edition, 2016.

2. Purohit, S. S., *Green Technology: An Approach for Sustainable Environment*, Agrobios Publication, 1st Edition, 2016.
3. *Energy Conservation Building Code (ECBC) 2007*, Bureau of Energy Efficiency, Govt. of India, New Delhi.
4. Twidell, J. W. and Weir, A. D., *Renewable Energy Resources*, Routledge, Taylor & Francis Group, 3rd Edition, 2015.

ADDITIONAL LEARNING RESOURCES:

- Daniel A. Vallero and Chris Brasier, *Sustainable Design: The Science of Sustainability and Green Engineering*, Wiley-Blackwell, 1st Edition, 2008.
- Jorge A. Vanegas, *Sustainable Engineering Practice: An Introduction*, Committee on Sustainability, American Society of Civil Engineers, <https://doi.org/10.1061/9780784407509>, 2004.
- Bell, S. and Morse, S, *Sustainability Indicators: Measuring the Immeasurable?*, Earthscan Publications, London, 2nd Edition, 2008.
- Mackenthun, K.M., *Basic Concepts in Environmental Management*, CRC Press, Taylor & Francis Group, 1st Edition, 1999.
- *Environment Impact Assessment Guidelines*, Notification of Government of India, 2006.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3		3		2	3	2								
CO2	3	3		2	2	2	2	2		1	2	1				
CO3	3	3		2	2	2	2	2		1	2					
CO4	3	3	3	2	2	2	2	2		1	2					
CO5	3	3		2	2	2	2	2		1	2					

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

II B.Tech. – II Semester
(20BT50108)CONTRACT LAWS AND REGULATIONS
 (Open Elective - 2)
 (Common to CSE, CSE(AI), CSE(DS), CSBS, CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Construction contracts; Tenders; Arbitration; Legal requirements; Labour regulations.

COURSE OBJECTIVES:

- To impart basic knowledge on construction contracts, tenders, arbitration, legal requirements and labour regulations.
- To develop skills in analysis, design, problem solving, finance management and documentation pertain to contracts and tenders.
- To instill ethics and lifelong learning in preparation of contracts and tenders following laws and regulations in the context of society.

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

- CO1. Develop construction contracts to solve complex contract related problems by following laws and regulations considering project schedule, cost, quality and risk.
- CO2. Prepare tenders as per the specifications by following latest developments, laws and regulations to solve complex tender problems considering project schedule, cost, quality and risk.
- CO3. Analyze arbitration problems to address the contract disputes following the laws and regulations in the context of society.
- CO4. Analyze legal issues pertaining to contracts and tenders considering society.
- CO5. Analyze labour regulations to address labour safety issues.

DETAILED SYLLABUS:

UNIT – I: CONSTRUCTION CONTRACTS (09 Periods)

Indian contracts act, Elements of contracts, Types of contracts, Features, Suitability, Design of contract documents, International contract document and laws, Standard contract document, Law of torts.

UNIT – II: TENDERS (09 Periods)

Prequalification, Bidding, Accepting; Evaluation of tender from technical, contractual and financial points of view; Two cover system, Preparation of the documentation, Contract formation and interpretation, Potential contractual problems, Price variation clause, Comparison of actions and laws, Subject matter, Violations, Latest developments in tendering.

UNIT–III: ARBITRATION (09 Periods)

Arbitration, Comparison of actions and laws, Agreements, Appointment of arbitrators, Conditions of arbitration, Powers and duties of arbitrator, Rules of evidence, Enforcement

of award, Arbitration disputes, Dispute review board.

UNIT – IV: LEGAL REQUIREMENTS

(09 Periods)

Legal requirements for planning, Property law, Agency law, Tax laws – Income tax, Sales tax, Excise and custom duties, Local government approval, Statutory regulations, Insurance and bonding, Laws governing purchase and sale, Use of urban and rural land, Land revenue codes, EMD, Security deposits, Liquidated damages.

UNIT – V: LABOUR REGULATIONS

(09 Periods)

Social security, Welfare legislation; Laws relating to wages, bonus and industrial disputes; Labour administration, Insurance and safety regulations, Workmen’s compensation act, Maternity benefit act, Child labour act, Other labour laws.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Subba Rao, G.C.V., *Law of Contracts I & II*, S. Gogia & Co., 11th Edition, 2011.
2. Jimmie Hinze, *Construction Contracts*, McGraw Hill, 3rd Edition, 2011.

REFERENCE BOOKS:

1. Kishore Gajaria, *GT Gajaria’s Law Relating to Building and Engineering Contracts in India*, Lexis Nexis Butterworths India, 4th Edition, 2000.
2. Patil, B. S., *Civil Engineering Contracts and Estimates*, University Press (India) Private Ltd., 4th Edition, 2015.
3. Joseph T. Bockrath, *Contracts and the Legal Environment for Engineers and Architects*, McGraw Hill Education, 7th Edition, 2010.
4. Akhileshwar Pathak, *Contract Law*, Oxford University Press, 2011.

ADDITIONAL LEARNING RESOURCES:

1. Markanda, P.C., Naresh Markanda, Rajesh Markanda, *Building and Engineering Contracts- Law and Practice*, Vol-I and II, LexisNexis Publication. 5th Edition, 2017.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3		3		3		2	1					
CO2	3	3	3	3		3		3		2	1	2				
CO3	2	2		3		3		3								
CO4	2	2				3		3								
CO5	2	2				3		3								

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

II B.Tech. – II Semester
(20BT50310) GLOBAL STRATEGY AND TECHNOLOGY
 (Open Elective - 2)
 (Common to CSE, CSE(AI), CSE(DS), CSBS, CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PREREQUISITES: --

COURSE DESCRIPTION: Introduction to strategic management; Strategic management process; Principles of good strategy; Globalization strategies; Research and Development strategies; Technology Management and Transfer; Elements of Transfer Process; Corporate Governance in the Indian scenario.

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

- CO1: Demonstrate the knowledge on strategic management, its approaches, and tools through ethical decision making.
- CO2: Analyze the globalization challenges for scrupulous selection of globalization strategies.
- CO3: Apply the R&D strategies and trends to enhance the technological breakthroughs for new products and applications.
- CO4: Demonstrate the knowledge on technology management and transfer that strengthen the economy and accelerate the application of technology and resources.
- CO5: Analyze the challenges of corporate governance in Indian scenario for the effective development of value oriented organizations.

DETAILED SYLLABUS:

UNIT-I: STRATEGIC MANAGEMENT (9 periods)

Introduction, Classes of decisions, Levels of strategy, Core competence, Strategic intent and stretch, Approaches to strategy making, Roles of different strategists, Strategic management-Process, Benefits, Limitations; Ethics in strategic decision making, Principles of good strategy, Strategic Management in India; Common managerial strategy formulation tools.

UNIT-II: GLOBALIZATION (9 periods)

Definition, Stages, Essential conditions for globalization, Globalization strategies, Competitive advantage of Nations and regions, Factors affecting Globalization, Globalization of Indian business.

UNIT-III: RESEARCH & DEVELOPMENT STRATEGIES (9 periods)

Concept, Evolution of R and D Management, R and D as a business, R and D as competitive advantage, Elements of R and D strategies, Integration of R and D, Selection and implementation of R and D strategies, R and D trends and challenges.

UNIT-IV: TECHNOLOGY MANAGEMENT AND TRANSFER (9 periods)

Technology Management: Introduction, Technology-Definition, Components, Classification Features; Technology Management-Concept, Nature; Drivers of Management of Technology-Significance, Scope, Responding to technology challenges.

Technology Transfer: Introduction, Definition, Classification, Significance, Elements of process, Types of Technology Transfer, Package, Modes of Transfer, Routes, Channels and Effectiveness of Technology Transfer.

UNIT-V: CORPORATE GOVERNANCE: THE INDIAN SCENARIO (9 periods)

Emergence of corporate governance in India-Landmarks, Models, Codes and status in India, Role and Responsibilities of Regulators, The Board of Directors; Corporate Governance- Specific issues in India, Family owned Business, Corporate Governance and the Indian ethos.

Total periods: 45**Topics for self-study are provided in the lesson plan****TEXT BOOKS:**

1. Francis Cherunilam, *Strategic Management*, Himalaya Publishing House, 3rdEdition, 2002.
2. C. S. G. Krishnamacharyulu and Lalitha Ramakrishnan, *Management of Technology*, Himalaya Publishing House, Second Edition, 2012.

REFERENCE BOOKS:

1. White and Bruton, *The Management of Technology and Innovation: A Strategic Approach*, Cengage Learning, 1stEdition, 2007.
2. S.K.Mandak, *Ethics in Business and Corporate Governance*, TMH, 2ndEdition, 2012.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	1	1		1		2								
CO2	3	3	1	1		1		1								
CO3	3	2	2	1		1										
CO4	3	2	1	1		1										
CO5	3	3	1	1		1		1								

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

II B.Tech. – II Semester
(20BT50311) MANAGEMENT SCIENCE
 (Open Elective - 2)
 (Common to CSE, CSE(AI), CSE(DS), CSBS, CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Concepts of Management; Concepts Related to ethics and social responsibility; Human Resource Management; Operations Management; Statistical Process Control; Inventory Management; Marketing; Project Management; Project Crashing.

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

- CO1: Demonstrate the concepts of management, its functions and processes used in optimum resource utilization within the context of ethics and social responsibility.
- CO2: Apply the concepts of HRM for selection and management of human resources.
- CO3: Analyze different operations management problems using quality management tools to produce effective, efficient and adoptable products/services.
- CO4: Identify different marketing strategies to maximize enterprise profitability and customer satisfaction within the realistic constraints.
- CO5: Develop network models in time-cost tradeoff for effective project management.

DETAILED SYLLABUS:

UNIT-I: MANAGERIAL FUNCTION AND PROCESS (10 periods)

Concept and foundations of management, Evolution of management thought; Managerial functions – Planning, Organizing, Directing and Controlling; Decision-making; Role of manager, managerial skills; Managing in a global environment, Flexible systems management; Social responsibility and managerial ethics; Process and customer orientation; Managerial processes on direct and indirect value chain.

UNIT-II: HUMAN RESOURCE MANAGEMENT (8 periods)

Human Resource challenges; Human Resource Management functions; Human Resource Planning; Job analysis; Job evaluation, Recruitment and selection; Training and Development; Promotion and transfer; Performance management; Compensation management and benefits; Employee morale and productivity; Human Resource Information System.

UNIT-III: OPERATIONS MANAGEMENT (10 periods)

Fundamentals of Operations Management, Services as a part of operations management; Facilities location and layout; Line balancing; Quality management – Statistical Process Control, Total Quality Management, Six sigma; Role and importance of materials management, Value analysis, Make or Buy decision, Inventory control, Materials Requirement Planning, Enterprise Resource Planning, Supply Chain Management.

UNIT-IV: MARKETING MANAGEMENT**(8 periods)**

Concept, evolution and scope; Marketing strategy formulation and components of marketing plan; Segmenting and targeting the market; Positioning and differentiating the market offering, Analyzing competition; Product strategy; Pricing strategies; Designing and managing marketing channels; Integrated marketing communications.

UNIT-V: PROJECT MANAGEMENT**(9 periods)**

Project management concepts; Project planning – Work Breakdown Structure, Gantt chart; Project scheduling – Critical Path Method, Program Evaluation and Review Technique, Crashing the project for time-cost trade off; Resource Levelling.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Martand T. Telsang, *Industrial Engineering and Production Management*, S. Chand, 2nd Edition, 2006.
2. Koontz and Weihrich, *Essentials of Management*, TMH, 6th Edition, New Delhi, 2007.

REFERENCE BOOKS:

1. O.P. Khanna, *Industrial Engineering and Management*, Dhanpat Rai and Sons, 2010.
2. N.D. Vohra, *Quantitative Techniques in Management*, TMH, 2nd Edition, New Delhi.
3. L.M. Prasad, *Principles and practice of Management*, S. Chand and Sons, 2006.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	1			1		2								
CO2	3	2	1			1		1								
CO3	3	3	2	1	1	1										
CO4	3	1	1			1										
CO5	3	3	3	1		1					3					

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

II B.Tech. – II Semester
(20BT40502) CYBER LAWS AND SECURITY
(Open Elective - 2)
(Common to CSE, CSE(AI), CSE(DS), CSBS, CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Evolution of Cyberspace, Jurisdiction in the borderless Cyberspace, E-Contracting, Models of E-Commerce, Modes of Electronic signatures, E-Money, Intellectual Property Rights, Cybercrimes, Privacy and data security.

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

- CO1: Demonstrate knowledge on jurisdiction in cyberspace and the impact of cybercrime to protect privacy on the Internet.
- CO2: Analyze the Indian cyber laws on E-Contracting, E-Commerce, E-signatures and E-money to promote digital law enforcement.
- CO3: Apply the knowledge of digital rights in Indian context to protect intellectual properties in electronic world.
- CO4: Practice ethics and cyber law regulations for leading electronic transactions on the Internet.

DETAILED SYLLABUS:

UNIT-I: EVOLUTION OF CYBERSPACE AND JURISDICTION IN BORDERLESS CYBERSPACE (9 Periods)

The Evolution of Cyberspace: Significance of information technology, Drawbacks in information technology, the digital divide, E-governance, Origin of cyberspace, Legal issues in cyberspace, regulating the Internet.

Jurisdiction in the Borderless Cyberspace: Meaning of jurisdiction, Three pre-requisites of jurisdiction, Jurisdictional theories in jurisdiction to prescribe, Tests to determine jurisdiction in Internet law cases, Indian laws to determine personal jurisdiction, Jurisdiction clauses in click wrap agreement.

UNIT-II: ELECTRONIC CONTRACTING AND ELECTRONIC COMMERCE (9 Periods)

Electronic Contracting: Formation of offline contracts under English common law, Fundamental requirements of an offline contract, Forming an E-contract through website, E-mail contracting, The Indian approach of E-contracts, Contract formation on the Internet and Information Technology Act 2000, B2C E-contracts.

Electronic Commerce: Models, Advantages, Restricted activities, Laws, India's information Technology Act2000, Online customer protection in India(B2B, B2C).

UNIT-III: ELECTRONIC SIGNATURES AND ELECTRONIC MONEY (9 Periods)

Electronic Signatures: The role of signatures, Significance of electronic signatures, Modes of electronic signatures, UNCITRAL model law on electronic signatures 2001, Cryptography, Role of certifying authority in PKI, The Indian Information Technology Act and electronic signatures- Electronic signatures, Prescribed authentication mechanisms, Secure electronic record.

Electronic Money: E-Money, RBI's guidelines on mobile banking and payments, The current E-payment systems, Earlier E-payment systems, Credit cards, Use of SET in online payment system.

UNIT- IV: INTELLECTUAL PROPERTY RIGHTS AND THE INTERNET WORLD

(9 Periods)

Protecting copyright in the E-world, International organizations protecting Intellectual Property, Copyright issues on the Internet, Digital rights management, Patent protection and computer software, India and copyright protection for computer software, Business method patents- Position of Business methods patents in India, Trademark protection on the Internet, Cyber squatting, The Indian trademark law and legal remedies, Hyper linking and framing.

UNIT - V: CYBERCRIMES AND PROTECTING PRIVACY ON INTERNET (9 Periods)

Cybercrimes: What is cybercrime, Categories, Different kinds of cybercrime, Cybercrimes and Information Technology Act, 2000 - Territorial scope and applicability, India's national cyber security policy.

Protecting Privacy on the Internet: Meaning of privacy, Threat to privacy on the Internet, Use of cookies and web bugs, Terms of use and privacy policy, Government right to interception, Employee privacy rights, Indian legal framework for data protection and privacy, Challenges to right of privacy in India.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOK(S):

1. Karnika Seth, *Computers Internet and New technology Laws*, LexisNexis, 2013.

REFERENCE BOOKS:

1. Sarika Gupta, Gaurav Gupta, *Information Security and Cyber Laws*, Khanna Publishing, 2019.
2. Vivek Sood, *Cyber Law Simplified*, McGraw Hill, 2018.
3. Pavan Duggal, *Textbook on Cyber Law*, Universal LexisNexis, 2019.

ADDITIONAL LEARNING RESOURCES:

- https://swayam.gov.in/nd2_cec20_cs09/preview
- https://swayam.gov.in/nd2_nou19_cs08/preview

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3					3										
CO2	3	2				3										
CO3	3					3										
CO4							3									

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

II B.Tech. – II Semester
(20BT50206) INTELLECTUAL PROPERTY RIGHTS
(Open Elective – 2)
(Common to CSE, CSE(AI), CSE(DS), CSBS, CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Introduction to Intellectual Property; Trade Marks; Law of Copy Rights; Law of Patents; Trade Secrets; Unfair Competition; New Development of Intellectual Property.

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

- CO1. Understand the concepts of intellectual property right and new amendments enforced in filling intellectual property right.
- CO2. Understand the processes and principles of trade mark registration and apply them for registering trade mark.
- CO3. Understand the process and principles of copy rights registration and judicial consequences for violating laws of copyright/patents.
- CO4. Understand the process and principles of trade secrets and judicial consequences for coping trade secrets.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO INTELLECTUAL PROPERTY (10 periods)

Introduction and the need for intellectual property rights (IPR); types of intellectual property- Design, Geographical Indication; International organizations, agencies and treaties.

UNIT-II: TRADEMARKS (08 Periods)

Introduction to trademark, Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

UNIT-III: LAW OF COPYRIGHTS (09 Periods)

Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer.

UNIT-IV: TRADESECRETS (09 periods)

Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

Unfair competition: Misappropriation right of publicity, false advertising.

UNIT-V: NEW DEVELOPMENT OF INTELLECTUAL PROPERTY (09 periods)

New developments in: trade mark law, copy right law, patent law, intellectual property audits. International overview on intellectual property; international - trade mark law, copy right law, international patent law, international development in trade secrets law.

Total Periods: 45

Topics for Self-study are provided in the Lesson Plan

TEXT BOOKS:

1. Deborah, E. Bouchoux, *Intellectual property: The law of Trademarks, Copyright, Patents, and Trade Secrets*, cengage learning, 4th edition, 2013.
2. Prabuddha Ganguli, *Intellectual property right - Unleashing the knowledge economy*, Tata McGraw Hill Publishing Company Ltd.

REFERENCE BOOKS:

1. Neeraj P., & Khusdeep D. *Intellectual Property Rights*. India, IN: PHI learning Private Limited. 1st edition 2019.

ADDITIONAL LEARNING RESOURCES:

1. Subramanian, N., & Sundararaman, M. (2018). *Intellectual Property Rights – An Overview*. Retrieved from <http://www.bdu.ac.in/cells/ipr/docs/ipr-eng-ebook.pdf>
2. World Intellectual Property Organisation. (2004). *WIPO Intellectual property Handbook*. Retrieved from https://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo_pub_489.pdf

USEFUL WEBSITES:

1. Cell for IPR Promotion and Management(<http://cipam.gov.in/>)
2. World Intellectual Property Organisation (<https://www.wipo.int/about-ip/en/>)
3. Office of the Controller General of Patents, Designs & Trademarks (<http://www.ipindia.nic.in/>)

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3					3		3								
CO2	2					2		2								
CO3	2					3		2								
CO4	2					3		2								

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

II B.Tech. – II Semester
(20BT50406) GREEN TECHNOLOGIES
(Open Elective - 2)
(Common to CSE, CSE(AI), CSE(DS), CSBS, CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Principles of green engineering; Green communications; Green energy; Green computing; Green construction; Green manufacturing.

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

- CO1: Analyze energy efficient communication systems such as Telecommunication systems, ICT, Wireless networks and cellular networks by understanding the principles of green communications.
- CO2: Understand the impact of conventional energy sources on environment and realize the significance and principles of green energy sources for sustainability.
- CO3: Understand the environmental impacts of IT and approaches for Green IT.
- CO4: Analyze concepts of sustainable green construction using appropriate tools and techniques following latest developments and considering safety and environment besides communicating effectively in graphical form.
- CO5: Demonstrate the environmental impact of traditional manufacturing and explore the need for green manufacturing process promoting sustainability.

DETAILED SYLLABUS:

UNIT –I: PRINCIPLES OF GREEN ENGINEERING AND GREEN COMMUNICATIONS
(9 Periods)

Principles of Green Engineering: Introduction, Definition of green engineering, Principles of green engineering

Green Communications: Introduction, Origin of Green Communications, Energy Efficiency in Telecommunication systems, Telecommunication system model and energy Efficiency, Energy saving concepts, Quantifying energy efficiency in ICT, Energy efficiency metrics of green wireless networks, Embodied energy of communication devices- Introduction, The extended energy model, Embodied/Operating Energy of a BS in Cellular network- A Case study; Energy efficient standards for wireline communications.

UNIT- II: GREEN ENERGY **(9 Periods)**

Introduction, green energy systems - composition, adverse impacts, Green energy and sustainability, the target and solution. Diversification and localization of energy systems, green energy and sustainable development. Energy sources and their availability. Green energy sources - solar energy, wind energy, geothermal energy, ocean energy, biomass and biogas.

UNIT- III: GREEN IT**(9 Periods)**

Introduction, Awareness to Implementation: Green IT Trends, Green Engineering, Greening by IT: Using RFID for Environmental Sustainability, Smart Grids, Smart Buildings and Homes, Green Supply Chain and Logistics, Enterprise-Wide Environmental Sustainability, A Seven-Step Approach to Creating Green IT Strategy: Balancing the Costs and Benefits of Going Green, Research and Development Directions.

UNIT- IV: GREEN CONSTRUCTION**(9 Periods)**

Green Building: Concept, Necessity, Characteristics, Benefits, Requisites for green building construction, Sustainability, Concept of REDUCE, REUSE, RECYCLE, RETHINK, REPLENISH AND REFUSE (6 R's), Sustainable construction focus point – Site selection, Planning, Water, Energy, Material, Indoor air quality, Construction procedures, case studies of residential and commercial green buildings.

Vastu: Concept, History, scientific approach, elements of vastu for selecting a plot.

Indian Green Building Council: Introduction to IGBC green homes, Benefits of IGBC, IGBC green home rating system, Introduction to USGBC, LEED rating system, Procedure to get IGBC certification, GRIHA Rating.

UNIT- V: GREEN MANUFACTURING**(9 Periods)**

Green Manufacturing - Introduction, Background and Definition; Impact of traditional manufacturing in environmental ecology, Need for green manufacturing, Motivation and barriers to green manufacturing, Advantages and Limitations of green manufacturing, Green manufacturing strategies, Green manufacturing and sustainability, Green manufacturing through clean energy supply, Green packaging and Supply chain.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Konstantinos Samdanis, Peter Rost, Andreas Maeder, Michela Meo, Christos Verikoukis, *Green Communications: Principles, Concepts and Practice*, John Wiley & Sons, 2015.
2. G.D. Rai, *Non-conventional Energy Sources*, Khanna Publishers, Delhi, 5th Edition, 2011.
3. San Murugesan, G.R. Gangadharan, *Harnessing Green IT – Principles and Practices*, John Wiley & Sons Ltd., 2008.
4. Tom Woolley, Sam Kimmins, Paul Harrison and Rob Harrison, *Green Building Handbook*, Volume 1, E & FN Spon, an imprint of Thomson Science & Professional.
5. J Paulo Davim, *Green Manufacturing: Processes and Systems*, Springer, 2012.
6. David A Dornfeld, *Green Manufacturing: Fundamentals and Applications*, Springer, 2013.

REFERENCE BOOKS:

1. Soli J. Arceivala, *Green Technologies for a better future*, McGraw Hill Education (India) Pvt. Ltd, 2014.
2. Marty Poniatowski, *Foundation of Green Information Technology*, Prentice Hall, 2009.
3. Athanasios V Alavanidis, Thomais Vlachogianni, *Green Chemistry and Green Engineering*, Synchrone Themata, 2012.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3				2										
CO2	3	1				2	3									
CO3	3					2	3									
CO4	3	3		2	2											
CO5	3	2					3									

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

II B. Tech. – II Semester

(20BT40531) DATABASE MANAGEMENT SYSTEMS LAB

(Common to CSE, CSE(AI), CSE(DS), CSBS, CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE-REQUISITES: A course on “Database Management Systems”

COURSE DESCRIPTION: Design of an ER Models; Hands-on experience on - DDL, DML commands, Query processing using operators, Joins, Views, Synonyms, Indexes, Single row functions, Group functions and Set functions; PL/SQL programming - Basic programs, Exception handling, Triggers, Functions, Cursors and Stored procedures.

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

- CO1. Analyze the requirements of a given database problem and design viable ER-Models for implementation of database.
- CO2. Create database schemas, select and apply suitable integrity constraints for querying databases using SQL interface.
- CO3. Develop and interpret PL/SQL blocks to centralize database applications for maintainability and reusability.
- CO4. Develop database applications for societal applications such as ticket reservation system, employee payroll system using modern tools.
- CO5. Work independently and communicate effectively in oral and written forms.

LIST OF EXERCISES:

1. Design and analyze an ER Model for the following use case.

Roadway Travels” is in business since 1977 with several buses connecting different places in India. Its main office is located in Hyderabad. The company wants to computerize its operations in the following areas:

- Reservations
- Ticketing
- Cancellations

Reservations:

Reservations are directly handled by booking office. Reservations can be made 60 days in advance in either cash or credit. In case the ticket is not available, await listed ticket is issued to the customer. This ticket is confirmed against the cancellation.

Cancellation and Modification:

Cancellations are also directly handed at the booking office. Cancellation charges will be charged. Waitlisted tickets that do not get confirmed are fully refunded.

2. a) Implement Data Definition Language commands -Create, Alter, Drop, Truncate, and Rename.
- b) Implement Data Manipulation Language commands - Insert, Select, Update, and Delete.

- c) Implement Single Row functions - Character, Numeric and Date functions.
- 3. Implement various types of integrity constraints - NOT NULL constraint, DEFAULT constraint, UNIQUE constraint, PRIMARY key, FOREIGN key, CHECK constraint.
- 4. a) Implement group functions with different operators such as aggregate operators, group by, having and order by.
b) Implement nested and correlated nested queries using set operators and set comparison operators.
- 5. a) Creation of views, synonyms, sequence, indexes and save point.
b) Implement various types of joins - outer join and inner join.

Basic PL/SQL:

- 6. Construct PL/SQL block for the following.
 - a) To determine whether a number is palindrome
 - b) To determine whether a number is an Armstrong number
 - c) To find greatest of three numbers
 - d) To display Fibonacci series

Control Structures:

- 7. a) Write a program in PL/SQL to update the salary of a specific employee by 8% if the salary exceeds the mid-range of the salary against this job and update up to mid-range if the salary is less than the mid-range of the salary, and display a suitable message.
b) Write a PL/SQL program to display the description against a student's grade using CASE statement.

Exception Handling:

- 8. a) Develop a PL/SQL program that displays the name and address of a student whose ID is given. If there is no student with the given student ID in the database, the program should raise a run-time exception NO_DATA_FOUND, which should be captured in the EXCEPTION block.
b) Construct the user-defined exceptions to get the salary of an employee and check it with the job's salary range. If the salary is below the range, raise an exception BELOW_SALARY_RANGE. If the salary is above the range, raise the exception ABOVE_SALARY_RANGE.

Functions:

- 9. a) Write a function that accepts two numbers A and B and performs the following operations.
 - o Addition
 - o Subtraction
 - o Multiplication
 - o Division

- b) Write a PL/SQL block that updates salary of an employee in Employee table by using incr function which takes employee number as argument and calculates increment and returns increment based on the following criteria.
If salary \leq 3000, increment = 30% of salary
If salary $>$ 3000 and \leq 6000, increment = 20% of salary
else increment = 10% of salary

Procedures:

10. a) Write a procedure that accepts two numbers and displays their sum.
b) Write procedures to demonstrate IN, IN OUT and OUT parameters.

Cursors:

11. a) Write a block in PL/SQL to create a Cursor that displays the employee name and number of jobs he or she has done in the past.
b) Write a program in PL/SQL to create a cursor to display the name and salary of each employee in the EMPLOYEES table whose salary is less than that specified by a passed-in parameter value.

Triggers:

12. Develop a suitable student database application by considering appropriate attributes.
Couple of attributes to be maintained is the attendance of a student in each subject for which he/she has enrolled and internal assessment Using TRIGGERS for the following
- a) Whenever the attendance is updated, check if the attendance is less than 85%; if so, notify the concerned head of the department.
b) Whenever, the marks in an internal assessment test are entered, check if the marks are less than 40%; if so, notify the concerned head of the department.

REFERENCE BOOKS:

1. Satish Ansani, *Oracle Database 11g: Hands-on SQL and PL/SQL*, PHI, 2010.
2. Pranab Kumar Das Gupta, P. Radha Krishna, *Database Management System Oracle SQL and PL/SQL*, PHI, 2nd Edition, 2009.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	2	3												3	
CO2	1	3	1	2	3								2		3	
CO3	1	2	3	2	3								2		3	
CO4	2	3	3	3	3	2							3		3	
CO5									3	3						

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

II B. Tech. – II Semester
(20BT31531) OPERATING SYSTEMS LAB
(Common to CSE, CSE(AI) and CSE(DS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE-REQUISITES: A course on "Operating Systems".

COURSE DESCRIPTION: Hands-on practice in simulating algorithms for CPU Scheduling, Memory Management, I/O Management, Deadlock Handling mechanisms; Implementing Synchronization problems;

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

- CO1. Analyze process scheduling problems by applying contextual knowledge on CPU scheduling algorithms.
- CO2. Apply memory management, file management and disk scheduling algorithms to attain optimal solutions.
- CO3. Devise solution for deadlock avoidance using banker's algorithm.
- CO4. Design solutions for process synchronization problems using semaphores and monitors.
- CO5. Apply file allocation strategies to achieve optimal disk utilization.
- CO6. Function effectively as an individual and in teams to foster knowledge and creativity.

LIST OF EXPERIMENTS:

1. a) Write a program to implement Process System Calls.
b) Write a program to implement I/O System Calls.
2. Write a program to implement named and unnamed pipes.
3. Demonstrate File Permissions.
4. Analyze the following CPU Scheduling Algorithms:
a) FCFS b) SJF (Preemptive) c) Priority d) Round Robin
5. Design solutions for the following synchronization problems:
a) Producer Consumer Problem b) Dining Philosophers Problem.
6. Design Banker's Algorithm for Deadlock Avoidance. Find the safe sequence. If Maximum request of any one process is changed, detect whether a deadlock has occurred or not. Consider the number of resources are three and Jobs are five.
7. Implement the following Algorithms:
a) First Fit b) Best Fit c) Worst Fit
8. Implement the following Page Replacement Algorithms
a) FIFO b) LFU c) LRU d) Optimal
9. Implement the following Disk Scheduling Algorithms
a) FCFS b) SSTF c) SCAN d) CSCAN

10. Implement the following file allocation strategies:
 a) Contiguous Allocation b) Linked Allocation

REFERENCE BOOKS:

1. Herbert Schildt, *Java the Complete Reference*, Ninth Edition, Oracle Press, 2014.
2. Sachin Malhotra and Saurab Choudhary, *Programming in Java*, Second Edition, Oxford University press, 2014.

SOFTWARES/TOOLS USED:

Compiler/Interpreter- C/C++/Python/Java
 Softwares - Code Blocks/Jupyter Notebook/Eclipse

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	2	2								3			
CO2	2	2	3		2								3			
CO3	2	2	3		2								3			
CO4	2	1	3		2								3			
CO5	3	3	2		3								3			
CO6									3	3	2					

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

II B. Tech. – II Semester
(20BT43231) FOUNDATIONS OF DATA SCIENCE LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE-REQUISITES:A Course on “Foundations of Data Science”.

COURSE DESCRIPTION:

Hands on practice on the concepts of data science using Python - Computations using NumPy, Data Manipulation using Pandas, Interacting with Web APIs and Databases, Data Cleaning and Preparation, Data Wrangling, Data Visualization using Matplotlib and Seaborn, Data Aggregation, Time Series Analysis.

COURSE OBJECTIVES:

- To impart knowledge on data manipulation and exploratory data analysis concepts that is vital for data science.
- To develop skills for applying python tools and techniques to analyze, visualize and interpret data.

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

- CO1. Demonstrate efficient storage and data handling methods in NumPy to perform mathematical computations vital for data science.
- CO2. Apply Data Preparation and Exploration methods using Pandas to gain insights about raw data and transform quality data to perform analysis.
- CO3. Create data visualization using charts, plots and histograms to identify trends, patterns and outliers in data importing Matplotlib and Seaborn.
- CO4. Develop methods to analyze and interpret time series data to extract meaningful statistics.
- CO5. Work independently or in teams to solve problems with effective communication.

List of Exercises:

1. Array Computations using NumPy
 - a. Perform arithmetic operations using array.
 - b. Perform slicing and indexing on multi-dimensional arrays.
 - c. Perform computations on multi-dimensional array using universal functions (ufunc).
 - d. Compute arithmetic mean, standard deviation, variance, percentile, minimum and maximum, cumulative sum and product using statistical functions in NumPy.
 - e. Perform set theory operations such as union, intersection, symmetric difference and fetching unique values.
2. Linear Algebra and Random Number generation using linalg and random module in

NumPy

- a. Compute dot product, vector product and inner product of two arrays.
- b. Perform matrix operations such as multiplication, determinant, sum of diagonal elements and inverse.
- c. Compute eigenvalues, eigenvectors and singular value decomposition for a square matrix.
- d. Generate random samples from uniform, normal, binomial, chi-square and Gaussian distributions using `numpy.random` functions.
- e. Implement a single random walk with 1000 steps using `random` module and extract the statistics like minimum and maximum value along the walk's trajectory.

3. Data Manipulation using pandas

- a. Create DataFrame from List, Dict, List of Dicts, Dicts of Series and perform operations such as column selection, addition, deletion and row selection, addition and deletion.
- b. Create a DataFrame and perform descriptive statistics functions such as sum, mean, median, mode, standard deviation, skewness, kurtosis, cumulative sum, cumulative product and percent changes.
- c. Implement the computation of correlation and covariance by considering the DataFrames of stock prices and volumes obtained from Yahoo Finance! Using `pandas-datareader` package.

4. Working with different data formats using pandas

- a. Perform reading and writing data in text format using `read_csv` and `read_table` considering any online dataset in delimited format (CSV).
- b. Perform reading, writing and parsing data in JSON (Javascript Object Notation) format using `read_json`.
- c. Perform reading and writing of Microsoft Excel Files (xlsx) using `read_excel`.

5. Interacting with Web APIs and Databases

- a. Predict the last 30 GitHub issues for pandas using `request` and `response` object's `json` method. Move the extracted data to DataFrame and extract fields of interest. (Use url: '<https://api.github.com/repos/pandas-dev/pandas/issues>')
- b. Connect to any relational database using corresponding SQL drivers and perform operations such as table creation, populating the table, selecting data from table, moving data from table to DataFrame, updating records and deleting records in a table.

6. Data Cleaning and Preparation

- a. Perform data cleaning by creating a DataFrame and identifying missing data using `NA` (Not Available) handling methods, filter out missing data using `dropna` function, fill the missing data using `fillna` function and remove duplicates using `drop_duplicates` and `drop_duplicates` functions.
- b. Perform data transformation by modifying set of values using `map` and `replace` method and create transformed version of original dataset without modification using `rename` method.
- c. Create a DataFrame with normally distributed data using random sampling and detect possible outliers.

- d. Perform text manipulation with regular expression by applying relevant regular expression methods to split a string with a variable number of whitespace characters (tabs, spaces, and newlines) and get a list of all patterns matching.

7. Data Wrangling

- a. Perform hierarchical indexing by creating a series with a list of lists (or arrays) as the index, select subsets of data at outer and inner levels using partial indexing.
- b. Rearrange the tabular data with hierarchical indexing using unstack and stack method.
- c. Create two different DataFrames and merge them using index as merge key and combine data with overlap using combine_first method.

8. Perform Data Visualization with Matplotlib and SeaBorn considering online dataset for processing.

- a. Create a Line Plot by setting the title, axis labels, ticks, ticklabels , annotations on subplots and save to a file.
- b. Create Bar Plots using Series and DataFrame index.
 - i. Create bar plots with a DataFrame to group the values in each row together in a group in bars side by side for each value.
 - ii. Create stacked bar plots from a DataFrame.
- c. Create Histogram to display the value frequency and Density Plot to generate continuous probability distribution function for observed data.
- d. Create Scatter Plot and examine the relationship between two one-dimensional data series.
- e. Create Box plots to visualize data with many categorical variables.

9. Time Series Analysis

- a. Create time series using datetime object in pandas indexed by timestamps.
- b. Use pandas.date_range to generate a DatetimeIndex with an indicated length.
- c. Generate data ranges by setting time zone, localize time zone and convert to particular time zone using tz_convert and combine two different time zones.
- d. Perform period arithmetic such as adding and subtracting integers from periods and construct range of periods using period_range function.
- e. Convert Periods and PeriodIndex objects to another frequency with asfreq method.
- f. Convert Series and DataFrame objects indexed by timestamps to periods with the to_period method.
- g. Perform resampling, downsampling and upsampling for the time series.

10. Data Aggregation

- a. Create a tabular dataset as a DataFrame and split data into groups using groupby method including single key and multiple key values. Select group by considering single and multiple columns.
- b. Compute summary statistics such as sum, mean and standard deviation for the grouped data using aggregate method.
- c. Use groupby function to split data into groups based on one column, multiple columns, compute summary statistics and perform exploratory data analysis. Consider any online dataset for processing.

11. Web Scraping using Beautiful Soup

- a. Extract product reviews from Amazon website and save to a file.

- b. Perform Exploratory Data Analysis on extracted product reviews.
 - i. Generate WordCloud for all reviews, positive and negative reviews.
 - ii. Plot the distribution of stopwords, numerics, wordcount values, charactercount values and average wordlength.
 - iii. Display the sentiment value using nltk and vader.
 - iv. Create Scatter Intensity Plot of Sentiments.

REFERENCE BOOKS/LABORATORY MANUALS:

1. Wes McKinney, Python for Data Analysis, O’Reilly, 2nd Edition, 2017.
2. Sinan Ozdemir, Principles of Data Science, Packt Publishers, 2nd Edition, 2018.
3. Rachel Schutt, Cathy O’Neil, *Doing Data Science: Straight Talk from the Frontline*, O’Reilly, 2014.

SOFTWARE/Tools used:

- Python 3.8
- Python Libraries – NumPy, Pandas, Matplotlib, Seaborn, Beautiful Soup, Vader
- Anaconda Framework

ADDITIONAL LEARNING RESOURCES:

- https://swayam.gov.in/nd1_noc19_cs60/preview
- <https://towardsdatascience.com/>
- <https://www.w3schools.com/datascience/>
- <https://github.com/jakevdp/PythonDataScienceHandbook>
- <https://www.kaggle.com>

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	1	3									3		
CO2	3	3	2	2	3									3		
CO3	3	3	2	2	3									3		
CO4	3	3	3	2	3									3		
CO5									3	3						

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

II B. Tech. – II Semester
(20BT3HS31) SOFT SKILLS LAB
(Common to CSE, CSE(AI), CSE(DS), CSBS, CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	1	2	2

PRE-REQUISITES: -

COURSE DESCRIPTION: Body Language, Assertiveness, Goal Setting, Thinking Skills, Team Building, Conflict Management, Technical Report Writing, Résumé Writing, Group Discussions, Interview Skills, Interpersonal Skills & Etiquette.

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

- CO1: Demonstrate knowledge of career skills by analyzing and applying the techniques and strategies of Goal Setting, Thinking Skills and Etiquettes.
- CO2: Analyze the various situations by applying Assertive communication and Non-verbal forms in developing Interpersonal Skills.
- CO3: Apply appropriate managerial techniques by analyzing the conflicts in various situations.
- CO4: Demonstrate various communication styles by analyzing and applying Thinking Skills in diverse teams as an individual and a team member during Interviews and Group Discussions.
- CO5: Analyze and apply appropriate techniques in Report Writing and Résumé Writing to communicate effectively.

List of Exercises:

A minimum of any **ten** experiments are to be conducted among the following:

1. Body Language

Body language basics – Types of Body Language – Facial Expressions and their messages – Eye Contact Insights – Body Posture – Hand gestures and finger movements.

2. Assertiveness

Communication Styles – Benefits – Asserting yourself – Tips – Role Play.

3. Goal Setting

Seven Steps of Goal Setting – Self Motivation – Personal Goal Setting – Setting Career Goals.

4. Thinking Skills

Positive Thinking – Creative Thinking – Lateral Thinking – Logical Thinking – Intuitive Thinking.

5. Team Building

Learning Activities – Management Essentials – Team Building Scenarios.

6. Conflict Management

Ways of Resolving Conflict – Personality Types and Conflict – Conflict Resolution Process – Team Conflict.

7. Technical Report Writing

Objectives – Formats – Types of reports – Writing Styles.

8. Résumé Writing

Structure and Presentation – Planning – Defining Career Objectives – Projecting Strengths and Skills – Cover Letter – Formats and Styles.

9. Group Discussions

Types of GD – Dos and Don'ts – Dynamics of GD – Intervention – Summarization Techniques.

10. Interview Skills

Planning – Opening Strategies – Answering Strategies – Teleconferencing – Videoconferencing – Practice questions – Dress code.

11. Interpersonal Skills

Starting a Conversation – Responding to a Conversation – Conversation Examples – Body Language – Role Play.

12. Etiquette

Basic Social Etiquette – Telephone Etiquette – Dining Etiquette – Conference Etiquette – E-Mail Etiquette

TEXT BOOK:

1. Department Lab Manual – SVEC 20

REFERENCE BOOKS:

1. Dr. K. Alex, *Soft Skills*, S. Chand & Company LTD, Latest Edition, New Delhi, 2018.
2. R. C. Sharma & Krishna Mohan, *Business Correspondence and Report Writing*, Tata McGraw-Hill Publishing Company Limited, Third Edition, New Delhi, 2012.

SOFTWARES/TOOLS:

- S1. K - VAN Solutions.
- S2. Learning to Speak English 8.1, The Learning Company – 4 CDs.

ADDITIONAL SOFTWARES:

- English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
- Language in Use 1, 2 & 3.
- Cambridge Advanced Learner's Dictionary - 3rd Edition.
- Let's Talk English, Regional Institute of English South India.

ONLINE LEARNING RESOURCES:

- <http://www.career.vt.edu/interviewing/TelephoneInterviews.html>
- http://job-search-search.com/interviewing/behavioral_interviews
- <https://goo.gl/laEHOY> (dealing with complaints)
- <http://www.adm.uwaterloo.ca/infocecs/CRC/manual/resumes.html>
- <https://goo.gl/FEMGXS>

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2			1					1						
CO2	3	2			1					3						
CO3	2	2			3					1	3					
CO4	2	2			2				3	2						
CO5	1	1			2					3						

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

II B.Tech. – II Semester
(20BT3MC01) ENVIRONMENTAL SCIENCE
(Mandatory Course)
(Common to CSE, CSE (AI), CSE (DS), CSBS, CSSE and IT)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	-	30	2	-	-	-

PRE-REQUISITES: -

COURSE DESCRIPTION: Natural resources; Ecosystems; Biodiversity; Environment pollution and control; Social issues and environment; Human population and environment.

COURSE OBJECTIVES:

- To impart knowledge on nature of environment, natural resources, ecosystems, biodiversity, environmental pollution and control, social issues and human population.
- To develop analysis, problem solving, team spirit, communication and resource management skills in environmental issues employing appropriate tools and techniques.
- To inculcate ethics and lifelong learning in solving environmental issues considering society and sustainability.

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

- CO1 Analyze natural resources to solve complex environmental problems and natural resource management considering society, environment and sustainability.
- CO2 Analyze ecosystems and biodiversity to solve complex environmental problems by following environmental ethics considering society, environment and sustainability besides communicating effectively in graphical form.
- CO3 Analyze various types of pollution and their control measures to solve environmental problems through appropriate tools and techniques following latest developments considering society, ethics, environment and sustainability.
- CO4 Analyze social issues and its impact on environment, environmental acts to solve complex environmental problems considering society, environment and sustainability besides communicating effectively in graphical form.
- CO5 Analyze human population and its impact on environment to solve complex environmental problems through team work and using appropriate tools and techniques considering ethics, society, environment and sustainability.

DETAILED SYLLABUS:

UNIT - I: NATURAL RESOURCES

(07 periods)

Multidisciplinary nature of environment; Natural Resources: Renewable and non-renewable resources; Forest, Water, Mineral, Food and Energy resources -Causes, Effects, Remedies, Case studies; Role of an individual in conservation of natural resource and equitable use of resources for sustainable lifestyles.

UNIT - II: ECOSYSTEMS AND BIODIVERSITY

(07 periods)

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem - Producers, Consumers, Decomposers; Food chains, Food webs, Ecological pyramids – Types; Characteristic features, Structure and functions of forest ecosystem, Desert ecosystem, Aquatic ecosystem.

Biodiversity: Concept and value of biodiversity, Role of biodiversity in addressing new millennium challenges, Hot spots of biodiversity, Threats to biodiversity, Man-wild life conflicts, Endemic, Endangered and extinct species of India, Conservation of biodiversity – In-situ and ex-situ.

UNIT - III: ENVIRONMENTAL POLLUTION AND CONTROL

(06 periods)

Causes, Adverse effects and control measures of pollution - Air pollution, Water pollution, Soil pollution, Noise pollution, Thermal pollution, Nuclear pollution, Solid waste management – Urban waste, industrial waste; Latest developments in pollution control, Hazards and disaster management – Floods, Earthquakes, Tsunamis, Case studies.

UNIT - IV: SOCIAL ISSUES AND THE ENVIRONMENT

(06 periods)

Sustainable development, Urban problems related to energy, Environmental ethics – Issues, Solutions; Global warming, Acid rain, Ozone layer depletion, Nuclear accidents and case studies, Wasteland reclamation, Consumerism and waste products, Concept of green technologies, Environment justice: National Green Tribunal and its importance; Environment protection act, Air act, Water act, Wildlife protection act, Forest conservation act, Issues involved in enforcement of environmental legislation, Public environmental awareness.

UNIT - V: HUMAN POPULATION AND THE ENVIRONMENT

(04 periods)

Population growth, Population characteristics and variation among nations, Population explosion, Family welfare programme, Environment and human health, Human rights, Value education, HIV/AIDS, Women and child welfare, Role of information technology in environment and human health; Case studies - Field Work/Assignment/Seminar on Environmental assets – Water bodies/Forest/Grassland/Hill/Mountain.

Total Periods: 30

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Anubha Kaushik and Kaushik, C. P., *Perspectives in Environmental Studies*, New Age International (P) Ltd. Publications, 6th Edition, 2018.
2. Erach Barucha, *Environmental Studies*, Orient Blackswan, 3rd Edition, 2021.

REFERENCE BOOKS:

1. Cunningham, W. P. and Cunningham, M. A., *Principles of Environmental Science*, Tata McGraw-Hill Publishing Company, New Delhi, 8th Edition, 2016.
2. Benny Joseph, *Environmental Studies*, Tata McGraw-Hill, 2nd Edition, 2009.
3. Anji Reddy, M., *Text Book of Environmental Science and Technology*, BS Publications, Revised Edition, 2014.
4. Rajagopalan, R., *Environmental Studies*, Oxford University Press, 3rd Edition, 2015.

ADDITIONAL LEARNING RESOURCES:

- Chauhan, B. S., *Environmental Studies*, University Science Press, 2nd Edition, 2018.
- Botkin, D. B. and Keller, E. A., *Environmental Science: Earth as a Living Planet*, John Wiley & Sons, 9th International Student Edition, 2014.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3		2		1	1				1					
CO2	3	3		2		1	1	1		1						
CO3	3	3		2	1	1	1	1				1				
CO4	3	3		3		1	1	1		1						
CO5	3	3		2	1	1	1	1	1							

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