ACADEMIC REGULATIONS

COURSE STRUCTURE

AND

DETAILED SYLLABI

OF

COMPUTER SCIENCE AND ENGINEERING

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 toface 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) 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) 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) program will be able to:

PSO1: Use mathematical methodologies to model real-world problems, Employ modern tools and platforms for efficient design and development of computer-based systems.

PSO2: Apply adaptive algorithms and methodologies to develop intelligent systems for solving problems from inter-disciplinary domains.

PSO3: Apply suitable models, tools and techniques to perform data analytics for effective decision making.

PSO4: Design and deploy networked systems using standards and principles, evaluate security measures for complex networks, apply procedures and tools to solve networking issues.

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 APSCHE, 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 APSCHE 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 invarious 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: 0.5 Credit
- **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)		The examination question paper in theory courses shall be for a maximum of 70 marks. The question paper shall be of descriptive type with **FIVEEITHER/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.
		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)	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. 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. **Mid-I:** After first spell of instruction (I & II Units). **Mid-II**: After second spell of instruction (III, IV & V Units). The question paper shall 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.
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.

Sl. No.	Course	Marks	Examination and Evaluation		Scheme of examination
			10	Practical Examination (Internal evaluation)	**Mid-I:** Shall be conducted just before FIRST mid-term theory examinations. **Mid-II:** Shall be conducted just before SECOND mid-term theory examinations.
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	-		Thestudent 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 learningaimed 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.

11.6.2Semester-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 ofclasses 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 year2021-2022):

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 theiradmission 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 berequired 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 sheeton the basis of participation, attendance, performance and behavior. If a student gets anunsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, inorder 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:

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

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 appearedin 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 appearedin 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:

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

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 inthetranscripts.

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

Equivalent Percentage = (CGPA – 0.50) x 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
	If the candidate:	
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	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

	additional sheet, during or after the examination.	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

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. – ISemester

Sl. 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.	20BT1BS01	Differential Equations and Multivariable Calculus	3	-	-	3	3	30	70	100
2.	20BT1BS02	Engineering Chemistry	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.	20BT1BS31	Engineering Chemistry 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				Credits 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.	20BT1BS03	Engineering Physics	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.	20BT1BS32	Engineering Physics 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**	**01**	**13**	**28**	**19.5**	**240**	**560**	**800**

II B. Tech. – I Semester

Sl. 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.	20BT3BS01	Numerical Methods, Probability and Statistics	3	-	-	3	3	30	70	100
2.	20BT12901	Discrete Mathematical Structures	3	-	-	3	3	30	70	100
3.	20BT30501	Computer Organization	3	-	-	3	3	30	70	100
4.	20BT30502	Data Structures	3	-	-	3	3	30	70	100
5.	20BT30503	Python Programming	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 (Audit Course)	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				Credits C	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1.	20BT31501	Operating Systems	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.	20BT40501	Database Management Systems	3	-	-	3	3	30	70	100
5.	**Open Elective-2**		3	-	-	3	3	30	70	100
6.	20BT31231	Software Engineering Lab	-	-	3	3	1.5	30	70	100
7.	20BT31531	Operating Systems Lab	-	-	3	3	1.5	30	70	100
8.	20BT40531	Database Management Systems Lab	-	-	3	3	1.5	30	70	100
9.	20BT3HS31	Soft Skills Lab	-	1	2	3	2	30	70	100
10.	20BT3MC01	Environmental Science(Mandatory Course)	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				Credits 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.	20BT50501	Computer Networks	3	-	-	3	3	30	70	100
3.	20BT50502	Design and Analysis of Algorithms	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
	20BT51204	Linux Programming								
	20BT43101	Artificial Intelligence								
	20BT50503	Advanced Computer Architecture								
	20BT50504	Cyber Security								
	20BT50505	Software Project Management								
6.	20BT41531	Design and Analysis of Algorithms Lab	-	-	3	3	1.5	30	70	100
7.	20BT50531	Computer Networks Lab	-	-	3	3	1.5	30	70	100
8.	20BT50532	Python for Data Science Lab	-	1	2	3	2	30	70	100
9.	20BT50533	Summer Internship-I	-	-	-	-	1.5	-	100	100
10.	20BT5MC01	Professional Ethics (Mandatory Course)	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				Credits 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.	20BT51202	Web Technologies	3	-	-	3	3	30	70	100
3.	20BT60501	Machine Learning	3	-	-	3	3	30	70	100
4.	**Professional Elective-2**		3	-	-	3	3	30	70	100
	20BT71201	Mobile Application Development								
	20BT51503	Natural Language Processing								
	20BT51203	Advanced Databases								
	20BT61206	Mobile Computing								
	20BT51506	Software Testing								
5.	**Professional Elective-3**		3	-	-	3	3	30	70	100
	20BT60502	Compiler Design								
	20BT60503	Soft Computing								
	20BT51201	Data Warehousing and Data Mining								
	20BT60504	Cryptography and Network Security								
	20BT61506	User Interface Design								
6.	**Interdisciplinary Elective-1**		3	-	-	3	3	30	70	100
	20BT60441	Microprocessors and Interfacing								
	20BT60314	Optimization Techniques								
	20BT60343	Robotics and Automation								
	20BT60406	Image Processing								
7.	20BT51232	Web Technologies Lab	-	-	3	3	1.5	30	70	100
8.	20BT60531	Machine LearningLab	-	-	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 (Audit Course)	2	-	-	2	-	-	-	-
		Total:	**20**	**01**	**08**	**29**	**23**	**270**	**630**	**900**

IV B. Tech. – ISemester

Sl. 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.	20BT61201	Cloud Computing	3	-	-	3	3	30	70	100
2.	20BT70501	Computer Vision	3	-	-	3	3	30	70	100
3.	**Professional Elective-4**		3	-	-	3	3	30	70	100
	20BT70502	Full Stack Development								
	20BT70503	Data Science								
	20BT71503	High Performance Computing								
	20BT61241	IoT Architecture and Protocols								
	20BT70504	Augmented Reality and Virtual Reality								
4.	**Professional Elective-5**		3	-	-	3	3	30	70	100
	20BT71206	Game Development								
	20BT71504	Deep Learning								
	20BT71203	Big Data Technologies								
	20BT70505	Blockchain Technologies								
	20BT70506	Service Oriented Architecture and Microservices Architecture								
5.	**Interdisciplinary Elective-2**		3	-	-	3	3	30	70	100
	20BT70401	Embedded Systems								
	20BT70507	Nature Inspired Algorithms								
	20BT70315	Industrial Internet of Things								
	20BT70406	Speech Processing								
6.	20BT61231	Cloud Computing Lab	-	-	3	3	1.5	30	70	100
7.	20BT70531	Computer Vision Lab	-	-	3	3	1.5	30	70	100
8.	20BT70532	R Programming Lab	-	1	2	3	2	30	70	100
9.	20BT70533	Summer Internship-II	-	-	-	-	1.5	-	100	100
10.	20BT705AC	Free and Open Source Software (Audit Course)	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.	20BT80531	Project Work	-	-	-	-	12	100	100	200
2.	20BT80532	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. – ISemester

(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											

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

I B. Tech. – ISemester

(20BT1BS02) ENGINEERING CHEMISTRY

(Common toCE, ME, CSE, CSSE, IT, 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: 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										

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

I B. Tech. – ISemester

(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: ACourse 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 usingproblem-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. PradipDey 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. YashavantKanetkar, 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. Kamakshaiah, 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. –ISemester

(20BT1BS31) ENGINEERING CHEMISTRY LAB

(Common to CE, ME, CSE, CSSE, IT, 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: --

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						

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

I B.Tech. – ISemester
(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.glsvMHZ1: 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: ACourse on "Programming for Problem Solving"

COURSE DESCRIPTION: Hands on practice in developing andexecuting 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 designsuitable 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. $2.5 \log x + \text{Cos } 32^0 + | x^2 + y^2|$

   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/sec^2). 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: $1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$. 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 Basic-pay<=Rs.5000 then increase it by 15%.

   If Basic-pay> Rs.5000 and <=Rs.25000 then it increases by10%.

   If Basic-pay>Rs.25000 then there is no change in Basic-pay.

   A function to print the details of employees whohave 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. YashavantKanetkar, *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. PradipDey 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. – ISemester

(20BT1MC01)UNIVERSAL HUMAN VALUES

(Mandatory Course)

(Common toCSE, 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 andthe 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. – IISemester

(20BT2BS01) TRANSFORMATION TECHNIQUES AND LINEAR ALGEBRA

(Common toAll 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, 2ndedition, 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

(20BT1BS03)ENGINEERING PHYSICS

(Common to CSE, CSSE, IT, CSBS, 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: 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,2nd edition, 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. – 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 toCSE, 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 writtenforms.

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, Involutes.

Exercises:

1. Practice exercises on Ellipse, Parabola, Hyperbola and Rectangular Hyperbola

2. Practice exercises on Cycloid, Epicycloid, Hypocycloid and Involutes

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

(20BT1BS32)ENGINEERING PHYSICS LAB

(Common to CSE, CSSE, IT, CSBS, 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:--

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. Balasubramaniah 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. – 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	1	1	1		1										
CO6									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 OOPS 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 OfSides() 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. –IISemester

(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 writingand 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 $1/3^{rd}$ and $3/8^{th}$ 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:

T1. T. K. V. Iyengar, B. Krishna Gandhi, S. Ranganatham and M. V. S. S. N. Prasad, *Mathematical Methods,* S. Chand & Company, 8th edition, 2013.
T2. 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:

R1. B. S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, 44th edition, 2017.
R2. P. Kandasamy, K. Thilagavathy, K. Gunavathi, *Numerical Methods*, S. Chand and Company, 2nd edition, Reprint 2012.
R3. S. C. Gupta and V. K. Kapoor, *Fundamentals of Mathematical Statistics*, Sultan Chand and Sons Publications, 11th edition, 2012.

E-RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/ (Numerical Methods)
2. https://perhuaman.files.wordpress.com/2014/07/metodos-numericos.pdf (Numerical Methods)
3. https://nptel.ac.in/courses/111/105/111105090/ (Probability and Statistics)
4. https://nptel.ac.in/courses/111/105/111105041/ (Probability and Statistics)
5. 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

(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

(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 ANDMICROOPERATIONS (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			

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO5	3	3	3	3	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.

Consumption units	**Rate (in Rupees/Unit)**
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) Writeapython scripttoperformfollowingsetsoperations.
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 pythonscriptto 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

(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
) the number of whole weeks corresponding to days. For example, if days contains 23, then the number of whole weeks is 3.
      i) 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 he 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 (minutes × 60 + 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:

1. https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process
2. https://www.ibm.com/design/thinking/page/toolkit
3. https://www.interaction-design.org/literature/article/define-and-frame-your-design-challenge-by-creating-your-point-of-view-and-ask-how-might-we
4. https://www.culturepartnership.eu/en/article/ten-tools-for-design-thinking
5. https://nptel.ac.in/courses/109/104/109104109/
6. 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

(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 BOOKS:

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
(20BT31201) SOFTWARE ENGINEERING

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

PRE-REQUISITES: --

COURSE DESCRIPTION: Concepts of Software Engineering; Software Process Models; Conventional and Agile Process Models; Software Requirements Engineering Process; System Analysis; Architectural Design; User Interface Design and Re-engineering; Software Testing; Risk and Quality Management.

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

CO1. Demonstrate knowledge on Fundamental concepts of software engineering and analyze process models required to develop a software system.

CO2. Analyze software requirements and model requirements for the given scenario.

CO3. Apply design concepts and metrics for software development.

CO4. Apply testing strategies and techniques for quality software.

CO5. Analyze risks in software development life cycle and apply risk strategies to mitigate risks.

DETAILED SYLLABUS:

UNIT I: SOFTWARE ENGINEERING AND SOFTWARE PROCESS (11 periods)

A Generic view of process: The Nature of Software, Software Engineering- Software Engineering Layers; The Software Process, Software Engineering Practice, Software myths.

Process models: A Generic Process Model, Prescriptive Process Models-The Waterfall Model, Incremental Process Models, Specialized Process Models; The Unified Process, Agile Development-Agility, Agile Process, Extreme Programming (XP), Scrum, Lean Software Development (LSD), Dynamic System Development Method, Agile Modeling (AM), Agile Unified Process (AUP), The Cleanroom strategy.

UNIT II: REQUIREMENTS ENGINEERING AND MODELING (07 periods)

Requirements Engineering: Functional and non-functional requirements, The software requirements document, Requirements specifications, Requirements engineering processes, Requirements elicitation and analysis, Requirements validation, Requirements management.

Requirements Modeling: Requirements Analysis, Data Modeling Concepts, Flow-Oriented Modeling, Scenario based Modeling, UML Models that supplement the Use Case Case study on Requirements modeling for Web and MobileApps.

UNIT III: DESIGN ENGINEERING AND METRICS (08 periods)

Design Engineering: Design within the context of Software Engineering, The Design process, Design concepts, Software Architecture, Architectural Styles, Architectural design, Pattern based Design-Design Patterns, Pattern based software design.

Process and Project Metrics: Metrics in the process and project domains, Software Measurement, Metrics for software quality.

UNIT IV: SOFTWARE TESTING STRATEGIES AND APPLICATIONS (09 periods)

Testing strategies: A strategic approach to software testing, Strategic issues, Test strategies for conventional software, Test strategies for object oriented software, Validation testing, System testing, The art of debugging.

Testing Conventional Applications: Software testing fundamentals, White box testing-Basis path testing, Control structure testing; Black box testing, Object oriented testing methods.

UNIT V: RISK, QUALITY MANAGEMENT AND REENGINEERING (10 periods)

Risk and Quality Management: Reactive and Proactive risk strategies, Software risks, Risk Mitigation Monitoring and Management (RMMM), RMMM plan, Software quality factors, Defect Amplification Model, Formal Technical Reviews (FTR), Software Quality Assurance (SQA)-Tasks, Goals and Metrics; Software reliability.

Reengineering: Introduction, Business Process Reengineering (BPR), Software Reengineering, Restructuring, Reverse engineering, Forward engineering.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Roger S. Pressman, *Software Engineering - A Practitioner's Approach,* McGraw-Hill, Eight Edition, 2015.
2. Ian Sommerville, *Software Engineering***,** Pearson Education, Ninth Edition, 2011.

REFERENCE BOOKS:

1. K. K. Aggarwal and Yogesh Singh, *Software Engineering,* New Age International Publishers, Third Edition, 2007.
2. Shely Cashman Rosenblatt, *Systems Analysis and Design*, Thomson Publications, Sixth Edition, 2006.

ADDITIONAL LEARNING RESOURCES:

- https://nptel.ac.in/courses/106105087/
- https://nptel.ac.in/courses/106105182/

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			
CO2	2	3				3	3	2			2		3			
CO3	2	3	3	2		2	2				3		3			
CO4	2				2	3							3			
CO5	2	3			2	3							3			

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

II B. Tech. – II Semester

(20BT41501) THEORY OF COMPUTATION

(Common to CSE, CSSE and IT)

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

PRE-REQUISITES: A Course on "Discrete Mathematical Structures"

COURSE DESCRIPTION: Finite automata; Nondeterministic Finite automata; Regular expressions; Applications of the pumping lemma; Context-Free Grammars; Normal forms for context-free grammars; pushdown automata; Chomsky hierarchy of languages; Turing machines.

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

CO1. Design finite state machines to recognize formal languages.

CO2. Analyze formal languages using automata.

CO3. Identify different types of grammars in formal languages.

CO4. Construct context free grammars for context free languages

CO5. Develop Turing machine for different computational problems.

CO6. Validate formal languages of automata by applying closure properties.

DETAILED SYLLABUS:

UNIT I– FINITE AUTOMATA (10 periods)

Introduction to Finite automata, the central concepts of automata theory, Deterministic finite automata, Nondeterministic Finite automata, the equivalence of DFA and NDFA, Finite automata with epsilon-transitions, Conversion of epsilon-NFA to NFA and DFA, Mealy and Moore models.

UNIT II– REGULAR EXPRESSIONS AND LANGUAGES (9 periods)

Regular expressions, Identity rules, Finite automata and Regular expressions, Applications of regular expressions, Pumping lemma for regular languages, Applications of the pumping lemma, Closure properties of regular languages, Equivalence of two regular expressions, Equivalence of two finite automata and minimization of automata.

UNIT III –CONTEXT-FREE GRAMMARS (9 periods)

Context-Free Grammars, Parse trees, Applications of context free grammars, Ambiguity in grammars and languages, Normal forms for context-free grammars, the pumping lemma for context-free languages.

UNIT IV – PUSH DOWN AUTOMATA (8 periods)

Definition of the pushdown automaton, the languages of a PDA, Equivalence of PDA's and CFG's, Deterministic pushdown automata, Chomsky hierarchy of languages, Undecidability.

UNIT V –TURING MACHINE **(9 periods)**

Turing machine model, Representation of Turing machine, Language acceptability by Turing machine, Design of Turing machine, Techniques for Turing machine construction, Variants of Turing machines, Universal Turing machine, Recursive and recursively enumerable languages (REL), properties of recursive and recursively enumerable languages, the model of linear bounded automaton.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOK:

T1. John E. Hopcroft, Rajeev Motwani and Jeffrey D Ullman, *Introduction to Automata Theory, Languages and Computation*, Pearson Education, 3rd Edition, 2011.

REFERENCE BOOKS:

R1. K.L.P. Mishra and N. Chandrasekaran, *Theory of Computer Science: Automata Languages and Computation*, PHI Learning, 3rd Edition, 2009.

R2. John C Martin, *Introduction to Languages and the Theory of Computation*, TMH, 4th Edition, 2010.

ADDITIONAL LEARNING RESOURCES:

https://nptel.ac.in/courses/106/104/106104148/

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

(8 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 (8 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 (9 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

(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 (9 periods)

Meaning - Importance of banking- Functions of banking - **Reserve Bank of India**: Functions – Role of RBI in sustainable development.

UNIT–II: BANK-CUSTOMER RELATIONSHIP (9 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 (9 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 (9 periods)

Concept of risk, risk *Vs* uncertainty. **Insurance**: Definition, Insurance as risk mitigation mechanism, elements of insurance.

UNIT–V: INSURANCE OVERVIEW **(9 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 andEnvironment*. 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, 1stedition, 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 the 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, Eswarchandravidyasagar 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 - Powersand 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. Briji 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 OUTCOMES: *After successful completion of this course, the students will be able to:*

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 Hazardsand 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:

1. 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 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 Developmen*t, 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:

1. Daniel A. Vallero and Chris Brasier, *Sustainable Design: The Science of Sustainability and Green Engineering*, Wiley-Blackwell, 1st Edition, 2008.
2. Jorge A. Vanegas, *Sustainable Engineering Practice: An Introduction*, Committee on Sustainability, American Society of Civil Engineers,https://doi.org/10.1061/9780784407509, 2004.
3. Bell, S. and Morse, S, *Sustainability Indicators: Measuring the Immeasurable?*, Earthscan Publications, London, 2nd Edition, 2008.
4. Mackenthun, K.M., *Basic Concepts in Environmental Management*, CRC Press, Taylor & Francis Group, 1st Edition, 1999.

5. *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 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, 3nd Edition, 2011.

REFERENCE BOOKS:

1. Kishore Gajaria, *GT Gajaria's Law Relating to Building and Engineering Contracts in India*, Lexis NexisButterworths India,4th Edition, 2000.
2. Patil, B. S., *Civil Engineering Contracts and Estimates*, University Press (India) Private Ltd., 4thEdition, 2015.
3. Joseph T. Bockrath, *Contracts and the Legal Environment for Engineers and Architects*, McGraw Hill Education,7th Edition, 2010.
4. AkhileshwarPathak, *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.5thEdition, 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

PRE-REQUISITES: --

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, Cybersquatting, 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*, SynchronaThemata, 2012.

4. 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
(20BT31231) SOFTWARE ENGINEERING LAB

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

PRE-REQUISITES: Courses on "Software Engineering" and "Object Oriented Programming through Java"

COURSE DESCRIPTION: Software development life cycle activities- requirements specification, SRS preparation,Modeling case studies –Online Ticket Reservation system; Point of sales.

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

CO1. Analyze user requirements and prepare software requirements specifications.

CO2. Apply design principles of UML for software design.

CO3. Apply tools for developing UML diagrams.

CO4. Use cost estimation models for project evaluation.

CO5. Work independently or in teams to solve problems with effective communication.

LIST OF CASE STUDIES:

Case studies given below should be Modeled using Visual Modeling tools in different views i.e., Use case view, logical view, component view, Deployment view.

CASE STUDY 1: ONLINE TICKET RESERVATION FOR RAILWAYS

Problem Statement: Computer play an integral part of the day in today's life. It makes the entire job easier and faster, every job is computerized so as the ticket reservation we can book over the online ticket reservation system. During the booking of the ticket reservation passenger has to select origin, date of journey, destination, class of train etc. The reservation counter keeps track of passenger's information. Thus the system will have all the details about the trains and facilities provided by them. There are various trains with the different level of convenience for the passengers. The whole database will be maintained by database administrator. There are varieties of trains where the passengers can select the train according to the convenience for their destination journey. The journey could be within the state or across the India. Each train has the three types of classes i.e. Sleeper class, First class and the AC compartment. Design the application for the above problem description.

CASE STUDY 2: A POINT OF SALE (POS) SYSTEM

Problem Statement: A POS System is a computerized application used to record sales and handle payments; it is typically used in a retail store. It includes hardware components such as a computer and bar code scanner, and software to run the system. It interfaces to various service applications, such as a third-party tax calculator and inventory control. These systems must be relatively fault tolerant; that is, even if remote services and temporarily unavailable they must still be of capturing sales and handling at least cash payments. A POS system must support multiple and varied client – side terminals and interfaces such as browser, PDA's, touch – screens.

CASE STUDY 3: RECRUITMENT PROCEDURE FOR SOFTWARE INDUSTRY

Problem Statement: In the software industry the recruitment procedure is the basic thing that goes in the hand with the requirement as specified by the technical management team. HR first gives an advertisement in leading Newspapers, Journals, Weeklies and Websites. The job seekers can apply for it through by Post or by e-mail to the company.The technical skill and the experience of the candidates are reviewed and the short listed candidates are called for the interview. There may be different rounds for interview like the written test, technical interview, and HR interview. After the successful completion of all rounds of interview, the selected candidates' names are displayed. Meanwhile HR gives all the details about the salary, working hours, terms and conditions and the retirement benefit to the candidate.

CASE STUDY 4: ONLINE AUCTION SALES

Problem Statement: The online auction system is a design about a website where sellers collect and prepare a list of items they want to sell and place it on the website for visualizing. To accomplish this purpose the user has to access the site. Incase it's a new user he has to register. Purchaser's login and select items they want to buy and keep bidding for it. Interacting with the purchasers and sellers through messages does this. There is no need for customer to interact with the sellers because every time the purchasers bid, the details will be updated in the database. The purchaser making the highest bid for an item before the close of the auction is declared as the owner of the item. If the auctioneer or the purchaser doesn't want to bid for the product then there is fixed cutoff price mentioned for every product. He can pay that amount directly and own the product. The purchaser gets a confirmation of his purchase as an acknowledgement from the website. After the transition by going back to the main menu where he can view other items.

CASE STUDY 5: TWO FLOOR ELEVATOR SIMULATOR

Problem Statement: The elevator has the basic function that all elevator systems have, such as moving up and down, open and close doors, and of course, pick up passengers. The elevator is supposed to be used in a building having floors numbered from 1 to MaxFloor, where the first floor is the lobby. There are car call buttons in the car corresponding to each floor. For every floor except for the top floor and the lobby, there are two hall call buttons for the passengers to call for going up and down. There is only one down hall call button at the top floor and one up hall call button in the lobby. When the car stops at a floor, the doors are opened and the car lantern indicating the current direction the car is going is illuminated so that the passengers can get to know the current moving direction of the car. The car moves fast between floors, but it should be able to slow down early enough to stop at a desired floor. When an elevator has no requests, it remains at its current floor with its doors closed.

In order to certificate system safety, emergency brake will be triggered and the car will be forced to stop under any unsafe conditions.

CASE STUDY 6: HOME APPLIANCE CONTROL SYSTEM

Problem Statement: A home appliance control system (HACS) is a system which provides various services to remotely operate on home appliances, such as microwave oven, TV, and garage door etc through remote devices such as mobile phone, desktop and palm-top. A home appliance control system (HACS) is a system which is controlled by a remote system such as a mobile phone or a palm-top, and at the same time controls, monitors and coordinates home appliances such as air conditioner, microwave oven, garage doors, TV set, VCR, audio controller, indoor/outdoor lights, water sprinkler, home security system, bath tub controller, etc. In order to activate home appliances and to allow for different ways of cooking, the HACS needs mechanisms for communication between the different devices in the system, and for coordination among the various

processes running on such devices. The system administrator of the HACS system has the ability to add a new appliance or delete an existing one. The system administrator has the ability to add a new remote device and configure it with HACS or delete an existing one when it is not used. Also, the system administrator can create an account for a new user or delete existing account if it is no longer used.

1. Identify Functional and Non Functional Requirements for

   i) Online Ticket Reservation for Railways, ii) Online Auction Sales

2. Prepare the Software Requirement Specification (SRS), High Level Design (HLD) and Detailed Design (DD) for the following experiments

   i) Employee Information System, ii) Online Airline Reservation

   Note: For the reference of SRS, HLD and DD templates refer department manual and use any open source Requirement documentation tool. Estimate project parameters such as size, effort and time for development for a Library Information system using Basic COCOMO model.

3. Mini project: For any given problem identify functional and non- functional requirements, prepare SRS document and design the system using UML diagrams.

REFERENCE BOOKS:

1. Grady Booch, James Rum Baugh and Ivar Jacobson, *The Unified Modeling Language User Guide*, Pearson Education, Second Edition, 2009.
2. Hans-Erik Eriksson, Magnus Penker, Brian Lyons and David Fado, *UML 2 Toolkit*, WILEY-Dreamtech India Pvt. Ltd., 2003.
3. Rajesh Naik and Swapna Kishore, *Software Requirements and Estimation*, Tata McGraw Hill, New Delhi, 2001.

SOFTWARE/TOOLS USED:

- Visual Paradigm for modeling diagrams

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

(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.
   - Addition
   - Subtraction
   - Multiplication

- 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 <= 3000, increment = 30% of salary

If salary > 3000 and <= 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

(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:

1. http://www.career.vt.edu/interviewing/TelephoneInterviews.html
2. http://job-search-search.com/interviewing/behavioral_interviews
3. https://goo.gl/laEHOY (dealing with complaints)
4. http://www.adm.uwaterloo.ca/infocecs/CRC/manual/resumes.html
5. 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 OUTCOMES: *After successful completion of this course, the students will be able to:*

CO1. Analyze natural resourcesto solve complex environmental problems andnatural resource management considering society, environment and sustainability.

CO2. Analyze ecosystemsand 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 problemsthrough appropriate tools and techniques following latest developmentsconsidering society, ethics, environment and sustainability.

CO4. Analyzesocial issues and its impact on environment, environmental acts to solve complex environmental problems considering society, environment and sustainability besides communicating effectively in graphical form.

C05. 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. AnubhaKaushik and Kaushik, C. P., *Perspectives in Environmental Studies*, New Age International (P) Ltd. Publications, 6th Edition, 2018.
2. ErachBarucha, *Environmental Studies,* Orient Blackswan, 3rd Edition, 2021.

REFERENCE BOOKS:

1. Cunningham, W.P. and Cunningham, M.A., *Principles of Environmental Science*, Tata McGraw-Hill PublishingCompany, 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:

1. Chauhan, B. S., *Environmental Studies*, University Science Press, 2nd Edition, 2018.
2. 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

III B.Tech. – I Semester

(20BT5HS01) ORGANIZATIONAL BEHAVIOR

(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 organizational Behavior; Individual behavior and Personality; Interpersonal and group behavior; Leadership; Organizational change and development

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

CO1. Demonstrate the nature, issues and challenges of Organizational Behaviour.

CO2. Demonstrate the concepts of behavior and theories of personality to assess the behavior of people in an organization

CO3. Demonstrate the Interpersonal and Group Behaviour in an Organization.

CO4. Apply the theories of Leadership to develop leadership qualities in an organization.

CO5. Apply the techniques of Organization development in the process of organizational change and development.

DETAILED SYLLABUS:

UNIT–I: INTRODUCTION TO ORGANIZATIONAL BEHAVIOR (9 Periods)

Meaning and Definition, Nature, Scope, Features, Significance of Organizational Behavior – Levels and Contributing disciples to OB – Emerging Issues and Challenges of OB

UNIT–II: INDIVIDUAL BEHAVIOR AND PERSONALITY (9 Periods)

Individual: Introduction – Role of Brain and Mind in Individual Behavior – Similarities and Dissimilarities in Individuals – Reasons for individual differences – Nature of Man – Models of man – Values, Attitudes, emotions, Moods and Job satisfaction.

Personality: Introduction– Personality Traits – Determinants of Personality – Personality Theories**.**

UNIT–III: INTERPERSONAL AND GROUP BEHAVIOR (9 Periods)

Introduction To Interpersonal: Process of perception – Inter personal perception.

Group Behavior: Meaning and Definition of a Group – Classification of Groups – Stages of Group development.

UNIT–IV: LEADERSHIP (9 periods)

Meaning and Definition of Leadership – Leadership Theories: Behavioral Theories and Modern theories – Leadership Styles – New directions for leadership.

UNIT–V: ORGANIZATIONAL CHANGE AND DEVELOPMENT (9 periods)

Meaning – Nature of work change – Pressure for change – Change Process – Types of change – Factors influencing change – Organizational development process – Organizational Development interventions/Techniques.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

T1: Stephen P. Robbins, Timothy A. Judge and Neharika Vohra, *Organizational Behavior*, Pearson, Noida, 16th edition, 2017.

T2: P.Subba Rao, *Management and Organizational behavior*, Himalaya Publishing House, Mumbai, Re-print 2019.

REFERENCE BOOKS:

R1: Fred Luthans, *Organizational behavior*, McGraw Hill Higher Education, 10th edition, 2016.

R2: Shashi K. Gupta and Rosy Joshi, *Organizational Behavior*, Kalyani Publications, 8th 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	2														
CO2	3	1							2							
CO3	3								2							
CO4	2	3							2							
CO5	1	3							1							

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

III B. Tech. – I Semester
(20BT50501) COMPUTER NETWORKS

(Common to CSE, CSSE, CSBS and EIE)

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 sub netting 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

III B. Tech. – I Semester
(20BT50502) DESIGN AND ANALYSIS OF ALGORITHMS

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

PRE-REQUISITES: A Course on "Data Structures"

COURSE DESCRIPTION: Algorithms and asymptotic notations; Algorithm performance analysis; Amortized analysis; Recurrences; Disjoint sets; Divide and Conquer; Dynamic programming; Greedy algorithms; Back tracking; Branch and bound; NP-hard and NP-complete problems.

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

CO1. Analyze the complexity of algorithms by applying the knowledge of asymptotic notations and recurrence methods.

CO2. Analyze the given problem and identify appropriate algorithm design technique for problem solving.

CO3. Perceive and apply different algorithm design paradigms to find solutions for computing problems.

CO4. Apply the knowledge of NP-hard and NP-Complete complexity classes to classify decision problems.

DETAILED SYLLABUS:

UNIT- I: INTRODUCTION TO ALGORITHMS (10 Periods)

Algorithm, Algorithm pseudocode conventions, Performance analysis - Space complexity, Time complexity, Asymptotic notations; Amortized analysis – Aggregate analysis, Accounting method, Potential method; Recurrences - Substitution method, Recursion-tree method, Master method.

UNIT- II: DISJOINT SETS, DIVIDE AND CONQUER (8 Periods)

Disjoint Sets: Operations, Union and Find algorithms.

Divide and Conquer: General method, Defective chess board, Binary search, Finding maximum and minimum, Merge sort, Strassen's matrix multiplication.

UNIT- III: DYNAMIC PROGRAMMING (9 Periods)

General method, Matrix-chain multiplication, All pairs shortest path, Optimal binary search trees, 0/1 Knapsack problem, Traveling salesperson problem, Flow shop scheduling.

UNIT- IV: GREEDY METHOD, BACKTRACKING (10 Periods)

Greedy Method: General method, Knapsack problem, Job sequencing with deadlines, Huffman codes, Single source shortest paths, Optimal merge patterns.

Backtracking: General method, 8–Queens problem, Sum of subsets, Graph coloring, Hamiltonian cycles.

UNIT- V: BRANCH AND BOUND, NP-HARD AND NP-COMPLETE PROBLEMS

(8 Periods)

Branch and Bound: LC search, LC branch and bound, FIFO branch and bound, 0/1 knapsack problem, Traveling salesperson problem.

NP Hard and NP-Complete Problems: Nondeterministic algorithms, NP-hard and NP-complete classes, Cook's theorem, NP-hard scheduling problems – Scheduling identical processors.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Ellis Horowitz, Sartaj Sahni, and Sanguthevar Rajasekaran*, Fundamentals of Computer Algorithms,* 2nd Edition, Universities Press, 2008.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, *Introduction to Algorithms*,3rd Edition, MIT Press, 2009.

REFERENCE BOOKS:

1. Michael T. Goodrich and Roberto Tamassia*, Algorithm Design and Applications,* Wiley, 2014.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, *The Design and Analysis of Computer Algorithms*, Pearson, 2006.

ADDITIONAL LEARNING RESOURCES:

- https://nptel.ac.in/courses/106/106/106106131/

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	2	3	3										3			
CO4	3	3											3			

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

III B.Tech. – I Semester

(20BT4BS01) MATERIAL SCIENCE

(Open Elective - 1)

(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 material science and engineering; properties, processing and applications of composite materials; smart materials; nano and biomimetic materials; emerging materials.

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

CO1. Demonstrate the basic knowledge on different materials.

CO2. Analyze the structure and properties of various composites used in commercial aircraft, marine grade sandwich and wind turbine blades using different methods.

CO3. Demonstrate the basic properties of piezoelectric, magneto-rheostatic, electro-rheostatic, and shape memory alloys used for different applications.

CO4. Analyze the properties of nano materials for NEMS & biomimetic materials for dolphin sound wave technology and apply Lithographic technique for deposition of nanomaterials.

CO5. Demonstrate the processing and properties of functionally graded materials for nanoelectronic and optoelectronic applications.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO MATERIAL SCIENCE AND ENGINEERING **(7 Periods)**

Introduction - material science and engineering, engineering materials and advanced materials, modern materials needs, processing and properties of metals, polymers and ceramics (Qualitative).

UNIT- II: COMPOSITE MATERIALS **(10 Periods)**

Composite materials – classification based on matrix phase and dispersed phase – functions of matrix phase and dispersed phase – polymer matrix composites and structural composites – applications (commercial aircraft, marine grade sandwich and wind turbine blades), basic composite manufacturing methods: prepeg-up process, wet lay –up (hand lay –up) process - advantages and limitations of composites.

UNIT- III:SMART MATERIALS **(08 Periods)**

Smart materials – piezoelectric, magneto-rheostatic (MR) and electro-rheostatic (ER) materials - shape memory alloys (SMA): characteristics, preparation of SMA, applications in different fields, advances in smart materials.

UNIT – IV: NANO AND BIOMIMETIC MATERIALS (10Periods)

Nanomaterials: Low dimensional structures and energy quantization, Fabrication of nano materials: Lithographic technique using photons, properties of nano materials (metallic, semiconducting and magnetic) and applications (renewable energy and nano electro-mechanical systems (NEMS).

Biomimetic materials – Introduction- classification and their applications of biomimetic materials (Lotus effect, Dolphin sound wave technology and viper as a model in its defence)

UNIT- V: EMERGING MATERIALS (10 Periods)

Functionally graded materials (FGM): Types, properties, processing and potential applications, functionally graded fiber cement: mixture design, processing and as structural material, Functionally Graded Nanoelectronic, Optoelectronic and Thermoelectric Materials (Qualitative) and its applications.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. K M Gupta, *Engineering Materials – Research, Applications and Advances*, CRC press (Taylor & Francis group), 2015.
2. William D Callister, David G Rethwisch, *Materials Science and Engineering*, Wiley, 9th edition, 2014.

REFERENCE BOOKS:

1. Sulabha K Kulkarni*, Nanotechnology: Principles and practices*, Springer, 9th edition,2014.
2. Charles P. Poole and Frank J. Owens, *Introduction to Nanotechnology*, Wiley-Interscience, May 2003.

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	3			2	3										
CO3	3					2										
CO4	3					3										
CO5	3					2										

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

III B.Tech. – I Semester

(20BT4HS02) BUSINESS COMMUNICATION AND CAREER SKILLS

(Open Elective - 1)

(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: Nature and Scope of Communication, Corporate Communication, Writing Business Messages & Documents, Careers & Résumés, and Interviews.

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

CO1. Demonstrate knowledge of professional communication by analyzing and applying the styles and strategies of business communication in Communication Networks, Interpersonal, and Informal communication.

CO2. Analyze the limitations of communication by applying and demonstrating corporate and cross-cultural communication strategies effectively in a business context and Crisis Management situations.

CO3. Apply appropriate strategies and techniquesinwriting business messages, business letters, and résumé for effective professional communication and career building.

CO4. Demonstrate appropriate communication techniques and answering strategies by analyzing the expectations during presentations and interviews.

DETAILED SYLLABUS:

UNIT–I: NATURE AND SCOPE OF COMMUNICATION (9 Periods)

Introduction – Communication Basics – Functions of Communication – Communication Networks – Interpersonal Communication – Informal Communication – Communication Barriers – Roles of a Manager.

UNIT–II: CORPORATE COMMUNICATION (9 Periods)

Introduction – Corporate Communication – Cross-Cultural Communication; Concept & Styles – Corporate Communication Strategy – Corporate Citizenship – Crisis Communication: Case Study.

UNIT–III: **WRITING BUSINESS MESSAGES & DOCUMENTS (9 Periods)**

Introduction – Importance of Written Business Communication – Types of Business Messages – Five Main Stages of Writing Business Messages – Business Letter Writing – Kinds of Business Letters – Common Components of Business Letters – Strategies for Writing the Body of a Letter.

UNIT–IV: CAREERS AND RÉSUMÉS **(9 Periods)**

Introduction – Career Building – Résumé Formats: Traditional, Electronic and Video Résumé – Sending Résumés – Follow-up Letters – Business Presentations and Speeches: Planning –Structuring – Organizing – Delivery.

UNIT–V: INTERVIEWS **(9 Periods)**

Introduction – General Preparation for an Interview – Success in an Interview – Important Non-verbal Aspects – Types of Interviews – Styles of Interviewing – Types of Interviewing –Online Recruitment Process.

Total Periods: 45

Topics for self-study areprovided in the lesson plan

TEXT BOOKS:

1. Meenakshi Raman, and Prakash Singh, *Business Communication*, Oxford University Press, New Delhi, 2nd edition, 2012.
2. Neera Jain, and Sharma Mukherji, *Effective Business Communication*, Tata Mc Graw–Hill Education, Pvt. Ltd., New Delhi, 2012.

REFERENCE BOOKS:

1. Courtland L. Bovee et al., *Business Communication Today*, Pearson, New Delhi,2011.
2. Krizan, *Effective Business Communication*, Cengage Learning, New Delhi, 2010.

ADDITIONAL LEARNING RESOURCES

1. http://www.career.vt.edu/interviewing/TelephoneInterviews.html
2. http://job-search-search.com/interviewing/behavioral_interviews
3. https://goo.gl/laEHOY (dealing with complaints)
4. http://www.adm.uwaterloo.ca/infocecs/CRC/manual/resumes.html
5. https://goo.gl/FEMGXS
6. http://www.resumania.com/arcindex.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	1			2					3						
CO2	1	2			2					3	1					
CO3	1				2					3						
CO4	1	2			2					3						

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

III B.Tech. – I Semester

(20BT4HS04) ENTREPRENEURSHIP FOR MICRO, SMALL AND MEDIUM ENTERPRISES

(Open Elective - 1)

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

CO1. Demonstrate the concepts of Entrepreneurship and Entrepreneur.

CO2. Analyze the Ideas and Business Plans for promoting entrepreneurships and start-ups.

CO3. Demonstrate the environment of Micro, Small and Medium Enterprises.

CO4. Analyze the various sources of Institutional Finance for promoting entrepreneurship.

CO5. Demonstrate the encouragement for Women and Rural Entrepreneurship.

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION TO ENTREPRENEURSHIP (9 Periods)

Introduction to Entrepreneurship - Concept ofEntrepreneurship – Growth of Entrepreneurship in India **-** Factors affecting entrepreneurship growth - Characteristics of an Entrepreneur – Functions of Entrepreneur – Types of Entrepreneurs – Distinction between an Entrepreneur and a manager.

UNIT – II: IDEA GENERATION AND FORMULATION OF BUSINESS PLANS (9 Periods)

Sources of Ideas – Methods of idea generation – Steps in Setting up of a Small Business Enterprise – Concepts of Business Plan – Significance – Formulation of Business Plan – Common Errors in the Formulation of Business Plan – The role of incubation centers for promoting entrepreneurships and start-ups.

UNIT – III: MICRO SMALL AND MEDIUM ENTERPRISES (9 Periods)

Meaning and Definition of Micro, Small and Medium Enterprises – Essential Features – Scope and Objectives of Micro Small and Medium Enterprises – relationship between Micro and Macro Enterprises- Problems of Micro Small and Medium Enterprises.

UNIT–IV: INSTITUTIONAL FINANCE (9 Periods)

Institutional Finance **–** Need – Scope - Services - Various Institutions offering Institutional support: – Small Industries Development of Bank of India (SIDBI), State Industrial Development Corporations (SIDC) – Small Industries Development Organization (SIDO) – Small Industries Service Institutes (SISIs) – State Financial

Corporation (SFC) - National Institute of Entrepreneurship and Small Business Development (NIESBUD) – Micro Units Development and Refinance Agency Bank (MUDRA).

UNIT–V: WOMEN & RURAL ENTREPRENEURSHIP (9 Periods)

Concept of Women entrepreneurs - Functions of Women entrepreneurs - Growth of women entrepreneurship in India - Challenges of Women entrepreneurs - Programmes for supporting women entrepreneurship – **Rural Entrepreneurship:** – Meaning, Need for Rural entrepreneurship, Problems of rural entrepreneurship, Role of NGOs, Role of Bharatiya Mahila Bank for encouraging Women Entrepreneurs – Micro Finance & Self Help Groups (Basic Concepts).

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Dr.S.S.Khanka*, Entrepreneurial Development*, S. Chand and Company Ltd,Revised edition,2012.
2. MadhurimaLall&ShikhaSahai, *Entrepreneurship*, Excel Books India, 4th edition,2014.

REFERENCE BOOKS:

1. Nandan, H., *Fundamentals of Entrepreneurship*, PHI Learning Pvt. Ltd., NewDelhi, 3rd edition, 2013.
2. Bholanath Dutta, *Entrepreneurship Management* – Text and Cases, Excel Books,3rd edition, 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															
CO2		3									2					
CO3	3	2								2						
CO4		3									2					
CO5	3										2					

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

III B.Tech. – I Semester

(20BT4HS06) GERMAN LANGUAGE (Deutsch alsFremdsprache)

(Open Elective - 1)

(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: Oral communication; Basic grammar; Basic writing; Berufsdeutcsch (Business German)

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

CO1. Demonstrate basic knowledge of German language and the verb conjugation.

CO2. Comprehend and apply the knowledge of vocabulary and phrases in day-to-day real-life conversation.

CO3. Apply the various sentence structures by examining the rules of grammar in speaking and writing.

CO4. Analyze and apply the various verb structure of English and German language effectively in professional writing.

DETAILED SYLLABUS:

UNIT- I: INTRODUCTION (9 Periods)

Introduction - German alphabets, numbers, days in a week, names of months, seasons. Grammar: Nouns –(i)Nominative case and (ii) Nominative personal pronouns, simple sentence, Verb Conjugation 1st and 2nd type, verb Conjugation 3rd type, 'Wh' questions (simple sentences) Nominative (definite and indefinite) Articles

UNIT-II: CITY AND FOOD (9 Periods)

In the city: naming places and buildings, means of transport, basic directions. Food: drink, groceries and meals. Apartments: rooms, furniture, colours.

Grammar: Nouns-articles negation–(kein and nicht); imperative and the accusative case; Nominative Possessive Pronouns.

UNIT-III: DAY TO DAY CONVERSATIONS (9 Periods)

Everyday life, telling time, making appointments, leisure activities, and celebrations. Different types of professions, Health and the body, Holiday and weather, Clothes and Dresses.

UNIT-IV: BASIC GRAMMAR (9 Periods)

Grammar: Possessive articles, Prepositions (am, um, von. bis); Modal verbs, Separable verbs, the accusative, past tense of 'to have' and 'to be', the imperative sentences, dative case, perfect tense.

UNIT V: BASIC WRITING **(9 Periods)**

Translation from English to German and German to English, Contacts, Writing letters and Email Writing.

Total Periods: 45

Topics for self-study areprovided in the lesson plan

TEXT BOOKS:

1. Stefanie Dengler, Paul Rusch, Helen Schmitz, Tana Sieber, *NetzwerkDeutsch als Fremdsprache, Kursbuch A1*, Goyal Publishers and Distributors Pvt. Ltd. 2015.
2. Stefanie Dengler, Paul Rusch, Helen Schmitz, Tana Sieber, *Netzwerk Deutsch als Fremdsprache, Arbeitsbuch A1*, Goyal Publishers and Distributors Pvt. Ltd. 2015.

WEB LINK:

- https://learngerman.dw.com/en/beginners/c-36519789

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						

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

III B.Tech. – I Semester

(20BT4HS08) INDIAN HISTORY

(Open Elective - 1)

(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; Ancient India; Classical and Medieval era; Modern India; India after independence.

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

CO1. Demonstrate contextual knowledge in evolution of ancient and medieval Indian History and acquire awareness on societal and cultural transformation.

CO2. Analyze the situations before and after Independence and assess the societal reforms implemented in India after Independence.

CO3. Practice culture transformations and appreciate its influence to adapt themselves in global scenario.

DETAILED SYLLABUS:

UNIT- I: INTRODUCTION TO INDIAN HISTORY (8 Periods)

Elements of Indian History; History Sources: Archaeology, Numismatics, Epigraphy & Archival research; Methods used in History; History & historiography; sociological concepts-structure, system, organization, social institutions, Culture and social stratification (caste, class, gender, power), State& Civil Society.

UNIT- II: ANCIENT INDIA (9 Periods)

Mohenjo-Daro civilization; Harappa civilization; Mauryan Empire.

UNIT- III: CLASSICAL & MEDIEVAL ERA (12 Periods)

Classic Era (200 BC - 1200 AD); Hindu - Islamic Era (1200 - 1800 AD).

UNIT- IV: MODERN INDIA (6 Periods)

Age of Colonialism (17th - 19th centuries); First war of Indian Independence; Freedom Struggle (1857-1947)

UNIT-V: INDIA AFTER INDEPENDENCE (1947 -) (10 Periods)

The Evolution of the Constitution and Main Provisions; Consolidation of India as a Nation; Politics in the States; Indian economy; Modernization and globalization, Secularism and communalism, Nature of development, Processes of social exclusion and inclusion, Changing Nature of work and organization.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOK:

1. K. Krishna Reddy, *Indian History,* Tata McGraw-Hill, 21st reprint, 2017.

REFERENCE BOOKS:

1. Guha, Ramachandra, *India after Gandhi*, Pan Macmillan, 2007.
2. Romila Thapar, *Early India*, Penguin India, New Delhi 2002.

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										
CO2	1	2				1										
CO3	1	1				2										

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

III B.Tech. – I Semester

(20BT4HS10) PERSONALITY DEVELOPMENT

(Open Elective - 1)

(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: Personalities and Leadership Qualities; Self Esteem and self-Development; Attitude; Communication Relationship; Critical Work Skills and Ethics.

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

CO1. Demonstrate knowledge of leadership qualities by examining and applying personality traits.

CO2. Analyze and apply the proven techniques to build self-esteem and self-confidence.

CO3. Analyze the limitations of attitudes by demonstrating how experiences andcircumstances impact attitudes.

CO4. Analyze the role of communication in relationships, qualities of a team player and leadership styles.

CO5. Apply appropriate techniques in solving problems by examining and demonstrating time management, stress management and anger management.

DETAILED SYLLABUS:

UNIT-I: PERSONALITIES AND LEADERSHIP QUALITIES (9 Periods)

Introduction: Different Personalities -Personality Analysis -Freudian Analysis - Vedantic Concept: Swamy Vivekananda -Personality Begets - Types - Leadership Qualities - Decision Making**-** Case Studies: Personalities.

UNIT-II: SELF ESTEEM AND SELF DEVELOPMENT (9 Periods)

Know Yourself: Self Image - Positive Self-Esteem - Turn Failure into Success - Be Sensitive to Feedback - Build Self-Confidence - Self Actualization - Set Goals - Action Plans - Accountability - Behavior Modification - Mentoring - Learning - Counseling - Challenge yourself with Aptitude Tests and Internships.

UNIT-III: ATTITUDE (9 Periods)

Importance - Difference between Behavior and Attitude - Changing Negative Attitude- Impact of Attitudes on others - Unproductive Attitudes -Assess your Behaviour.

UNIT-IV: COMMUNICATIONRELATIONSHIP (9 Periods)

Introduction - Positive and Negative Traits - Grapevine Communication - Open Communication; Team Player - Leadership styles -Performance Evaluations - Electronic

Communication; Text Messaging - Voicemail - E-Mail.

UNIT-V: CRITICAL WORK SKILLS AND ETHICS (9 Periods)

Time Management - Balancing Life and Work - Stress Management - Anger Management - Making Decisions and Solving Problems - Developing Creativity - Ethics and Self-Righteousness - Being Judgmental in the Real World - Striving for Integrity.

Total Periods: 45

Topics for self-study areprovided in the lesson plan

TEXT BOOKS:

1. Barun K. Mitra, *Personality Development and Soft Skills,* Oxford University Press, 2011.
2. Harold R. Wallace and L. Ann Masters, *Personal Development for Life and Work*, Cengage Learning, Delhi, 10th edition Indian Reprint, 2011. (6th Indian Reprint 2015)

REFERENCE BOOKS:

1. K. Alex, *Soft Skills*, S. Chand & Company Ltd, New Delhi, 2nd Revised Edition 2011.
2. Stephen P. Robbins and Timothy A. Judge*, Organizational Behaviour*, Prentice Hall, Delhi, 16th edition 2014.

ADDITIONAL LEARNING RESOURCES:

- https://www.universalclass.com/.../the-process-of-perso...
- https://www.ncbi.nlm.nih.gov/pubmed/25545842

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					1						
CO2	1	3			3					1						
CO3	1	2			3					2						
CO4	1	2			1				2	3						
CO5	1	1			2					3						

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

III B.Tech. – I Semester

(20BT4HS12) WOMEN EMPOWERMENT

(Open Elective - 1)

(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: Concept & Framework, Status of Women, Women's Right to work, International Women's Decade, and Women Entrepreneurship.

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

CO1. Demonstrate the knowledge of the characteristics and achievements of empowered women and women's empowerment techniques by analyzing women's legal and political status.

CO2. Apply the knowledge of women's rights by analyzing various societal issues and obstacles in different fields, including science and technology.

CO3. Demonstrate the knowledge of significance of women's participation in policy debates, National conferences, and common forums for equality and development by identifying and analyzing issues.

CO4. Analyze the concept of women's entrepreneurship, government schemes, and entrepreneurial challenges and opportunities.

DETAILED SYLLABUS:

UNIT- I: CONCEPT & FRAMEWORK (9 Periods)

Introduction– Empowered Women's Characteristics – Achievements of Women's Empowerment **Concept of Empowerment:** Meaning & Concept – Generalizations about Empowerment – Empowerment Propositions – Choices women can make for empowerment – Women's participation in decision making, development process & in Governance. **Framework for Empowerment** – Five levels of equality – Tenets of Empowerment– Elements – Phases and aspects – Techniques – Categories and Models – Approaches.

UNIT- II: STATUS OF WOMEN (9 Periods)

Legal Status: Present Scenario – Call for Social change – Significant trends – Legal & Schemes – Personal Law – Joint Family – Criminal Law – Shift towards Dowry – Deterrent Punishment – Criminal Law (II Amendment) – Discrimination in Employment.

Political Status: Present Scenario – Political Participation & its Nature – Socio–economic Characteristics – Political Mobilization: Mass Media – Campaign Exposure – Group Orientation – Awareness of issues and participation – Progress & Future Thrust.

UNIT - III: WOMEN'S RIGHT TO WORK (9 Periods)

Introduction – Present Scenario – Changes in Policy & Programme – National Plan of

Action– Women's Cells and Bureau – Increase in work participation rate – Discrimination in labour market – Women in unorganized sector – Issues and Obstacles– Women in Education – Women in Science & Technology – **Case Study:** Linking Education to Women's Access to resources.

UNIT - IV: WOMEN'S PARTICIPATORY DEVELOPMENT (9 Periods)

Dynamics of social change – conscious participation – Information Explosion – Organized Articulation – National Conference – Common Forums – Participatory Development – New Issues Identified – Role of other Institutions.

UNIT - V: WOMEN ENTREPRENEURSHIP (9 Periods)

Introduction – Definition – Concept – Traits of women Entrepreneurs – Role of women Entrepreneurs in India – Reasons of Women Entrepreneurship – Government schemes & Financial Institutions to develop Women Entrepreneurs – Key policy recommendations – Project Planning – Suggestions and measures to strengthen women entrepreneurship – Growth & Future challenges – Training and Opportunities – **Case Study:** Training Women as Hand–pump Mechanics– **CaseStudy**: Literacy for Empowering Craftswomen.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. SahaySushama,*Women and Empowerment.* Discovery Publishing House, New Delhi, 2013.
2. NayakSarojini, Jeevan Nair,*Women's Empowerment in India*. Pointer Publishers, Jaipur, 2017.

REFERENCE BOOKS:

1. Baluchamy. S,*Women's Empowerment of Women*. Pointer Publishers, Jaipur, 2010.
2. Khobragade Grishma,*Women's Empowerment: Challenges and Strategies Empowering Indian Women*, Booksclinic Publishing, Chhattisgarh, 2020.
3. https://www.economicsdiscussion.net/entrepreneurship/women–entrepreneurs–in–india
4. https://www.businessmanagementideas.com/entrepreneurship–2/women–entrepreneurs

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

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

III B.Tech. – I Semester

(20BT40205) RELIABILITY AND SAFETY ENGINEERING

(Open Elective - 1)

(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: Courses on "Differential Equations and Multivariable Calculus", "Transformation Techniques and Linear Algebra"

COURSE DESCRIPTION: Fundamentals of reliability engineering; Network modelling and reliability evaluation; Markov chain and Markov processes; basics of safety concepts and safety techniques and applications.

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

CO1. Develop mathematical model of a network to evaluate the parameters for assessing the reliability of a system.

CO2. Analyze the time dependent/independent characteristics of a repairable system and frequency durations techniques to assess reliability.

CO3. Understand various safety management, policy, and planning strategies for personal and industrial safety.

CO4. Understand various safety and hazard identification techniques and follow appropriate safety measures in industry and society.

DETAILED SYLLABUS:

UNIT-I: FUNDAMENTALS OF RELIABILITY ENGINEERING (9 periods)

Random variables, probability concepts, rules for probabilities of events. Probability density and distribution functions. Binomial distribution - Expected value and standard deviation for binomial distribution. Reliability functions, f(t), F(t), h(t) - Relationship between these functions, Exponential density and distribution functions, expected value and standard deviation of exponential distribution. Measures of reliability - MTTF, MTTR, MTBF. Bathtub curve.

UNIT-II: NETWORK MODELING AND RELIABILITY EVALUATION (9 periods)

Basic concepts - Evaluation of network reliability/unreliability, series systems, parallel systems, series - Parallel configuration systems. Redundant systems and its types. Evaluation of network Reliability / Unreliability using conditional probability method, tie-set and cut-set based approach, complete event tree and reduced event tree methods.

UNIT-III: MARKOV CHAIN AND MARKOV PROCESSES (9 periods)

Basic concepts, stochastic transitional Probability matrix, time dependent probability evaluation, Limiting State Probability evaluation, Absorbing states. Modelling concepts – State space diagrams, time dependent reliability evaluation of single component repairable model, two component repairable model. Frequency and duration techniques.

UNIT-IV: BASICS OF SAFETY CONCEPTS (9 periods)

Introduction, goals, need for safety, history of safety movement - evolution of modern safety concept, general concepts of safety management. Planning for safety-productivity, quality and safety, line and staff functions, budgeting for safety, safety policy.

UNIT-V: SAFETY TECHNIQUES AND APPLICATIONS (9 periods)

Introduction to safety techniques, Incident Recall Technique (IRT), disaster control, job safety analysis, safety survey, safety inspection, safety sampling, evaluation of performance of supervisors on safety. Hazard identification techniques, components of safety audit, types of audit, audit methodology, process of safety reporting. Applications of industrial Safety, environmental safety, health safety, electrical safety, fire safety.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Roy Billintonand Ronald N Allen, *Reliability Evaluation of Engineering Systems*, 2nd edition, Springer, New York, 2013.
2. Frank R. Spellman, Nancy E. Whiting, *Safety Engineering: Principles and Practices*,3rd edition, Rowman& Littlefield, 2018.

REFERENCE BOOKS:

1. Charles E. Ebeling, *An introduction to reliability and maintainability engineering*,2nd edition Tata McGraw-Hill Education, 2010.
2. Dan Petersen, *Techniques of Safety Management: A Systems Approach*, 4th edition,American society of safety engineers, 2003.

ADDITIONAL LEARNING RESOURCES:

1. https://nptel.ac.in/courses/105/108/105108128/
2. https://nptel.ac.in/courses/110/105/110105094/
3. https://www.youtube.com/watch?v=uutg8jKrL9w
4. https://www.youtube.com/watch?v=_c-iZ2BAXPw
5. https://www.youtube.com/watch?v=GeMCF3s5EDk
6. https://www.youtube.com/watch?v=xYWyype7cxE

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

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

III B.Tech. – I Semester

(20BT40105) ENVIRONMENTAL POLLUTION AND CONTROL

(Open Elective - 1)

(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: Fundamentals of air pollution; Dispersion of pollutants; Effects and control of air pollution; Water pollution; Soil pollution and control; Municipal solid waste management.

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

CO1. Analyze air and noise pollution using appropriate tools and techniques to solve complex environmental issues following relevant standards considering society, environment and sustainability besides communicating effectively in graphical form.

CO2. Analyze air and noise pollution control measures using appropriate tools and techniques to solve complex environmental issues following relevant standards and latest developments considering society, environment and sustainability besides communicating effectively in graphical form.

CO3. Analyze water pollution and its control measures using appropriate tools and techniques to solve complex environmental issues following relevant standards and latest developments considering society, environment and sustainability besides communicating effectively in graphical form.

CO4. Analyze soil pollution and its control measures using appropriate tools and techniques to solve complex environmental issues following relevant standards and latest developments considering society, environment and sustainability besides communicating effectively in graphical form.

CO5. Analyze solid waste and its management measures using appropriate tools and techniques to solve solid waste disposal issues following relevant standards and latest developments considering society, environment and sustainability besides communicating effectively in graphical form.

DETAILED SYLLABUS:

UNIT – I: AIR AND NOISE POLLUTION (08 Periods)

Air Pollution: Scope, Significance, Classification, Sources – Line, Area, Stationary, Mobile; Effects of air pollutants on man, material and vegetation; Global effects of air pollution; Air pollution meteorology - Lapse rate, Inversion, Plume pattern; Dispersion of air pollutants - Dispersion models and applications; Ambient air quality standards.

Noise Pollution: Sound pressure, Power and intensity, Impacts of noise, permissible limits of noise pollution, measurement of noise, Noise standards.

UNIT – II: AIR AND NOISE POLLUTION CONTROL (10 Periods)

Self cleansing properties of the environment,Dilution method, Control at source, Process changes and equipment modifications, Control of particulates – Types of equipment, Design and operation - Settling chambers, Centrifugal separators, Bag house filters, Wet scrubbers, Electrostatic precipitators; Control of gaseous pollutants – Adsorption, Absorption, Condensation, Combustion; Control of air pollution from automobiles, Control of noise pollution, Case studies, Latest developments in the air and noise pollution control.

UNIT – III: WATER POLLUTION AND CONTROL (10 Periods)

Water pollution – Sources, Causes, Effects; Surface and groundwater quality – Physical, Chemical, Biological; Drinking water quality standards, Water purification – Processes, Engineered systems – Aeration, Solids separation, Settling operations, Coagulation, Softening, Filtration, Disinfection; Wastewater – Sources, Causes, Effects, Treatment process and disposal – Primary, Secondary, Tertiary; Case studies, Latest developments in the water pollution control.

UNIT – IV: SOIL POLLUTION AND CONTROL (08 Periods)

Soil pollutants, Sources of soil pollution, Causes, Effects and control of soil pollution, Diseases caused by soil pollution, Methods to minimize soil pollution, Effective measures to control soil pollution, Soil quality standards, Case studies, Latest developments in the soil pollution control.

UNIT – V: MUNICIPAL SOLID WASTE MANAGEMENT (09 Periods)

Municipal solid waste – Types, Composition and characteristics; Methods of collection and transportation; Methods of disposal – Open dumping, Sanitary landfill, Composting and Incineration; Utilization - 6R Concept, Recovery and recycling and Energy Recovery; Latest developments in solid waste management.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Peavy, H. S, Rowe, D. R., and Tchobanoglous, G., *Environmental Engineering*, McGraw Hill Inc., 1985.
2. Rao, C.S.*Environmental Pollution Control Engineering*, New Age International Pvt. Ltd., 2nd Edition, 2007.
3. Ibrahim A. Mirsa, *Soil Pollution: Origin, Monitoring & Remediation*, Springer, UK, 2nd Edition, 2008.

REFERENCE BOOKS:

1. Rao, M.N. and Rao, H.V.N.,*Air Pollution,* Tata McGraw–Hill Education Pvt. Ltd., 19th Edition, 2010.
2. Daniel Vallero, *Fundamentals of Air Pollution,* Academic Press (Elsevier), 5th Edition, 2014.
3. Khopkar,S.M., *Environmental Pollution Monitoring and Control,* New Age International Pvt. Ltd., 2nd Edition, 2007.

4. Domkundwar, V. M., *Environmental Engineering*, Dhanpat Rai & Co. Pvt. Ltd., New Delhi, 2014.

ADDITIONAL LEARNING RESOURCES:

1. *National Ambient Air Quality Standards*, Central Pollution Control Board, New Delhi
2. *Specifications for Drinking Water Standards*, IS10500:2012
3. *Solid Waste Management Rules*, 2016

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	3	2		1						
CO2	3	3		2	2	2	2	1		1		1				
CO3	3	3		2	2	2	2	1		1		1				
CO4	3	3		2	2	2	2	2		1		1				
CO5	3	3		2	2	2	2	1		1	2	1				

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

III B.Tech. – I Semester

(20BT40106) PLANNING FOR SUSTAINABLE DEVELOPMENT

(Open Elective - 1)

(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: Sustainable development; Environmental impact; Sustainable Policies; Governance; Theories and strategies; Media and education for sustainability.

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

CO1. Compare sustainable development theories in national and global context to protect the society and environment.

CO2. Analyze the unforeseen environmental impacts on sustainable development to protect the society and environment.

CO3. Analyze policies and governance for sustainable development considering ethics, economics, society and environment.

CO4. Analyze systems and strategies for sustainable development using appropriate tools and techniques considering ethics, economics, society and environment.

CO5. Analyze the role of media and education in sustainable development using appropriate tools and techniques considering ethics, society and environment besides communicating effectively.

DETAILED SYLLABUS:

UNIT– I: SUSTAINABLE DEVELOPMENT (09 Periods)

Definition and concepts of sustainable development, Capitalization of sustainability-National and global context; Sustainable development goals, Emergence and evolution of sustainability and sustainable development, Theories of sustainability, Case studies.

UNIT –II: ENVIRONMENTAL IMPACT (09 Periods)

Climate change – Science, Knowledge and sustainability; Unforeseen environmental impacts on development, Challenges of sustainable development, Centrality of resources in sustainable development, Case studies.

UNIT– III: SUSTAINABLE POLICIES AND GOVERNANCE (09 Periods)

Governance - Democracy and Eco–welfare; Global civil society and world civil politics, Civic environmentalism, Policy responses to sustainable development, Economics of sustainability, Social responsibility in sustainability, National action, ISO 14001: Environmental management system.

UNIT– IV: SUSTAINABLE SYSTEMS AND STRATAGIES (09 Periods)

Need for system innovation, Transition and co–evolution, Theories and methods for sustainable development, Strategies for eco–innovation, Ecological foot print analysis, Socio ecological indicators – Eco labels; Policy programmes for system innovation, Case studies.

UNIT –V: MEDIA AND EDUCATION FOR SUSTAINABILITY (09 Periods)

Role of emerging media, Remarkable design and communication art, Activism and the public interest, Education for sustainability, Participation in decision making, Critical thinking and reflection, Case studies.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. John Blewitt, *Understanding Sustainable Development*, Earth Scan Publications Ltd., 3rd Edition, 2018.
2. Jennifer A. Elliot, *An Introduction to Sustainable Development*, Routledge, 4th Edition, 2013.

REFERENCE BOOKS:

1. Peter Rogers, Kazi F Jalal and John A Boyd, *An Introduction to Sustainable Development*, Earth Scan Publications Ltd., 2008.
2. Simon Dresner, *The Principles of Sustainability*, Earth Scan Publications Ltd., 2nd Edition, 2008.
3. Peter Bartelmus, *Environment Growth and Development: The Concepts and Strategies of Sustainability*, Routledge, 3rd Edition, 2003.
4. Gabriel Moser, Enric Pol, Yvonne Bernard, MiriliaBonnes, Jose Antonio Corraliza and Maria Vittoria Giuliani, *People Places and Sustainability*, Hogrefe& Huber Publishers, 2nd Edition, 2003.

ADDITIONAL LEARNING RESOURCES:

1. Anil Markandya, *Climate Change and Sustainable Development: Prospects for Developing Countries*, Routledge, 2002

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	2	3									
CO2	3	3				3	3									
CO3	3	3				2	1	1			1					
CO4	3	3			1	2	1	1			1					
CO5	2	2			2	2	1	1		2						

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

III B.Tech. – I Semester

(20BT40107) RURAL TECHNOLOGY

(Open Elective - 1)

(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: Technology forrural development; Non-conventional energy; Technologies for rural development; Community development; IT in rural development.

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

CO1. Compare various technologies for rural development by solving rural problems through different schemes by considering ethics, society, environment and sustainability.

CO2. Analyze non conventional energy sources using appropriate tools and techniques to solve rural energy problems considering society, environment and sustainability besides communicating effectively in graphical form.

CO3. Select appropriate technologies in different areas of rural development to solve rural issues following latest developments considering society, environment and sustainability.

CO4. Relate water conservation, health, safety and rural employment issues for community development to solve rural problems through appropriate technologies considering ethics, society, environment and sustainability.

CO5. Analyze the impact of IT, public and private partnership on rural development to solve complex rural problems using appropriate tools and techniques considering ethics, society, environment and sustainability.

DETAILED SYLLABUS:

UNIT–I:TECHNOLOGY FOR RURAL DEVLOPMENT (09 Periods)

India - Technology and rural development, Pre and post independence period,Rural India Life, Indian farmer, Role of science and technology in rural development, Rural technology and poverty eradication, Rural business hubs, Technology in improving rural infrastructure, Various organizations related to innovation, Issues of technology transfer - CAPART, NABARD, CSIR, NIF.

UNIT–II: NON CONVENTIONAL ENERGY (09 Periods)

Definition of energy, Types of alternative sources of energy, Sources of non conventional energy – Solar energy: Solar pump in agriculture, Solar dryer, Solar cooker, Solar heater; Biogas, Recycling and management, Wastes conservation, Assessment and production of biomass products and their utilization.

UNIT –III: TECHNOLOGIES FOR RURAL DEVELOPMENT (09 Periods)

Food and agro based technologies, Tissue culture, Nursery, Building and construction technologies, Cultivation and processing of economic plants, Cottage and social industries, Latest developments in rural technologies.

UNIT–IV: COMMUNITY DEVELOPMENT (09 Periods)

Water conservation, Rain water Harvesting, Drinking water Standards and simple treatments used, Environment and Sanitation, Bio fertilizers, Medical and aromatic plants, Employment generating technologies–Apiculture, Pisciculture, Aquaculture.

UNIT – V:IT IN RURAL DEVELOPMENT (09 Periods)

Role of information technology (IT) in rural areas, Impact of IT in rural development, Need and necessity of technology, Corporate social responsibilities, Private sector participation(Activities in different spheres: Employment, Education, Health, Agriculture and service sectors) and Saansad Adarsh Gram Yojana (SAGY), Village adoption schemes.

Total Periods: *45*

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Prabhath, S. V., and Sita Devi, P. Ch., *Technology and Rural India*, Serials Publications, 1st Edition, 2012.
2. Virdi, M. S.,*Sustainable Rural Technologies*, Daya Publishing House, 2ndEdition 2018.
3. Chakravarthy, R., and Murthy, P. R. S., *Information Technology and Rural Development*, Pacific Book International, 1st Edition, 2012.

REFERENCE BOOKS:

1. Chakravarthy, R., and Murthy, P. R. S., *Information Technology and Rural Development*, Pacific Book International, 1st Edition, 2012.
2. Shivakanth Singh, *Rural Development Policies and Programmes*, Northern Book Centre, 1st Edition, 2002.
3. Katar Singh and Anil Shishodia*, Rural Development: Principles, Policies, and Management,* SAGE Publications India Private Limited, 4thEdition, 2016.
4. Vinayak Reddy,A., YadagiraCharyulu,M., *Rural Development in India: Policies & Initiatives,* New Century Publications, 1st Edition, 2008.

ADDITIONAL LEARNING RESOURCES:

1. Prasad,L. M., *Principles and Practice of Management*, S. Chand & Sons, 9thEdition, 2019.
2. Venkata Reddy, K., *Agriculture and Rural Development - Gandhian Perspective*, Himalaya Publishing House, 1st 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	2	3		3	2	1	1	1								
CO2	2	3		2	2	1	1			1						
CO3	2	3		2	2	1	1					1				
CO4	2	3		2	2	1	2	1								
CO5	2	3		3	2	1	1	1								

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

III B.Tech. – I Semester

(20BT40305) HUMAN RESOURCE MANAGEMENT

(Open Elective - 1)

(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 HRM; recruitment, training and Placement, talent management; Basic types of interviews; Components; Compensation and reward administration;Ethics, Employee Relations, and Fair Treatment at Work, Dispute resolution and grievance management, trade unions andtheir role in collective bargaining;

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

CO1. Demonstrate the knowledge of concepts and perspective on HRM.

CO2. Demonstrate the knowledge of recruitment, placement and talent management.

CO3. Demonstrate the knowledge of training and development.

CO4. Demonstrate the knowledge of compensation and reward administration.

CO5. Demonstrate the knowledge of ethics, and employee relations.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO HUMAN RESOURCE MANAGEMENT (9 Periods)

Importance of Human Resource Management (HRM), Concepts and perspective on HRM,Role of HRM in a competitive business environment, Environment affecting HRM at the enterprise level, The trends shaping HRM, HR metrics and benchmarking, HR accounting, inventory and information systems.

UNIT-II: RECRUITMENT, PLACEMENT, AND TALENT MANAGEMENT (9 Periods)

HR planning and job analysis, Employee testing and selection, Basic types of interviews, Placement, induction and socialization of the employees, Talent acquisition, talent management.

UNIT-III: TRAINING AND DEVELOPMENT (9 Periods)

Employee Orientation/Onboarding,Appraising employee performance and potential evaluation, Techniques for appraising performance,Managing Employee Retention, Engagement, and Careers, Human Resource Development (HRD).

UNIT-IV: COMPENSATION (8 Periods)

Compensation and reward administration, Basic factors in determining pay rates, Job evaluation methods, Pay for Performance and Financial Incentives, Employee benefits and services.

UNIT-V: ENRICHMENT TOPICS IN HRM (10 Periods)

Ethics, Employee Relations, and Fair Treatment at Work, Dispute resolution and grievance management, trade unions andtheir role in collective bargaining, Employee Safety and Health, Global Challenges in HRM, Managing Human Resources in Small and Entrepreneurial Firms, Business environment and workforce adjustments, Creating high performance systems,Innovations in HRM.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Garry Dessler and BijuVarkkey, *Human Resource Management*, Pearson education,16th Edition, 2020.
2. Aswathappa K, *Human Resource Management*, McGraw Hill Education,8thEdition, 2017.

REFERENCE BOOKS:

1. V.S.P Rao, *Human Resource Management*, Taxmann Publications Pvt. Ltd, 2ndEdition 2020.
2. BohlanderGeorge W, Snell Scott, *Principles of Human Resource Management*, Cengage Learning, 16th edition,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	1									1					
CO2	3	1														
CO3	3	1														
CO4	3	1									1					
CO5	3	1						1								

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

III B.Tech. – I Semester

(20BT50506) ETHICAL HACKING

(Open Elective - 1)

(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: Ethical hacking, Network and computer attacks, Footprinting, Social engineering, Port scanning, System hacking, Sniffers, Denial of service, Hacking web servers, Wireless hacking, Cryptography, Network Protection System.

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

CO1. Demonstrate knowledge on the computer security, social engineering and the intent of ethical hacking.

CO2. Select and apply footprinting and port scanning tools to discover vulnerabilities of the computer system.

CO3. Investigate hacking techniques and tools to maintain computer security.

CO4. Analyze cryptosystems and network protection systems for information security and intrusion prevention.

DETAILED SYLLABUS:

UNIT-I: ETHICAL HACKING, NETWORK AND COMPUTER ATTACKS (9 Periods)

Introduction to Ethical Hacking: The role of security and penetration testers, Penetration-Testing methodologies, What you can and cannot do legally.

Network and Computer Attacks: Malicious software, Trojans, Backdoors, Viruses, and Worms, Protection against malware attacks, Intruder attacks on networks and computers, Addressing physical security.

UNIT–II:TCP/IP CONCEPTS AND SOCIAL ENGINEERING (9 Periods)

TCP/IP Concepts: Overview of TCP/IP – Application layer, Transport layer, Internet layer; IP addressing – Planning IP address assignments, IPv6 addressing.

Social Engineering: What is social engineering, What are the common types of attacks, Understand insider attacks, Understand identity theft, Describe phishing attacks, Understand online scams, Understand URL obfuscation, Social engineering countermeasures.

UNIT-III: FOOTPRINTING ANDPORT SCANNING (9 Periods)

Footprinting: Using web tools for footprinting, Conducting competitive intelligence, Using domain name system zone transfers.

Port Scanning: Port scanning, Using port scanning tools, Conducting ping sweeps, Understanding scripting.

UNIT-IV: SYSTEM HACKING (9 Periods)

System hacking -Password cracking techniques, Types of passwords, Key loggers and other spyware technologies, Escalating privileges, Root kits, How to hide files, Steganography technologies, How to cover your tracks and evidences; Sniffers - Protocols susceptible to sniffing, Active and passive sniffing, ARP poisoning, Ethereal capture and display filters, MAC flooding, DNS spoofing techniques, Sniffing countermeasures; Denial of Service - Types of DoS attacks, How DDoS attacks work, How BOTs/BOTNETs work, Smurf attack, SYN flooding, DoS/DDoS counter measures; Session hijacking - Spoofing vs. hijacking, Types of session hijacking, Sequence prediction, Steps in performing session hijacking, Preventing session hijacking.

UNIT-V: CRYPTOGRAPHY, NETWORK PROTECTION SYSTEMS (9 Periods)

Cryptography: Understanding Cryptography basics, Symmetric and asymmetric algorithms, Public key infrastructure, Cryptography attacks.

Network Protection Systems: Understanding routers, Firewalls, Honeypots.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Michael T. Simpson, Kent Backman, James E. Corley, *Hands-On Ethical Hacking and Network Defense*, 3rd Edition, Cengage Learning, 2017.
2. Kimberly Graves, *CEH: Official Certified Ethical Hacker Review Guide*, Wiley, 2007.

REFERENCE BOOK:

1. Michael Gregg, *Certified Ethical Hacker (CEH) Cert guide*,3rd Edition, Pearson, 2019.

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	3				3											
CO3	3				3											
CO4	3	2														

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

III B.Tech. – I Semester

(20BT51205) AI IN HEALTHCARE

(Open Elective - 1)

(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 Artificial Intelligence (AI) in Healthcare; The Present State and Future of AI in Healthcare Specialties;The Role of Major Corporations in AI in Healthcare;Applications of AI in Healthcare.

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

CO1. Understand the fundamental concepts of AI in Healthcare sector.

CO2. Analyze the present state and future of AI in Healthcare specialties for different scenarios.

CO3. Apply design concepts and metrics for AI in Healthcare.

CO4. Demonstrate basic concepts and terminologies of future applications of Healthcare in AI.

CO5. Develop AI applications through AI techniques for healthcare.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO ARTIFICIAL INTELLIGENCE IN HEALTHCARE (8 periods)

Introduction to AI in Healthcare, Benefits and Risks, AI in the health sector, AI versus Human Intelligence, The future of AI in health sector, AI and Neural networks.

UNIT-II: THE PRESENT STATE AND FUTURE OF AI IN HEALTHCARE SPECIALTIES (10 periods)

Artificial Intelligence in: preventive healthcare, Radiology, Pathology, Surgery, Anesthesiology, Psychiatry, Cardiology, Pharmacy, Dermatology, Dentistry, Orthopedics, Ophthalmology.

UNIT-III: THE ROLE OF MAJOR CORPORATIONS IN AI IN HEALTHCARE (8 periods)

IBM Watson, The role of Google and Deep mind in AI in Healthcare, Baidu, Facebook and AI in Healthcare, Microsoft and AI in Healthcare.

UNIT-IV: FUTURE OF HEALTHCARE IN AI (10 periods)

Evidence-based medicine, personalized medicine, Connected medicine,Disease and Condition Management, Virtual Assistants, Remote Monitoring, Medication Adherence, Accessible Diagnostic Tests, Smart Implantables, Digital Health and Therapeutics,

Education, Incentivized Wellness, Artificial Intelligence, Block chain, Robots, Robot-Assisted Surgery, Exoskeletons, Inpatient Care, Companions, Drones, Smart Places, Smart Homes, Smart Hospitals, Reductionism, Innovation vs. Deliberation.

UNIT-V: APPLICATIONS OF AI IN HEALTHCARE (9 periods)

Case Study 1: AI for Imaging of Diabetic Foot Concerns and Prioritization of Referral for Improvements in Morbidity and Mortality.

Case Study2: Outcomes of a Digitally Delivered, Low-Carbohydrate, Type 2 Diabetes Self-Management.

Case Study3: Delivering a Scalable and Engaging Digital Therapy.

Case Study4: Improving Learning Outcomes for Junior Doctors through the Novel Use of Augmented and Virtual Reality for Epilepsy

Case Study5: Big Data, Big Impact, Big Ethics-Diagnosing DiseaseRisk from Patient Data.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Dr. Parag Mahajan, *Artificial Intelligence in Healthcare, MedManthra Publications*, First Edition 2019.
2. *Arjun Panesar, Machine Learning and AI for Healthcare Big Data for Improved Health*, Apress Publications, 2019.

REFERENCE BOOKS:

1. Michael Matheny, SonooThadaneyIsrani, Mahnoor Ahmed, and Danielle Whicher,*Artificial Intelligence in Health Care: The Hope, the Hype, the Promise, the Peril*, National Academy of Medicine Publication, First Edition, 2019.

ADDITIONAL LEARNING RESOURCES:

1. https://www.udacity.com/course/ai-for-healthcare-nanodegree--nd320
   (AI for Healthcare)
2. https://builtin.com/artificial-intelligence/artificial-intelligence-healthcare
   (Surgical robots, new medicines and better care: 32 examples of AI in healthcare)
3. https://healthtechmagazine.net/article/2020/02/future-artificial-intelligence-healthcare (Future of Artificial Intelligence in Healthcare)

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		2									
CO4	3					2	2									
CO5	3						2									

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

III B.Tech. – I Semester

(20BT51501) BIOINFORMATICS

(Open Elective - 1)

(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: Biological Data Acquisition, Databases, Data Processing, Methods of Analysis, Applications of Bio-informatics

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

CO1. Understand basic biological data acquisition in bioinformatics.

CO2. Identify the proper databases for the information search by choosing the biological databases and also submission and retrieval of data from databases.

CO3. Analyze the results of bioinformatics data using text and sequence-based searching techniques.

CO4. Analyze the secondary and tertiary structures of proteins by applying different alignment programs

CO5. Design biological databases and novel drugs by using contextual knowledge on bioinformatics.

DETAILED SYLLABUS:

UNIT-I: BIOLOGICAL DATA ACQUISITION (9 Periods)

Biological information, Retrieval methods for DNA sequence, protein sequence and protein structure information

UNIT-II: DATABASES (9 Periods)

Format and Annotation: Conventions for database indexing and specification of search terms, Common sequence file formats. Annotated sequence databases - primary and secondary sequence databases, protein sequence and structure databases.

UNIT-III: DATA PROCESSING (9 Periods)

Data – Access, Retrieval and Submission: Standard search engines; Data retrieval tools – Entrez, DBGET and SRS; Submission of (new and revised) data; Sequence Similarity Searches: Local and global. Distance metrics. Similarity and homology. Scoring matrices, PAM and BLOSUM

UNIT-IV: METHODS OF ANALYSIS (9 Periods)

Dynamic programming algorithms, Needleman-Wunsch and Smith-waterman. Heuristic Methods of sequence alignment, FASTA and BLAST; Multiple Sequence Alignment and software tools for pair wise and multiple sequence alignment, CLUSTAL program,

Prediction of Tertiary structure of proteins.

UNIT-V: APPLICATIONS (9 Periods)

Genome Annotation and Gene Prediction; ORF finding; Phylogenetic Analysis, Genomics, Proteomics, Genome analysis – Genome annotation, DNA Microarray, computer aided drug design (CADD).

Total Periods: 45

Topics for self-study are provided in lesson plan

TEXT BOOKS:

1. Lesk, A. K., "*Introduction to Bioinformatics*", 4th Edition, Oxford University Press, 2013
2. Dan Gusfield, "*Algorithms on Strings, Trees and Sequences: Computer Science and Computational Biology*", Cambridge University Press, 1997.

REFERENCE BOOKS:

1. Baldi, P. and Brunak, S., "*Bioinformatics: The Machine Learning Approach*", 2nd Edition, MIT Press. 2001.
2. Mount, D.W., "*Bioinformatics Sequence and Genome Analysis*", 2nd Edition, Cold Spring Harbor Laboratory Press, 2004.
3. Tindall, J., "*Beginning Perl for Bioinformatics: An introduction to Perl for Biologists*", 1st Edition, O'Reilly Media, 2001.

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	2	3														
CO3	2	3			2											
CO4	2	3														
CO5	3	2	3													

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

III B. Tech. – I Semester
(20BT51204) LINUX PROGRAMMING

(Professional Elective - 1)

(Common to CSE and IT)

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

PRE-REQUISITES: A Course on "Operating Systems"

COURSE DESCRIPTION: Concepts on Linux Programming; Basic Commands in Linux; Shell Programming; Process, Signals and File System Structure; Inter process Communications and Socket Programming for Client-Server Interaction.

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

CO1. Demonstrate knowledge on
- Basic commands
- Program arguments
- Environment Variables

CO2. Design interactive shell scripts related to Linux Environment for solving specified computational problems.

CO3. Analyze system calls related to standard I/O library, formatted input, output, file and directory maintenance.

CO4. Apply the system calls for process management and signal handling.

CO5. Apply inter process communication and socket programming for developing client-server applications.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO LINUX AND LINUX ENVIRONMENT (10 periods)

The GNU project and the Free Software Foundation, Linux distributions, Programming Linux - Linux programs, Text editors, The C Compiler; Basic commands -- cat, tail, head , sort, nl, uniq, grep, cut, paste, join, tee, pg, comm, cmp, diff, cp, mv, ln, rm, unlink, tty, clear, date , cal, mkdir, rmdir, du, df, find, umask, ps, who, sed; Program arguments - getopt, getopt_long. Environment variables - Use of environment variables, The environ variable, Time and Date, User information, Host information.

UNIT-II: SHELL PROGRAMMING (8 periods)

Necessity of shell programming, Pipes and redirection - Redirecting output, Redirecting input, Pipes, The Shell as a programming language - Interactive programs, Creating a script, Making a script executable, Shell syntax – Variables, Conditions, Control structures, Functions, Commands, Command execution.

UNIT-III: FILE SYSTEM STRUCTURE AND SYSTEM CALLS (9 periods)

Linux File Structure and Commands: File structure - Directories, Files and devices, System calls and Device drivers; Library functions - Low-level file access, write, read and open commands, Initial permissions, Other system calls for managing files; File and directory maintenance commands - chmod, chown, unlink, link, symlink, mkdir, rmdir, chdir, getcwd.

Input-Output Commands: The standard I/O library commands - fopen, fread, fwrite, fclose, fflush, fseek, fgetc, getc, and getchar, fputc, putc and putchar, fgets and gets; Formatted input and output commands - printf, fprintf, sprintf, scanf, fscanf, sscanf.

UNIT-IV:PROCESS AND SIGNALS (9 periods)

Process structure - Process table, Viewing processes, System processes, Process scheduling; Starting new processes - Waiting for a process, Zombie processes, Input and output redirection, Threads; Signals - Sending signals, Signal sets.

UNIT-V:INTER-PROCESS COMMUNICATION AND SOCKETS (9 periods)

Inter-Process Communication: Pipe definition, Process pipes, Sending output to popen - Passing more data, popen, implementation, The pipe call; Parent and child processes - Reading closed pipes, pipes used as standard input and output; Named pipes – FIFOs, Accessing a FIFO, Client/Server using FIFOs.

Socket Connections: Socket attributes, Creating a socket, Socket addresses, Naming a socket, Creating a socket queue, Accepting connections, Requesting connections, Closing a socket, Socket communications, Host and network byte Ordering.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Neil Matthew and Richard Stones, *Beginning Linux Programming*, Wiley Dreamtech, Fourth Edition, 2008.
2. Sumitabha Das, *Your UNIX: The Ultimate Guide*, Tata McGraw-Hill, 2007.

REFERENCE BOOKS:

1. Richard Petersen, *Linux: The Complete Reference*, Tata McGraw-Hill, Six Edition, 2007.
2. Yashwanth Kanitkar, *Unix Shell programming*, BPB Publications, First Edition.

ADDITIONAL LEARNING RESOURCES:

1. https://www.howtogeek.com/412055/37-important-linux-commands-you-should-know/
2. https://maker.pro/linux/tutorial/basic-linux-commands-for-beginners

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			
CO2	2	2		3	1	1		1					3			
CO3	2	3											3			
CO4	3												3			
CO5	2	2	3	3	1	1		1					3			1

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

III B. Tech. – I Semester

(20BT43101) ARTIFICIAL INTELLIGENCE

(Professional Elective – 1)

(Common to CSE and CSE(DS))

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

PRE-REQUISITES: A Course on "Discrete Mathematical Structures"

COURSE DESCRIPTION: Introduction to artificial intelligence, Designing intelligent agents, Solving general purpose problems, Search in complex environments, Probabilistic reasoning, Represent knowledge and reason under uncertainty, Robotics, Ethics and safety in AI.

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

CO1. Architect intelligent agents using artificial intelligence techniques and principles.

CO2. Analyze and interpret the problem, identify suitable solutions using heuristic functions, optimization algorithms and search algorithms.

CO3. Select and apply appropriate knowledge representation to build Bayesian network models to reason under uncertainty.

CO4. Investigate robot hardware and frameworks for intelligent robotic perception.

CO5. Demonstrate knowledge on ethical implications of intelligent machines for providing privacy, trust, security and safety.

DETAILED SYLLABUS:

UNIT–I: INTRODUCTION TO ARTIFICIAL INTELLIGENCE (10 periods)

Foundations of artificial intelligence, History of artificial intelligence, State of the art, Risks and benefits of AI, Intelligent agents – Agents and environments, The concept of rationality, Structure of agents.

UNIT–II: PROBLEM SOLVING BY SEARCHING (9 periods)

Problem solving agents, Search algorithms, Uninformed search strategies, Informed search strategies – Greedy best-first search, A* search; Heuristic functions.

UNIT–III: SEARCH IN COMPLEX ENVIRONMENTS (9 periods)

Local search algorithms and optimization problems – Hill-climbing search, Simulated annealing, Local beam search, Evolutionary algorithms; Optimal decisions in games – The minimax search algorithm, Optimal decisions in multiplayer games, Alpha-Beta pruning, Move ordering; Monte Carlo tree search.

UNIT–IV: PROBABILISTIC REASONING (9 periods)

Representing Knowledge in an uncertain domain, Semantics of Bayesian networks, Probabilistic reasoning over time – Time and uncertainty, Inference in temporal models, Hidden Markov models, Kalman Filter.

UNIT–V: ROBOTICS, ETHICS AND SAFETY IN AI (8 periods)

Robotics: Robots, Robot hardware, Robotic perception, Alternative robotic frameworks, Application domains.

Ethics and Safety in AI: Limits of AI, Ethics of AI – Surveillance, security and privacy, Fairness and bias, Trust and transparency, AI safety.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOK:

1. Stuart Russell, Peter Norvig, *Artificial Intelligence: A Modern Approach*, Prentice Hall, 4th Edition, 2020.

REFERENCE BOOKS:

1. Stephen Lucci, Danny Kopec, *Artificial Intelligence in the 21st Century*, Mercury Learning and Information, 3rd Edition, 2018.
2. Rich, Knight, Nair, *Artificial intelligence*, Tata McGraw Hill, 3rd Edition, 2009.
3. Deepak Khemani, *A First Course in Artificial Intelligence*, McGraw Hill, 2017.
4. Saroj Kaushik, *Artificial Intelligence,* Cengage Learning, 2011.

ADDITIONAL LEARNING RESOURCES:

- https://searchenterpriseai.techtarget.com/definition/AI-Artificial-Intelligence
- http://aima.cs.berkeley.edu/
- https://ai.google/education/
- https://www.coursera.org/courses?query=artificial%20intelligence
- https://www.edureka.co/blog/artificial-intelligence-with-python/

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		
CO2	3	3	2											3		
CO3	3	3	2											3		
CO4	3					1								3		
CO5						1		2						3		

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

III B. Tech. – I Semester

(20BT50503) ADVANCED COMPUTER ARCHITECTURE

(Professional Elective - 1)

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

PRE-REQUISITES: A Course on "Computer Organization"

COURSE DESCRIPTION: Parallel computer models and network properties, Principles of scalable performance, Linear and nonlinear pipelining, Multiprocessors and multicomputers, Multi-vector and SIMD computers, Instruction level parallelism, Parallel languages and compilers, Parallel programming tools and environments.

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

CO1. Apply the knowledge of parallelism and principles of performance to assess the potential and limitations of parallel computing.

CO2. Design linear and nonlinear pipelines with collision free schedules to improve processor performance.

CO3. Analyze various shared memory organizations, cache synchronization and message passing mechanisms for implementing multiprocessor and multi computer systems.

CO4. Investigate the architectures of multiprocessors and SIMD array processors for developing high performance multivector computers.

CO5. Use appropriate parallel programming languages, compilers and environments for parallel program development.

DETAILED SYLLABUS:

UNIT–I: THEORY OF PARALLELISM (10 periods)

Parallel Computer Models: Elements of modern computers, Evolution of computer architecture, Multiprocessors and multi-com̄puters, Multi vector and SIMD computers.

Program and Network Properties: Conditions of parallelism, Program partitioning and scheduling, Program flow mechanisms, Network properties and routing, Static connection networks, Dynamic connection networks – Omega network, Baseline network.

UNIT–II: PRINCIPLES OF SCALABLE PERFORMANCE AND PIPELINING (8 periods)

Principles of Scalable Performance: System attributes to performance**,** Performance metrics and measures – Parallelism profile in programs, Mean performance, Efficiency, utilization and quality; Speedup performance laws – Amdahl's law, Gustafson's law.

Pipelining: Linear pipeline processors - Asynchronous and synchronous models,Clocking and timing control, Speedup, efficiency and throughput; Nonlinear pipeline processors - Reservation and latency analysis, Collision-free scheduling, Pipeline schedule optimization.

UNIT–III: MULTIPROCESSORS AND MULTICOMPUTERS (9 periods)

Shared Memory Organizations: Interleaved memory organization, Bandwidth and fault tolerance, Memory allocation schemes.

Cache Coherence and Synchronization Mechanisms: The cache coherence problem, Snoopy bus protocols, Directory-based protocols, Hardware synchronization mechanisms.

Message Passing Mechanisms: Message passing schemes, Deadlock virtual channels, Flow control strategies.

UNIT–IV: MULTIVECTOR AND SIMD COMPUTERS (8 periods)

Vector Processing Principles: Vector instruction types, Vector-access memory schemes.

Multivector Multiprocessors: Performance-directed design rules, Cray Y-MP, C-90, Fujitsu VP2000, Mainframes and Mini supercomputers.

SIMD Computer Organizations: Implementation models, CM-2 architecture, MasPar MP-1 architecture.

UNIT–V: INSTRUCTION LEVEL PARALLELISM AND PARALLEL PROGRAM DEVELOPMENT (10 periods)

Instruction Level Parallelism: Problem definition, Compiler-detected instruction level parallelism, Operand forwarding, Register renaming, Tomasulo's algorithm, Branch prediction, Limitations, Thread level parallelism.

Parallel Program Development: Parallel languages and compilers, Code optimization–Scalar optimization with basic blocks, Local and global optimizations, vectorization and parallelization methods; Software tools and environments for parallel programming.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOK:

1. Kai Hwang, Naresh Jotwani, *Advanced Computer Architecture*, McGraw Hill, 3rd Edition, 2015.

REFERENCE BOOKS:

1. John Hennessy, David Patterson, *Computer Architecture: A Quantitative Approach,* Morgan Kaufmann,6th Edition, 2017.
2. William Stallings, *Computer Organization and Architecture: Designing for Performance*, 11th Edition, Pearson Education, 2018.
3. John Paul Shen, Mikko H. Lipasti, Modern Processor Design: Fundamentals of Superscalar Processors, Waveland Press Inc, 2013.

ADDITIONAL LEARNING RESOURCES:

- https://nptel.ac.in/courses/106/103/106103206/
- https://www.coursera.org/learn/comparch

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										3			
CO3	3	3											3			1
CO4	3	3											3			
CO5	3				2								3			

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

III B. Tech. – I Semester

(20BT50504) CYBER SECURITY

(Professional Elective – 1)

(Common to CSE and CSE(AI)

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

PRE-REQUISITES: A Course on "Computer Networks"

COURSE DESCRIPTION: Cybercrime, Cyberoffenses, Phishing, Identity theft, Cybercrime in mobile and wireless devices, Organizational measures for handling mobile devices, Security implications on using mobile devices, Tools and methods used in cybercrime, Forensics of computer and handheld devices, Real-life examples of cybercrime.

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

CO1. Analyze methods of cybercrime, cyberoffenses to maintain cybersecurity.

CO2. Investigate tools used for cybercrime to protect computational assets.

CO3. Apply appropriate authentication mechanisms to reduce attacks on mobile and wireless devices.

CO4. Use appropriate cyberforensics tools and techniques to maintain cybersecurity.

CO5. Recognize the need for cybersecurity and practice ethics to protect privacy, property rights in cyberspace.

DETAILED SYLLABUS:

UNIT–I: CYBERCRIME (8 periods)

Cybercrime and information security, Cybercriminals, Classifications of cybercrimes, Need for Cyberlaws in Indian context, Legal perspectives of cybercrime, Indian perspective of cybercrimes, Cybercrime and the Indian ITA 2000, Positive aspects and weak areas of ITA 2000, Amendments made in Indian ITA 2000 for admissibility of e-records, Amendments to the Indian IT Act, Global perspective on cybercrimes, Intellectual property in cyberspace, Ethical dimension of cybercrimes.

UNIT–II: CYBEROFFENSES (11 periods)

Categories of cybercrime, How criminals plan the attacks, Social engineering, Cyberstalking, Cybercafe and cybercrimes, Botnets, Attack vector, Cloud computing, Phishing – Methods, Techniques, Spear phishing, Phishing scams, Phishing toolkits, Spy phishing, Countermeasures; Identity Theft – Personally identifiable information, Types, Techniques, Countermeasures, Effacing online identity.

UNIT–III: CYBERCRIME IN MOBILE AND WIRELESS DEVICES (7 periods)

Proliferation of mobile and wireless devices, Trends in mobility, Credit card frauds in mobile and wireless computing era, Security challenges posed by mobile devices, Registry settings for mobile devices, Authentication service security, Attacks on

mobile/cell phones, Security implications of mobile devices for organizations, Organizational measures for handling mobile devices related security issues.

UNIT–IV: TOOLS AND METHODS USED IN CYBERCRIME (10 periods)

Proxy servers and anonymizers, Password cracking, Keyloggers and spywares, Virus and worms, Trojan horses and backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow, Attacks on wireless networks.

UNIT–V: CYBERFORENSICS, CYBERCRIME IN REAL-WORLD (9 periods)

Forensics of Computer and Handheld Devices: Cyberforensics, Cyberforensics and digital evidence, Forensics analysis of e-mail, Forensics and social networking sites, Forensics of handheld devices – Smartphone forensics, EnCase, Device Seizure, MOBILedit.

Cybercrime examples, mini-cases, online scams: Real-life examples - Official website of Maharashtra Government hacked, Indian banks lose millions of rupees, Game source code stolen; Mini-cases - Indian Case of online gambling, Indian case of intellectual property crime; Online scams - Cheque cashing scam, Charity scams.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOK:

1. Nina Godbole, Sunit Belapure, *Cyber Security*: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley, 2013.

REFERENCE BOOKS:

1. Nilakshi Jain, Ramesh Menon, *Cyber Security and Cyber Laws*, Wiley, 2020.
2. Charles J. Brooks, Christopher Grow, Philip Craig, Donald Short, *Cybersecurity Essentials*, 1st Edition, Sybex, 2018.
3. Erdal Ozkaya, *Cybersecurity: The Beginner's Guide*, 1st Edition, Packt Publishing, 2019.

ADDITIONAL LEARNING RESOURCES:

- Yuri Diogenes, Erdal Ozkaya, *Cybersecurity: Attack and Defense Strategies*, 2nd Edition, Packt Publishing, 2019.
- http://www.ignou.ac.in/upload/Announcement/programmedetails.pdf
- Alessandro Parisi, *Hands-On Artificial Intelligence for Cybersecurity*, Packt Publishing, 2019.

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
CO3	3	2	1													3
CO4	3	2			2											3
CO5						2		2								3

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

III B. Tech. – I Semester

(20BT50505)SOFTWARE PROJECT MANAGEMENT

(Professional Elective - 1)

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

PRE-REQUISITES: A Course on "Software Engineering"

COURSE DESCRIPTION: Software project management and its importance, Plans, methods and methodologies, Software processes and process models, Stepwise project planning, Software effort estimation, Cost estimation, Activity planning, Plan models, Critical path and critical activities, Risk management, Resource allocation, Monitoring and control, Managing people, Software quality.

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

CO1. Apply knowledge of software project management, project plans, process models for efficient implementation and completion of projects.

CO2. Estimate effort for the project to assign and schedule available resources in the most effective and economical way possible.

CO3. Develop network models for sequences of activities in a project for effective project management.

CO4. Identify the risk factors, monitor the progress and quality of projects to take mitigating actions.

CO5. Recognize the need for organizational behavior, teamwork and communication to improve the performance on projects.

DETAILED SYLLABUS:

UNIT–I:INTRODUCTIONTO SOFTWARE PROJECT MANAGEMENT AND PROJECT PLANNING (11 periods)

Introduction to Software Project Management: Importance of software project management, Defining project, Software projects versus other types of project, Contract management and technical project management, Activities covered by software project management, Plans, methods and methodologies, Categorizing software projects, Project charter, Stakeholders, Setting objectives, The business case, Project success and failure, Management and management control, Project management life cycle, Traditional versus modern project management practices.

Project Planning: Step wise project planning, Select project, Identify project scope and objectives, Identify project infrastructure, Analyze project characteristics, Identify project products and activities, Estimate effort for each activity, Identify activity risks, Allocate resources, Review/publicize plan, Execute plan/lower levels of planning.

UNIT–II: PROJECT APPROACH AND EFFORT ESTIMATION (9 periods)

Selection of Project Approach: Build or buy, Choosing methodologies and technologies, Software processes and process models, Choice of process models, Spiral model, Software prototyping, Incremental delivery, Agile methods.

Software Effort Estimation: Effort estimation, Problems with over and under estimates, Basis for software estimating, Software effort estimation techniques, Bottom-up estimating, The top-down approach and parametric models, Albrecht function point analysis, COCOMO II.

UNIT–III: ACTIVITY PLANNING AND RISK MANAGEMENT (8 periods)

Activity Planning: Objectives of activity planning, Projects and activities, Sequencing and scheduling activities, Network planning models, Formulating a network model, Adding the time dimension, The forward pass, The backward pass, Identifying the critical path and critical activities, Activity float.

Risk Management: Risk, Categories of risk, Risk management approaches, A framework for dealing with risk, Risk identification, Risk assessment, Risk planning, Risk management, PERT technique, Monte Carlo simulation.

UNIT–IV: RESOURCE ALLOCATION, MONITORING AND CONTROL(9 periods)

Resource Allocation: Nature of resources, Identifying resource requirements, Scheduling resources, Creating critical paths, Publishing resource schedule, Cost schedules, Scheduling sequence.

Monitoring and Control: Creating framework, Review, Visualizing progress, Cost monitoring, Earned value analysis, Prioritizing monitoring, Getting the project back to target, Change control, Software configuration management.

UNIT–V: MANAGING PEOPLE, QUALITY IN SOFTWARE ENVIRONMENT

(8 periods)

Managing People: Organizational behavior, Oldham-Hackman job characteristics model, Ethical and professional concerns, Working in teams – Decision making, Organization and team structures, Dispersed and virtual teams, Communication genres and plans, Leadership.

Software Quality: The place of software quality in project planning, Importance of software quality, Defining software quality, Software quality models, ISO 9126, Process capability models, Quality plans.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOK:

1. Bob Hughes, Mike Cotterell, Rajib Mall, *Software Project Management*, 6th Edition, McGraw Hill, 2018.

REFERENCE BOOKS:

1. Michele Sliger and Stacia Broderick, *The Software Project Manager's Bridge to Agility*, Addison-Wesley, 2008.
2. S.A. Kelkar, *Software Project Management: A Concise Study*, PHI, 2012.
3. Pankaj Jalote, *Software Project Management in Practice*, Pearson, 2002.

ADDITIONAL LEARNING RESOURCES:

- Richard H.Thayer, Software Engineering Project Management, IEEE Computer Society, 2004.
- Information Technology and Project Management, Schwalbe, Thomson Learning.
- https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-cs70/

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	2	2										3			
CO4	3	2	2										3			
CO5								1	1	1			3			

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

III B. Tech. – I Semester
(20BT41531)DESIGN AND ANALYSIS OF ALGORITHMS LAB

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

PRE-REQUISITES: A Course on "Design and Analysis of Algorithms"

COURSE DESCRIPTION: Divide and conquer; Quick Sort; Merge Sort; Kruskal's Algorithm; Prim's Algorithm; Dijkstra's Algorithm; Dynamic Programming; Greedy method; Back tracking method; Floyd's Algorithm.

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

CO1. Analyze the performance of Merge sort and quick sort algorithms using divide and conquer technique.

CO2. Develop algorithms to solve knapsack problem using greedy and dynamic programming methods.

CO3. Devise solutions for finding minimum cost spanning tree by using kruskal's and prim's algorithms.

CO4. Solve different shortest path problems by applying Floyd's and Dijkstra's algorithms.

CO5. Implement algorithms to solve real world problems using Dynamic Programming and backtracking methods.

CO6. Work independently and communicate effectively in oral and written forms.

LIST OF EXERCISES:

1. Sort a given set of n integer elements using Quick Sort and merge sort methods and compute its time complexities. Run the programs for varied values of n >1000 and record the time taken to sort. Plot a graph of the time taken versus n for both algorithms. The elements can be read from a file or can be generated using the random number generator. Demonstrate how the divide and conquer method works along with its time complexity analysis: worst case, average case and best case.
2. Write a program to implement knapsack problem using greedy method.
3. a) Write a program to find minimum cost spanning tree using Kruskal's Algorithm.

   b) Write a program to find minimum cost spanning tree using Prim's Algorithm.
4. Write a program to find shortest paths to other vertices using Dijkstra's algorithm from a given vertex in a weighted connected graph.
5. Write a program to implement 0/1 Knapsack problem using Dynamic Programming method.
6. Write a program to implement All-Pairs Shortest Paths problem using Floyd's algorithm.

7. Write a program to implement Travelling Sales Person problem using Dynamic programming method.
8. Write a program to implement backtracking algorithm for the N-queens problem.
9. Write a program to find a subset of a given set S = {Sl, S2,.....,Sn} of n positive integers whose SUM is equal to a given positive integer d. For example, if S ={1, 2, 5, 6, 8} and d= 9, there are two solutions {1,2,6}and {1,8}. Display a suitable message, if the given problem instance doesn't have a solution.
10. Write a program to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using backtracking principle.

REFERENCE BOOKS:

1. Ellis Horowitz, Satraj Sahni and Rajasekharam, *Fundamentals of Computer Algorithms*, Galgotia Publications Pvt. Ltd, New Delhi, 2nd Edition, 2007.

SOFTWARE/TOOLS USED:

Software: JDK 1.8

Operating System: Windows/ Linux

ADDITIONAL LEARNING RESOURCES:

- NPTEL course on Design and Analysis of Algorithms
  URL: https://nptel.ac.in/courses/106/101/106101060/

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		1								3			
CO2	2	2	3		1								3			
CO3	2	2	3	2	1								3			
CO4	2	2	3	1	1								3			
CO5	2	2	3	2	1								3			
CO6									3	3	2					

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

III B. Tech. – I Semester

(20BT50531) COMPUTER NETWORKS LAB

(Common to CSE, CSBS and CSSE)

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

PRE-REQUISITES: A Course on "Computer Networks"

COURSE DESCRIPTION: Hands on Practice on Data Link Layer Framing Methods; Routing Algorithms; Congestion Control Algorithms; Connection Management in Transport Layer; Introduction to Packet Tracer network simulation tool.

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

CO1. Implement computer network protocols to solve problems related to flow control, error control, congestion control and network routing.

CO2. Design solutions to provide client-server communication using protocols like TCP/IP, SMTP, HTTP.

CO3. Select and apply network simulation tools like Packet Tracer to simulate networking topologies.

CO4. Work independently to solve problems with effective communication.

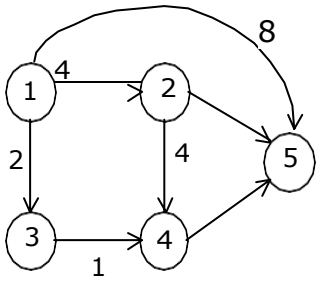
LIST OF EXERCISES:

1. Implement the following data link layer framing methods.
   i) Character count
   ii) Character stuffing
   iii) Bit stuffing

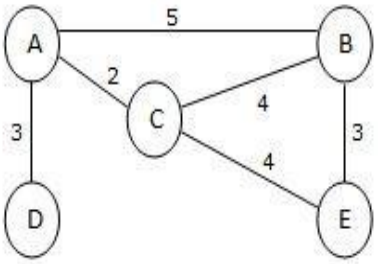
2. Implement the frame sorting technique used in buffers.

3. Design and develop a program to compute checksum for the given frame 1101011011 using CRC-12, CRC-16, and CRC-CCIP. Display the actual bit string transmitted. Suppose any bit is inverted during transmission. Show that this error is detected at the receiver's end.

4. Implement Dijkstra's algorithm to compute the shortest path for the given graph.



5. Develop a program to obtain routing table for each node using Distance Vector Routing Algorithm by considering the given subnet with weights indicating delay between Nodes.



6. Write a program to simulate flow-based routing.
7. Write a program to simulate random early detection congestion control algorithm.
8. Using TCP/IP sockets, write a client-server program to open a file available in the server.
9. Write a program for congestion control using leaky bucket algorithm.
10. Write a program for the Mail Client
    i) POP Client: Gives the server name, user name and password retrieve the mails and allow manipulation of mail box using POP commands.
    ii) SMTP Client: Gives the server name, send email to the recipient using SMTP commands.
11. Write a program for HTTP server to implement the commands - GET, POST, HEAD and DELETE. The server must handle multiple clients.

Exercises on Packet Tracer Simulator Tool:

12. a) Study of basic network commands and network configuration commands.
    i) ping ii) nslookup iii) netstat iv) ifconfig

    b) Create a network topology and configure a networktopology with four PCs, two switches, and two routers.

REFERENCE BOOKS:

1. Andrew S. Tanenbaum and David J. Wetherall, *Computer Networks*, Pearson, 5th Edition, 2015.
2. A. Jesin, *Packet Tracer Network Simulator*,Packt Publishing, 2014.

SOFTWARE/TOOLS USED:

- C/Python/Java
- Network simulator tool - Packet Tracer
- Virtual Labs (Computer Networks Lab – http://vlabs.iitb.ac.in/vlabs-dev/labs_local/ computer-networks/ labs/explist.php)

ADDITIONAL LEARNING RESOURCES:

- https://www.itprc.com/packet-tracers/
- https://www.nsnam.org/docs/tutorial/html/
- http://www.tcpipguide.com/free/t_OSIReferenceModelLayers.htm

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

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

III B. Tech. – I Semester

(20BT50532) PYTHON FOR DATA SCIENCE LAB

(Common to CSE and IT)

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

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

COURSE DESCRIPTION: Hands on practice on the concepts Python for data science – Computations using NumPy, Data manipulation using Pandas dataframes, Interacting with Web APIs and databases, Data cleaning and preparation, Data wrangling, Plotting and visualization, Handling time series data, Web scraping.

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 perform data manipulation.

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 to solve problems with effective communication.

LIST OF EXERCISES:

Arrays and vectorized computation using NumPy - The NumPy ndarray, Fast element-wise array functions, Linear algebra, Pseudorandom number generation, 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.

1. Array Computations using NumPy
   a. Perform arithmetic operations using array.
   b. Perform slicing and indexing on multi-dimensional arrays.
   c. Compute arithmetic mean, standard deviation, variance, percentile, minimum and maximum, cumulative sum and product using statistical functions in NumPy.

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.

3. Data Manipulation using pandas

a) Create DataFrame from List, Dict, List of Dicts and perform operations such as column selection, addition, deletion and row selection.

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 (xslx) 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.

Handling missing data, Data transformation, Vectorized string functions in pandas; Data wrangling: Join, combine and reshape - Hierarchical indexing, Combining and merging datasets, Reshaping and pivoting.

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 duplicated 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.

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.

Plotting and visualization - A brief Matplotlib API Primer, Plotting with pandas and seaborn, Other python visualization tools; 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; Web scraping using beautiful soup.

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 DatetimeIndexwith 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.

10. Web Scraping using Beautiful Soup

    Extract product reviews from Amazon website and save to a file. 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:

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:

- 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

III B.Tech. – I Semester
(20BT50533) SUMMER INTERNSHIP-I

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

PRE-REQUISITES: --

COURSE DESCRIPTION: Expose students to the industrial environment; Create competent professionals for the industry; sharpen the real time technical / managerial skills required at the job; Gain professional experience and understand engineer's responsibilities and ethics; Familiarize with latest equipment, materials and technologies; Gain exposure to technical report writing; Gain exposure to corporate working culture.

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

CO1. Analyze latest equipment, materials and technologies that are used in industry to solve complex engineering problems following relevant standards, codes, policies and regulations.

CO2. Analyze safety, health, societal, environmental, sustainability, economical and managerial factors considered in industry in solving complex engineering problems.

CO3. Perform individually or in a team besides communicating effectively in written, oral and graphical forms on practicing engineering.

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				
CO2		3				3	3				3					
CO3									3	3						

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

III B. Tech. – I Semester

(20BT5MC01) PROFESSIONAL ETHICS

(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: Engineering Ethics; Professional Ideals and Virtues; Engineering as Social Experimentation; Responsibilities and Rights; Global Issues.

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

CO1: Demonstrate knowledge of Engineering Ethics, Senses of engineering ethics, Moral dilemmas and theories in professional engineering practice.

CO2: Analyze the concepts of Professional ideals to assess and to address societal, health,safety, legal and cultural issues in discharging the professional responsibilities.

CO3: Apply the reasoning informed by the various aspects of Code of Ethics and its provisionsto assess societal issues and carry out Professional responsibilities effectively.

CO4: Practice Collegiality considering conflict of interests to safeguard professional rights inprofessional engineering practice.

CO5: Provide professional engineering solutions considering distinct ethics to address globalissues.

DETAILED SYLLABUS:

UNIT-I: ENGINEERING ETHICS (5 periods)

Scope and aim of engineering ethics, Senses of engineering ethics, Variety of moral issues, Types of inquiry, Moral dilemmas, Moral autonomy-Kohlberg's theory, Gilligan's theory, Consensus and controversy.

UNIT-II: PROFESSIONAL IDEALS AND VIRTUES (6 periods)

Theories about virtues, Professions, Professionalism, Characteristics, Expectations, Professional responsibility, Integrity, Self-respect, Sense of responsibility, Self-interest, Customs and religion, Self-interest and ethical egoism, Customs and ethical relativism, Religion and divine command ethics, Use of ethical theories, Resolving moral dilemmas and moral leadership.

UNIT-III: ENGINEERING AS SOCIAL EXPERIMENTATION (7 periods)

Engineering as experimentation, Similarities to standard experiments, Learning from the past and knowledge gained, Engineers as responsible experimenters, Conscientiousness,

Moral autonomy and accountability, The challenger case, Codes of ethics and limitations, Industrial standards, Problems with the law of engineering.

UNIT-IV: RIGHTS AND RESPONSIBILITIES OF AN ENGINEER (6 periods)

Collegiality and loyalty, Respect for authority, Collective bargaining, Confidentiality, Conflict of interests, Occupational crime, Rights of engineers, Professional rights, Whistle-blowing, The BART case, Employee rights and discrimination.

UNIT-V: GLOBAL ISSUE (6 periods)

Multinational corporations, Professional ethics, Environmental ethics, Computer ethics, Engineers as consultants, Witnesses, Advisors and Leaders, Engineers as Managers, Managerial ethics applied to Engineering Profession, moral leadership.

Total Periods: 30

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Mike W. Martin and Roland Schinzinger, *Ethics in Engineering*, Tata McGraw-Hill, 3rd edition, 2007.
2. Govindarajan, M., Nata Govindarajan, M., Natarajan, S. and Senthil kumar, V.S., *Engineering Ethics*, Prentice Hall of India, 2004.

REFERENCE BOOKS:

1. S. Kannan and K. Srilakshmi, Human Values and Professional Ethics, Taxmann Allied Services Pvt. Ltd., 2009.
2. Edmund G. Seebauer and Robert L. Barry, Fundamental of Ethics for Scientists and Engineers, Oxford University Press, 2001.

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	2	3			1	2	2	2								
CO3	1	1			2	2	2	3								
CO4	1	1			1	3	1	1								
CO5	1	1			2	1	3	2								

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

III B.Tech. – II Semester

(20BT5HS02) PRINCIPLES OF BUSINESS ECONOMICS AND ACCOUNTANCY

(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: Business economics and demand analysis; theory of production and cost analysis; markets and pricing; principles of accounting and capital; final accounts and tally erp 9.0.

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

CO1. Demonstrate the principles of Business Economics and theories of Demand.

CO2. Apply the theories of Production and Cost for the managerial decision making of an organization.

CO3. Determine the Price and Output relation in the different Market structures.

CO4. Demonstrate the principles of Accountancy and sources of Capital.

CO5. Analyze the profitability and soundness of an organization.

DETAILED SYLLABUS:

UNIT–I: BUSINESS ECONOMICS AND DEMAND ANALYSIS (9 periods)

Definition - Nature and Scope of Business Economics - Demand: Determinants of demand – Demand function - Law of demand, assumptions and exceptions - Elasticity of demand – Types of elasticity of demand - Demand forecasting and methods of demand forecasting.

UNIT–II: THEORY OF PRODUCTION AND COST ANALYSIS (9 periods)

Production Function: Input-output relationship - Law of Variable proportion- Isoquants and Isocosts.

Cost Concepts: Total, Average and Marginal Cost **-** Fixed vs. Variable costs – Opportunity Costs Vs Outlay Costs– Separable Costs Vs Joint Costs, Urgent Costs Vs Postponable Costs- Avoidable Costs Vs Unavoidable Costs.

Break Even Analysis (BEA) – Assumptions, Merits and demerits - Determination of Break Even Point (Simple problems).

UNIT–III: MARKETS AND PRICING (9 periods)

Market Structure: Types of Markets - Features of perfect competition - Monopoly and monopolistic competition - Price and Output determination in perfect competition, monopoly and monopolistic Markets.

Pricing: Objectives and policies of pricing – Sealed bid pricing - Marginal cost pricing - Cost plus pricing - Going rate pricing – penetration Pricing –skimming Pricing - Block pricing – Peak load pricing - Cross subsidization.

UNIT–IV: PRINCIPLES OF ACCOUNTING & CAPITAL (9 periods)

Accountancy: Introduction – Concepts – Conventions – Double Entry Book Keeping – Journal – Ledger - Trial Balance (Simple problems)

Capital: Significance - Types of capital – Sources of Capital.

UNIT–V: FINAL ACCOUNTS & TALLY ERP 9.0 (9 periods)

Introduction to Final Accounts - Trading account - Profit and Loss account and Balance Sheet with simple adjustments (Simple problems)

Tally ERP 9.0: Introduction – Create a company – Create ledger – Posting vouchers – Advantages of Tally.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. H L Ahuja, *Business Economics (Thirteenth edition)*, S Chand Publishing, Jan 2016.
2. S.P. Jain and K.L. Narang, *Financial Accounting*, Kalyani Publishers, Ludhiana, 12th edition, 2018.

REFERENCE BOOKS:

1. Joseph G.Nellis and David Parker, Principles of Business Economics, Pearson Education Canada, 2nd edition, 2016.
2. Larry M. Walther, Financial Accounting, Create Space Independent Publishing Platform, July 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	2														
CO2	1	3														
CO3	2	3									1					
CO4	3	1	1													
CO5		3	1							2	1					

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

III B. Tech. – II Semester

(20BT51202) WEB TECHNOLOGIES

(Common to CSE and CSSE)

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: Hyper Text Markup Language (HTML); Features of HTML5; Cascading Style Sheets (CSS); JavaScript; JQuery; Bootstrap; Hypertext Preprocessor (PHP); MySQL.

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

CO1. Demonstrate knowledge on web page design elements, dynamic content and database connection.

CO2. Analyze user requirements to develop web applications.

CO3. Design client-server applications using web technologies.

CO4. Demonstrate problem solving skills to develop enterprise web applications.

CO5. Apply HTML, CSS, JavaScript, JQuery, Bootstrap and PHP technologies for device independent web application development.

CO6. Apply web technologies to develop interactive, dynamic and scalable web applications for societal needs.

DETAILED SYLLABUS:

UNIT-I: HTML (09 periods)

Introduction: Fundamentals of HTML, Working with Text, Organizing Text in HTML, Working with Links and URLs, Creating Tables, Working with Images, Canvas, Forms, Frames and Multimedia.

HTML5: Introduction, HTML5 Document Structure, Creating Editable Content, Checking Spelling Mistakes, Exploring Custom Data Attributes, Client-Side Storage, Drag and Drop Feature, Offline Web Applications, Web Communications, Cross-Document Messaging and Desktop Notifications.

UNIT-II: CSS AND JAVASCRIPT (10 periods)

CSS: Introduction, CSS Selectors, Inserting CSS in an HTML document, Backgrounds, Fonts, and Text Styles, Creating Boxes, Displaying, Positioning and Floating Elements, Features of CSS3, Media Queries.

Javascript: Overview of JavaScript, JavaScript Functions, Events, Image Maps and Animations, JavaScript Objects, Working with Browser and Document Objects, JQuery **-** Introduction, JQuery Selectors, Events, Methods to access HTML elements and attributes, Introduction to AJAX.

UNIT-III: BOOTSTRAP (09 periods)

Getting Started with Bootstrap, Creating Responsive Layouts Using Bootstrap CSS - Basic HTML structure for Bootstrap, Responsive classes, Rendering images, The grid system, Constructing data entry forms, Packaged Components in Bootstrap - The page header, Glyphicons, The navigation bar, Badges, Alerts, Toolbars and button groups, Panels.

UNIT-IV: INTRODUCTION TO PHP (09 periods)

Introduction, Data Types, Variables, Constants, Expressions, String Interpolation, Control Structures, Functions, Arrays, Embedding PHP Code in Web Pages, Object Oriented PHP.

UNIT-V: PHP WEB FORMS AND MYSQL (08 periods)

PHP Web forms: PHP and Web Forms, Sending Form Data to a Server, Working with Cookies and Session Handlers

PHP with MySQL: Interacting with the Database, Prepared Statement, Database Transactions.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Kogent Learning Solutions Inc, *HTML 5 Black Book: Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP and JQuery*, Dreamtech Press, FirstEdition, 2011.
2. W. Jason Gilmore, *Beginning PHP and MySQL*, APress, Fourth Edition, 2011.

REFERENCE BOOKS:

1. Snig Bahumik, *Bootstrap Essentials*, PACKT Publishing, First Edition, 2015. (e-book).
2. Thomas A. Powell, *The Complete Reference: HTML and CSS,*Tata McGraw Hill, Fifth Edition, 2010.
3. Andrea Tarr, *PHP and MySQL*, Willy India, First Edition, 2012.

ADDITIONAL LEARNING RESOURCES:

1. https://www.w3schools.com/php/DEFAULT.asp
2. https://www.w3schools.com/js/

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	2	3											3			
CO3	2	2	3										3			2
CO4	2	2	2	3									3			
CO5	2	2	2	2	3								3		3	
CO6	2	2	2	2	2	3	3						3		3	2

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

III B. Tech. – II Semester

(20BT60501) MACHINE LEARNING

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

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

PRE-REQUISITES: Courses on "Numerical Methods, Probability and Statistics", "Discrete Mathematical Structures", "Design and Analysis of Algorithms"

COURSE DESCRIPTION: Concept learning, General to specific ordering, Decision tree learning, Support vector machine, Artificial neural networks, Multilayer neural networks, Bayesian learning, Instance based learning, reinforcement learning.

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

CO1. Analyze the concept learning algorithms to automatically infer a general description for a given learning problem.

CO2. Analyze the underlying mathematical models within machine learning algorithms and learning tasks.

CO3. Evaluate and apply suitable machine learning algorithms for various types of learning tasks.

CO4. Design efficient neural architectures to model patterns for a given learning problem.

CO5. Select and apply machine learning algorithms to solve societal problems such as face recognition, text classification.

DETAILED SYLLABUS:

UNIT–I: CONCEPT LEARNING AND GENERAL-TO-SPECIFIC ORDERING

(9 periods)

Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning, Concept learning task, Concept learning as search, FIND-S, Version spaces and candidate elimination algorithm, Inductive bias.

UNIT–II: DECISION TREE LEARNING AND KERNEL MACHINES (9 periods)

Decision Tree Learning: Decision tree representation, Problems for decision tree learning, Decision tree learning algorithm, Hypothesis space search, Inductive bias in decision tree learning, Issues in decision tree learning.

Kernel Machines: Support vector machines – SVMs for regression, SVMs for classification, Choosing C, A probabilistic interpretation of SVMs.

UNIT–III: ARTIFICIAL NEURAL NETWORKS (9 periods)

Neural network representations, Appropriate problems for neural network learning, Perceptrons, Multilayer networks and Backpropagation algorithm, Convergence and local minima, Representational power of feedforward networks, Hypothesis space search and

inductive bias, Hidden layer representations, Generalization, Overfitting, Stopping criterion, An Example - Face Recognition.

UNIT–IV: BAYESIAN LEARNING **(10 periods)**

Bayes theorem and concept learning, Maximum likelihood and least-squared error hypothesis, Maximum likelihood hypotheses for predicting probabilities, Minimum Description Length principle, Bayes optimal classifier, Gibbs algorithm, Naive Bayes classifier, An Example – Learning to classify text; Bayesian belief networks, EM Algorithm.

UNIT–V: INSTANCE BASED LEARNING AND REINFORCEMENT LEARNING

(8 periods)

Instance Based Learning: k-Nearest Neighbor learning, Locally weighted regression, Radial basis functions, Case-based reasoning.

Reinforcement Learning: The learning task, Q-learning, Nondeterministic rewards and actions, Temporal difference learning, Generalizing from examples, Relationship to dynamic programming.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Tom M. Mitchell, *Machine Learning*, McGraw Hill, 2013.
2. Kevin P. Murphy, *Machine Learning*: *A Probabilistic Perspective*, MIT Press, 2012.

REFERENCE BOOKS:

1. Ethem Alpaydin, *Introduction to Machine Learning*, MIT Press, 4th Edition, 2020.
2. Shai Shalev Shwartz, Shai Ben David, *Understanding Machine Learning: From Theory to Algorithms,* Cambridge University Press, 2014.

ADDITIONAL LEARNING RESOURCES:

- https://swayam.gov.in/nd1_noc19_cs52/preview
- https://www.udemy.com/course/machinelearning/

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	2	3												3		
CO3	2	3	2	1										3		
CO4	3	3	3	1										3		

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

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

III B. Tech. – II Semester

(20BT71201) MOBILE APPLICATION DEVELOPMENT

(Professional Elective - 2)

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

PRE-REQUISITES: Courses on"Object Oriented Programming throughJava" and "Web Technologies"

COURSE DESCRIPTION: Mobile platforms; Mobile User Interface and tools; Introduction to Android; Activities; Views; Menus; Database Storage; SMS; e-mail; Displaying Maps; Building a Location Tracker Web Services Using HTTP; Sockets Programming; Communication between a Service and an Activity; Introduction to iOS.

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

CO1. Demonstrate knowledge on mobile platforms, mobile user interface and user interface design requirements.

CO2. Design user interfaces by analyzing user requirements.

CO3. Develop mobile applications for Messaging, Location-Based Services, And Networking.

CO4. Develop mobile applications and publish in different mobile platforms.

DETAILED SYLLABUS:

UNIT - I: INTRODUCTION AND MOBILE USER INTERFACE DESIGN (8 periods)

Mobile web presence, Mobile applications, Marketing, App as a mobile web app; User interface design - Effective use of screen real estate, Mobile application users, Mobile information design, Mobile platforms, Tools of mobile interface design.

Android versions, Features and architecture, Required tools, Android application launching.

UNIT - II: ACTIVITIES, INTENTS AND ANDROID USER INTERFACE (9 periods)

Activities, Linking activities using intents, Calling Built – In Applications Using Intents, Displaying notifications, Components of a screen, Adapting to display orientation, Managing changes to screen orientation, Utilizing the action bar, Listening for UI notifications.

UNIT - III: ADVANCED USER INTERFACE AND DATA PERSISTENCE (10 periods)

Basic views, Picker views, List view, Image view, Menus with views, Web view, Saving and loading user preferences, Persisting data to files, Creating and using databases.

UNIT - IV: MESSAGING, LOCATION-BASED SERVICES, AND NETWORKING (9 Periods)

SMS messaging, Sending e-mail, Displaying maps, Getting location data, Monitoring a location, Consuming web services using HTTP.

UNIT - V: ANDROID SERVICES, PUBLISHING ANDROID APPLICATIONS AND IOS

(9 Periods)

Services, Communication between a service and an activity, Binding activities to services, Threading, Preparing for publishing, Deploying APK files.

iOS tools, iOS project, Debugging iOS apps, Objective-C basics, Hello world app, Building the derby app in iOS.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. J. F. DiMarzio, "Beginning Android Programming with Android Studio," Wiley India, Fourth Edition, 2017.
2. Wei – Meng Lee, "Beginning Android 4 Application Development", Wrox, 2017.
3. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development," Wiley India, First Edition, 2012.

REFERENCE BOOKS:

1. Neils Smyth "Android Stduio Development Essentials," Creative Space Independent publishing platform, Seventh edition 2016.
2. Paul Deital and Harvey Deital, "Android How to Program," Detial associates publishers, First Edition, 2013.

ADDITIONAL LEARNING RESOURCES:

- https://www.youtube.com/playlist?list=PLknSwrodgQ72X4sKpzf5vT8kY80HKcUSe
- https://developer.android.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	1	2	3	2									3			
CO3	1	2	2	2	3	2	2	1					3			2
CO4	1	2	3	2	3	2	2	1					3			

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

III B. Tech. – II Semester

(20BT51503) NATURAL LANGUAGE PROCESSING

(Professional Elective - 2)

(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 "Theory of Computation"

COURSE DESCRIPTION: Language Modeling, Regular Expressions, Text Normalization, Word level analysis, PoS Tagging and Entropy models; Context free grammars and Parsing techniques; Semantics and pragmatics, Discourse analysis and lexical resources.

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

CO1. Demonstrate knowledge on Regular Expressions, Words, Corpora and Tokenization in Natural Language Processing.

CO2. Analyze various models and techniques for world level recognition.

CO3. Construct Grammars to implement Parsing for text Processing.

CO4. Analyze Word level similarities using Semantics and Pragmatics.

CO5. Analyze different algorithms on Discourse Analysis for Natural Language Processing applications.

CO6. Investigate Probabilistic models to perform syntax analysis in Natural Language Processing.

DETAILED SYLLABUS:

UNIT I– INTRODUCTION (9 periods)

Origins and challenges of NLP, Language Modeling- Grammar based LM, Statistical LM, Regular Expressions, Words, Corpora, Text Normalization – Tokenization and Normalization, Word Tokenization, Byte-Pair Encoding for Tokenization, Word Normalization, Lemmatization and Stemming, Minimum Edit Distance.

UNIT II –WORD LEVEL ANALYSIS (9 periods)

N-grams, Evaluating Language models, Generalization and Zeros, Smoothing, Kneser-Ney Smoothing, Backoff, Naive Bayes Classifiers, Training Naive Bayes Classifier, Worked example, Sentiment analysis, Test sets and cross validations, English Word classes, Part of Speech Tagging, HMM Part-of-speech Tagging, Conditional Random Field(CRFs),Evaluation of Named Entity Recognition.

UNIT III –SYNTACTIC ANALYSIS (9 periods)

Context-Free Grammars, Grammar rules for English, Treebanks, Grammar equivalence and Normal Forms, Lexicalized grammars, Ambiguity, CYK Parsing- Dynamic Programming Approach, Span-Based Neural Constituency Parsing, Evaluating Parsers, Partial parsing, CCG Parsing, Dependency Parsing- Dependency Relations, Dependency Formalisms, Dependency Treebanks, Transition-Based Dependency Parsing, Graph-Based Dependency Parsing.

UNIT IV – SEMANTICS AND SEMANTICS PARSING (9 periods)

Information Extraction- Relation Extraction, Relation Extraction Algorithms, Extracting Times, Template Filling, Word Senses, Relations between Senses, WordNet, Word Sense Disambiguation, Alternate WSD algorithms and Tasks, Using Thesauruses to improve Embeddings, Semantic Roles, The Proposition Bank, FrameNet, Semantic Role Labeling, Primitive Decomposition of Predicates.

UNIT V – DISCOURSE ANALYSIS AND LEXICAL RESOURCES (9 periods)

Coreference Phenomena: Linguistic Background, Coreference Tasks and Datasets, Mention Detection, Architectures for Coreference Algorithms, Classifiers using hand-built features, A neural mention-ranking algorithm,Evaluation of Coreference Resolution, Discourse Coherence, Coherence Relations,Discourse Structure ParsingCentering and Entity-Based Coherence, Representation learning models for local coherence, Global Coherence.

Case study: Question Answering and Summarization, Dialogue and Conversational Agents.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Daniel Jurafsky, James H. Martin, "*Speech and Language Processing: An Introduction to Natural Language Processing"*, Computational Linguistics and Speech, Pearson Publication, 2020.

REFERENCE BOOKS:

1. Breck Baldwin, "*Language processing with Java and LingPipe Cookbook"*, Atlantic Publisher, 2015.
2. Richard M Reese, "*Natural Language Processing with Java"*, OReilly Media, 2015.
3. Steven Bird, Ewan Klein and Edward Loper, "*Natural Language Processing with Python"*,1st Edition, OReilly Media, 2009.

ADDITIONAL LEARNING RESOURCES:

https://nptel.ac.in/courses/106/105/106105158/

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	
CO2	2	3	2											2	3	
CO3	3	2	3											2	3	
CO4	2	3	2											2	3	
CO5	2	3				1								3	3	
CO6	2	3	2											3	2	

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

III B. Tech. – II Semester

(20BT51203) ADVANCED DATABASES

(Professional Elective - 2)

(Common to CSE and CSSE)

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

PRE-REQUISITES: Courses on "Database Management Systems" and "Computer Networks"

COURSE DESCRIPTION: Parallel Databases; Object Based Databases; Distributed Databases; XML; Emerging Database Technologies and Applications.

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

CO1. Design parallel databases for efficient data access.

CO2. Apply object oriented concepts to design object based databases.

CO3. Design distributed databases by analyzing various data fragmentations.

CO4. Create XML databases for web based applications.

CO5. Demonstrate knowledge on emerging database technologies: mobile, multimedia and NoSQL databases.

DETAILED SYLLABUS:

UNIT-I: PARALLEL DATABASES (09 periods)

Introduction, I/O Parallelism, Inter query Parallelism, Intra query Parallelism, Intra operation Parallelism, Interoperation Parallelism, Query Optimization, Design of Parallel Systems, Parallelism on Multicore Processors.

UNIT-II: OBJECT-BASED DATABASES (09 periods)

Overview, Complex Data Types, Structured Types and Inheritance in SQL, Table Inheritance, Array and Multi set Types in SQL, Object-Identity and Reference Types in SQL, Implementing O-R Features, Persistent Programming Languages, Object-Relational Mapping, Object-Oriented versus Object-Relational.

UNIT-III: DISTRIBUTED DATABASES (09 periods)

Features of Distributed versus Centralized Databases, Reference Architecture for Distributed Databases, Types of Data Fragmentation, Integrity Constraints in Distributed databases, Distributed Database Design.

UNIT-IV: XML (09 periods)

Structure of XML data, XML Document Schema, Querying and Transformation, Application Program Interfaces to XML, Storage of XML Data, XML Applications.

UNIT-V: EMERGING DATABASE TECHNOLOGIES AND APPLICATION (09 periods)

Mobile Database, Geographic Information Systems, Genome Data Management, Multimedia Database; NoSQL-An Overview of NoSQL, Characteristics of NoSQL, NoSQL Storage Types.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. A. Silberschatz, H. F. Korth and S. Sudarshan, *Database System Concepts*, Tata McGraw hill, Seventh Edition, 2019.
2. Stefand Ceri and Giuseppe Pelagatti, *Distributed Databases Principles and Systems*, McGraw hill, First Edition, 2008.

REFERENCE BOOKS:

1. Ramea Elmasri and Shamkant B.Navathe, *Fundamentals of database Systems*, Pearson Education, Fifth Edition,2007.
2. Gaurav Vaish, *Getting Started with NoSQL*, Packt Publishing, First Edition, 2013. (e-book)

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	
CO2	1		3		1										3	
CO3	1	2	3												3	
CO4	1	1	1	3	2										3	
CO5	3				2										3	

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

III B. Tech. – II Semester

(20BT61206) MOBILE COMPUTING

(Professional Elective - 2)

(Common to CSE and IT)

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

PRE-REQUISITES: A Course on "Computer Networks"

COURSE DESCRIPTION: Overview of Mobile computing and Second-Generation Architecture; Wireless Medium Access Control, CDMA, 3G, WIMAX, 4G and 5G Networks; Mobile IP Network Layer; Mobile Transport Layer; Wireless LAN and Personal Area Network Protocols.

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

CO1. Demonstrate knowledge on the characteristics of mobile computing, GSM and GPRS.

CO2. Analyze the mobility, scalability, and medium characteristics of 3G, WIMAX, 4G and 5G networks.

CO3. Analyze the services and protocols of Mobile IP Network Layer and Transport Layer.

CO4. Demonstrate Knowledge on wireless LAN and personal area network protocols.

DETAILED SYLLABUS:

UNIT-I: OVERVIEW OF MOBILE COMPUTING AND SECOND-GENERATION ARCHITECTURE (10 periods)

Mobile Computing Architecture: An Overview: Mobile Computing, Mobile Computing Operating System, Mobile Computing Architecture, Design Considerations for Mobile Computing, Mobile Computing and the Apps, Limitations of Mobile Devices, Security Issues.

Second-generation Architecture-GSM, GPRS, and Others: GSM Services, GSM System Architecture, Space Division Multiple Access, Time Division Multiple Access, and Frequency Division Multiple Access, Call Routing, Public Land Mobile Network (PLMN) Interface, GSM Subscriber Addresses and Identities, Protocols, Localization, Call Handling, Handover, Security, Introduction to SMS, General Packet Radio Service, High-speed Circuit-switched Data, Digital Enhanced Cordless Telecommunications, WLL Application.

UNIT-II: WIRELESS MEDIUM ACCESS CONTROL, CDMA, 3G, WIMAX, 4G AND 5G NETWORKS (10 periods)

Modulation, Medium Access Control, Exposed and Hidden Terminal Problem, Near and Far Terminal Problem, and Power Control for Medium Access, MAC Algorithms, WLAN and CAMA/CA Wireless Protocols, SDMA, TDMA, FDMA and CDMA, Direct Sequence Spread Spectrum, Frequency Hopping Spread Spectrum, Code Division Multiple Access.

3G: Applications of 3G Mobile Services, 3G Mobile Services: IMT2000 and UMTs, CDMA 2000: 3G, WCDMA 3G, OFDM, High-speed Packet Access, Mimo in HSPA, Long-term Evolution and WiMax 16E, Ultra-wide Band and Broadband Wireless Access.

4G Networks: HS-OFDM, LTE Advanced and WiMax 16M, Upcoming 5G Network Features.

UNIT-III: MOBILE IP NETWORK LAYER (9 periods)

Functioning of OSI Layers, and TCP/IP, IP, UDP and ICMP Protocols, Mobile IP, Packet Delivery and Handover Management, Location Management, Registration, IP Header: Encapsulation and Routes Optimization, Mobility Binding, Tunneling, and Reverse Tunneling, Dynamic Host Configuration Protocol, Cellular IP, Mobile IP with IPv6, Voice over IP, IP Security.

UNIT-IV: MOBILE TRANSPORT LAYER (8 periods)

Conventional Transport Layer Protocols: UDP and TCP, Indirect TCP, Snooping Transmission Control Protocol, Mobile TCP, Other Transmission Methods at TCP Layer for Mobile Networks, TCP over 2.5G/3G Mobile Networks.

UNIT-V: WIRELESS LAN AND PERSONAL AREA NETWORK PROTOCOLS

(8 periods)

Wireless LANs, Wireless Application Protocol, Wireless Markup Language, Bluetooth, WiMax, ZigBee and Wi-Fi, Bluetooth, and ZigBee Features.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOK:

1. Rajkamal, "Mobile Computing," OXFORD University Press, Third Edition, 2019.

REFERENCE BOOK:

1. Jochen Schiller, "Mobile Communications," Pearson Education, Second Edition, 2009.

ADDITIONAL LEARNING RESOURCES:

1. Mobile Computing - The Future is in your Hands! by Andrew Leong
2. http://kosmi.snubi.org/APAMI/resource/Tutorials/T2-Leong.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
CO2	2	3			2											3
CO3	2	3														3

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

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

III B. Tech. – II Semester

(20BT51506) SOFTWARE TESTING

(Professional Elective – 2)

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

PRE-REQUISITES: A Course on "Software Engineering"

COURSE DESCRIPTION: Evolution of Software Testing; Software Testing Life Cycle; Verification and Validation; White Box Testing, Black Box Testing and Regression Testing; Testing Process; Test Management, Software Metrics; Automation Testing and Testing Tools.

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

CO1. Analyse the functionality of software by using software testing methodologies.

CO2. Examine end user requirements by applying functional testing techniques**.**

CO3. Design test cases to verify the functionality of the software by using test management techniques**.**

CO4. Evaluate the performance of software using Testing Metrics.

CO5. Analyse test metrics and testing tools to measure the quality of software in real time applications.

CO6. Understand the concepts of static and dynamic testing tools for test design and development.

DETAILED SYLLABUS:

UNIT I: INTRODUCTION TO SOFTWARE TESTING (9 periods)

Introduction, Evolution of Software Testing, Myths and Facts, Goals and Psychology of Testing, Definitions, Model for Software Testing, Effective vs Exhaustive Testing, Testing as a Process, Terminology, Software Testing Life Cycle, Software Testing Methodology, Static vs Dynamic Testing.

Verification and Validation: Verification and Validation Activities, Verification of High-Level Design and Low-Level Design.

UNIT II: WHITE BOX TESTING and BLACK BOX TESTING (9 periods)

Introduction to Testing Techniques, Need of White-Box Testing, Logic Coverage Criteria, Basis Path Testing, Graph Matrices, Loop Testing, Mutation Testing.

Black Box Testing: Introduction, Boundary Value Analysis (BVA), Equivalence Class Testing, State Table-Based Testing, Decision Table-Based Testing, Error Guessing.

UNIT III: TESTING PROCESS (10 Periods)

Test planning –test policy, contents, strategy, test plan, Quality plan, test plan template, guidelines, test administration and estimation, standards, building test data, test cases, scenarios, templates for test cases, test scripts, effective test cases, building test data, generation of test data, test process monitoring.

UNIT IV: REGRESSION TESTING AND TEST METRICS (8 periods)

Regression Testing: Introduction, Progressive vs. Regressive Testing, Regression Testing Produces Quality Software, Regression Testability, Objectives of Regression Testing, Regression Testing Types, Defining Regression Test Problem, Regression Testing Techniques.

Test Metrics: Definition of Software Metrics, Classification of Software Metrics, Size Metrics.

UNIT V – TEST MANAGEMENT AND AUTOMATION (9 periods)

Test Management: Test Organization, Structure of Testing Group, Test Planning, Detailed Test Design, Test Specifications.

Automated and Testing Tools: Need for Automation, Categorization of Testing Tools, Selection of Testing Tools, Costs Incurred in Testing Tools, Guidelines for Automated Testing, Overview of Some Commercial Testing Tools.

Case Study: Income Tax Calculator.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Naresh Chauhan, *Software Testing: Principles and Practices*, Oxford University Press, 2nd Edition, 2016.
2. M. G. Limaye, "*Software Testing: Principles and Techniques and Tools*," Tata McGraw –Hill Education, 1st Edition, 2012

REFERENCE BOOKS:

1. Boris Beizer, *Software Testing Techniques*, DreamTech Press, 2nd Edition, 2004.
2. Dr. K. V. K. K. Prasad, *Software Testing Tools*, Dreamtech, 2004.
3. Srinivasan Desikan and Gopalaswamy Ramesh, *Software Testing – Principles and Practices*, Pearson Education, 2006.

ADDITIONAL LEARNING RESOURCES:

- https://www.tutorialspoint.com/software_testing_dictionary/test_management.htm
- https://lecturenotes.in/subject/129/software-testing-st

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								3			
CO2	2	3			2								3			
CO3	2	2	3	2	2								3			
CO4	2	3		2	2								3			
CO5	2	3			2	1							3			
CO6	3												3			

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

III B. Tech. – II Semester

(20BT60502) COMPILER DESIGN

(Professional Elective – 3)

(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 "Theory of Computation"

COURSE DESCRIPTION: Phases of compilers, Lexical analysis, Syntax analysis, Parsers, Syntax directed translation, Type checking, Intermediate code generation, Runtime environments, Code optimization, Code generation.

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

CO1. Demonstrate knowledge on structure of compiler and programming language basics.

CO2. Develop lexical analyzers for specification of tokens.

CO3. Design parsers for performing syntax analysis.

CO4. Use syntax directed translations and type expressions to construct semantic trees.

CO5. Analyze program code and runtime environment for code optimization and generation.

DETAILED SYLLABUS:

UNIT–I:INTRODUCTION TO COMPILERS AND LEXICAL ANALYSIS(8 periods)

Introduction to Compilers: Language Processors, Structure of a compiler, Programming language basics - Static scope and block structure, Dynamic scope.

Lexical Analysis: The role of the lexical analyzer,Input buffering, Specification of tokens, Structure of LEX program.

UNIT–II: SYNTAX ANALYSIS (11 periods)

Role of the parser, Context free grammar - Derivations, Parse trees, Ambiguity; Eliminating ambiguity from dangling-else grammar, Elimination of left recursion, Left factoring, Top-down parsing – Recursive descent parsing, LL(1) grammars, Non recursive predictive parsing; Bottom-up parsing - Definition of bottom up parsing, Handles, Handle pruning, Shift reduce parsing; LR parsers – Simple LR parser, Canonical LR(1) parser, LALR parser; Using ambiguous grammars, YACC-automatic parser generator.

UNIT–III: SYNTAX DIRECTED TRANSLATION AND TYPE CHECKING (7 periods)

Syntax Directed Translation: Syntax directed definitions, Construction of syntax trees, S-attributed and L-attributed definitions, Translation schemes.

Type Checking: Type expressions, Type systems, Static and dynamic checking of types, Type equivalence, Rules for type checking, Type conversions, Overloading of functions and operators, control flow.

UNIT–IV: INTERMEDIATE CODE GENERATION AND RUN TIME ENVIRONMENT (10 periods)

Intermediate Code Generation: Intermediate forms of source programs - abstract syntax tree, polish notation; Three-address code, Intermediate code for procedures, Syntax directed translation into three-address code, Translation of simple statements, Boolean expressions and flow-of-control statements.

Run Time Environment: Source language issues, Storage organization, Stack allocation of space, Access to nonlocal data on the stack, Parameter passing, Symbol tables.

UNIT–V: CODE OPTIMIZATION AND GENERATION (9 periods)

Code Optimization: Organization of code optimizer, Basic blocks and flow graphs, Optimization of basic blocks, The principal sources of optimization.

Code Generation: Issues in the design of a code generator, Machine dependent code generation, Object code forms, The target language, Simple code generator, Register allocation and assignment, Peephole optimization.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOK(S):

1. Alfred V. Aho, Monica S.Lam, Ravi Sethi, Jeffrey D. Ullman, *Compilers: Principles, Techniques and Tools*, Pearson, 2nd Edition, 2012.

REFERENCE BOOKS:

1. Y.N. Srikant, Priti Shankar, T*he Compiler Design Handbook: Optimizations and Machine Code Generation*, CRC Press, 2nd Edition, 2007.
2. Grune D, Van Reeuwijk K, Bal H.E, Jacobs C.J.H, Langendoen K, *Modern Compiler Design,* Springer, 2nd edition, 2012.
3. David Galles, *Modern Compiler Design,* Pearson, 2007.

ADDITIONAL LEARNING RESOURCES:

https://nptel.ac.in/courses/106/105/106105190/

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	3	1								3			
CO3	2	3	3	3	1								3			
CO4	3	3											3			

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

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

III B. Tech. – II Semester

(20BT60503)SOFT COMPUTING

(Professional Elective - 3)

(Common to CSE, CSE(DS) and CSSE)

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

PRE-REQUISITES: Courses on "Numerical Methods, Probability and Statistics", "Design and Analysis of Algorithms"

COURSE DESCRIPTION: Soft computing technique concepts, Supervised learning networks, Unsupervised learning networks, Genetic algorithms, Fuzzy logic, Hybrid soft computing techniques and applications.

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

CO1. Investigate soft computing techniques for solving computational problems.

CO2. Design efficient neural architectures to model patterns for a given learning problem.

CO3. Investigate and solve optimization problems using genetic algorithms.

CO4. Apply fuzzy logic and reasoning to handle uncertainty in engineering problems.

CO5. Develop intelligent solutions using hybrid soft computing techniques to solve problems of multidisciplinary domains.

DETAILED SYLLABUS:

UNIT–I: INTRODUCTION TO SOFT COMPUTING AND SUPERVISED LEARNING NETWORKS (10 periods)

Introduction to Soft Computing: Neural networks, Application scope of neural networks, Fuzzy logic, Genetic algorithm, Hybrid systems, Soft computing.

Artificial Neural Networks: Fundamentals, Basic Models, Terminologies, Linear Separability, Hebb network.

Supervised Learning Networks: Perceptron Networks- Theory, Perceptron learning rule, Architecture, Flowchart for training process, Perceptron training algorithm for single and multiple output classes, Perceptron network testing algorithm; Back-Propagation Network - Theory, Architecture, Flow chart for training process, Training algorithm, Learning factors of back-propagation network, Testing algorithm for back-propagation network.

UNIT–II: UNSUPERVISED LEARNING NETWORKS (8 periods)

Fixed weight competitive nets – Maxnet, Mexican Hat Net, Hamming network; Kohonen self-organizing feature maps – Theory, Architecture, Flowchart, Training algorithm; Learning vector quantization – Theory, Architecture, Flowchart, Training algorithm, Variants; Counterpropagation networks – Theory, Full counterpropagation Net, Forward-only counterpropagation Net; Adaptive resonance theory network – Fundamental architecture, Fundamental operating principle, Fundamental algorithm.

UNIT–III: GENETIC ALGORITHMS (9 periods)

Genetic algorithms - Biological background, Traditional optimization and search techniques, Genetic algorithm and search space, Genetic algorithms vs. traditional algorithms, Basic terminologies in genetic algorithm, Simple GA, General genetic algorithm, Operators in genetic algorithm, Stopping condition for genetic algorithm flow, Constraints in genetic algorithm, Problem solving using genetic algorithm, Adaptive genetic algorithms, Hybrid genetic algorithms, Advantages and limitations of genetic algorithm, Applications of genetic algorithm.

UNIT–IV: FUZZY LOGIC (11 periods)

Introduction to fuzzy logic, Classical sets, Fuzzy sets, Membership function – Features, Fuzzification, Methods of membership value assignments; Fuzzy arithmetic and measures – Fuzzy arithmetic, Extension principle, Fuzzy measures, Measures of fuzziness, Fuzzy integrals; Fuzzy rule base and approximation reasoning - Truth values and tables in fuzzy logic, Fuzzy propositions, Formation of rules, Compound rules, Aggregation of fuzzy rules, Fuzzy reasoning, Fuzzy inference systems, Overview of fuzzy expert system; Fuzzy decision making, Fuzzy logic control systems.

UNIT–V: HYBRID SOFT COMPUTING TECHNIQUES AND APPLICATIONS

(7 periods)

Hybrid Soft Computing Techniques: Genetic neuro hybrid systems,Genetic fuzzy hybrid and fuzzy genetic hybrid systems.

Applications of Soft Computing: Optimization of traveling salesman problem using genetic algorithm approach, Genetic algorithm-based internet search technique, Soft computing-based hybrid fuzzy controllers, Soft computing-based rocket engine control.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOK(S):

1. S. N. Sivanandam and S. N. Deepa, *Principles of Soft Computing*, Wiley, 3rd Edition, 2019.

REFERENCE BOOKS:

1. S. Rajasekaran and G. A. Vijayalakshmi Pai, *Neural Networks, Fuzzy Logic and Genetic Algorithms:* Synthesis and Applications, PHI Learning Private Ltd, 2011.
2. Udit Chakraborty, Samir Roy, *Soft Computing: Neuro-Fuzzy and Genetic Algorithms,* Pearson, 2013.
3. Saroj Kaushik, Sunita Tewari, *Soft Computing: Fundamentals, Techniques and Applications*, McGraw Hill, 2018.

ADDITIONAL LEARNING RESOURCES:

- https://nptel.ac.in/courses/106105173/

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	3	1										3		
CO3	3	2												3		
CO4	3	2												3		
CO5	3	3	3			2								3		

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

III B. Tech. – II Semester

(20BT51201)DATA WAREHOUSING AND DATA MINING

(Professional Elective – 3)

(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 "Database Management Systems"

COURSE DESCRIPTION: Data Mining Fundamentals; Data Preprocessing; Operational Database Systems and Data Warehouses; Mining Frequent Patterns; Classification and Prediction; Clustering; Data warehousing and Mining tools, New Trends and Research Frontiers.

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

CO1. Demonstrate knowledge on Data Warehousing architecture, Multidimensional models and OLAP operations.

CO2. Apply data preprocessing techniques to produce refined data.

CO3. Apply Association rules and classification techniques for data categorization.

CO4. Use clustering techniques for grouping similar data items and identify outliers.

CO5. Understand Data Mining trends and applications.

DETAILED SYLLABUS:

UNIT I: DATA WAREHOUSING AND ONLINE ANALYTICAL PROCESSING **(9 periods)**

Data Warehouse, Operational Database Systems versus Data Warehouses, A Multi tired Architecture, A Multidimensional Data Model, Stars, Snowflakes and Fact Constellations: Schemas, Role of Concept hierarchies, Measures, OLAP Operations, From online Analytical processing to Multidimensional Data Mining, Indexing OLAP Data.

UNIT II: DATA MINING AND DATA PREPROCESSING **(8 periods)**

Introduction to Data Mining, kinds of data, kinds of patterns, major issues in Data Mining, Data Pre-processing, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Discretization.

UNIT III: ASSOCIATIONS AND CLASSIFICATION **(10 periods)**

Basic Concepts, Frequent itemset Mining Methods, pattern evaluation methods- From Association Mining to Correlation Analysis, Classification, Decision Tree Introduction, Bayesian Classification Methods, Rule Based Classification, Prediction: Linear Regression.

UNIT IV: CLUSTER ANALYSIS **(9 periods)**

Cluster Analysis: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods-k-Means and K-Medoids, Hierarchical methods-Agglomerative and divisive method, Density-Based Method-DBSCAN, Grid-Based

Method-STING, Outlier Analysis.

UNIT V: DATA MINING TRENDS **(9 periods)**

Mining Complex Data Types: Mining sequence data, Mining other kinds of data: Spatial, Text, Multimedia and Web data.

Data Mining Trends: Mining Complex Data Types, Methodologies of Data Mining, Data Mining Applications, Data Mining and Society, Data Mining Trends.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOK:

1. Jiawei Han, Micheline Kamber and Jian Pei, *Data Mining: Concepts and Techniques,* Elsevier, Third Edition, 2013.

REFERENCE BOOKS:

1. K.P. Soman, Shyam Diwakar and V. Ajay, *Insight into Data mining Theory and Practice*, Easter Economy Edition, Prentice Hall of India, 2006.
2. G. K. Gupta, *Introduction to Data Mining with Case Studies*, Easter Economy Edition, Prentice Hall of India, 2006.
3. Tan P.N, Steinbach M. and Kumar V., *Introduction to Data Mining*, Addison-Wesley, 2006.

ADDITIONAL LEARNING RESOURCES:

- http://myweb.sabanciuniv.edu/rdehkharghani/files/2016/02/The-Morgan-Kaufmann-Series-in-Data-Management-Systems-Jiawei-Han-Micheline-Kamber-Jian-Pei-Data-Mining.-Concepts-and-Techniques-3rd-Edition-Morgan-Kaufmann-2011.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	
CO2	1	2	3	3	1										3	
CO3	1	2	3	3	1									3	3	
CO4	1	2	3	3	1									3	3	
CO5	3														3	

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

III B. Tech. – II Semester

(20BT60504) CRYPTOGRAPHY AND NETWORK SECURITY

(Professional Elective – 3)

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

PRE-REQUISITES: A Course on "Computer Networks"

COURSE DESCRIPTION: Concepts of cryptographic algorithms, Substitution techniques, Symmetric ciphers, Block cipher operations, Cryptographic data integrity algorithms,Key management and distribution, User authentication, Transport level security, Electronic mail security, IP security.

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

CO1. Apply the knowledge of concepts of network security, symmetric and public key cryptosystems to identify the potential threats in networks.

CO2. Analyze hash functions, message authentication codes, digital signatures for providing data integrity in information security applications.

CO3. Use key management and distribution techniques, user authentication techniques for assuring mutual trust among users.

CO4. Demonstrate knowledge on network and Internet security techniques for addressing the security threats.

DETAILED SYLLABUS:

UNIT–I: INTRODUCTION (9 periods)

Computer security concepts, Security attacks, Security services, Security mechanisms, Model for network security, Symmetric cipher model, Substitution techniques - Monoalphabetic ciphers and Polyalphabetic ciphers.

UNIT–II: SYMMETRIC CIPHERS (7 periods)

Stream ciphers and block ciphers, Data Encryption Standard (DES), Advanced Encryption Standard (AES) - Structure, Transformation Functions; Block Cipher Operation - Multiple encryption and triple DES, Cipher block chaining mode, Cipher feedback mode, Output feedback mode, Counter mode.

UNIT–III: PUBLIC KEY CRYPTOGRAPHY AND CRYPTOGRAPHIC DATA INTEGRITY ALGORITHMS (9 periods)

Public Key Cryptography: RSA, Diffie-Hellman key exchange, Elgamal cryptographic system.

Cryptographic Data Integrity Algorithms: Hash Functions - Simple hash functions, Secure Hash Algorithm SHA-512; Message Authentication Codes – Requirements, Functions, Security of MACs, HMAC; Digital signatures - Schnorr Digital signature scheme.

UNIT–IV: MUTUAL TRUST (10 periods)

Key Management and Distribution: Symmetric key distribution using symmetric and asymmetric encryption, Distribution of public keys, X.509 certificates, Public key infrastructure.

User Authentication: Remote user authentication principles, Kerberos, Personal identity verification.

UNIT–V: NETWORK AND INTERNET SECURITY (10 periods)

Transport Level Security: Web security considerations, Transport layer security, HTTPS.

Electronic Mail Security: S/MIME, Pretty Good Privacy, DNSSEC.

IP Security: Overview, Policy, Encapsulating security payload.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOK:

1. William Stallings, *Cryptography and Network Security: Principles and Practice*, 8th Edition, Pearson, 2020.

REFERENCE BOOKS:

1. William Stallings, *Network Security Essentials: Applications and Standards*, 6th Edition, Pearson, 2018.
2. Douglas R. Stinson, Maura B. Paterson, *Cryptography: Theory and Practice*, 4th Edition, CRC Press, 2018.
3. Atul Kahate, Cryptography and Network Security, 3rd Edition, McGraw Hill, 2017.

ADDITIONAL RESOURCES

- https://nptel.ac.in/courses/106105031/
- https://www.udemy.com/introduction-to-cryptography-online-course-rahsoft-crypto-certificate/
- https://www.coursera.org/learn/asymmetric-cryptography
- https://www.khanacademy.org/computing/computer-science/cryptography

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
CO2	3	3		3												3
CO3	3	3														3

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

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

III B. Tech. – II Semester

(20BT61506) USER INTERFACE DESIGN

(Professional Elective - 3)

(Common to CSE, CSSE and IT)

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

PRE-REQUISITES: Courses on "Computer Organization" and "Operating Systems"

COURSE DESCRIPTION: Usability Goals and Measures; Physical Abilities and Physical Workplaces; The Design Process, Design Frameworks;2-D and 3-D Interfaces; Keyboards and Keypads, Pointing Devices; Five-Stage Search Framework, Dynamic Queries and Faceted Search.

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

CO1. Analyze the user requirements, technological and physical characteristics of users for better interface design.

CO2. Analyze desktop and mobile applications by applying various user interface design methods.

CO3. Analyze the usability of user-interfaces using qualitative Nielsen's guidelines and testing methodologies.

CO4. Identify interaction and navigation styles to model the user interfaces.

CO5. Apply speech recognition, command languages, collaboration models to find the design consistency in user interfaces.

CO6. Analyze search interfaces by applying five stage framework for effective data visualization.

DETAILED SYLLABUS:

UNIT I: USABILITY OF INTERACTIVE SYSTEMS (9 Periods)

Usability Goals and Measures, Usability Motivations Universal Usability: Variations in Physical Abilities and Physical Workplaces, Diverse Cognitive and Perceptual Abilities, Personality Differences, Cultural and International Diversity, Users with Disabilities, Older Adult Users, Children, Accommodating Hardware and Software Diversity.

UNIT II: DESIGN PROCESSES AND USER EXPERIENCE (9 Periods)

Organizational Support for Design, the Design Process, Design Frameworks, Design Methods, Design Tools, Practices, and Patterns, Social Impact Analysis, Legal Issues.

Evaluation and the User Experience: Expert Reviews and Heuristics, Usability Testing and Laboratories, Survey Instruments, Acceptance Tests, Evaluation during Active Use and Beyond, Controlled Psychologically Oriented Experiments.

UNIT III: INTERACTION STYLES (9 Periods)

Direct Manipulation and immersive Environments: What Is Direct Manipulation?, 2-D and 3-D Interfaces, Teleoperation and Presence, Augmented and Virtual Reality.

Fluid Navigation: Navigation by Selection, Small Displays, Content Organization, Audio Menus, Form Fill-in and Dialog Boxes.

Case Study: Iterative Design Evaluation of Automated Teller Machines (ATMs).

UNIT IV: EXPRESSIVE HUMAN AND COMMAND LANGUAGES (9 Periods)

Speech Recognition, Speech Production, Human Language Technology, Traditional Command Languages

Device: Keyboards and Keypads, Pointing Devices, Displays

Communication and Collaboration: Models of Collaboration, Specific Goals and Contexts, Design Considerations

Case Study: Design Consistency at Apple Computer

UNIT V: INFORMATION SEARCH AND DATA VISUALIZATION (9 Periods)

Five-Stage Search Framework, Dynamic Queries and Faceted Search, Command Languages and "Natural" Language Queries, Multimedia Document Search and Other Specialized Search, the Social Aspects of Search.

Data Visualization: Tasks in Data Visualization, Visualization by Data Type, Visualization by Data Type, Challenges for Data Visualization.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Schneiderman, Plaisant, Cohen, Jacobs, Elmqvist, *Designing the User Interface*, Pearson Education, 6th Edition, 2018.

REFERENCE BOOKS:

1. A Dix, Janet Finlay, G. D. Abowd and R. Beale, *Human- Computer Interaction*, Pearson Publishers, 3rd Edition, 2008.
2. Jonathan Wolpaw and Elizabeth Winter Wolpaw, *Brain-Computer Interfaces: Principles and Practice*, Oxford Publishers, 2012.

ADDITIONAL LEARNING RESOURCES

- https://nptel.ac.in/courses/106103115/

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			
CO2	2	3	2		2								3			
CO3	2	3	1	2	1								3			
CO4	3	3	2	1	2								3			
CO5	3	3	2	1	2								3			
CO6	2	3	1	2	1								3			

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

III B. Tech. – II Semester

(20BT60441) MICROPROCESSORS AND INTERFACING

(Interdisciplinary Elective – 1)

(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 "Digital Logic Design"

COURSE DESCRIPTION: INTEL 8086 & 8051- Architectures; Instruction set; Programmable Interfacing Concepts; ADC, DAC, 8255, 8257,8259 ,8279,8251, Advanced peripheral Interfacing; Applications.

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

CO1. Analyze architecture of Intel 8086 microprocessor.

CO2. Develop programs for various control applications using Assembly language by analyzing Instruction set and addressing modes of Intel 8086.

CO3. Design a Microcomputer based system with external peripherals by analyzing various Interfacing techniques Using 8086

CO4. Develop programs for Intel 8051 Microcontroller by analyzing its Architecture, Instruction set and On-chip resources.

DETAILED SYLLABUS:

UNIT I – INTEL 8086 ARCHITECTURE AND PROGRAMMING (08 periods)

Evolution of Microprocessors, Architecture of 8086 microprocessor, Register organization, Physical Memory Organization, Signal description of 8086, General Bus Operation Minimum and Maximum mode operation of 8086, Timing diagram, Addressing modes.

UNIT II – ASSEMBLY LANGUAGE PROGRAMMING WITH 8086 AND INTERRUPTS (11 periods)

Instruction set of 8086, Assembler directives and Operators; Interrupts and Interrupt service routines, Interrupt Cycle of 8086, Non Maskable interrupt, Maskable interrupt (INTR), Interrupt Programming, Passing Parameters to procedures, MACROS.

UNIT III–BASIC PERIPHERALS AND THEIR INTERFACING WITH 8086 (08 periods)

Semiconductor memory Interfacing, Dynamic RAM interfacing, Interfacing I/O ports, Programmable Input-Output Port (PIO) 8255, Modes of operations of 8255, Interfacing analog to digital and digital to analog converters, stepper motor interfacing.

UNIT IV – SPECIAL PURPOSE PROGRAMMABLE PERIPHERAL DEVISES

(09 periods)

Programmable Interrupt Controller 8259A; The keyboard/Display Controller 8279-Architecture, Signal Description, Modes of operations; Programmable Communication Interface 8251 USART; DMA Controller 8257, DMA Transfers and Operations.

UNIT V – AN INTRODUCTION TO 8051 MICROCONTROLLER (09 periods)

Microprocessors Vs Microcontrollers, The 8051 Architecture: Introduction, 8051 Microcontroller Hardware, input/output pins, Ports and circuits, External Memory, Counters and Timers, Serial Data Input / Output, Interrupts; Addressing Modes, Instruction set of 8051, simple programs on arithmetic operations using 8051.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. A.K. Ray & K.M.Bhurchandi, A*dvanced Microprocessors and Peripherals- Architecture, Programming and Interfacing,* TMH, 2nd Edition, 2002 reprint.
2. Kenneth J. Ayala, *The 8051 Microcontroller-Architecture, Programming & Applications,* Cengage learning, 3rd Edition, June 2004.

REFERENCE BOOKS:

1. Douglas V.Hall, *Microprocessors and Interfacing: Programming and Hardware,*TMH, revised 2nd Edition, 2003*.*
2. Mazidi and Mazidi, *The 8051 Microcontroller and Embedded Systems*, PHI, 2nd Edition, 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	3		2									3			
CO2	3	2	3	2									3			
CO3	3	2	3	2	2	1							3			
CO4	3	2	3	2	1								3			

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

III B. Tech. – II Semester

(20BT60314) OPTIMIZATION TECHNIQUES

(Interdisciplinary Elective -1)

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

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

PRE-REQUISITES: A Course on "Differential Equations and Multivariable Calculus"

COURSE DESCRIPTION: Introduction to optimization; classical optimization techniques; classification of optimization problems; linear programming; Transshipment and Travelling salesman problem; non-linear programming; un-constrained non-linear programming; constrained non-linear programming; dynamic programming; Genetic Algorithm; Ant Colony Optimization.

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

CO1. Model and solve unconstrained optimization problems.

CO2. Apply LP Techniques and Conduct Sensitivity analysis for real life Problems.

CO3. Apply Non-Linear Programming techniques for real life problems.

CO4. Analyze various complex problems by using Dynamic programming approaches.

CO5. Model and solve complex problems using evolutionary algorithms to optimize the parameters.

DETAILED SYLLABUS:

UNIT -I: CLASSICAL OPTIMIZATION TECHNIQUES (09 periods)

Introduction, Engineering applications of optimization, Statement of an optimization problem, Design vector, Design constraints, Constraint surface, Objective function, Classification of optimization problems, Single variable optimization, Multi variable optimization without constraints, Multi variable optimization with equality constraints - Lagrange multipliers method; Multi variable optimization with inequality constraint - Kuhn Tucker conditions.

UNIT -II: LINEAR PROGRAMMING (09 periods)

Introduction, Formulation, Primal Simplex method, Dual simplex method, Sensitivity Analysis, Goal programming.

UNIT –III: NON-LINEAR PROGRAMMING (09 periods)

One dimensional minimization methods, classification - Fibonacci method, quadratic interpolation method; classification of unconstrained minimization methods - Powell's method, steepest descent method (Cauchy's method); classification of constrained optimization techniques - interior and exterior penalty function methods.

UNIT –IV: DYNAMIC PROGRAMMING (09 periods)

Multistage decision processes, Concept of sub optimization and Principle of optimality, Computational procedure in dynamic programming - Calculus method, Tabular method; Linear Programming problem by dynamic programming approach, Applications - reliability problem, shortest path problem, and capital budgeting problem.

UNIT- V: EVOLUTIONARY OPTIMIZATION ALGORITHMS (09 periods)

Introduction to Evolutionary optimization, genetic algorithm-Mathematical Modeling of Genetic algorithm, Ant Colony Optimization, particle swarm Optimization and differential evolution techniques.

Total Periods:45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Singiresu S Rao, Engineering Optimization: Theory and Practice, New Age International, 3rdEdition, 2013.
2. A.Ravindran, K.M.Ragsdell, G.V.Reklaitis, Engineering Optimization: Methods and applications, Wiley India Pvt. Ltd., 2nd Edition, 2006.
3. Dan Simon, Evolutionary Optimization Algorithms, John Wiley & Sons, 2013.

REFERENCE BOOKS:

1. C Mohan and Kusum Deep, Optimization Techniques, New Age International Publishers, 1st Edition, 2010.
2. Hamdy A. Taha, Introduction to Operations Research, PHI, 10th 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	1		1							3			
CO2	3	3	3	1		1							3			
CO3	3	3	3	1		1							3			
CO4	3	3	3	1		1							3			
CO5	3	3	3	1		1							3			

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

III B. Tech. – II Semester
(20BT60343) ROBOTICS AND AUTOMATION

(Interdisciplinary Elective – 1)

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

PRE-REQUISITES: --

COURSE DESCRIPTION: Introduction to automation; Need and levels of automation; Applications of automation; Programmable logical controller; Introduction to robotics; End effectors; Robotic drive mechanisms; Manipulator kinematics; Manipulator dynamics; Trajectory planning; Sensors; Robotic programming; Robotic application; Artificial intelligence; Case studies;

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

CO1. Demonstrate the knowledge of automation and usage of programmable logical controllers.

CO2. Demonstrate the knowledge of robotics, end effector and drive systems associated with a robot.

CO3. Analyze different robotic manipulations for robotic kinematics and dynamic motion planning.

CO4. Analyze trajectory planning for robotics path planning and sensors for vision.

CO5. Demonstrate the robotic programming applications and implementing artificial intelligence strategies.

DETAILED SYLLABUS:

UNIT - I: AUTOMATION (9 Periods)

Introduction to automation; Need; Elements; Types of automation systems; Levels of automation: Applications of automation; Goals; Programmable Logical Controller, Hardware, Architecture of PLC system, Power supplies and Isolators, Selection of PLC Systems-Allen Bradley, Omron, Mitsubishi. IEC Standard, Programming PLC's, Networking of PLC's, Advantages and Disadvantages of PLC.

UNIT - II: ROBOTICS (9 Periods)

Introduction to Robot, History, Classifications, law of robotics, Anatomy, Configuration of robots, Joint notation schemes, Work volume, Degrees of freedom, End effectors-Classification of End effectors, Tools as end effectors; Drive system for grippers - Mechanical, Adhesive, Vacuum, Magnetic; Hooks & scoops, Gripper force analysis and gripper design, Active and Passive grippers; Robot Drive Mechanisms - Hydraulic, Electric-Servomotor, Stepper Motor, Pneumatic drives.

UNIT-III: MANIPULATOR KINEMATICS AND DYNAMICS (9 Periods)

Manipulator kinematics: Mathematical Preliminaries on Vectors& Matrices, Homogeneous transformations as applicable to rotation and translation, (D-H) notation, forward

kinematics, Inverse kinematics, Manipulators with two, Three degrees of freedom. Manipulator dynamics: Introduction, Inertia of a Link, Lagrangian formulation for a planar 2R manipulator.

UNIT-IV: TRAJECTORY PLANNING AND SENSORS (9 Periods)

Trajectory planning: Trajectory planning and avoidance of obstacles, Path planning, Skew motion, Joint integrated motion, straight line motion.

Sensors: Position sensors, Velocity sensors, Tactile sensors, Proximity sensors, Machine vision sensors, Fail safe hazard sensor systems and Compliance mechanism.

UNIT - V: ROBOT PROGRAMMING AND APPLICATIONS (9 Periods)

Robot programming: Types, Features of languages and Software packages. Robot application: Robot Application in Industry, Task programming, Goals of AI Research, AI Techniques, Robot Intelligence and Task Planning, Modern Robots, Future Application and Challenges, and Case Studies.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. M.P.Groover, *Industrial Robotics: Technology, Programming, and Applications*, Tata McGraw-Hill, 2008.
2. John. J. Craig, *Introduction to Robotics: Mechanics and Control*, Pearson/Prentice Hall, 3rd Edition, 2005.

REFERENCE BOOKS:

1. S.K. Singh, *Computer Aided Process Control*, PHI, 2009.
2. Bolton. W, *Programmable Logic Controllers*, 5th edition, 2009.
3. K. S. Fu., R. C. Gonzalez, C. S. G. Lee, *Robotics: Control Sensing, Vision and Intelligence,* International Edition, Tata McGraw Hill, 2008.
4. John W. *Webb* and Ronald A. Reis, Programmable Logic Controllers-Principles and Applications, Pearson Education, 5th Edition, 2002.

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							3			
CO2	3	2	1			1							3			
CO3	3	3	2			1							3			
CO4	3	3	2			1							3			
CO5	3	3	1		1	1							3	1		

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

III B. Tech. – II Semester

(20BT60406) IMAGE PROCESSING

(Interdisciplinary Elective – 1)

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

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

PRE-REQUISITES: --

COURSE DESCRIPTION: Image Fundamentals, Image Transforms, Image enhancement in spatial and frequency domains, Restoration of images corrupted by noise, Image Compression models with coding, Segmenting images based on properties and Color image processing.

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

CO1. Apply various transformations on images by analyzing basic operations on images.

CO2. Apply various image enhancement techniques in spatial and frequency domains.

CO3. Apply restoration techniques based on noise models and degradation function to restore the images, pertaining to health and societal applications.

CO4. Analyze various coding techniques for compression to reduce redundancies in images.

CO5. Analyze various segmentation techniques on images for societal applications.

CO6. Analyze various color models for different types of images.

DETAILED SYLLABUS:

UNIT–I: IMAGE FUNDAMENTALS (10 Periods)

Fundamental steps in Image Processing, Image sampling & quantization, some basic relationships between pixels, Arithmetic operations, Logical operations, Spatial operations.

Image Transforms: 2D-DFT, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar-Transform, Slant Transform and KL Transform, properties of image transforms.

UNIT-II: IMAGE ENHANCEMENT (11 Periods)

Basic Intensity transformation functions, Histogram processing, Fundamentals of Spatial Filtering, Smoothing spatial filters, Sharpening spatial filters, Combining spatial Enhancement methods.

Basics of filtering in frequency domain, Correspondence between filtering in the spatial and frequency domains, Image smoothing using frequency domain filters, Image sharpening using frequency domain filters, Homomorphic filtering.

UNIT-III: IMAGE RESTORATION (07 Periods)

Image degradation/Restoration model, Noise models, Restoration in the presence of Noise only-spatial filtering - mean, order- statistic and adaptive filters. Estimating the degradation function, Inverse filtering, Weiner filtering, Constrained least squares filtering.

UNIT-IV: IMAGE COMPRESSION (08 Periods)

Classification of redundancy in Images, Image Compression models, Run length coding, Arithmetic coding, Dictionary based compression, bit-plane coding, Transform based coding, Fidelity Criteria, JPEG 2000.

UNIT-V: IMAGE SEGMENTATION AND COLOR IMAGE PROCESSING (09 Periods)

Detection of discontinuities- Point, line and edge Detection. Thresholding- global thresholding, adaptive thresholding. Region based Segmentation. Color image fundamentals - RGB, HSI models, conversions, Pseudo Color Image Processing, Color transformations.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Rafael C. Gonzalez & Richard E. Woods, *Digital Image Processing*, Pearson Education,4th Edition, 2018.
2. Anil K. Jain, *Fundamentals of Digital Image processing*, Prentice Hall, 2007.

REFERENCE BOOKS:

1. S Jayaraman, S Esakkirajan, T Veerakumar, *Digital Image Processing*, Tata McGraw Hill Education, Second Edition, 2020.
2. Vipula Singh, *Digital Image Processing with MATLAB & LabVIEW*, Elsevier, 2019.

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	3									3		
CO2	3	2	2	2	3									3		
CO3	3	2		2	3	2	2							3		
CO4	3	3	2	2	2	2	2	2						3		
CO5	3	3	2	2	2	2	2						1			
CO6	3	3			2									3		

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

III B. Tech. – II Semester

(20BT51232) WEB TECHNOLOGIES LAB

(Common to CSE and CSSE)

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

PRE-REQUISITES: Courses on "Object Oriented Programming through Java" and "Web Technologies"

COURSE DESCRIPTION: Hands-on experience on HTML, HTML5, CSS, JavaScript, JQuery, Bootstrap, PHP and MySQL.

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

CO1. Demonstrate knowledge on web page design elements, dynamic content and database connection.

CO2. Analyze user requirements to develop web applications.

CO3. Design client-server applications using web technologies.

CO4. Demonstrate problem solving skills to develop enterprise web applications.

CO5. Apply HTML, CSS, JavaScript, JQuery, Bootstrap and PHP technologies for device independent web application development.

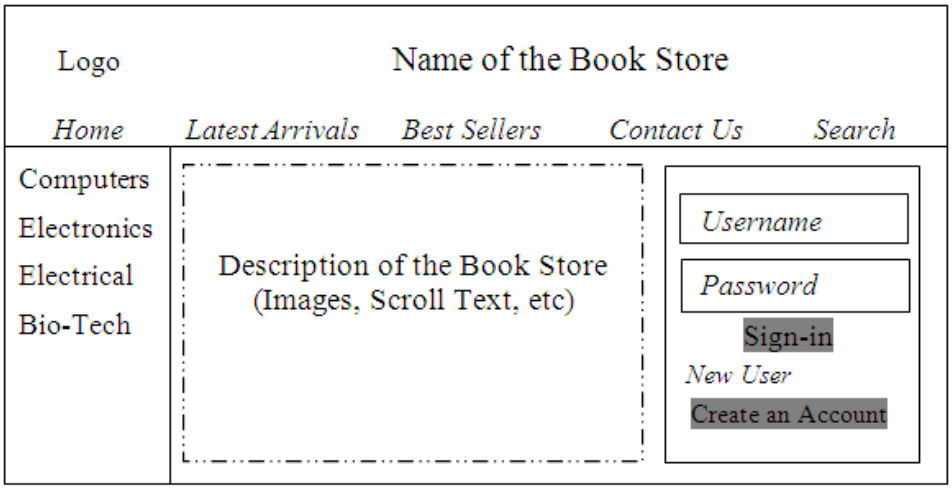
CO6. Apply web technologies to develop interactive, dynamic and scalable web applications for societal needs.

CO7. Work independently or in teams to solve problems with effective communication.

LIST OF EXPERIMENTS:

1. Design the following static web pages of an online book store web application.

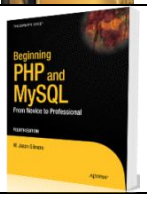
a. Home Page:



b. Catalogue Page:

The catalogue page should display the following details of available books.

i. Snap shot of cover page ii. Title of the text book iii. Author name
iv. Publisher v. Price vi. More details link

Logo	Name of the Book Store			
Home	*Latest Arrivals*	*Best Sellers*	*Contact Us*	*Search*
Computers Electronics Electrical Bio-Tech	 	**HTML5 Black Book** Kogent Learning Solutions Dreamtech Press Rs. 570/-	More Details	
	 	**Beginning PHP and MySQL** 4th Edition W Jason Gilmore Apress Rs. 520/-	More Details	

c. Registration Page:

Design the Registration page with the following fields and navigate it with create an account link.

i. First Name ii. Last Name iii. Gender
iv. Date of Birth v. Username vi. Password
vii. Confirm Password viii. Address ix. Postal Code
x. Mobile No. xi. Email-Id

2. a. Design a web page to store username and password information using the local storage concept.

   b. Design a web page to store employee information including Name, Emp. Id, Department, Salary and Address on a client's machine using a real SQL database.

3. Apply the following styles to all web pages of online book store web application.
   a. Fonts and Styles: font-family, font-style, font-weight and font-size
   b. Backgrounds and colors: color, background-color, background-image and background-repeat
   c. Text: text-decoration, text-transformation, text-align and text-indentation, text-align
   d. Borders: border, border-width, border-color and border-style
   e. Styles for links: A: link, A: visited, A: active, A: hover
   f. Selectors, Classes, Layers and Positioning elements.

4. Write a JavaScript/JQuery code to validate the following fields of the Registration web page.
   a. First Name/Last Name - should contain only alphabets and the length should not be less than 8 characters.
   b. Username - It should contain combination of alphabets, numbers and underscore. It should not allow spaces and special symbols.
   c. Password - It should not less than 8 characters in length and it contains one uppercase letter and one special symbol.
   d. Date of Birth - It should allow only valid date; otherwise display a message stating that entered date is invalid. Ex. 29 Feb. 2009 is an invalid date.
   e. Postal Code: It must allow only 6 digit valid number.
   f. Mobile No. - It should allow only numbers and total number of digits should be equal to 10.
   g. e-mail id - It should allow the mail id with the following format: Ex. mailid@domainname.com

5. Design a web page with the following features using HTML5, JavaScript and JQuery
   a. Displaying of images with Custom animated effects
   b. Playing of selected video from the list of videos
   c. Showing the animated text in increasing and decreasing font size
   d. Changing the size of the area in a web page using DIV tag
   e. Hiding and Showing elements in a web page.

6. Design a web page with the following features using Bootstrap and Media Query.
   a. Components
   b. Responsive tables
   c. Responsive images and videos
   d. Toolbars, Buttons and Lists

7. a. Deploy and navigate web pages of online book store using WAMP/XAMPP web server.
   b. Write a PHP program to read user name and favorite color from the HTML form. Display the name of the user in green color and sets user favorite color as a background for the web page.

8. Write a PHP code to read the username and password entered in the Login form of the online book store and authenticate with the values available in cookies. If user enters a valid username and password, welcome the user by username otherwise display a message stating that, entered details are invalid.

9. Write a PHP code to read user details entered through the registration web page and store the same into MySQL database.

10. Write a PHP code for storing books details like Name of the book, author, publisher, edition, price, etc into MySQL database. Embed a PHP code in catalogue page of the online book store to extract books details from the database.

11. Mini Project

REFERENCE BOOKS:

1. Kogent Learning Solutions Inc, HTML 5 Black Book: Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP and JQuery, Dreamtech Press, FirstEdition, 2011.
2. W. Jason Gilmore, Beginning PHP and MySQL, APress, Fourth Edition, 2011.
3. Snig Bahumik, Bootstrap Essentials, PACKT Publishing, First Edition, 2015. (e-book).

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	3											3			
CO3	2	2	3										3			2
CO4	2	2	2	3									3			
CO5	2	2	3	2	3								3		3	
CO6	2	2	2	2	1		3						3		3	2
CO7									3	3						

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

III B. Tech. – II Semester

(20BT60531) MACHINE LEARNING LAB

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

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

PRE-REQUISITES: Courses on "Python Programming", "Machine Learning"

COURSE DESCRIPTION: Implementation of Back propagation algorithm, Decision tree learning, Neural networks, k-NN from scratch algorithm, Naïve Bayes classifier, Radial basis function neural network, SVM based classifier, Maximum likelihood estimation using statistical techniques.

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

CO1. Analyze the given problem and identify appropriate machine learning technique to provide an intelligent solution.

CO2. Design and implement machine learning solutions for classification, regression, and clustering problems.

CO3. Develop intelligent solutions to solve societal problems related to computer vision, information security, healthcare and other areas.

CO4. Work independently to solve problems with effective communication.

LIST OF EXERCISES:

1. Solve classification problem by constructing a feedforward neural network using Backpropagation algorithm. (Wheat Seed Data)
2. Implement ID3 (information gain) algorithm for decision tree learning for transforming continuous variables into discrete variables.
3. Explore the problem of overfitting in decision tree and develop solution using pruning technique.
4. Build a neural network that will read the image of a digit and correctly identify the number.
5. Implement k-NN algorithm to solve classification problem.
6. Use Naïve Bayes classifier to solve the credit card fraud detection problem over a skewed dataset.
7. Design and implement a radial basis function neural network to solve function approximation or regression problem.
8. Compare and analyze the performance of optimal Bayes classifier and Naïve Bayes using simulated Gaussian Data.
9. Train an SVM based classifier to predict whether the cancer is malignant or benign.
10. Solve the stock price forecasting problem using statistical techniques – Maximum Likelihood estimation after understanding the distribution of the data.

REFERENCE BOOKS:

1. Sebastian Raschka, Vahid Mirjalili, *Python Machine Learning*, Packt Publishing, 3rd Edition, 2019.
2. Aurelien Geron, *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems*, 2nd Edition, O'Reilly, 2019.

SOFTWARE/TOOLS:

- Python
- Scikit-learn/Keras/TensorFlow

ADDITIONAL LEARNING RESOURCES:

- https://www.coursera.org/learn/machine-learning
- https://nptel.ac.in/courses/106106202/

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	3									3		
CO2	1	3	3	3	3									3		
CO3	1	3	3	3	3	3								3		
CO4									3	3						

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

III B. Tech. – II Semester

(20BT51551) INTERNET OF THINGS LAB

(Common to CSE, CSE(AI), CSE(DS), EEE, EIE and CE)

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

PRE-REQUISITES: --

COURSE DESCRIPTION: Setting up IoT work-flow, Programming with Python, Micro-controller programming using Arduino, Building IoT Applications using Raspberry Pi, IoT Cloud Infrastructure.

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

CO1. Design an interface to embedded systems using real time sensors with Arduino and Raspberry Pi.

CO2. Develop applications to capture the data generated by sensors and send to cloud.

CO3. Develop real time applications using NodeMCU and BLYNK.

CO4. Design applications to push sensor data to cloud using MQTT protocol.

CO5. Work independently and in team to solve problems with effective communication.

Theory Component: **(10 Periods)**

Arduino IDE, 7-segment display, Servo motor, ultrasonic sensor, LCD, Flame sensor, gas sensor, Humidity & temperature sensors, MQTT protocols, ECG System, Raspberry Pi, Home security system with camera, PIR sensor, light sensor, motion detector, NodeMCU, BLYNK, cloud.

LIST OF EXPERIMENTS:

1. (a) Design and simulate LED 7-Segment Display interfacing with Arduino.
   (b) Design and simulate Servo motor interfacing with Arduino.
2. (a) Design and simulate ultrasonic sensor and LCD interfacing with Arduino.
   (b) Design and simulate Flame Sensor interfacing with Arduino.
3. Design and implement to capture Gas Sensor and send sensor data to cloud from your NodeMCU device using Arduino IDE.
4. Design and implementation of Humidity and Temperature Monitoring Using Arduino and upload data to cloud using MQTT.
5. Design and implementation of an IoT ECG (Electrocardiogram) System to record hearts electrical activity.
6. Design and simulate controlling an LED 7-Segment Display with Raspberry Pi.
7. Design and implementation of Raspberry Pi Home Security System with Camera and PIR Sensor with Email Notifications.

8. Design and implement to upload Light sensor (TSL) data to cloud through Raspberry Pi.
9. Design and implementation of Motion Detector with NodeMCU and BLYNK.
10. Design and implementation of Fire notification IoT system with BLYNK.

REFERENCE BOOKS:

1. Adrian McEwen and Hakin Cassimally, *Designing the Internet of Things,* Wiley India.
2. Simon Monk, *Programming Arduino,* Second Edition, McGraw-Hill Education,2016.
3. Matt Richardson and Shawn Wallace, *Getting Started with Raspberry Pi*, O'Reilly, 2014.
4. Rahul Dubey, *An Introduction to Internet of Things: Connecting Devices, Edge Gateway, and Cloud with Applications*, Cengage Learning India Pvt. Ltd, 2019.

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						3			
CO2	2		2			2	3						3			2
CO3	1	3	2		1	1	1						3			
CO4	1	2	2		3	1	1	1					3			2
CO5									3	3						

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

III B.Tech. – II Semester

(20BT503AC) FOUNDATIONS OF ENTREPRENEURSHIP

(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: The nature and growth of entrepreneurship; Characteristics of an entrepreneur; Types of Entrepreneurs; Ethics and social responsibility of entrepreneurs; Generating ideas; Opportunity identification; Implementing and managing the venture; Principles of creativity and innovation; Methods of protecting innovation and creativity; Market research; Feasibility analysis; Sources of funding; Preparation of business plan; Start-Ups; Social Entrepreneurship; Rural entrepreneurship.

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

CO1. Demonstrate knowledge on personal attributes that enable best use of entrepreneurial opportunities.

CO2. Apply suitable method to protect creativity and innovation.

CO3. Design and prepare high impact strategic and business plan.

CO4. Analyze the major steps and requirements in order to convert innovative idea into a successful start-up.

CO5. Develop an idea to create a business for social change by identifying social entrepreneurship opportunities.

DETAILED SYLLABUS:

UNIT–I: ENTREPRENEURIAL MINDSET (06 Periods)

The nature and growth of entrepreneurship, Entrepreneurship and Intrapreneurship, Characteristics of an entrepreneur, Types of Entrepreneurs, Women as an Entrepreneur, Factors that contribute to the success of entrepreneurs, Ethics and social responsibility of entrepreneurs.

UNIT–II: **ENTREPRENEURIAL PROCESS (06 Periods)**

Generating ideas, Opportunity identification, Business concepts, Resources (Financial, Physical and Human), Implementing and managing the venture, Harvesting the venture, Harvesting strategies: Absorption of new concept into mainstream operations, Licensing of rights, Family succession, Liquidate (Shut down) venture, Selling the venture, Management Buy-Out (MBO).

UNIT–III: CREATIVITY AND INNOVATION (06 Periods)

Principles of creativity and innovation, Disruptive, incremental and open innovations, Nurturing and managing innovation, Methods of protecting innovation and creativity:

Intellectual property rights, Branding, Trademarks, Patents, Copyrights, Registered design protection, Trade secrets.

UNIT–IV: NEW VENTURE PLANNING AND CREATION (06 Periods)

Market research (venture opportunity screening), Feasibility analysis, Start-up capital;

Sources of funding: equity financing, debt financing (loans, venture funding, angel funding), grants, gifts, bequests and financial statements, Introduction to the business plan, Preparation of business plan.

UNIT–V: START-UPS AND SOCIAL ENTREPRENEURSHIP (06 Periods)

Start-Ups: Definition to start-up, Start-up activities, Promising start-ups, Venture-backed start-ups, Corporate-supported start-ups.

Social Entrepreneurship: Social enterprise-Need - Types - Characteristics and benefits of social enterprises, Rural entrepreneurship.

Total Periods: 30

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Robert D. Hisrich, Mathew J. Manimala, Michael P. Peters, Dean A. Shepherd, *Entrepreneurship*, McGraw Hill Education (India) Private Limited, Eighth Edition, 2013.
2. Marc J Dollinger, Entrepreneurship: Strategies and Resources, Pearson, Third Edition, 2003.

REFERENCE BOOKS:

1. Vasant Desai, *Dynamics of Entrepreneurial Development and Management,* Himalaya Publ. House, 2004.
2. *Harvard Business Review on Entrepreneurship,* HBR Paper Back.
3. Thomas W. Zimmerer & Norman M. Scarborough, *Essential of Entrepreneurship and small business management,* PHI.

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	3	2	1			1		1			1					
CO3	3	2	2			2		1								
CO4	3	3	1			2		1			3					
CO5	3	2	1			2		1			1					

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

IV B. Tech. – I Semester

(20BT61201) CLOUD COMPUTING

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

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

PRE-REQUISITES: Courses on"Object Oriented Programming through Java", "Computer Networks" and "Operating Systems"

COURSE DESCRIPTION: Fundamental Cloud Computing and Virtualization; Understanding Cloud Models and Architectures; Understanding Cloud Services, Applications and Capacity Planning; Exploring Platform as a Service (PaaS); Exploring Infrastructure as a Service (IaaS).

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

CO1. Demonstrate knowledge on basic concepts and terminologies of Cloud Computing and Virtualization.

CO2. Demonstrate knowledge on Cloud deployment models, Service models and Architectures.

CO3. Analyze Cloud services, Applications and Capacity Planning.

CO4. Use different PaaS application frameworks to construct Cloud applications.

CO5. Develop web applications through Google, Microsoft and Amazon web services as per societal needs.

DETAILED SYLLABUS:

UNIT I–FUNDAMENTAL CLOUD COMPUTING AND VIRTUALIZATION (10 periods)

Cloud Computing: Origin and influences, Basic concepts and terminology, Goals and benefits, Risks and challenges, Roles and boundaries and Cloud characteristics.

Introduction to Virtualization: Characteristics, Taxonomy of virtualization technologies, Pros and cons of virtualization, Virtualization Technologies: Xen,VMware and Hyper-V.

UNIT II– UNDERSTANDINGCLOUD MODELS AND ARCHITECTURES (8 periods)

Cloud Models: NIST model, Cloud Cube model, Deployment models: Public, Private, Hybrid and Community; Service models: IaaS, PaaS and SaaS.

Understanding Cloud Architecture: Exploring the Cloud Computing Stack: Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications; Connecting to the Cloud: The Jolicloud Netbook OS and Chromium OS - The Browser as an Operating System.

UNIT III – UNDERSTANDING CLOUD SERVICES, APPLICATIONS AND CAPACITY PLANNING (9 periods)

Understanding Cloud Services and Applications Infrastructure as a Service (IaaS): IaaS workloads, Pods, aggregation, and silos; Platform as a Service (PaaS), Software as a Service (SaaS): SaaS characteristics, Open SaaS and SOA, Salesforce.com and CRM SaaS; Identity as a Service (IDaaS): Identity, Networked identity service classes, Identity system codes of conduct, IDaaS interoperability; Compliance as a Service (CaaS).

CapacityPlanning: Defining Baseline and Metrics: Baseline measurements, System metrics, Load Testing, Resource ceilings, Server and instance types; Network Capacity and Scaling.

UNIT IV – EXPLORING PLATFORM AS A SERVICE (PaaS) (10 periods)

PaaS Application Frameworks: Drupal, Eccentex AppBase 3.0, LongJump, Squarespace, WaveMaker and Wolf Frameworks.

Exploring Platform as a Service using Google Web Services: Surveying the Google Application Portfolio, Google Toolkit and Working with the Google App Engine.

Exploring Platform as a Service using Microsoft Cloud Services: Exploring Microsoft Cloud Services, Microsoft Azure- Live Essentials, Live Home and Live for Mobile.

UNIT V – EXPLORING INFRASTRUCTURE AS A SERVICE (IaaS) (8 periods)

Understanding Amazon Web Services, Amazon Web Service Components and Services, Working with the Elastic Compute Cloud (EC2): Amazon Machine Images, Pricing models, System images and software, Creating an account and instance on EC2; Working with Amazon Storage Systems: Amazon Simple Storage System (S3), Amazon Elastic Block Store (EBS) and CloudFront; Understanding Amazon Database Services: Amazon SimpleDB, Amazon Relational Database Service (RDS) and Choosing a database for AWS.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Barrie Sosinsky, *Cloud Computing Bible,* Wiley India Pvt Ltd, 2011 (Reprint 2017).
2. Thomas Erl and RicardoPuttini, *Cloud Computing- Concepts, Technology and Architecture,* Pearson, 2014 (Seventh Impression 2017).

REFERENCE BOOKS:

1. Rajkumar Buyya, Christian Vecchiloa and S Thamarai Selvi, *Mastering Cloud Computing*, McGraw Hill Education, 2013 (Reprint 2017).
2. George Reese, *Cloud Application and Architectures*, O'Relly, 2009 (Reprint 2017).

ADDITIONAL LEARNING RESOURCES:

1. "Exploring the Google Toolkit", https://code.google.com/, drafted on 23 December, 2019.
2. "Understanding Amazon Web Services", https://aws.amazon.com/, drafted on 23 December, 2019.
3. "Exploring Microsoft Cloud Services", https://www.microsoft.com/windowsazure, drafted on 23 December, 2019.

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	2	3	3	2									2		3	
CO4	1	2	3		3			1					3		2	
CO5	1	2	3			1	1						2		3	

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

IV B. Tech. – I Semester
(20BT70501) COMPUTER VISION

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

PRE-REQUISITES: Courses on "Transformation Techniques and Linear Algebra", "Machine Learning"

COURSE DESCRIPTION: Concepts of low-level vision, Image filtering operations, Masking, Thresholding techniques, Edge Detection, Dilation and erosion, Background subtraction, Shot boundary detection, Interactive segmentation, Clustering based segmentation, Texture, Classification, Overfitting, Receiver Operator curves, Object detection and recognition and Information Retrieval methods.

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

CO1. Analyze image filtering operations to enhance image quality.

CO2. Apply threshold techniques, morphological process and region growing methods for edge detection in images.

CO3. Develop clustering based segmentation solutions for image synthesis.

CO4. Synthesize and evaluate classification procedures for texture and feature analysis.

CO5. Select and apply appropriate techniques for object recognition and detection in computer vision based applications.

DETAILED SYLLABUS:

UNIT–I: INTRODUCTION AND IMAGE ENHANCEMENT (8 periods)

The nature of the vision, Low-level vision – Gray scale versus color, Image processing operations; Basic image filtering operations – Gaussian smoothing, Median filters, Mode Filters, Rank Order Filters, Sharp and Unsharp masking.

UNIT–II: THRESHOLDING AND EDGE DETECTION (10 periods)

Region-growing methods, Thresholding, Adaptive thresholding, Threshold selection – Variance-based thresholding, Entropy-based thresholding, Maximumlikelihood thresholding; Global valley approach to thresholding; Edge Detection – Template Matching Approach, 3×3 Template Operators, Canny Operator, Laplacian Operator; Dilation and erosion in binary images – Properties of dilation and erosion operators, Closing and opening.

UNIT–III: SEGMENTATION BY CLUSTERING (9 periods)

Grouping and gestalt, Important applications – Background subtraction, Shot boundary detection, Interactive segmentation, Forming imaging regions; Image segmentation by clustering pixels, Segmentation, clustering and graphs – Terminology and facts for graphs, Agglomerative clustering with a graph, Divisive clustering with a graph, Normalized cuts.

UNIT–IV: CLASSIFICATION AND DETECTION OF OBJECTS (11 Periods)

Texture – Spots and bars, Representation, Synthesizing textures and filling holes in images, Shape from texture; Learning to classify – Using loss to determine decisions, Training error, test error and overfitting, Regularization, Error rate and Cross-validation, Receiver operating curves; Classifying images – Classifying images of single objects; Detecting objects in images – The sliding window method.

UNIT–V: OBJECT RECOGNITION, APPLICATIONS (7 periods)

Object Recognition – Categorization, Selection, Feature questions, Geometric questions, Semantic questions; Applications – Classifying materials, Classifying scenes, Tracking people.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. David A. Forsyth, Jean Ponce, *Computer Vision: A Modern Approach*, Pearson, 2nd Edition, 2012.
2. E. R. Davies, *Computer and Machine Vision: Theory, Algorithms, Practicalities*, Elsevier, 5th Edition, 2017.

REFERENCE BOOKS:

1. Rafael C. Gonzalez, Richard E. Woods, *Digital Image Processing*, Pearson, 4th Edition, 2018.
2. William K. Pratt, *Digital Image Processing*, Wiley, 4th Edition, 2006.

ADDITIONAL LEARNING RESOURCES:

1. https://slideplayer.com/slide/5158896/
2. www.scs.carleton.ca/~c_shu/Courses/comp4900d/notes/PPT/lect1_intro.ppt

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	3	2													3	
CO3	2	3	1											3		
CO4	2	3	1											3		
CO5	2	2			1	1								3		

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

IV B. Tech. – I Semester

(20BT70502) FULL STACK DEVELOPMENT

(Professional Elective - 4)

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

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

PRE-REQUISITES: A Course on "Web Technologies"

COURSE DESCRIPTION:jQuery, Node.js – Node packages, Applications, Events, listeners, timers and callbacks, Handling data I/O, Accessing file system, Implementing HTTP services; MongoDB – Basics, MongoDB and Node.js, Manipulating MongoDB documents from Node.js, Accessing MongoDB from Node.js; Implementing Express in Node.js; Angular – Basics, Components, Data binding, Built-in directives.

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

CO1. Demonstrate knowledge on jQuery to control the behavior of different elements in web page.

CO2. Analyze Node.js syntax, NPM package management, MongoDB and Express.js syntaxes to build scalable and responsive web applications.

CO3. Develop components using templates, directives of AngularJS for designing single-page applications.

CO4. Build applications by applying Node.js, CRUD applications using MongoDB and Express.js.

DETAILED SYLLABUS:

UNIT–I: JQUERY (9 periods)

Introduction, jQuery selectors, jQuery event methods, jQuery effects, DOM manipulation using jQuery get/set content methods, Add/remove new HTML elements, Manipulating CSS.

UNIT–II: NODE.JS (11 periods)

Understanding the web development framework, Understanding the Node.js-to-Angular stack components,Installing Node.JS, Node Package Manager (NPM), Creating Node.js application, Event model, Event queue, Callbacks, Buffer module, Stream module, Opening and closing files, Writing Files, Reading Files, Request, response and server objects, Implementing HTTP and HTTPS client-server.

UNIT–III: MONGODB (11 periods)

Configuring MongoDB environment, Datatypes, Administering databases, Managing collections, Connecting to MongoDB from Node.js, Objects – Db, Admin, Collection, Cursor; Accessing and manipulating collections, Manipulating MongoDB documents from Node.js, Query objects, Query options objects, Limiting and sorting result sets, Grouping result, Applying MapReduce by aggregating results.

UNIT–IV: EXPRESS IN NODE.JS: **(7 periods)**

Configuring and starting Express server, Configuring routes, Requests objects, Response objects, Implementing a template engine, Handling POST Body Data, Sending and Receiving Cookies, Implementing Sessions.

UNIT–V: ANGULAR **(7 periods)**

Introduction to Angular, Creating a basic Angular application, Component configuration, Building template, Using Constructors, Using external templates, Injecting directives, Data binding, Built-in directives.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Brad Dayley, Brendan Dayley, Caleb Dayley, *Node.js, MongoDB and Angular Web Development*, Pearson, 2nd Edition,2018.
2. *HTML 5 Black Book: Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP and jQuery*, Dreamtech Press, 2nd Edition, 2016.

REFERENCE BOOKS:

1. Simon Holmes, Clive Harber, *Getting MEAN with Mongo, Express, Angular, and Node,* 2nd Edition, Manning Publishers, 2016.
2. Amos Q Haviv, Adrian Mejia, Robert Onodi, *Web Application Development with MEAN*, Packt Publishers, 2017.

ADDITIONAL LEARNING RESOURCES:

- https://www.udemy.com/topic/mean-stack/
- https://www.coursera.org/learn/building-modern-node-applications-on-aws/

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	2	3	3	3	3								3			
CO3	2	3	3	3	3								3			
CO4	2	3	3	3	3								3			

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

IV B. Tech. – I Semester

(20BT70503) DATA SCIENCE

(Professional Elective – 4)

(Common to CSE, CSBS and CSSE)

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"

COURSE DESCRIPTION: Concepts of data science, Extracting meaning from data, The dimensionality problem, Plotting with pandas and seaborn, Probability distributions, Time series analysis, Predictive modeling.

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 data analysis.

CO2. Develop methods to extract meaning from data using feature selection techniques.

CO3. Create data visualization using charts, plots and histograms to identify trends, patterns and outliers in data using Matplotlib and Seaborn.

CO4. Develop distribution functions to analyze and interpret data to extract meaningful statistics.

CO5. Design and develop predictive models for a given problem to support prediction and forecasting.

DETAILED SYLLABUS:

UNIT–I: INTRODUCTION (9 periods)

Definition of data science, Skills for data science, Tools for data science, Data types, Data collections, Data preprocessing, Data analysis and data analytics, Descriptive analysis, Diagnostic analytics, Predictive analytics, Prescriptive analytics, Exploratory analysis, Mechanistic analysis.

UNIT–II: DATA EXTRACTION (9 periods)

Extracting meaning from data – Feature selection, User retention, Filters, Wrappers, Entropy, Decision tree algorithm; Random forests, The dimensionality problem, Single value decomposition, Principal component analysis.

UNIT–III: DATA VISUALIZATION (8 periods)

A Brief matplotlib API primer, Plotting with Pandas and Seaborn – Line plots, Bar plots, Histograms and density plots, Scatter plots, Facet grids and Categorical data; Other Python visualization tools.

UNIT–IV: STATISTICAL THINKING (11 periods)

Distributions – Representing and plotting histograms, Outliers, Summarizing distributions, Variance, Reporting results; Probability mass function – Plotting PMFs, Other visualizations, The class size paradox, Data frame indexing; Cumulative distribution functions - Limits of PMFs, Representing CDFs, Percentile based statistics, Random numbers, Comparing percentile ranks; Modeling distributions - Exponential distribution, Normal distribution, Lognormal distribution.

UNIT–V: TIME SERIES ANALYSIS AND PREDICTIVE MODELING (8 periods)

Time series analysis – Importing and cleaning, Plotting, Moving averages, Missing values, Serial correlation, Autocorrelation; Predictive modeling – Overview, Evaluating predictive models, Building predictive model solutions, Sentiment analysis.

Total Hours: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Chirag Shah, *A Hands-on Introduction to Data Science*, Cambridge University Press, 2020.
2. Alen B. Downey, *Think Stats: Exploratory Data Analysis*, O'Reilly, 2nd Edition, 2014.

REFERENCE BOOKS:

1. Wes McKinney, *Python for Data Analysis*, O'Reilly, 2nd Edition, 2017.
2. Ofer Mendelevitch, Casey Stella, Douglas Eadline, *Practical Data science with Hadoop and Spark: Designing and Building Effective Analytics at Scale*, Addison Wesley, 2017.
3. Rachel Schutt, Cathy O'Neil, *Doing Data Science: Straight Talk from the Frontline*, O'Reilly, 2014.
4. Jake VanderPlas, *Python Data Science Handbook: Essential Tools for Working with Data*, O'Reilly, 2017.

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	
CO2	3	3	2	2	1										3	
CO3	3	3	2	2	2										3	
CO4	3	3	2	2	2										3	
CO5	3	3	2	2	2	1								2	3	

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

IV B. Tech. – I Semester

(20BT71503) HIGH PERFORMANCE COMPUTING

(Professional Elective – 4)

(Common to CSE, CSE(DS) and CSSE)

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

PRE-REQUISITES: Courses on "Computer Organization", "Programming for Problem Solving"

COURSE DESCRIPTION: Heterogeneous Parallel Computing, Architecture of Modern CPU; Data Parallelism, CUDA Program Structure; Device Global Memory and Data Transfer; Thread Scheduling and Latency Tolerance, Querying Device Properties; Computational Thinking, Basic OpenACC Programs, Future Directions of OpenACC.

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

CO1. Explore parallel programming models to understand behavior of algorithms and application on parallel systems.

CO2. Analyze the functionality of GPU architecture using parallel computing platform CUDA.

CO3. Design CUDA kernel functions to launch data parallel execution on multiple GPU's processor cores.

CO4. Explore the concepts of CUDA thread organization and scheduling for data access in heterogeneous systems.

CO5. Apply strategies of CUDA memories to boost the execution efficiency of kernel functions on parallel computers.

CO6. Identify OpenCL API and OpenACC directivesto accelerate the applications on high performance architectures.

DETAILED SYLLABUS:

UNIT I: PARALLEL COMPUTING (08 Periods)

Heterogeneous Parallel Computing, Architecture of Modern CPU, Why more parallelism, Speeding up real applications, Parallel programming languages and models.

UNIT II: GPU COMPUTING (10 Periods)

Evolution of Graphics Pipelines, GPGPU: An intermediate Step, GPU Computing.

Introduction to Data Parallelism and CUDA C: Data Parallelism, CUDA Program Structure, A Vector Addition Kernel, Device Global Memory and Data Transfer, Kernel Functions and Threading.

UNIT III: DATA-PARALLEL EXECUTION MODEL (10 Periods)

CUDA Thread Organization, Mapping Threads to Multidimensional Data, Matrix-Matrix Multiplication-A More Complex Kernel, Synchronization and Transparent Scalability,

Assigning Resources to Blocks, Querying Device Properties, Thread Scheduling and Latency Tolerance.

UNIT IV: CUDA MEMEORIES AND PARALLEL PROGRAMMING (08 Periods)

Importance of Memory Access Efficiency, CUDA Device Memory Types, A Strategy for Reducing Global Memory Traffic, A Tiled Matrix_Matrix Multiplication Kernel, Memory as a Limiting Factor to Parallelism.

Parallel Programming: Goals of Parallel Computing, Problem Decomposition, Algorithm Selection, Computational Thinking.

UNIT V: AN INTRODUCTION TO OPENCL & PARALLEL PROGRAMMING WITH OPENACC (09 Periods)

Data Parallelism Model, Device Architecture, Kernel Functions, Device Management and Kernel Launch, Electrostatic Potential Map in OpenCL.

OpenACC: OpenACC Versus CUDA C, Execution Model, Memory Model, Basic OpenACC Programs, Future Directions of OpenACC.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOK:

1. David B. Kirk, Wen-mei W. Hwu, *Programming Massively Parallel Processors: A Hands-on Approach*, Elsevier Science,2nd Edition,2013.

REFERNCE BOOKS:

1. Charles Severance and Kevin Dowd, *High Performance Computing*, O'Reilly Media, 2nd Edition, 1998.
2. Kai Hwang and Faye Alaye Briggs, *Computer Architecture and Parallel Processing*, McGraw Hill, 1984.

ADDITIONAL LEARNING RESOURCES

- https://nptel.ac.in/courses/106/108/106108055/
- https://www.cdac.in/index.aspx?id=hpc_nsf_scientific_affiliation_param

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	1	1	2								3			
CO2	2	3	1	1	1								3			
CO3	2	2	3	1	1								3			
CO4	2	3	2	2	1								3			
CO5	3	3	3	2	2								3			
CO6	3	3	2	2	2								3			

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

IV B. Tech. – I Semester

(20BT61241) IoT ARCHITECTURE AND PROTOCOLS

(Professional Elective – 4)

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

PRE-REQUISITES: Courses on "Computer Networks", "Internet of Things Lab"

COURSE DESCRIPTION: M2M to IoT An Architectural Overview and M2M and IoT Technology Fundamentals, IoT Architecture State of the Art, IoT Reference Architecture and Real-World Design Constraints, IoT Data Link Layer & Network Layer Protocols, Session Layer Protocols and Application Layer Protocols, Security in IoT Protocols and Case studies.

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

CO1. Demonstrate knowledge on architecture and technology of M2M to IoT.

CO2. Demonstrate knowledge on IoT architectures and identify design constraints of IoT.

CO3. Select suitable protocols of data link and network layer protocols for different applications of IoT.

CO4. Identify appropriate protocols of session and application layer protocols for different applications of IoT.

CO5. Evaluate security issues and challenges during implementation of real world models.

DETAILED SYLLABUS:

UNIT I - M2M TO IOT AN ARCHITECTURAL OVERVIEW AND M2M AND IOT TECHNOLOGY FUNDAMENTALS (09 Periods)

M2M to IoT an Architectural Overview: Building architecture, Main design principles and needed capabilities, An IoT architecture outline, Standards considerations.

M2M and IoT Technology Fundamentals: Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a service (XaaS), M2M and IoT analytics, Knowledge management.

UNIT II- IOT ARCHITECTURE STATE OF THE ART, IOT REFERENCE ARCHITECTURE AND REAL-WORLD DESIGN CONSTRAINTS (09 Periods)

IoT Architecture State of the Art: Introduction, State of the art, Architecture Reference Model- Reference model and architecture, IoT reference model.

IoT ReferenceArchitecture: Functional view, Information View, Deployment and operational view, Other relevant architectural views.

Real-World Design Constraints: Technical design constraints hardware is popular again, Data representation and visualization, Interaction and remote control.

UNIT III- IOT DATA LINK LAYER & NETWORK LAYER PROTOCOLS (09 Periods)

IoT Data Link Layer: IEEE 802.15.4, IEEE 802.11ah, LoRaWAN, Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy.

Network Layer Encapsulation Protocols: 6LoWPAN, 6TiSCH, 6Lo.

Network Layer Routing Protocols: RPL, CORPL, CARP.

UNIT IV- SESSION LAYER PROTOCOLS AND APPLICATION LAYER PROTOCOLS (09 Periods)

Session Layer Protocols: MQTT, AMQP, CoAP, XMPP, DDS.

Application Layer Protocols: SCADA, Generic Web-Based Protocol.

UNIT V- SECURITY IN IOT PROTOCOLS AND CASE STUDIES (09 Periods)

Security in IoT protocols: MAC 802.15.4, 6LoWPAN, RPL, IoT Challenges.

Case Studies: Smart Metering, Smart House, Smart Cities.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Jan Holler and Vlasios Tsiatsis, *From Machine-to-Machine to the Internet of Things Introduction to a New Age of Intelligence,* Elsevier Ltd., 2014.
2. David Hanes and Gonzalo Salgueiro, *IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things,* Cisco Press, 2017.

REFERENCE BOOKS:

1. Peter Waher, *Learning Internet of Things*, PACKT publishing, BIRMINGHAM –MUMBAI.
2. Olivier Hersent and David Boswarthick, *The Internet of Things Key Applications and Protocols*, John Wiley & Sons Ltd Publication, 2012.
3. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/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													3
CO2	2	3	2													3
CO3	2	3	2					2								3
CO4	2	3	2					2								3
CO5	2	3	2					2								3

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

IV B. Tech. – I Semester

(20BT70504) AUGMENTED REALITY AND VIRTUAL REALITY

(Professional Elective - 4)

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

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

PRE-REQUISITES: Courses on "Transformation Techniques and Linear Algebra","Machine Learning", "Web Technologies"

COURSE DESCRIPTION: Augmented reality - Displays, Visual perception, Tracking methods, Computer vision algorithms, Interaction, Authoring, Navigation and Collaboration methods; Virtual reality - Stereoscopic displays, Computing platforms, Virtual reality hardware, Basics of 3D graphics, Basics of Unity 3D, Gear VR and WebVR.

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

CO1. Analyze the augmented reality display environment, applications and tracking methods for spatial measurement and alignment of objects.

CO2. Analyze optical tracking and scene reconstruction algorithms for electronically perceiving imagery from camera sensors.

CO3. Investigate interaction, authoring, navigation and collaboration methods for providing human computer interaction in augmented reality systems.

CO4. Demonstrate knowledge on the fundamental concepts and hardware of virtual reality medium.

CO5. Develop virtual reality modules using Oculus SDK and WebVR API to provide simulated experience.

DETAILED SYLLABUS:

UNIT–I: INTRODUCTION TO AUGMENTED REALITY (9 periods)

History of augmented reality, Examples, Related fields – Mixed reality, Virtual reality, Ubiquitous computing; Displays – Multimodal displays, Visual perception, Requirements and characteristics, Spatial display model, Visual displays.

UNIT–II: COMPUTER VISION FOR AUGMENTED REALITY (10 periods)

Tracking – Tracking, calibration and registration, Coordinate systems, Characteristics of tracking technology, Stationary tracking systems, Mobile sensors, Optical tracking, Sensor fusion; Marker Tracking, Multiple-camera Infrared tracking, Natural feature tracking by detection, Incremental tracking, Outdoor tracking.

UNIT–III: HUMAN COMPUTER INTERACTION FOR AUGMENTED REALITY (9 periods)

Interaction – Input modalities, Output modalities, Haptic interaction, Multimodal interaction; Authoring – Requirements of AR authoring, Elements of authoring, Stand-

alone authoring solutions, Plug-In approaches; Navigation – Foundations of human navigation, Route visualization, Viewpoint guidance, Multiple perspectives; Collaboration – Co-located collaboration, Remote collaboration.

UNIT–IV: INTRODUCTION TO VIRTUAL REALITY (8 periods)

Stereoscopic displays, Motion tracking hardware, Input devices, Computing platforms, Virtual reality applications, Virtual reality hardware – Oculus Rift, Crescent Bay, Samsung Gear VR, Google Cardboard; 3D graphics basics – Coordinate systems, Meshes, Polygons, Vertices, Materials, Textures, Lights, Transforms, Matrices, Cameras, Perspective, Viewports and Projections, Stereoscopic Rendering; Unity 3D, Setting up the Oculus SDK, Example VR Application.

UNIT–V: Gear VR AND WebVR IN VIRTUAL REALITY (9 periods)

Gear VR – Gear VR user interface and Oculus Home, Oculus Mobile SDK, Developing for Gear VR using Unity3D, Deploying applications for Gear VR; WebVR – WebVR API, Creating WebVR application, Tools and techniques for creating WebVR.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Dieter Schmalstieg, Tobias Hollerer, *Augmented Reality: Principles and Practice*, Addison Wesley, 2016.
2. Tony Parisi, *Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web and Mobile*, O'Reilly, 2015.

REFERENCE BOOKS:

1. Grigore C. Burdea, Philippe Coiffet, *Virtual Reality Technology*, 2nd Edition, Wiley, 2006.
2. Helen Papagiannis, *Augmented Human: How Technology Is Shaping the New Reality*, O'Reilly, 2017.

ADDITIONAL LEARNING RESOURCES:

- https://nptel.ac.in/courses/106106138/
- https://www.oreilly.com/library/view/augmented-human/9781491928363/ch01.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	3											3			
CO3	3	2											3			
CO4	3				2								3			
CO5	3	2	2		2								3			

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

IV B. Tech. – I Semester

(20BT71206) GAME DEVELOPMENT

(Professional Elective – 5)

(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: Third Dimension, Prototyping and Scripting Basics; Creating the Environment, Player Characters and Further Scripting; Interactions, Collection, Inventory, and HUD(heads up display); Instantiation and Rigidbodies, Particle Systems; Designing Menus, Animation Basics, and Building.

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

CO1. Demonstrate knowledge on Third Dimension, Prototyping and Scripting.

CO2. Build game environment, player characters and script for game development.

CO3. Analyze the interactions between players, understand the Collections and Inventory for game development.

CO4. Develop games using rigidbodies and particle systems.

CO5. Design menus, animations and publish the games.

DETAILED SYLLABUS:

UNIT-I:THIRD DIMENSION, PROTOTYPING AND SCRIPTING BASICS (9 Periods)

Third Dimension: Getting to grips with 3D, Rigidbody physics, Essential Unity concepts, The interface.

Prototyping and Scripting Basics: first Unity project, A basic prototyping environment, Introducing scripting, Understanding Translate, Testing the game so far, Storing with prefabs, Using Instantiate() to spawn objects.

UNIT-II: CREATING THE ENVIRONMENT, PLAYER CHARACTERS AND FURTHER SCRIPTING (9 Periods)

Creating the Environment: Designing the game, Using the terrain editor, The terrain toolset, Creating the island—sun, sea, and sand.

Player Characters and Further Scripting: Working with the Inspector, Anatomy of a character, Deconstructing the First Person Controller object, Further scripting, Full example, Inter-script communication and Dot Syntax, Scripting for character movement.

UNIT-III: INTERACTIONS, COLLECTION, INVENTORY, AND HUD (HEADS UP DISPLAY) (9 Periods)

Interactions: External modeling applications, Setting up the outpost model, Adding the outpost, Collisions and triggers, Ray casting, Opening the outpost.

Collection, Inventory, and HUD: Creating the power cell prefab, Scattering power cells, Restricting outpost access, Displaying the power cell HUD.

UNIT-IV: INSTANTIATION AND RIGIDBODIES, PARTICLE SYSTEMS (9 Periods)

Instantiation and Rigidbodies: Utilizing instantiation, Rigidbodies, Making the mini-game.

Particle Systems: particle system, Creating the task, Testing and confirming.

UNIT-V: DESIGNING MENUS, ANIMATION BASICS, AND BUILDING (9 Periods)

Designing Menus: Interfaces and menus, Creating the menu with GUI Textures and mouse events, Creating the menu with the Unity GUI class and GUI skins

Animation Basics: Game win sequence.

Building: Build options, Build Settings, Player Settings, Quality Settings, Building the game.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Will Goldstone, *Unity 3.x Game Development Essentials Game development with C# and Javascript*, PacktPublishing, Second Edition, 2011.

REFERENCE BOOKS:

1. Sue Blackman, *Beginning 3D Game Development with Unity 4*, Apress Publisher, Second Edition, 2013.
2. Mike Geig, *Unity Game Development in 24 Hours*, Pearson Education, First Edition, 2013.

ADDITIONAL LEARNING RESOURCES:

1. Making your first game - https://learn.unity.com/tutorial/your-first-game#
2. Game Development Tutorial using Unity 3D - https://www.studytonight.com/game-development-in-2D/

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	1	2	3		1								3			
CO3	2	3											3			
CO4	1	2	3										3			
CO5	1	2	3			1	1	1					3			

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

IV B. Tech. – I Semester

(20BT71504) DEEP LEARNING

(Professional Elective – 5)

(Common to CSE, CSE(DS) and CSSE)

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

PRE-REQUISITES: A Course on "Machine Learning"

COURSE DESCRIPTION: Overview of machine learning; Fundamentals of deep learning; Modern approaches in deep learning; Feedforward neural network architectures; Deep learning Models and Applications.

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

CO1. Analyze a neural network by applying the basics of mathematics and machine learning.

CO2. Analyze the data using multilayer perceptron and backpropagation algorithms.

CO3. Apply regularization and optimization techniques to improve the performance of Deep neural networks.

CO4. Identify appropriate deep learning model for text, multimedia, and biological data analysis.

CO5. Compare deep neural networks and deep learning models to infer the suitable learning algorithm on large scale data.

CO6. Develop a model for domain specific applications by applying various network models in deep learning.

DETAILED SYLLABUS:

UNIT I – INTRODUCTION (9 Periods)

Historical Trends in Deep Learning – Machine Learning basics - Learning algorithms: Supervised and Unsupervised Training - Linear Algebra for Machine Learning - Testing - Cross Validation - Dimensionality Reduction - Over fitting /Under Fitting - Hyper parameters and validation sets - Estimators – Bias – Variance - Loss Function- Regularization.

UNIT II – NEURAL NETWORKS (9 Periods)

Biological Neuron – Idea of Computational units - Linear Perceptron - Perceptron Learning Algorithm - Convergence theorem for Perceptron Learning Algorithm - Linear Separability - Multilayer perceptron – Backpropagation.

UNIT III – MODERN PRACTICES IN DEEP NETWORKS (10 Periods)

Introductions to Simple DNN - Platform for Deep Learning - Deep Learning Software Libraries - Deep Feed forward networks – Gradient-Based Learning - Architecture Design –Various Activation Functions, ReLU, Sigmoid – Error Functions - Regularization methods

for Deep Learning - Early Stopping - Drop Out - Optimization methods for Neural Networks-Adagrad, Adam.

UNIT IV – DEEP LEARNING MODELS (9 Periods)

Convolutional Neural Networks (CNNs): CNN Fundamentals – Architectures – Pooling – Visualization – Sequence Modeling: Recurrent Neural Networks (RNN) - Long-Short Term Memory (LSTM) – Bidirectional LSTMs-Bidirectional RNNs -Deep Unsupervised Learning: Autoencoders – Auto Encoder Applications -Deep Boltzmann Machine (DBM).

UNIT V – CASE STUDY AND APPLICATIONS (8 Periods)

Application Case Study - Handwritten digits recognition using deep learning - LSTM with Keras – Sentiment Analysis – Image Dimensionality Reduction using Encoders LSTM with Keras – Alexnet – VGGnet.

Total periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, *Deep Learning*, 4th Edition, MIT Press,2016.

REFERENCE BOOKS:

1. Kevin P. Murphy, "*Machine Learning: A Probabilistic Perspective*", MIT Press, 2012.
2. Michael A. Nielsen, *Neural Networks and Deep Learning, Determination* Press, 2015.
3. Deng & Yu, *Deep Learning: Methods and Applications*, Now Publishers, 2013.

ADDITIONAL RESOURCES:

1. https://www.youtube.com/watch?reload=9&v=aPfkYu_qiF4
2. http://www.deeplearning.net/tutorial/
3. https://www.guru99.com/deep-learning-tutorial.html
4. https://www.coursera.org/courses?query=deep%20learning

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	1									3		
CO2	2	3	2	2	2									3		
CO3	2	2	2	2	1									3		
CO4	2	3	2	2	1									3		
CO5	1	2	3	2	2									3		
CO6	2	2	3	2	3	1	1							3		

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

IV B.Tech. – I Semester

(20BT71203) BIG DATA TECHNOLOGIES

(Professional Elective - 5)

(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: Courses on "Database Management Systems" and "Data Warehousing and Data Mining"

COURSE DESCRIPTION: Introduction to Big Data, Hadoop; Hadoop Distributed File Systems; Hadoop I/O; MapReduce; Hive; Pig; HBase; Zookeeper; Sqoop and Case studies.

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

CO1. Demonstrate knowledge on Structure of Big Data, Big Data characteristics, storage, processing, querying and reporting.

CO2. Analyze large dataset with Hadoop Distributed File System and MapReduce techniques to optimize storage space.

CO3. Analyze data with MapReduce framework.

CO4. Apply Hive, Pig, and HBase tools for database querying and processing.

CO5. Apply Sqoop and Zookeeper tools for data analytics.

DETAILED SYLLABUS:

UNIT I - INTRODUCTION TO BIG DATA AND HADOOP (9 periods)

Introduction to Big Data: Evolution and Definition of Big Data, Structure of Big Data, Characteristics, Advantages, Applications and Tools.

Hadoop: Data storage and analysis, Comparison with other systems, History of Hadoop, Apache Hadoop and the Hadoop Ecosystem, Hadoop Releases.

UNIT II – HADOOP DISTRIBUTED FILE SYSTEM AND HADOOP I/O (9 periods)

Hadoop Distributed File system: HDFS concepts, Command-Line Interface, Hadoop file systems, Java Interface, Data Flow, Hadoop Archives.

Hadoop I/O: Data Integrity, Compression, Serialization, File-Based Data Structures.

UNIT III – MAPREDUCE, TYPES & FORMATS AND FEATURES (9 periods)

MapReduce: Analyzing the data with Hadoop, Scaling Out, Hadoop Streaming, Hadoop Pipes.

Types and Formats: MapReduce Types, Input Formats, Output Formats.

Features: Counters, Sorting, Joins, Side Data Distribution and MapReduce Library Classes.

UNIT IV – HIVE, PIG AND HBASE (9 periods)

Hive: Comparison with Traditional Databases, HiveQL, Tables, Querying Data, and User-Defined Functions.

Pig: Comparison with Databases, Pig Latin, User-Defined Functions, Data Processing Operators.

HBase: Basics, Concepts, Clients, HBase vs. RDBMS, Praxis.

UNIT V – ZOOKEEPER, SQOOP AND CASE STUDIES (9 periods)

Zookeeper: Zookeeper Service, Building applications with Zookeeper, Zookeeper in production.

Sqoop: Database Imports, working with Imported Data, Importing Large Objects, Performing an Export.

Case Studies: WhatsApp, Facebook and Twitter.

Total periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Tom White,*Hadoop: The Definitive Guide*, O'REILLY Publications, Third Edition, 2012.
2. Anil Maheswari, *Big Data*, Tata McGraw Hill, First Edition, 2017.

REFERENCE BOOKS:

1. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications," Wiley Publications, 2014.
2. Paul Zikopoulos, IBM, Chris Eaton and Paul Zikopoulos "Understanding Big Data: Analytics for Enterprise Class Hadoop and streaming Data," The McGraw-Hill Companies, 2012.
3. Chuck Lam "Hadoop in action," Manning Publications, 2011.

ADITIONAL LEARNING RESOURCES

1. https://www.simplilearn.com/introduction-to-big-data-and-hadoop-tutorial
2. https://hadoop.apache.org/docs/r1.2.1/hdfs_design.html
3. https://www.developer.com/java/understanding-mapreduce-types-and-formats.html
4. https://prismoskills.appspot.com/lessons/System_Design_and_Big_Data/Chapter_01_-_Hadoop.jsp
5. https://www.simplilearn.com/introduction-to-zookeeper-tutorial

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			2										3	
CO3	2	2	3	3	3	1	1							2	3	
CO4	2	2	3	3	3	1	1							3	3	
CO5	2	2	3	3	3	1	1							3	3	

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

IV B.Tech. – I Semester

(20BT70505) BLOCKCHAIN TECHNOLOGIES

(Professional Elective – 5)

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

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

PRE-REQUISITES: A Course on "Cryptography and Network Security"

COURSE DESCRIPTION: Introduction to Blockchain Technologies and its decentralization concepts, Digital Currencies, Smart Contracts, Ethereum, Hyperledger, Alternative Blockchains, Current Challenges and Scope of Research.

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

CO1. Analyze the concepts of distributed systems, decentralization and blockchains in the Blockchain ecosystem.

CO2. Devise suitable Blockchain platforms for scalable applications.

CO3. Assess the challenges, trending technologies for understanding the research scope in Blockchain technologies.

CO4. Pertain to ethical and legal usage of Blockchain applications.

CO5. Formulate secured and sustainable Blockchains for healthy and safe society.

DETAILED SYLLABUS:

UNIT–I: INTRODUCTION TO BLOCKCHAIN AND DECENTRALIZATION

(9 Periods)

Introduction to Blockchain: Distributed systems, History of Blockchain, Introduction to Blockchain - Definitions, Generic elements, Features, Applications, Tiers; Types of Blockchain, CAP theorem and Blockchain, Benefits and limitations of Blockchain technology.

Decentralization: Decentralization using Blockchain, Decentralization methods and routes, Full ecosystem decentralization, Smart contract, Decentralized organizations, Decentralized autonomous organizations, corporations and societies, Applications and platforms for decentralization.

UNIT–II: DIGITAL CURRENCY – BITCOIN (9 Periods)

Definitions, Transactions – Life cycle, Structure, Types; Blockchain – Structure of block and block header, Genesis block, Bitcoin network, Wallets; Bitcoin Payments – Investment and buying and selling bitcoins, Installation; Bitcoin Limitations, Namecoin.

UNIT–III: SMART CONTRACTS AND ETHEREUM (11 Periods)

Smart Contracts: History & definition, Ricardian contracts - Smart contract templates, Oracles, Smart Oracles, Deployment of smart contracts on Blockchain.

Ethereum: Introduction, Ethereum Blockchain, Elements of Ethereum Blockchain, Precompiled contracts, Accounts, Block, Ether, Messages, Mining – Ethash, CPU and GPU mining; Clients and wallets, Ethereum Network, Applications developed on Ethereum, Scalability and security issues.

UNIT–IV: HYPERLEDGERS AND ALTERNATIVE BLOCKCHAINS (8 Periods)

Hyperledgers: Projects, Hyperledger as protocol, Fabric, Hyperledger Fabric, Sawtooth Lake, Corda.

Alternative Blockchains: Blockchains - Kadena, Stellar, Rootstock, Quorum, Tezos, Storj, Maidsafe, BigChainDB, Multichain, Tendermint; Platforms - BlockApps, Eris.

UNIT–V: CHALLENGES AND EMERGING TRENDS (8 Periods)

Current Challenges: Scalability - Block size increase, block internal reduction, Invertible Blooms lookup tables, Sharding, State channels, Private Blockchain, Proof of stake; Privacy - Indistinguishability obfuscation, Homomorphic encryption, Zero knowledge proofs, State channels, Secure multiparty computation, Usage of hardware to provide confidentiality, Coinjoin, Confidential transactions, MimbleWimble; Security - Smart Contract Security.

Emerging Trends: Emerging trends, Improvement proposals, Blockchain Research - Smart contracts, Centralization issues, Limitations in cryptographic functions, Consensus algorithms, Scalability, Code obfuscation.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOK:

1. Imran Bashir, *Mastering Blockchain: Deeper Insights into Decentralization, Cryptography, Bitcoin, and Popular Blockchain Frameworks*, Packt Publishing, 1st Edition, 2017.

REFERENCE BOOKS:

1. Arshdeep Bahga, Vijay Madisetti, *Blockchain Applications: A Hands-On Approach*, VPT Books, 2017.
2. Josh Thompson, *Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming*, Create Space Independent Publishing Platform, 2017.

ADDITIONAL LEARNING RESOURCES

1. https://nptel.ac.in/courses/106105184/
2. https://medium.com/moatcoin/part-6-blockchain-simplified-notes-nptel-892f13875555
3. http://www.hands-on-books-series.com/assets/Bahga-Madisetti-Blockchain-Book-Code.zip

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	2	3	3		3											3
CO3	2															2
CO4								3								2
CO5						3	3									3

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

IV B. Tech. – I Semester

(20BT70506) SERVICE ORIENTED ARCHITECTURE AND MICROSERVICES ARCHITECTURE

(Professional Elective – 5)

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

PRE-REQUISITES: A Course on "Software Engineering"

COURSE DESCRIPTION: Software engineering principles, Agile with DevOps, Software architecture, Architecting process, SOA and MSA basics, Enterprise-wide SOA, Service oriented analysis and design, Software platforms, SOA applications, Technologies for SOA; SOA governance and implementation, SOA best practices, Trends in SOA and MSA, Big data and SOA,Cloud and MSA, Mobile and MSA.

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

CO1. Identify suitable software architecture by analyzing software requirements, engineering principles and development methodologies.

CO2. Apply the architecting process for developing SOA and MSA for software applications.

CO3. Design service-oriented architecture on enterprise level perspective by understanding the architectural aspects and types of services.

CO4. Use software platforms, technologies, best practices, strategy development and governance for providing SOA solutions.

CO5. Demonstrate knowledge on SOA and MSA applications and hybrid service models to address the business needs of an organization.

DETAILED SYLLABUS:

UNIT–I: SOFTWARE ARCHITECTURE (9 periods)

Software Engineering Principles: Software development life cycle, Project management practice, Software engineering project, Critical success factors for software projects.

Agile with DevOps: Agile development methodologies, Emergence of DevOps, DevOps application delivery, Continuous integration, Continuous delivery, Continuous deployment, DevOps – putting it all together.

Software Architecture: Need, Objectives, Types of Information Technology architecture, Architectural patterns and styles.

Architecting Process: Architectural considerations, Architecting process for software applications, High level architecture, Solution architecture, Detailed design.

UNIT–II: SERVICE ORIENTED ARCHITECTURE AND MICROSERVICES ARCHITECTURE (9 periods)

SOA and MSA Basics: Service orientation, Evolution, Basic concepts, Drivers and dimensions of SOA, Conceptual model of SOA, Standards and guidelines for SOA, Emergence of MSA.

Enterprise-Wide SOA: Considerations, Strawman architecture, Reference architecture, Object oriented analysis and design process, Service oriented analysis and design process, SOA methodology for enterprise.

Service Oriented Analysis and Design: Need for models, Principles of service design, Non-functional properties for services, Design of activity services, Design of data services, Design of client services, Design of business process services.

UNIT–III: PLATFORMS, APPLICATIONS, TECHNOLOGIES FOR SERVICE ORIENTED ARCHITECTURE (11 periods)

Software Platforms: Software applications in an enterprise, Packaged applications, Custom software applications, Software platforms, Java platform enterprise edition, .NET Microsoft application platform.

Service-Oriented Applications: Considerations, Patterns, Pattern based architecture for service-oriented applications, Composite applications, Composite application programming model.

Technologies for SOA: Technologies for service enablement, Technologies for service integration, Technologies for service orchestration.

UNIT–IV: SERVICE ORIENTED ARCHITECTURE GOVERNANCE AND PRACTICES (7 periods)

SOA Governance and Implementation: Strategic architecture governance, Service design-time governance, Service run-time governance, Approach for enterprise-wide SOA implementation.

SOA Best Practices: SOA Strategy best practices, SOA Development best practices, SOA Governance best practices.

UNIT–V: TRENDS IN SERVICE ORIENTED ARCHITECTURE AND MICROSERVICES ARCHITECTURE (9 periods)

Trends in SOA and MSA: Services model for cloud and mobile solutions, API adoption on the rise, Challenges and takeaways from SOA implementations, Architecture trend, Microservices architecture in action.

Big Data and SOA: Data concepts, Big data and its characteristics, Technologies for big data, Service-orientation for big data solutions.

Cloud and MSA: Cloud services, Hybrid cloud services, Considerations for hybrid cloud services, Cloud services and MSA, MSA for SMAC solutions.

Mobile and MSA: Mobile technologies, Types of mobile applications, MSA for mobile solutions.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOK:

1. Shankar Kambhampaty, *Service-Oriented Architecture & Microservices Architecture, For Enterprise, Cloud, Big Data and Mobile*, 3rd Edition, Wiley, 2018.

REFERENCE BOOKS:

1. Thomas Erl, *Service-Oriented Architecture: Analysis and Design for Services and Microservices*, 2nd Edition, Prentice Hall, 2016.
2. Irakli Nadareishvili, Ronnie Mitra, Matt McLarty, Mike Amundsen, *Microservice Architecture: Aligning Principles, Practices, and Culture*, O'Reilly, 2016.

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			
CO3	3	3											3			
CO4	3				3			3					3			
CO5	3	2											3			

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

IV B. Tech. – I Semester

(20BT70401) EMBEDDED SYSTEMS

(Interdisciplinary Elective – 2)

(Common to CSE, CSE(AI), CSE(DS), CSSE, IT, ECE, EEE and EIE)

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

PRE-REQUISITES: Courses on "Digital Logic Design", "Microprocessors and Interfacing"

COURSE DESCRIPTION: MSP430 Architecture; Instruction Set; Programming; On-Chip Resources; Communication with peripherals; Embedded system design approaches.

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

CO1. Analyze MSP430 architecture, instruction set, addressing modes to develop programs for various control applications using assembly and embedded C.

CO2. Solve problems by analyzing MSP430 on chip resources such as timer, clock system, low power modes/techniques and interrupt structure.

CO3. Realize mixed signal processing and networking applications, by analyzing on-chip resources such as Comparator, ADC, Temperature Sensor, PWM and Communication Peripherals.

CO4. Analyze language, IDE support, processor IC &design technologies, and system modeling techniques to capture behavior of embedded prototype usingsuitable model.

DETAILED SYLLABUS:

UNIT- I: ARCHITECTURE OF MSP430 (09 periods)

Embedded Systems – Introduction, MSP430 - Anatomy of microcontroller, Memory, Software, Pin out (MSP430G2553), Functional Block diagram, Memory, CPU, and Memory mapped input and output, Clock generator; Exceptions- Interrupts and Resets.

UNIT- II: PROGRAMMING MSP430 (09 periods)

Development Environment, Aspects of C for Embedded Systems, Assembly Language, Register Organization, Addressing Modes, Constant Generator and Emulated Instructions, Instruction Set, Example programs- Light LEDs, Read input from a switch; Automatic Control-Flashing light by delay, use of subroutines and Functions; Basic Clock System, Interrupts and Low Power Modes.

UNIT- III: TIMERS AND MIXED SIGNAL SYSTEMS (09 periods)

Timers - Watchdog Timer, RTC, Timer_A, Measurement in capture mode, PWM generation;

Mixed Signal Systems- Comparator_A, ADC10 SAADC –Architecture, operation- Single Conversion, Temperature Sensor on ADC10, DTC in ADC10; ADC12 – Comparison with ADC10.

UNIT- IV: COMMUNICATION PERIPHERALS & PROTOCOLS (09 periods)

MSP430 Communication Interfaces- USART, USCI, USI;

Communication Protocols- SPI, Inter-integrated Circuit Bus, USB, CAN.

UNIT - V: EMBEDDED SYSTEM DESIGN (09 periods)

Processor Technology, IC Technology, Design Technology, Tradeoffs.

Model vs Language, System Modelling – Data Flow Model, FSM, FSMD, HCFSM, PSM, Concurrent Process Model & implementation.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. John H. Davies, *MSP430 Microcontroller Basics*, Newnes Publications, 1st Edition, 2008.
2. Santanu Chattopadyay, *Embedded System Design*, PHI, 2010.
3. Frank Vahid, Tony D. Givargis, *Embedded System Design – A Unified Hardware/Software Introduction,* John Wiley, January 2006.

REFERENCE BOOKS:

1. Chris Nagy, *Embedded Systems Design using the TI MSP30 Series*, Newnes Publications, 2003.
2. Jorgeon Staunstrup, Wayne Wolf, *Hardware/Software Co-design Principles and Practice*, Springer 2009.
3. Patrick R Schamont, *A Practical Introduction to Hardware/Software Co-design*,Springer publications, January 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	3		1									3			
CO2	3	3	2	3	2	2							3			
CO3	3	3	3	2	2	2		2					3			1
CO4	3	3	2	2	2	2		2					3			

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

IV B. Tech. – I Semester

(20BT70507) NATURE INSPIRED ALGORITHMS

(Interdisciplinary Elective – 2)

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

PRE-REQUISITES: Courses on "Differential Equations and Multivariable Calculus", "Optimization Techniques"

COURSE DESCRIPTION: Optimization, Classical optimization techniques, Nature inspired algorithms, Genetic algorithm, Particle swarm optimization, Ant colony optimization, Bee colony optimization, Cuckoo search algorithm, Firefly algorithm, Bat algorithm, Gray wolf optimization, Elephant herding optimization, Applications of nature inspired algorithms.

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

CO1. Demonstrate knowledge on optimization and classical optimization techniques to find optimal solutions for a given problem.

CO2. Analyze the key components and mathematical aspects of nature inspired algorithms.

CO3. Design efficient solutions for optimization problems using nature inspired algorithms.

CO4. Investigate the applications of nature inspired algorithms to solve wide range of optimization problems.

DETAILED SYLLABUS:

UNIT–I: INTRODUCTION TO OPTIMIZATION (9 periods)

Introduction to Optimization: Fundamentals of optimization, Types of optimization problems, Examples of optimization, Formulation of optimization problems, Classification of optimization algorithms, Traveling salesman problem, Knapsack problem.

Classical Optimization Techniques: Mathematical model of optimization, Linear programming – Simplex method, Revised simplex method, Kamarkar's method, Duality theorem, Decomposition principle, Transportation problem; Nonlinear Programming – Quadratic programming, Geometric programming; Dynamic programming, Integer programming, Stochastic programming, Lagrange multiplier method.

UNIT–II: NATURE INSPIRED ALGORITHMS AND GENETIC ALGORITHM (8 periods)

Nature Inspired Algorithms: Traditional vs nature inspired algorithms, Bioinspired algorithms, Swarm intelligence, Metaheuristics, Diversification and intensification, No free lunch theorem, Parameter tuning and control, Algorithm.

Genetic Algorithm: Basics, Genetic operators, Example of GA, Algorithm, Schema theory, Prisoner's dilemma problem, Variants and hybrids of GA.

UNIT–III: PARTICLE SWARM, ANT COLONY, BEE COLONY AND CUCKOO SEARCH OPTIMIZATION ALGORITHMS (10 periods)

Particle Swarm Optimization: Swarm behavior, Algorithm, Variants of algorithm.

Ant Colony Optimization: Ant colony characteristics, Ant colony optimization – Travelling salesman problem, algorithm; Variants of algorithm.

Bee Colony Optimization: Honey bee characteristics, Algorithm, Variants of algorithm.

Cuckoo Search Algorithm: Cuckoo bird behavior, Levy flights, Algorithm, Variants of algorithm.

UNIT–IV: FIREFLY, BAT, GRAY WOLF AND ELEPHANT HERDING OPTIMIZATION ALGORITHMS (9 periods)

Firefly Algorithm: Firefly behavior and characteristics, Algorithm, Variants and applications.

Bat Algorithm: Behavior of bats in nature, Algorithm, Variants and applications.

Gray Wolf Optimization: Gray wolf characteristics, Gray wolf optimization, Variants and applications.

Elephant Herding Optimization: Elephant herding behavior, Algorithm, Pseudocode, Variants of the algorithm.

UNIT–V: APPLICATIONS OF NATURE INSPIRED ALGORITHMS (9 periods)

Image processing, Classification, clustering and feature selection, Traveling salesman problem, Vehicle routing, Scheduling, Software testing, Deep belief networks, Swarm robots, Data mining and deep learning – Clustering, Support vector machines, Artificial neural networks, Optimizers for machine learning, Deep learning.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. A. Vasuki, *Nature-Inspired Optimization Algorithms,* CRC Press, 2020.
2. Xin-She Yang, *Nature-Inspired Optimization Algorithms,* Elsevier, 2nd Edition, 2020.

REFERENCE BOOKS:

1. Xin-She Yang, Xing-Shi He, *Mathematical Foundations of Nature-Inspired Algorithms*, Springer, 2019.
2. George Lindfield, John Penny, *Introduction to Nature-Inspired Optimization,* Elsevier, 2017.

ADDITIONAL LEARNING RESOURCES:

- Xin-She Yang, *Nature-Inspired Computation and Swarm Intelligence: Algorithms, Theory and Applications,* Elsevier, 2020.
- Hema Banati, Shikha Mehta, Parmeet Kaur, *Nature-Inspired Algorithms for Big Data Frameworks*, IGI Global, 2019.

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	2	3	3											3		
CO4	3													3		

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

IV B. Tech. – I Semester

(20BT70315) INDUSTRIAL INTERNET OF THINGS

(Interdisciplinary Elective – 2)

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

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

PRE-REQUISITES: --

COURSE DESCRIPTION: Introduction to the Industrial Internet; IIoT Reference Architecture; Design of Industrial Internet Systems; Modern Communication Protocols, Wireless Communication Technologies, The Access Network, Access Networks Connecting, Defining Industry 4.0, Introducing the Smart Factory, Smart Factories in Action, IOT – A Market Perspective, Technical Design constraints

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

CO1. Analyze the functional, informational, and operational characteristics of IoT and IIOT architectures.

CO2. Design industrial internet systems encompassing access network technology and protocols.

CO3. Apply design principles, characteristics, and building blocks of Industry 4.0. for innovative manufacturing applications.

CO4. Demonstrate knowledge of IoT market perspective and Security issues in smart manufacturing.

CO5. Apply real-world design constraints for solving problems encountered in smart manufacturing.

DETAILED SYLLABUS:

UNIT-I: IOT AND IIOT REFERENCE ARCHITECTURE (09 Periods)

Introduction: Introduction to the Internet of Things (IoT). Architecture, Enabling Technologies, Applications.

IIoT Reference Architecture: Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

UNIT-II: DESIGN OF INDUSTRIAL INTERNET SYSTEMS AND ACCESS NETWORK TECHNOLOGY & PROTOCOLS (09 Periods)

Design of Industrial Internet Systems: The Concept of the IIoT, The Proximity Network, WSNEdge Node, Legacy Industrial Protocols, Modern Communication Protocols, Wireless Communication Technologies, Proximity Network Communication Protocols, Gateways.

Access Network Technology and Protocols: The Access Network, Access Networks Connecting Remote Edge Networks.

UNIT-III: INDUSTRY 4.0 AND SMART FACTORIES (09 Periods)

Industry 4.0: Defining Industry 4.0, Four Main Characteristics of Industry 4.0, The Value Chain, Industry 4.0 Design Principles, Building Blocks of Industry 4.0, Smart Manufacturing.

Smart Factories: Introducing the Smart Factory, Smart Factories in Action, Importance of Smart Manufacturing, Real-World Smart Factories - GE's Brilliant Factory, Airbus: Smart Tools and Smart Apps, Siemens' Amberg Electronics Plant (EWA), Industry 4.0: The Way Forward.

UNIT-IV: IOT MARKET PERSPECTIVE AND SECURITY ISSUES IN MANUFACTURING (09 Periods)

IoT Market perspective: M2M to IoT – A Market Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, emerging industrial structures for IoT, The international driven global value chain and global information monopolies.

Security issues in Manufacturing: PLCs and DCS, Securing the OT, Network Level: Potential Security Issues, System Level: Potential Security Issues, Identity Access Management.

UNIT-V: REAL WORLD IOT DESIGN CONSTRAINTS AND INDUSTRIAL AUTOMATION (09 Periods)

Real-World IOT Design Constraints- Introduction, Technical Design constraints-hardware components, Data representation and visualization, Interaction and remote control.

Industrial Automation- Service-oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Alasdair Gilchrist, *Industry 4.0: The Industrial Internet of Things*, Apress Publications, 2016.
2. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "*From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence*", 1st Edition, Academic Press, 2014.

REFERENCE BOOKS:

1. Giacomo Veneri and Antonio Capasso, *Hands-on Industrial Internet of Things: Create a powerful Industrial IoT infrastructure using Industry 4.0*, Ingram Academic Services, 2018.
2. Vijay Madisetti and Arshdeep Bahga, *Internet of Things A Hands-On- Approach*, Orient Blackswan Private Limited, 2015.
3. Francis daCosta, *Rethinking the Internet of Things: A Scalable Approach to Connecting Everything*", 1st edition, Apress Publications, 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	1	1	1	1										3
CO2	3	3	2	1	1	1										3
CO3	3	3	2	1	1	1								3		
CO4	3	1	1	1	1	1								3		
CO5	3	3	3	1	1	1								3		

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

IV B. Tech. – I Semester

(20BT70406) SPEECH PROCESSING

(Interdisciplinary Elective – 2)

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

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

PRE-REQUISITES: --

COURSE DESCRIPTION: Acoustic Theory of speech production; model for speech signals and speech processing systems; Mathematical analysis of speech signal - Homomorphic and LPC models; Speech and Speaker recognition systems.

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

CO1. Analyze digital models of speech signals for various losses in vocal tract by articulators and estimate pitch period and cepstrum.

CO2. Understand the operation of different types of synthesizers for speech synthesis.

CO3. Apply coding using different types of vocoders for speech coding.

CO4. Use Hidden Markov Model in speech recognition and speaker identification to classify speech for authentication.

DETAILED SYLLABUS:

UNIT-I: DIGITAL MODEL FOR THE SPEECH SIGNAL (10Periods)

The process of speech production - the mechanism of speech production, acoustic phonetics. The Acoustic theory of speech production- sound propagation, uniform lossless tubes, Effect of losses in the vocal tract, Effect of radiation at the lips, Vocal tract transfer functions for vowels, the effect of nasal coupling, Excitation of sound in the vocal tract, Digital models for speech signals.

UNIT II: TIME DOMAIN MODELS FOR SPEECH PROCESSING (10Periods)

Introduction, Window considerations, Short time energy and average magnitude, Short time average zero crossing rate, Speech vs silence discrimination using Average energy and zero crossing, Pitch period estimation using parallel processing approach, The short time autocorrelation function, The short time average magnitude difference function, Cepstral Analysis of Speech.

UNIT-III: SPEECH SYNTHESIS (07Periods)

History of speech synthesis, Formant synthesisers, Linear predictive synthesisers, Copy synthesis, Phoneme synthesis, Concatenation of multi-phonemic units, Text-to-speech synthesis, Articulatory speech synthesis.

UNIT-IV: SPEECH CODING (07Periods)

Sub-band coding, Transform coding, Channel Vocoder, Formant vocoder, Cepstralvocoder, Linear predictive vocoders, The LPC-10 algorithm, Multi-pulse and RELP vocoders, Vector quantiser coders.

UNIT-V: SPEECH AND SPEAKER RECOGNITION SYSTEMS (11Periods)

Basic pattern recognition approaches, parametric representations of Speech recognition, Speech recognition system- isolated digit recognition system. Speaker Verification vs. recognition, features that distinguish speaker, Speaker recognition system-speaker verification system, speaker identification systems, Hidden Markov models, Word recognition using HMMs, Training hidden Markov models.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. L.R. Rabiner and R.W. Schafer, *Digital processing of speech signals*, Pearson Education, 2006.
2. F. J. Owens, *Signal Processing of Speech*, Macmillan, 1993.

REFERENCE BOOKS:

1. Douglas O Shaughnessy, *Speech Communications*, Oxford University Press, 2nd Edition, 2000.
2. L R Rabiner, BH Juang, B Yegnanarayana, *Fundamentals of Speech Recognition*, Pearson Education, 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	3	3	2	2	2									3	2	
CO2	3	2												3	3	
CO3	3	2	1	2	3	1	1	1						3	3	
CO4	3	2	1	2	3	1	1							3	3	

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

IV B. Tech. – I Semester

(20BT61231) CLOUD COMPUTING 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 "Cloud Computing"

COURSE DESCRIPTION: The course is designed to provide hands on practice on Virtual PC, Virtual Box, Google, Microsoft, Amazon Web Services, Qwiklabs Cloud, IBM Cloud environment, Cloud Analyst simulation tool and Thingspeak Cloud.

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

CO1. Demonstrate hands-on experience on Virtualization models and Cloud Environment.

CO2. Use Amazon Elastic Compute Cloud (EC2) and Simple Storage Services (S3) to create virtual machine instance and storage of objects.

CO3. ApplyAWS Lambda, Amazon DynamoDB, Google Cloud Pub/Sub and Dialogflow services to perform different operations in Qwiklabs Cloud Environment.

CO4. Develop and deploy different web applications using Watson studio in IBM Cloud Environment.

CO5. Create virtual datacenters and instances for monitoring and visualizing of Cloud data through Cloud Analyst simulation tool and Thingspeak Cloud.

CO6. Work independently or in teams to solve problems with effective communication.

LIST OF EXERCISES:

1. Create a Virtual Machine on Virtual Box with Ubuntu 14LTs files, 2GB RAM and 200GB Hard Disk configuration through Infrastructure as a Service (IaaS).
2. Create a Virtual Machine on Virtual PC with Windows, 2GB RAM and 200GB Hard Disk configuration through Infrastructure as a Service (IaaS).
3. Create Virtual Private Cloud (VPC) with subnets, route table and Internet gateway using AWS Management Console.
4. Create a virtual machine instance with 2GB RAM and 200 GB hard disk configuration on Amazon Web Services (AWS) cloud through Elastic Compute Cloud (EC2) service and develop a home web page for online bookstore information.
5. Develop a catalogue web page for online bookstore and create a Simple Storage Service (S3) bucket on Amazon Web Services (AWS) cloud and upload catalogue web page into S3 bucket.
6. Compute the following tasks through AWS Lambda function in an event-driven environment using Qwiklabs Cloud:
    i. Create an AWS Lambda function
    ii. Configure an Amazon S3 bucket as a Lambda Event Source
    iii. Trigger a Lambda function by uploading an object to Amazon S3
    iv. Monitor AWS Lambda S3 functions through Amazon CloudWatch Log.

7. Compute the following tasks through Amazon DynamoDB using Qwiklabs Cloud:
    i. Create an Amazon DynamoDB table
    ii. Enter data into an Amazon DynamoDB table
    iii. Query an Amazon DynamoDB table
    iv. Delete an Amazon DynamoDB table.
8. (a) Perform the following operations through Google Cloud Pub/Sub using Qwiklabs Cloud:
    i. Setup a topic to hold data
    ii. Subscribe to a topic to access the data
    iii. Publish and then consume messages with a pull subscriber.

    (b) Create an Google Assistant environment through Actions and Dialogflow for building an Assistant application that generates quotes when prompted by a user using Qwiklabs Cloud.
9. (a) Implement a Python Program using Watson studio in IBM Cloud Environment

    (b) Deploy and Run any application in IBM Cloud Environment

    (c) Develop a chat bot using Watson Assistant in IBM Cloud Environment.
10. (a) Create two data centers in different regions with 10-20 physical host, 6-10 userbases, 100-250 executable instructions length per request using Cloud Analyst simulation tool.

    (b) Evaluate and generate reports for 10(a) with different Service Broker and Load Balancing Policies. Sketch out the comparison report on different policies.
11. Create an instance for connecting, monitoring and visualizing Internet of Things (IoT) device data through Thingspeak cloud.
12. Mini Project: Form a group of maximum 3 members as a team and assign unique projects for each team.

REFERENCE BOOKS/LABORATORY MANUALS:

1. Barrie Sosinsky, "*Cloud Computing Bible",* Wiley India Pvt Ltd, 2011 (Reprint 2017).
2. Rajkumar Buyya, Christian Vecchiloa and S Thamarai Selvi, "*Mastering Cloud Computing*", McGraw Hill Education, 2013 (Reprint 2017).
3. Lab Manual on "Cloud Computing".

SOFTWARE/TOOLS USED:

1. Virtual Box and Virtual PC Software
2. Cloud Analyst Simulation Tool
3. Amazon Web Services (AWS), Qwiklabs, IBM Bluemix and Thingspeak Cloud

ADDITIONAL LEARNING RESOURCES:

1. "Understanding Amazon Web Services", https://aws.amazon.com/, drafted on 23 December, 2019.
2. "Qwiklabs – Hands-on Cloud Environment", https://www.qwiklabs.com/, drafted on 23 December, 2019.
3. "IBM Cloud Environment", https://www.ibm.com/in-en/cloud, drafted on 23 December, 2019.

4. "Cloud Analytics Simulation Tool", http://www.cloudbus.org/cloudsim/, drafted on 23 December, 2019.
5. "Thingspeak Cloud", https://thingspeak.com/, drafted on 23 December, 2019.
6. "Exploring Microsoft Cloud Services", https://www.microsoft.com/windowsazure, drafted on 23 December, 2019.

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	1	2	1		3								2		3	
CO3	1	2	3		2								2		3	
CO4	1	2	2		3	2	2	2					3			
CO5	2	2	3	2	3							2	2		3	
CO6									3	3						

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

IV B. Tech. – I Semester
(20BT70531) COMPUTER VISION LAB

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

PRE-REQUISITES: Courses on "Python Programming", "Computer Vision"

COURSE DESCRIPTION: Image Filtering Operations, Thresholding Techniques, Edge Detection, Dilation and Erosion, Background Subtraction, Clustering based segmentation, Texture, Classification, Receiver Operator Curves, Object Recognition and Information Retrieval methods.

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

CO1. Analyze and implement computer vision techniques for image enhancement, synthesis and segmentation.

CO2. Synthesize and implement classification procedures for texture and feature analysis.

CO3. Develop applications like face recognition system, image classification system using computer vision methods.

CO4. Work independently to solve problems with effective communication.

LIST OF EXERCISES:

1. Implement the following image pre-processing commands:
    a. To read an image
    b. To show an image
    c. Convert RGB to Gray Scale
    d. Read RGB values of a pixel
    e. Convert Gray Scale to Binary
    f. Perform Image Crop
    g. Perform Image Resize
    h. Perform Image Rotation
    i. Histogram Equalization

2. Implement the following image filtering techniques:
    a. Median Filters
    b. Mode Filters

3. Implement Image sharpening using 2-D Laplacian high pass filter in spatial domain.

4. Implement Edge detection in a segmented binary image using Canny edge detector.

5. Implement Morphological image operations – erosion, dilation, opening & closing to correct the damaged Digital photo image.

6. Implement Color image processing to differentiate objects in a digital image.
   (Image Database Prints and Photographs online Catalog
   url: http://www.loc.gov/pictures)

7. Implement Image segmentation using K-means clustering method in a Fruit basket application.
   (Image Database: CVOnline: Image Databases
   url: http://homepages.inf.ed.ac.uk/rbf/CVonline/Imagedbase.htm)

8. Implement Image segmentation using Watershed transform in any Scenery photo.
   (Image Database: CVOnline: Image Databases
   url: http://homepages.inf.ed.ac.uk/rbf/CVonline/Imagedbase.htm)

9. Implement a program for Features Identification in Fingerprint Recognition System.
   (Image Database: FVC2006 fingerprint database
   url: http://atvs.ii.uam.es/atvs/fvc2006.html)

10. Implement a program using Texture based Image Classification, find the accuracy level using Receiver Operating curve.
    (Image Database: Biometric Spatial Databases and Software –
    url: https://www.nist.gov/itl/iad/image-group/resources/biometric-special-databases-and-software)

11. Implement a Sliding window method and detect the objects present in the Video Surveillance system.
    (Image Database: VIRAT Video Dataset, url: https://viratdata.org/)

REFERENCE BOOKS:

1. Will Ballard, *Hands-on Deep Learning for Images with Tensorflow: Build Intelligent Computer Vision Applications using Tensorflow and Keras*, Packt Publishing, 2018.
2. Ahmed Fawzy Mohamed Gad, *Practical Computer Vision Applications using Deep Learning with CNNs: With Detailed Examples in Python using Tensorflow and Kivy*, Apress, 2018.
3. Abhinav Dadhich, *Practial Computer Vision: Extract Insightful Information from Images using Tensorflow, Keras, OpenCV*, Packt, 2018.

SOFTWARE/TOOLS:

- OpenCV
- Tensorflow
- Virtual Labs (Image Processing Lab - http://cse19-iiith.vlabs.ac.in/)

ADDITIONAL LEARNING RESOURCES:

- http://coeosmanabad.com/etc/manual/BE%20DIP%20Lab%20Manual.pdf
- https://jnec.org/Lab-manuals/CSE/CSE1/TE-Part-1/DIP.pdf
- http://gn.dronacharya.info/CSEDept/Downloads/Labmanuals/DIP-Lab-Manual.pdf
- http://titagartala.ac.in/wp-content/uploads/2018/12/Digital-Lab-Processing-Lab-Manual.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	1	2		1	3										3	
CO2	1	3	2	3	3									3		
CO3	1	3	3	3	3	2						3		3		
CO4									3	3						

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

IV B. Tech. – I Semester
(20BT70532) RPROGRAMMING LAB

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

PRE-REQUISITES: --

COURSE DESCRIPTION: Hands on experience on Introduction to R, Data structures, Control statements, Functions, Object oriented programming, Statistical analysis, Importing data into R, Data visualization.

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

CO1. Apply R programming constructs to store and manipulate datasets.

CO2. Develop modules using R programming constructs to solve statistical problems.

CO3. Perceive data models to perform descriptive and inferential statistical analysis to identify trends, patterns in data.

CO4. Create effective visualization using Histograms, Barplots, Boxplots, Scatterplots for exploratory data analysis.

CO5. Work independently to solve problems with effective communication.

LIST OF EXERCISES:

Datatypes, Variables, Operators, Data structures – Vectors, Arrays, Matrices, Lists, Data frames; Object oriented programming – S3, S4 classes; Selection statements – if statement, if else statement, switch statement; Iterative statements – For loop, While loop, Repeat loop, Nested loops; Functions – Creating functions, Default values for arguments, Return values, Environment and scope issues, Recursion.

1. Create the vectors:

   (a) (1, 2, 3, . . . , 19, 20)

   (b) (20, 19, . . . , 2, 1)

   (c) (1, 2, 3, . . . , 19, 20, 19, 18, . . . , 2, 1)

   (d) (4, 6, 3) and assign it to the name tmp.

   For parts (e), (f) and (g) look at the help for the function rep.

   (e) (4, 6, 3, 4, 6, 3, . . . , 4, 6, 3) where there are 10 occurrences of 4.

   (f) (4, 6, 3, 4, 6, 3, . . . , 4, 6, 3, 4) where there are 11 occurrences of 4, 10 occurrences of 6 and 10 occurrences of 3.

   (g) (4, 4, . . . , 4, 6, 6, . . . , 6, 3, 3, . . . , 3) where there are 10 occurrences of 4, 20 occurrences of 6 and 30 occurrences of 3.

2. a) Write R code that will generate a vector with the following elements.

   "aa" "ba" "ca" "da" "ea" "ab" "bb" "cb" "db" "eb" "ac" "bc" "cc" "dc" "ec" "ad" "bd" "cd" "dd" "ed" "ae" "be" "ce" "de" "ee"

b) Write a R program to create a Dataframes which contain details of 5 employees and display summary of the data.

3. a) Create a vector of a data set and treat it as an object. Using the vector and object perform (.) dot product and (x) cross product. Take your own data.

b) "Fizzbuzz" is a simple programming challenge often used at interviews to test very basic programming skill. Your goal is the following: for the numbers 1 to 100, print "fizz" if the number is a multiple of 3, "buzz" if the number is a multiple of 5, "fizzbuzz" if the number is a multiple of both 3 and 5, and simply print the number otherwise.

4. a) Imagine a high school with 1000 lockers all in a row, numbered 1 to 1000 in order. At the start, all of them are closed. 1000 students are sent, one after the other, to change the state of a set of lockers (from open to closed or closed to open). The first student changes the state of all lockers. The second changes the state of every other one (2, 4, 6, 8, . . .). The third changes the state of every third one (3, 6, 9, 12, . . .). This process continues until all 1000 students have gone. Write a R program to determine which lockers are open at the end of this process?

b) Write a function chomp() that, given a string, removes from the string any occurrence of the character &, as well as the character to the left of each & character. So, for example, your function should return:

```
 > chomp ( " a&c " )
" c "
> chomp ( " a&" )
 " "
> chomp ( " abc " )
" abc "
```

5. a) Write a function which takes a single argument which is a matrix. The function should return a matrix which is the same as the function argument but every odd number is doubled.

b) Write a function that takes an array of numbers x and returns the smallest number in the array.

Importance and applications of statistical learning, Types of data, Types of variables, Frequency distributions, Measures of center – Mean, Median, Mode; Measures of spread – Range, Percentile, Quartiles & Interquartile range, Standard deviation, Variance; Correlation and Covariance.

6. a) Compute descriptive statistics for the data given below.

X: 14, 20, 22, 19, 15, 18, 30, 27

Y: 16, 25, 27, 20, 16, 18, 27, 23

b) Write a R script which will compute the mean and variance of the vector x <- 1:100. Compare with R's internal mean() and var() functions.

7. a) Write a function to compute running medians. Running medians are a simple smoothing method usually applied to time-series. For example, for the numbers 7,5, 2, 8, 5, 5, 9, 4, 7, 8, the running medians of length 3 are 5, 5, 5, 5, 5, 5, 7, 7. The first running median is the median of the three numbers 7, 5, and 2; the second running median is the median of 5, 2, and 8; and so on. Your function should take two arguments: the data (say, x), and the number of observations for each median (say, length).

b) Write a R script to calculate Central tendency and spread by choosing the appropriate dataset.

Importing data into R – Importing data from a CSV file, Importing data from Excel; Data Visualization – Histograms, Barplots, Boxplots, Scatterplots, correlation matrix.

8. a) Write a R program to perform data import/export (.csv, .xlxs) operations using data frames in R.

   b) Write a R program to draw Box plot by choosing appropriate dataset.

9. a) Write a R program to create bell curve of a random normal distribution.

   b) Write a R program to draw Histograms by choosing appropriate dataset.

10. a) Write a R program to draw Scatter plots by choosing appropriate dataset.

    b) Write a R program to design correlation matrix by choosing appropriate dataset.

REFERENCE BOOKS:

1. Sandip Rakshit, *R for Beginners*, McGraw Hill,2017.
2. Seema Acharya, *Data analytics using R*, McGraw Hill, 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			2	3								3			
CO2	3	1	1	1	3								3			
CO3	3	3	2	3	3								3			
CO4	3	3	2	3	3								3			
CO5									3	3						

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

IV B.Tech. – I Semester
(20BT70533) SUMMER INTERNSHIP-II

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

PRE-REQUISITES: --

COURSE DESCRIPTION: Expose students to the industrial environment; Create competent professionals for the industry; sharpen the real time technical / managerial skills required at the job; Gain professional experience and understand engineer's responsibilities and ethics; Familiarize with latest equipment, materials and technologies; Gain exposure to technical report writing; Gain exposure to corporate working culture.

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

CO1. Analyze latest equipment, materials and technologies that are used in industry to solve complex engineering problems following relevant standards, codes, policies and regulations.

CO2. Analyze safety, health, societal, environmental, sustainability, economical and managerial factors considered in industry in solving complex engineering problems.

CO3. Perform individually or in a team besides communicating effectively in written, oral and graphical forms on practicing engineering.

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				
CO2		3				3	3				3					
CO3									3	3						

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

IV B. Tech. – I Semester

(20BT705AC) FREE AND OPEN SOURCE SOFTWARE

(Audit Course)

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

PRE-REQUISITES: --

COURSE DESCRIPTION: Open source, Principles, Standards, Requirements, Methodologies, Free software vs open source software, Licensing model, Open source software development, Case studies, Open source projects, Licenses, Copyright, Copyleft, Patents, Creative Commons, Ethics.

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

CO1. Demonstrate knowledge on the principles and methodology of open source software.

CO2. Demonstrate knowledge on open source projects, the licensing procedures and intellectual property rights.

CO3. Understand and practice the open source ethics for open source software development.

CO4. Recognize the need and importance of contributing to free and open source software community.

DETAILED SYLLABUS:

UNIT–I:INTRODUCTION TO OPEN SOURCE (5 periods)

Open source, Principles, Standard requirements for open software, Success of OSS, Free software, Examples of free software, Free software license provider, Free software vs open source software, Public domain, History, Proprietary vs open source licensing model, Why companies use/don't use open source software.

UNIT–II: PRINCIPLES AND OPEN SOURCE METHODOLOGY (5 periods)

Open source initiatives, Open standards principles, Methodologies, Philosophy, Software freedom, Open source software development, Zero marginal cost, Income generation opportunities, Internationalization.

UNIT–III: CASE STUDIES (8 periods)

Apache, Berkeley Software Distribution, Linux, Mozilla Firefox, Wikipedia, GNU compiler collection.

UNIT–IV: OPEN SOURCE PROJECTS AND LICENSING (7 periods)

Open Source Projects: Starting and maintaining an open source project, Open source hardware, Open Source design, Open Source Teaching (OST), Open Source Media.

Licensing: Licenses, Copyright, Copyleft, Patent, Creative Commons, Attribution 2.5 India (CC BY 2.5 IN).

UNIT–V: OPEN SOURCE ETHICS (5 periods)

Open source vs closed source, Open source government, Ethics of open source, Social and financial impacts of open source technology, Shared software, Shared source.

Total Periods: 30

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Kailash Vadera, Bhavyesh Gandhi, *Open Source Technology*, University Science Press, 2009.
2. Moreno Muffatto, *Open Source: A Multidisciplinary Approach*, Imperial College Press, 2006.

REFERENCE BOOKS:

1. Andrew M. St. Laurent, *Understanding Open Source and Free Software Licensing*, O'Reilly, 2004.
2. Paul Kavanagh, *Open Source Software: Implementation and Management*, Elsevier, 2004.

ADDITIONAL LEARNING RESOURCES:

1. VM Brasseur, *Forge Your Future with Open Source: Build Your Skills, Build Your Network, Build the Future of Technology*, 2018.
2. Fadi P. Deek and James A. M. McHugh, *Open Source Technology and Policy*, Cambridge University Press, 2008.
3. Open Source Technology: Concepts, Methodologies, Tools and Applications, IGI-Global, 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			
CO2	3					3							3			
CO3								3					3			
CO4						3							3			

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

IV B.Tech. – II Semester
(20BT80531) PROJECT WORK

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
100	100	200	-	-	-	12

PRE-REQUISITES: --

COURSE DESCRIPTION: Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the project work; Preparation of thesis and presentation.

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

CO1. Create/Design computer science engineering systems or processes to solve complex computer science engineering and allied problems using appropriate tools and techniques following relevant standards, codes, policies, regulations and latest developments.

CO2. Consider society, health, safety, environment, sustainability, economics and project management in solving complex computer science engineering and allied problems.

CO3. Perform individually or in a team besides communicating effectively in written, oral and graphical forms on computer science engineering systems or processes.

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				3				
CO2						3	3				3					
CO3									3	3						

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