ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS
(Choice Based Credit System)

R20

Computer Science and Engineering

For

B.TECH. FOUR YEAR DEGREE COURSE

(Applicable for batches admitted from 2020-2021)

SWARNANDHRA
COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

SEETHARAMAPURAM, NARSAPUR-534 280, W.G.DT., A.P.

SWARNANDHRA COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Vision of the Institution:

To provide the society with Centre of Learning in Technical Education and Research that motivates the students to evolve into dynamic professionals.

Mission of the Institution:

- Providing Quality education, student centered teaching learning process and sate of the art infrastructure for professional aspirants hailing from both rural and urban areas.
- Evolving this organization into a centre of Academic and Research Excellence.
- Imparting Technical Education that encourages independent thinking develops strong domain knowledge and positive attitudes towards holistic growth of young minds.

Vision of the Department

To empower Computer Science Engineers as highly proficient, innovative, self-driven, and socially responsible professionals by offering a multidimensional education.

Mission of the Department

M1: Empowerment of Computer Science Engineers :To empower Computer Science Engineers through comprehensive education, fostering high proficiency.

M2: Multidimensional Education: To provide a diverse education, equipping engineers with skills to navigate the global needs.

M3: Development of Proficiency and Innovation :To ensure graduates are well prepared to address technical issues with creativity and innovation.

.**M4: Social Responsibility and Professional Excellence: To** instill a strong sense of commitment, shaping graduates into socially responsible professionals and self-driven.

Program Educational Objectives Statements (PEOs)

PEO1:
Technical Excellence: Graduates will demonstrate a high level of proficiency and competence in computer science and engineering, equipped with the knowledge and practical skills necessary to excel in their chosen career paths.

PEO2:
Innovation and Problem-Solving : Graduates will be innovative thinkers and problem-solver, capable of applying their skills to tackle complex challenges in the ever-evolving technological landscape.

PEO3:
Self-Motivation and Lifelong Learning: Graduates will exhibit self-motivation and a commitment to lifelong learning, continually updating their skills and knowledge to stay current in their field.

PEO4:
Social Responsibility and Leadership: Graduates will demonstrate a strong sense of social responsibility, ethical conduct, and leadership abilities.

PROGRAM OUTCOMES

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.

a. **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.

b. **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.

c. **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.

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

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

f. **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.

g. **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.

h. **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 OUTCOME (PSOs)

PSO1:
Student will possess comprehensive knowledge and skills in computer networks, distributed computing and network security to design, implement, and manage robust secure and scalable computing systems that meet the evolving needs of organizations and industries

PSO2:
Students will be equipped with the knowledge and skills to effectively apply data science and machine learning techniques o solve real-world problems , analyze complex datasets, and make data-driven decisions in diverse industries

ACADEMIC REGULATIONS

1. INTRODUCTION

Swarnandhra College of Engineering & Technology (**Subsequently referred to as SCET**) will be followed the norms of Jawaharlal Nehru Technological University Kakinada and Govt. of Andhra Pradesh.

All Academic Programme rules and regulations are approved by the Academic Council, which is the highest Academic body of the Institute. It is applicable for all Bachelor of Technology (B. Tech) degree programme from academic year 2020-21.

2. ADMISSIONS

2.1 Regular Admission

(Join in first year B. Tech Programme)

Admissions in the Institution are classified into **CATEGORY – A,** through convener, EAMCET and **CATEGORY- B** filled by the college management.

2.2 Lateral Entry Admission

(Join in the Second year/third semester of B. Tech Programme)

Eligibility: Diploma in Engineering / B.Sc Degree with Mathematics as one course .

Based on the rank secured by the candidate at Engineering Common Entrance Test (ECET) conducted by APSCHE, Government of Andhra Pradesh.

2.3 Advance standing Admission

(Transfer from other Colleges/ Re-admission due to dis-continuation)

These may arise in the following cases:

a) When a student seeks transfer from other colleges to SCET and desirous to pursue the study at SCET in an eligible branch of study.
b) When students of SCET get transferred from one regulation to another regulation.

In all such cases, approval is mandatory from the statutory bodies

3. UNDER GRADUATE (UG) PROGRAMMES OFFERED

The College is offering the following programmes:

- Computer Science and Engineering (CSE)
- Electronics and communication Engineering (ECE)
- Electrical and Electronics Engineering (EEE)
- Information Technology (IT)
- Mechanical Engineering (ME)
- Civil Engineering (CE)
- Artificial Intelligence and Machine Learning (AI&ML)
- Robotics (ROBO)

3.1 Structure of the Programme:

i) **Preamble:**

It is emphasized in UGC Guidelines on Choice Based Credit System (CBCS), that the important measures taken to enhance academic standards and quality in higher education include innovation and

improvements in curriculum, teaching-learning process, examination and evaluation systems, besides governance and other matters. It is adopted grading system in place of conventional system of marks and percentages.

CBCS provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The students can register any course of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach through open electives.

Key words CBCS, such as Course, credit, credit point, CGPA, SGPA, Grade Point, Letter Grades as given in the UGC guidelines are used the same definitions.

Each Programme consists of:

- Foundation courses in Basic Sciences, Engineering Sciences, Humanities and social science including management courses.
- Professional core Courses to impart broad knowledge.
- Professional Elective Courses from the discipline or interdisciplinary areas / industry related opted by the student based on their interest in specialization.
- Open Elective Courses from the interdisciplinary areas opted by the students based on their interest in specialization.
- Mandatory Courses, Internship, Seminar, Project work.
- Skill Oriented Courses to upskilling the graduates on the skills relevant to the need and demands of the industry.

Each Programme designed to have 35-40 theory courses, 20-25 laboratory courses and 05 Skill Oriented Courses. The categories of courses are indicated in the following table.

A three-week induction program is mandatory for all first year UG students and shall be conducted as per AICTE/UGC/APSCHE guidelines.

TABLE-1 CATEGORY OF COURSES

S.No	Category	Code
1	Humanities and social science including Management courses	HSMC
2	Basic Science courses	BSC
3	Engineering courses science	ESC
4	Professional core Courses	PCC
5	Open Elective Courses	OEC
6	Professional Elective Courses	PEC
7	Internship, seminar, project work	PROJ
8	Skill Oriented Courses	SC
9	Laboratory Courses	LC
10	Mandatory courses	MC

Note: All components prescribed in the curriculum will be conducted and evaluated.

MOOCS: A student shall be permitted to pursue up to a maximum of two elective courses under MOOCs during the Programme. Each of the courses must be of minimum 12 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to pursue and acquire a certificate for a MOOC course only from the organizations/agencies approved by the BoS in order to earn the 3 credits. The Head of the department shall notify the list of such courses at the beginning of the semester.

ii) **Contact hours:** Depending on the complexity and volume of the course, the number of contact hours per week will be determined.

iii) **Credits:**

TABLE-2 CREDITS BASED ON CONTACT HOURS

Course type	No. of Contact Hours	No. of Credits
Theory	1	1
Practical	2	1

TABLE-3 CREDITS FOR DIFFERENT COURSES

Course type	Lecture method			Credits
	L	T	P	C
Theory/Elective	2	1	0	3
	3	0	0	3
	2	0	2	3
	2	0	0	2
Laboratory	0	0	2	1
	0	0	3	1.5
	0	0	4	2
Skill Oriented Courses	1	0	2	2

3.2 Curriculum for each Programme:

- All Four year B. Tech Programme of study is formulated based on the guidelines mentioned in 3.1 and recommended by the concerned Board of Studies (BoS) and approved by the Academic Council (AC).
- The same curriculum will be applicable for lateral entry students from 3 rd semester onwards.
- For advance standing admission, the equivalent curriculum will be prepared by BoS and approved by AC.

4 DURATION OF THE PROGRAMME:

The duration of the B. Tech. Programme is four academic years consisting of eight semesters. Students, who fail to fulfill all the academic requirements for the award of the degree within the prescribed duration as per article 4.1, will forfeit their admission in B. Tech**.**

4.1 Maximum duration of study.

Maximum duration permitted for completion of the B. Tech. Programme of study will be:

Regular Admission: Eight academic years in sequence from the year of admission for a student admitted into first year of any Programme.

Lateral Entry Admission: Six academic years in sequence from the year of admission for a student admitted into second year of any Programme.

Advanced standing Admission: The maximum time for completion of Programme of study, will be twice the period in terms of academic years in sequence, with prescribed curriculum.

TABLE- 4 MAXIMUM DURATION OF STUDY

Admitted year of study	Maximum duration
First year	8 Academic years in sequence
Second year (Lateral entry)	6 Academic years in sequence
Advanced standing	Twice the period in terms of academic years in sequence

4.2 Cancellation of Admission :

In case candidate fails the above conditions for the award of degree, admission stands cancelled.

5 MEDIUM OF INSTRUCTION :

The medium of instruction and examinations are in English.

6 MINIMUM INSTRUCTION DAYS: Each semester will consist of 22 weeks duration with minimum of 110 working days which includes instruction days, internal tests and End examinations.

7 TRANSITORY REGULATIONS (Admitted under advance standing)**:**

The following regulations will be followed the operandi. At the time of such admission, based on the Programme pursued (case by case)

- Discontinued or detained candidates are eligible for re-admission in subsequent years in the same semester.
- The re-admitted candidate will be governed by the rules & regulations under which the candidate has been admitted.

In case of transferred students from other colleges, credits shall be transferred to SCET as per the academic regulations and course structure of SCET.

8 DISTRIBUTION AND WEIGHTAGE OF MARKS:

Each semester consists of 4/5/6 theory courses and 4/3/2 Laboratory courses. However, in the 8th semester there will be only project work / internship in industry.

(a). **Theory Courses:**

- Each course consists of five units.
- All courses will be evaluated with a maximum of 100 marks.
- Marks distribution will be 30 marks for internal evaluation and 70 marks for the end semester examination.
- The internal evaluation of 30 marks consists of Two Mids for 20 marks and Five class tests for 10 marks.
- Mid Examination: Each mid examination will be conducted for 20 marks with the duration of 75 Minutes. Internal test paper consists of three questions (8M+8M+4M) from two and half units and all are to be answered.
- **Weighted average of two Mids** performance will be considered, weightage of 80% for the best Mid marks and 20% for the second.
- **Class tests for 10 marks calculation**: There will be one class test conducted in each unit. Average of **Best three** will be considered.
- The **end semester** examination will be conducted for 70 marks which covers full syllabus. In end examination pattern, **Part – A** consists of five short questions from all units (Brainstorming/Thought provoking/Case study) for 10 marks. **Part – B** has **5 questions** with internal choice from each unit and valued for 60 marks.
- Internal Marks will be considered for three academic years only if the candidates will not completed the concern course because of less than 12 internal marks. Thereafter the candidate writes external examination for 70 which will be converted to 100 but the candidate must get minimum 40 %.

(b). **Practical Courses:**

- All courses will be evaluated with a maximum of 100 marks.
- Marks distribution will be 30 marks for internal evaluation and 70 marks for the end semester examination.
- End practical examination will be conducted by the internal and external examiner appointed by COE.
- Internal evaluation will be a continuous assessment during the semester for 30 marks with 15 marks for day-to-day work, including record valuation and 15 marks for internal test.

(c). **Design or Engineering Drawing Marks Distribution:** For the courses of design or drawing such as Engineering Graphics, etc., the distribution will be 30 marks for internal evaluation with 10 marks for day-to-day work, and 20 marks from two internal test (80% of first best + 20% of second best). End examination will be conducted for 70 marks.

(d) **Summer Internship:** It can be carried out with a minimum of Six weeks and maximum Eight weeks duration at end of 4^{th} semester and 6^{th} semester. The internship can be done by the students at local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs. It will be evaluated internally by an internal evaluation committee comprising of Head of the Department and two faculty of the department. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee. The report and the oral presentation shall carry 40% and 60% weightage respectively. A minimum of 50% of maximum marks shall be obtained to earn the corresponding credits

(e) **Full Internship and Project Work:** The 8th Semester Project Work with full internship will be evaluated for 200 Marks. The project work is evaluated for internal assessment of 60 and external Examination for 140. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship. Completion of internships is mandatory, 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.

i) Internal Assessment: Internal Assessment will be monitored by Project Review Committee consists of Head of the Department , Supervisor and Senior faculty member on the basis of two seminars and the internal marks will be awarded by Project Supervisor with recommendation of PRC.

ii) External Examination: External Examination will be conducted by Project external examination committee consists of Head of the Department, Supervisor and External examiner appointed by CoE , through presentation / viva - voce by the student.

9. Community Service Project (Experiential Learning through Community Engagement):

Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development. Community Service Project is meant to link the community with the college for mutual benefit.

Community Service Project is an integral part of the curriculum with 4 Credits and evaluated internally for 100 marks.

Objectives:

- To sensitize the students to the living conditions of the people who are around them,
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project:

1. Every student should put in a minimum of 180 hours for the Community Service Project during the summer/ Semester vacation.
2. Each class/section should be assigned with a mentor
3. Specific Departments could concentrate on their major areas of concern.
4. A log book has to be maintained by each of the student, where the activities undertaken / involved to be recorded.
5. The log book has to be countersigned by the concerned mentor/faculty incharge.
6. Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
7. The final evaluation to be reflected in the grade memo of the student.
8. The Community Service Project should be different from the regular programmes of NSS / NCC / Green Corps / Red Ribbon Club, etc.
9. Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
10. The Project Log-, Project Implementation, Project report and Presentation shall carry 20%, 30%, 25% and 25% weightage respectively. A minimum of 50% of maximum marks shall be obtained to earn the corresponding credits.

TABLE- 5 MARKS ALLOCATION

Course type	Marks Allocation			
	Internal		End Semester	Total
	Internal test	Class Test/ Day to day work		
Theory course	20	10	70	100
Laboratory course	15	15	70	100
Design or Drawing course	20	10	70	100
Skill Oriented Courses	15	15	70	100
Summer Internship	50		-	50
Community Service Project	100		-	100
Project Work	60		140	200

(f) **Mandatory Courses**:
These courses are compulsory with zero credits. Only internal examination will be conducted and student has to secure minimum 40% of the marks in the evaluation for passing the course. The minimum attendance requirement is 75 %.

(g) **Open Electives:** Students are to choose Open Elective – I during 5th Semester, Open Elective–II during 6th Semester and Open Elective – III and IV during 7th Semester from the list of Open Electives given in the Course Structure. However, students cannot opt for an Open Elective Subject offered by their own (parent) Department, if it is already listed under any category of the courses offered by the parent Department in any Semester.

(h) **Skill Oriented Courses:**

i) A pool of interdisciplinary and job-oriented mandatory skill courses which are relevant to the industry are integrated into the curriculum of concerned branch of engineering.

ii) For these courses, one theory and two practical hours may be allotted as approved by the concerned BOS.

iii) The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries/Professional bodies/APSSDC or any other accredited bodies as approved by the concerned BoS.

iv) Every year the concerned BoS review the skill oriented courses based on industrial demand which are offered by the eligible external agencies and college.

v) Marks distribution will be 30 marks for internal evaluation and 70 marks for the end semester examination. End examination will be conducted by the internal and external examiner appointed by COE. Internal evaluation will be a continuous assessment during the semester for 30 marks with 15 marks for day-to-day work, including record valuation and 15 marks for internal test.

vi) If a student chooses a Certificate Course offered by industries/Professional bodies/APSSDC or any other accredited bodies, in lieu of the skill advanced course offered by the Department, the credits shall be awarded depends on the Course Completion Certificate.

vii) College academic committee evaluates the grades/marks given for a course by external agencies and convert to the equivalent marks/grades.

viii) There are five (05) skill-oriented courses shall be offered during III to VII semesters.

ix) Out of the five skill courses two shall be skill-oriented courses from the same domain and shall be completed in second year. Of the remaining 3 skill courses, one shall be necessarily be a soft skill course and the remaining 2 shall be skill-advanced courses either from the same domain or Job oriented skill courses, which can be of inter disciplinary nature.

10. ATTENDANCE REQUIREMENTS

(i) A student will be eligible to appear for end semester examinations, if he/she acquired a minimum of 75% of attendance in aggregate of all the courses.

(ii) Condonation of shortage of attendance in aggregate up to 10% on medical grounds (Above 65% and below 75%) in any semester may be granted by the College Academic Committee.

(iii) Shortage of Attendance below 65% in aggregate shall not be condoned.

(iv) Students with less than 65% of attendance in any semester are not eligible to take up their end examination of that particular semester and their registration for previous semesters examinations shall be allowed.

(v) Attendance may also be condoned for those who participate in Inter Collegiate/university sports, co- and extracurricular activities provided their attendance is in the minimum prescribed range for the purpose (>65%) and recommended by the concerned authority. He/ She shall pay the prescribed Condonation fee.

(vi) Prescribed Condonation fee shall be payable by the student to appear for the end examination.

(vii) A Student will not be promoted to the next semester unless he/she satisfies the attendance requirement of the present semester as applicable. They may seek re-admission for that semester as and when offered consecutively.

(viii) A student will be condoned only four times for regular student and three times for lateral entry students during entire course of study.

(ix) For induction programme attendance shall be maintained as per AICTE norms.

TABLE-6 ATTENDANCE REQUIREMENT

Attendance Percentage	Condonation fee	Appear End Exams
Above 75 %	Nil	Eligible
65 % -75%	Yes (on medical grounds)	Eligible
Below 65 %	Nil	Not Eligible (Seek re-admission to that semester when offered)

11. MINIMUM ACADEMIC REQUIREMENTS:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in **S.No.10.**

(i) A student will be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or practical or design or drawing subject or project if he/she secures not less than a minimum of 35% of marks exclusively in the end semester examinations in each of the courses, for which the candidate had appeared. However, the candidate should have secured a minimum of 40% marks in both external and internal components put together to declare eligible for pass..

(ii) A student will be promoted from first semester to second semester, second semester to third and third to fourth semester, if he/she satisfies the minimum attendance requirement.

(iii) A student will be promoted from 4th to 5th Semester (2nd year to 3rd year), if he/she fulfills the academic requirements of 40% of the credits up to either 3rd or 4th Semester from all the examinations (Regular and supplementary) whether or not the candidate takes the examinations.

(iv) A student will be promoted from 6th to 7th Semester (3rd year to 4th year), only if he/she fulfills the academic requirements of 40% of the credits up to either 5th or 6th Semester from, all the examinations (regular and supply) whether or not the candidate takes the examinations.

(v) When a student is detained for lack of credits/shortage of attendance, he may be re-admitted into the same semester/year in which he has been detained. However, the academic regulations under which he was first admitted shall continue to be applicable to him.

TABLE-7 PROMOTION IN TO NEXT HIGHER CLASS

Promotion		Promotion Criteria
From	To	
1ST Semester	2nd Semester	Minimum Attendance requirement
2nd Semester	3rd Semester	
3rd Semester	4th Semester	
4th Semester	5th Semester	Minimum Attendance requirement & 40% of credits up to either 3rd or 4th semester from all exams
5th Semester	6th Semester	Minimum Attendance requirement
6th Semester	7th Semester	Minimum Attendance requirement & 40% of credits up to either 5th or 6th semester from all exams
7th Semester	8th Semester	Minimum Attendance requirement

12. GAP YEAR CONCEPT

Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year study, after the 4th Semester with the due recommendations of the GAP committee and approved by the principal. This may be extended to two years at the most which period is not counted for the maximum time for graduation.

13. AWARD OF B.TECH DEGREE:

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

(i) Pursue the programme of study for a stipulated period of four years and not more than eight years.

(ii) Register for 160 credits and secure the same.

(iii) Registered and successfully completed all the components prescribed in the programme of study in which he/she is admitted.

(iv) All mandatory courses must be completed with satisfactory.

(vi) Obtained CGPA greater than or equal to 5.0 (minimum requirements for pass).

(vii) A student shall be eligible for the award of B.Tech degree with Honors or Minor if he/she earns 20 credits in addition to the 160 credits. A student shall be permitted to register either for Honors or for Minor and not for both simultaneously.

(viii) All students shall register for NCC/NSS activities and will be required to participate in an activity specified by NSS officer during first two years. Grade shall be awarded as Satisfactory or Unsatisfactory in the mark sheet on the basis of participation, attendance,performance and behavior. If a student gets an unsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.

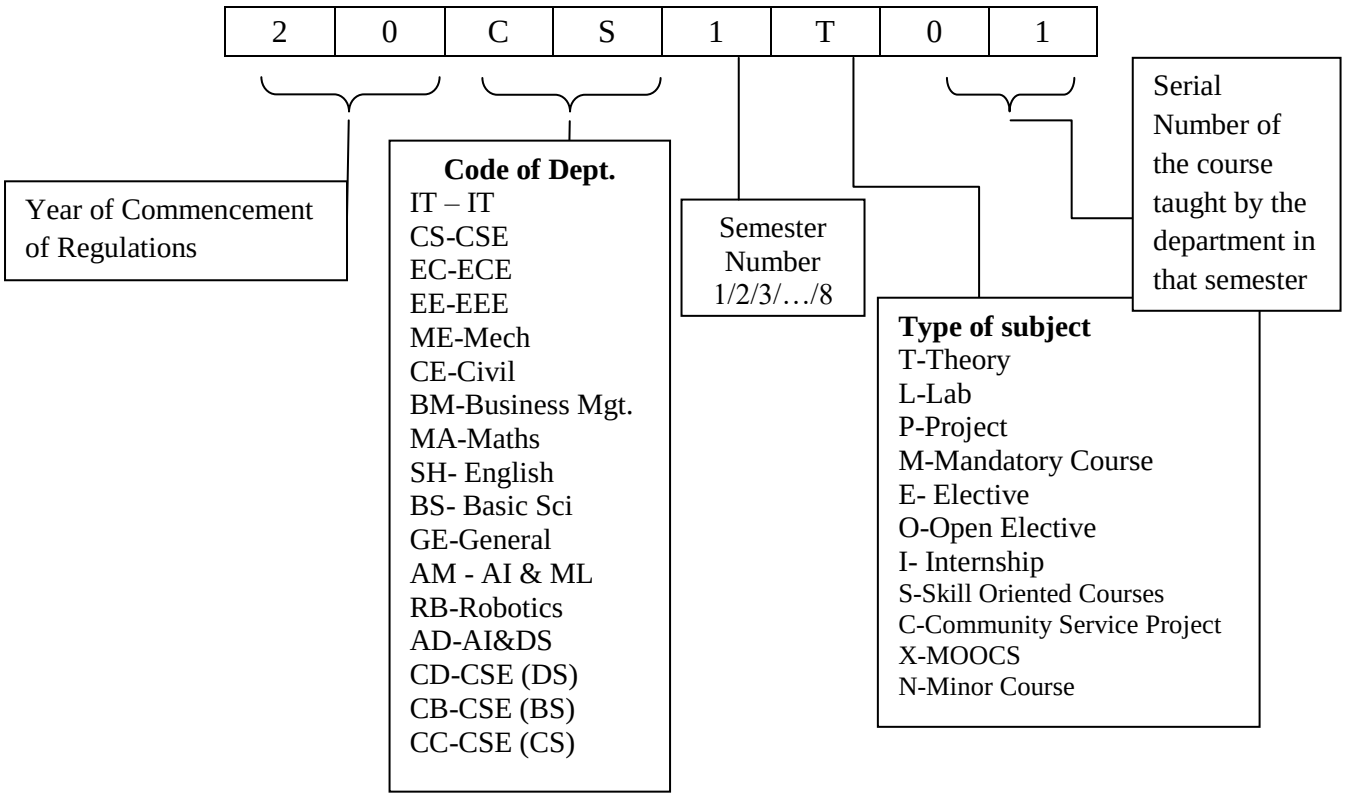
(ix) Courses like Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc., shall be included in the curriculum as non-credit mandatory courses. Environmental Sciences is to be offered compulsorily as mandatory course for all branches. A student has to secure 40% of the marks allotted in the internal evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses.

14. AWARD OF B. TECH. (HONOR)/B. TECH. (MINOR):

B. Tech. with Honors or a B. Tech. with a Minor will be awarded if the student earns 20 additional credits are acquired as per the regulations/guidelines. Registering for Honors/Minor is optional. (Refer Sl.No 24 & 25)

15. COURSE CODE & COURSE NUMBERING SCHEME:

The subject codes will be given by the department teaching the subject. Each subject code contains 8 characters. The 8 characters for each subject will be filled as per the following guidelines.



16. GRADING SYSTEM:

16.1 Award of Grade:

(i) Semester Grade Point Average (SGPA):

a) The Semester Grade Point Average (SGPA) will be calculated according to the formula

$$\text{SGPA (Si)} = \frac{\sum C_i G_i}{\sum C_i}$$

Where C_i = number of credits for the subject i

G_i = grade points obtained by the student in the subject.

b) To arrive at Cumulative Grade Point Average (CGPA), the formula is used considering the student's performance in all the courses taken in all the semesters completed up to the particular point of time.

$$\text{CGPA} = \frac{\sum C_i S_i}{\sum C_i}$$

where 'Si' is the SGPA of the ith semester and Ci is the total number of credits in that semester

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

ii. Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale.

iii. Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters A+, A, B, C, D, E and F.

iv. Equivalent Percentage = (CGPA – 0.75) x 10

(ii) After a student satisfy the requirements prescribed for the award of B.Tech Programme he/she shall be placed in one of the following four grades. The award of the degree is based on CGPA on a grade point scale of 10 and given in Table 8.

Table -8

CGPA	Award of Division
≥ 7.75	First Class with Distinction (Without any supplementary appearance)
≥ 6.75 < 7.75	First Class
≥ 5.75 < 6.75	Second Class
≥ 5.00 < 5.75	Pass Class

16.2 Award of Grade in Each Semester:

(i) Based on the student performance during a given semester, a final letter grade will be awarded at the end of the semester for each subject. The letter grades and the corresponding grade points are as given in the Table 10.

Table -9

Percentage of Marks Scored	Letter Grade	Level	Grade Points
>=90	A+	Outstanding	10
80 - 89	A	Excellent	9
70-79	B	Very Good	8
60-69	C	Good	7
50-59	D	Fair	6
40-49	E	Satisfactory	5
<40	F	Fail	0
	Ab	Absent	0

(ii) A student earns a minimum of 5 grade points in a subject is declared to have successfully completed the subject, and is deemed to have earned the credits assigned to that subject. However, it should be noted that a pass in any subject/Internship/project/ shall be governed by the rules mentioned in **S.No. 13**.

(iii) Grade Sheet: A grade sheet (memorandum) will be issued to each student indicating his/her performance in all courses taken in that semester and also indicating the grades.

(iv) Transcripts: After successful completion of the programme of study, a Transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued up to any point of study to the student on request and by paying stipulated fee in force.

(v) Candidates shall be permitted to apply for revaluation within the stipulated period with payment of prescribed fee.

(vi) The Academic Council has to approve and recommend to the JNTUK, Kakinada for the award of a degree to any student.

17. ACADEMIC REGULATIONS FOR B.TECH (LATERAL ENTRY SCHEME):

i. The students have to acquire 121 credits from 3rd Semester to 8th Semester of Program (regular) for the award of the degree.

ii. Students, who fail to fulfill the requirement for the award of the degree in 6 consecutive academic years from the year of admission, shall forfeit their seat.

iii. The same attendance regulations are to be adopted as per the rules mentioned in item No.9.

iv. **Rules for Promotion in to Next Higher Class:** (6th Semester to 7th Semester): A student shall be promoted from 6th Semester to 7th Semester only if he/she fulfills the academic requirements of 40% credits up to either 5th or 6th Semester.

18. SUPPLEMENTARY EXAMINATIONS:

In addition to the Regular Final Examinations held at the end of each semester, a Supplementary Examination will be conducted. A student can appear for any number courses of supplementary examinations till he/she clears the courses. However the maximum stipulated period of programme cannot be relaxed under any circumstance.

19. ADVANCED SUPPLEMENTARY EXAMINATIONS:

Candidate who fails the courses in 7th and 8th Semester can appear for Advanced Supplementary Examinations.

20. ACADEMIC REGULATIONS FOR B.TECH (LATERAL ENTRY SCHEME):

i. The students have to acquire 121 credits from 3rd Semester to 8th Semester of B. Tech Programme for the award of the degree.
ii. All mandatory courses must be completed with satisfactory for award of degree.
iii. Obtained CGPA greater than or equal to 4.5 (minimum requirements for pass).
iv. The same attendance regulations are to be adopted as per the rules mentioned in item No.09.
v. **Rules for Promotion from 6th Semester to 7th Semester**: A student shall be promoted from 6th Semester to 7th Semester only if he/she fulfills the academic requirements of 40% credits up to 6th Semester.
vi. Students, who fail to fulfill the requirement for the award of the degree in six consecutive academic years from the year of admission, shall forfeit their seat.

21. CONDUCT AND DISCIPLINE:

Students admitted in SCET are to be followed the conduct and discipline of the college and which will be updated from time to time.

22. MALPRACTICES:

If any malpractices held in internal assessment tests or Semester-End Examinations, Principal constitute a Malpractice Enquiry Committee to enquire the case. The principal shall take necessary action based on the recommendations of the committee as per stipulated norms.

23. WITHHOLDING OF RESULTS

If the student has not paid the dues, if any, to the institution or if any case of indiscipline is pending against him, the result of the student will be withheld. His degree will be withheld in such cases.

24. HONORS PROGRAMME:

a) Students of a Department/Discipline are eligible to opt for Honors Programme offered by the same Department/Discipline.

b) A student shall be permitted to register for Honors program at the beginning of 4th semester provided that the student must have acquired a minimum of 7.75 CGPA upto the end of 2nd semester without any backlogs. In case of the declaration of the 3rd semester results after the commencement of the 4th semester and if a student fails to score the required minimum of 8 CGPA, his/her registration for Honors Programme stands cancelled and he/she shall continue with the regular Programme.

c) Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same. e.g. If a Mechanical Engineering student completes the selected advanced courses from same branch under this scheme, he/she will be awarded B.Tech. (Honors) in Mechanical Engineering.

d) In addition to fulfilling all the requisites of a Regular B.Tech Programme, a student shall earn 20 additional credits to be eligible for the award of B. Tech (Honors) degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

e) Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12 weeks as recommended by the Board of studies.

f) It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. The courses offered in each pool shall be domain specific courses and advanced courses.

g) The concerned BoS shall decide on the minimum enrolments for offering Honors program by the department. If minimum enrolments criteria are not met then the students shall be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

h) Each pool can have theory as well as laboratory courses. If a course comes with a lab component, that component has to be cleared separately. The concerned BoS shall explore the possibility of introducing virtual labs for such courses with lab component.

i) If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Honors will be shown in the transcript. None of the courses done under the dropped Honors will be shown in the transcript.

j) In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and they will receive regular B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

k) Honors must be completed simultaneously with a major degree program. A student cannot earn Honors after he/she has already earned bachelor's degree.

25. MINOR PROGRAMME:

a) **i**) Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specialization groups offered by a department other than their parent department. For example, If Mechanical Engineering student selects subjects from Civil Engineering under this scheme; he/she will get Major degree of Mechanical Engineering with minor degree of Civil Engineering

ii) Student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree, for example, a B.Tech Mechanical student can opt for the industry relevant tracks like Data Mining track, IOT track, Machine learning track etc.

b) The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand. For example, the minor tracks can be the fundamental courses in CSE, ECE, EEE,CE,ME etc or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, VLSI etc.

c) The concerned BoS shall decide on the minimum enrolments for offering Minor program by the department. If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

d) A student shall be permitted to register for Minors program at the beginning of 4th semester subject to a maximum of two additional courses per semester, provided that the student must have acquired 7.75 CGPA (Cumulative Grade Point Average) upto the end of 2nd semester without any history of backlogs. It is expected that the 3rd semester results may be announced after the commencement of the 4th semester. If a student fails to acquire 7.75 CGPA upto 3rd semester or failed in any of the courses, his registration for Minors program shall stand cancelled. An CGPA of 7.75 has to be maintained in the subsequent semesters without any backlog in order to keep the Minors registration active.

e) A student shall earn additional 20 credits in the specified area to be eligible for the award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

f) Out of the 20 Credits, 16 credits shall be earned by undergoing specified courses listed by the concerned BoS along with prerequisites. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. If a course comes with a lab component, that component has to be cleared separately. A student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

g) In addition to the 16 credits, students must pursue at least 2 courses through MOOCs. The courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned as decided by the university/academic council.

h) Student can opt for the Industry relevant minor specialization as approved by the concerned departmental BoS. Student can opt the courses from Skill Development Corporation (APSSDC) or can opt the courses from an external agency recommended and approved by concerned BOS and should produce course completion certificate. The Board of studies of the concerned discipline of Engineering shall review such courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest skills based on industrial demand.

i) College Academic committee evaluates the grades/marks given by external agencies to a student which are approved by concerned BoS. Upon completion of courses the departmental committee should convert the obtained grades/marks to the maximum marks assigned to that course. The controller of examinations can take a decision on such conversions and may give appropriate grades.

j) If a student drops (or terminated) from the Minor program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

k) In case a student fails to meet the CGPA requirement for B.Tech degree with Minor at any point after registration, he/she will be dropped from the list of students eligible for degree with Minors and they will receive B. Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

l) Minor must be completed simultaneously with a major degree program. A student cannot earn the Minor after he/she has already earned bachelor's degree.

26. GENERAL:

a) Wherever the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".
b) The academic regulation should be read as a whole for the purpose of any interpretation.
c) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final and which is to be ratified by the Chairman of the Governing Body.
d) The college may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the college.

COURSE STRUCTURE – UG(CBCS)

BASIC STRUCTURE FOR COMPUTER SCIENCE AND ENGINEERING BRANCH

SEMESTER-I									
S.no	Course Type	Course Title	**L**	**T**	**P**	**C**	**IM**	**EM**	**TM**
1	20MA1T01	Linear Algebra	3	0	0	3	30	70	100
2	20BS1T02	Engineering Chemistry	3	0	0	3	30	70	100
3	20HS1T01	English	3	0	0	3	30	70	100
4	20CS1T01	Problem Solving Using C Programming	3	0	0	3	30	70	100
5	20BS1L02	Engineering Chemistry Lab	0	0	3	1.5	30	70	100
6	20HS1L01	English Proficiency Lab	0	0	3	1.5	30	70	100
7	20CS1L01	C Programming Lab	0	0	3	1.5	30	70	100
8	20IT1L01	IT Work shop	0	0	3	1.5	30	70	100
		TOTAL	12	0	12	18	240	560	800
SEMESTER-II									
S.no	Course Type	Course Title	**L**	**T**	**P**	**C**	**IM**	**EM**	**TM**
1	20MA2T02	Differential Equation and Numerical Methods	3	0	0	3	30	70	100
2	20BS2T01	Engineering Physics	3	0	0	3	30	70	100
3	20CS2T03	Object Oriented Programming with Python	3	0	0	3	30	70	100
4	20IT2T01	IT Essentials	3	0	0	3	30	70	100
5	20EE2T01	Basic Electrical and Electronics Engineering	3	0	0	3	30	70	100
6	20CS2L03	Object Oriented Programming Lab with Python	0	0	3	1.5	30	70	100
7	20EE2L01	Basic Electrical and Electronics Engineering Lab	0	0	3	1.5	30	70	100
8	20BS2L01	Engineering Physics Lab	0	0	3	1.5	30	70	100
9	20HS2L02	English Communications Lab	0	0	3	1.5	30	70	100
		TOTAL	15	0	12	21	270	630	900

Category	Sem-I Credits	Sem-II Credits
Basic Science Courses (BSC)	7.5	7.5
Engineering Science Courses (ESC)	6.0	12
Humanities and Social Science (HSC)	4.5	1.5
Total Credits	18	21

SEMESTER-III

S.no	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	20IT3T01	Discrete Mathematics	3	-	-	3.0	30	70	100
2	20CS3T01	Data Structures	3	-	-	3.0	30	70	100
3	20CS3T02	Database Management Systems	3	-	-	3.0	30	70	100
4	20EC3T06	Digital Logic Design	3	-	-	3.0	30	70	100
5	20CS3T03	Computer Organization & Architecture	3	-	-	3.0	30	70	100
6	20CS3L01	Data Structures Lab	-	-	3	1.5	30	70	100
7	20CS3L02	Database Management Systems Lab	-	-	3	1.5	30	70	100
8	20EC3L05	Digital Logic Design Lab	-	-	3	1.5	30	70	100
9	20CS3S01	Data Analytics using MS Excel	1	-	2	2.0	30	70	100
10	20CE3M01	Environmental Science	2	-	-	-	-	-	-
		TOTAL	18	0	11	21.5	270	630	900

Category	CREDITS
Basic Science Courses	3
Engineering Science Courses	16.5
Skill Oriented Course	2
Total Credits	21.5

SEMESTER-IV

S.No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	20MA4T07	Probability and Statistics	3	-	-	3.0	30	70	100
2	20CS4T01	Operating Systems	3	-	-	3.0	30	70	100
3	20CS4T02	Java Programming	3	-	-	3.0	30	70	100
4	20CS4T03	Design and Analysis of Algorithms	3	-	-	3.0	30	70	100
5	20BM4T01	Managerial Economics and Financial Analysis	3	-	-	3.0	30	70	100
6	20CS4L01	IOT Lab Using Python	0	-	3	1.5	30	70	100
7	20CS4L02	Operating Systems using Linux Lab	0	-	3	1.5	30	70	100
8	20CS4L03	Java Programming Lab	0	-	3	1.5	30	70	100
9	20CS4S01	Fundamentals of Networking-CCNA	0	-	2	2.0	30	70	100
10	20BM4M01	Indian Constitution	1	-	-	-	-	-	-
		TOTAL	16	0	11	21.5	270	630	900

Category	CREDITS
Basic Science Courses	3
Professional Core Courses	12
Engineering Sciences	4.5
Skill Oriented Course	2
Total Credits	21.5

SEMESTER – V

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	20CS5T01	Computer Networks	3	-	-	3.0	30	70	100
2	20CS5T02	Data Science	3	-	-	3.0	30	70	100
3	20CS5T03	Software Engineering	3	-	-	3.0	30	70	100
4		Professional Elective-I	2	-	2	3.0	30	70	100
5		Open Elective –I / Job Oriented Elective-I	3	-	-	3.0	30	70	100
6	20CS5L01	Computer Networks Lab	-	-	3	1.5	30	70	100
7	20CS5L02	Data Science Lab	-	-	3	1.5	30	70	100
8	20HS5S01	Advanced Communication Skills Lab	1	-	2	2.0	30	70	100
9	20BM5M01	Essence of Indian Traditional knowledge	2	-	-	-	-	-	-
10	20CS5I01	Internship I	-	-	-	1.5	50	-	50
		TOTAL	**17**	**0**	**10**	**21.5**	**290**	**560**	**850**

Category	CREDITS
Professional Core Courses	12
Professional Elective Courses	3
Open Elective Courses	3
Skill Oriented Course	2
Summer Internship	1.5
Total Credits	21.5

SEMESTER – VI

S.No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	20CS6T01	Compiler Design	3	-	-	3.0	30	70	100
2	20CS6T02	Object Oriented Analysis and Design	3	-	-	3.0	30	70	100
3	20CS6T03	Machine Learning	3	-	-	3.0	30	70	100
4		**Professional Elective-II**	3	-	-	3.0	30	70	100
	20CS6E01	Software Testing Methodologies							
	20AM6E01	Human Computer Interaction							
	20CS6E02	Mobile Application Development							
	20CS6E03	Artificial Intelligence Tools and Techniques							
5		**Open Elective - II / Job Oriented Elective-II**	2	-	2	3.0	30	70	100
6	20CS6L01	Machine Learning Lab	-	-	3	1.5	30	70	100
7	20CS6L02	Object Oriented Analysis and Design Lab	-	-	3	1.5	30	70	100
8	20CS6L03	Compiler Design Lab	-	-	3	1.5	30	70	100
9	20CS6S01	Web Design and Development	1	-	2	2	30	70	100
10	20CS6C01	Community Service Project	-	-	-	4	100	-	100
11	20HS6T01	Professional Ethics and Intellectual Property Rights	2	0	0	0	-	-	-
TOTAL			21	0	13	25.5	370	630	1000

SEMESTER – VII

S.No	Course Code	Course Title	L	T	P	C	IM	EM	TM
1		Prof. Elective Courses – III	3	0	0	3.0	30	70	100
2		Prof. Elective Courses – IV	3	0	0	3.0	30	70	100
3		Prof. Elective Courses – V	3	0	0	3.0	30	70	100
4		Open Elective – III	2	0	2	3.0	30	70	100
5		Open Elective – IV	2	0	2	3.0	30	70	100
6	20HS7T01	Universal Human Values : Understanding Harmony	3	0	0	3.0	30	70	100
7	20CS7S01	Advanced Python Programming	1	0	2	2.0	30	70	100
8	20CS7I01	Internship II	0	0	0	3.0	50	-	50
		TOTAL	17	0	6	23	260	490	750

CATEGORY	CREDITS
Professional Elective Courses	9
Open Elective/Job Oriented Courses	6
Humanities and Social Science Elective	3
Skill Advanced Course	2
Summer Internship	3
Total Credits	23

SEMESTER – VIII

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	20CS8P01	Project Work, Seminar and Internship in Industry	-	-	-	8	60	140	200
		TOTAL CREDITS	**-**	**-**	**-**	**8**	**60**	**140**	**200**

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PROFESSIONAL ELECTIVE - I

S.No	Course Code	Course Title	Semester
1	20CS5E01	Computer Graphics	V
2	20CS5E02	Theory of Computation	V
3	20CS5E03	Block Chain Technologies	V
4	20CS5E04	Advanced Data Structures	V

OPEN ELECTIVE - I

S. No	Course Code	Course Title	Offering Dept.
1	20EE5O01	Non-conventional Energy sources	EEE
2	20ME5O01	Waste to Energy Conversion	ME
3	20CS5O01	Internet of Things and Applications	CSE
4	20CS5O02	Data Engineering	CSE
5	20BM5O01	Innovations and Entrepreneurship	MBA
6	20BM5O03	Digital Marketing	MBA
7	20BM5O04	Business Environment	MBA
8	20IT5J01	Linux Administration	IT
9	20CS5J01	Full Stack with JAVA	CSE

JOB ORIENTED ELECTIVE - I

S. No	Course Code	Course Title	Offering Dept.
1	20IT5J01	Linux Administration	IT
2	20CS5J01	Full Stack with JAVA	CSE

PROFESSIONAL ELECTIVE - II

S.No	Course Code	Course Title	Semester
1	20CS6E01	Software Testing Methodologies	VI
2	20AM6E01	Human Computer Interaction	VI
3	20CS6E02	Mobile Application Development	VI
4	20CS6E03	Artificial Intelligence Tools and Techniques	VI

OPEN ELECTIVE – II

S. No	Course Code	Course Title	Offering Dept.
1	20CE6O01	Environmental Pollution and Control	CE
2	20CE6O02	Disaster Management	CE
3	20EE6O01	Fundamentals of Electrical Vehicle	EEE
4	20EC6O01	Mobile Communication and its Applications	ECE
5	20ME6O01	Basics of 3D Printing	MECH
6	20ME6O02	Farm Machinery	MECH
7	20CS6O01	Fundamentals of Software Engineering	CSE
8	20CS6O02	Fundamentals of Computer Networks	CSE
9	20BM6O01	Stress and Work Life Management	MBA
10	20BM6O02	Banking and Insurance	MBA
11	20MA6O01	Operation Research	S&H
12	20IT6O01	Introduction to Cloud Computing	IT
13	20IT6O02	E-Commerce	IT

JOB ORIENTED ELECTIVE – II

S. No	Course Code	Course Title	Offering Dept.
1	20CS6J01	AWS Cloud Practitioner	CSE
2	20CS6J02	Software Testing Tools	CSE
3	20IT6J01	Full Stack Development	IT
4	20IT6J02	Block Chain Technology	IT

PROFESSIONAL ELECTIVE - III

S.No	Course Code	Course Title	Semester
1	20CS7E01	Cryptography and Network Security (common to CSE,IT &AIML)	VII
2	20CS7E02	Design Patterns	VII
3	20CS7E03	Artificial Neural Networks	VII
4	20CS7E04	Information Retrieval Systems	VII

PROFESSIONAL ELECTIVE - IV

S.No	Course Code	Course Title	Semester
1	20CS7E05	Quantum Computing (Common to CSE&IT)	VII
2	20CS7E06	Natural Language Processing	VII
3	20CS7E07	Mobile Computing	VII
4	20IT7E04	Distributed systems (Common to CSE&IT)	VII

PROFESSIONAL ELECTIVE - V

S.No	Course Code	Course Title	Semester
1	20CS7E08	Edge Computing (Common to CSE&IT)	VII
2	20CS7E09	Wireless Sensor Networks	VII
3	20IT7E06	Computer Vision (Common to CSE&IT)	VII
4	20AM7E07	Social Networks Analysis (Common to CSE&AIML)	VII

OPEN ELECTIVE – III (VII SEMESTER)

S. No	Course Code	Course Title	Offering Dept.
1	20CE7O01	Solid Waste Management	CE
2	20CE7O02	Building Planning and Drawing	CE
3	20EE7O01	Energy Auditing, Conservation And Management	EEE
4	20EC7O01	Introduction To Global Positioning Systems	ECE
5	20BM7O01	Industrial Sociology And Psychology	MBA
6	20ME7O01	Bio-Mechanical Engineering	MECH
7	20CS7O01	Full-Stack Development	CSE

OPEN ELECTIVE – IV (VII SEMESTER)

S. No	Course Code	Course Title	Offering Dept.
1	20CE7O03	Introduction To Watershed Management	CE
2	20EE7O02	Introduction To Programmable Logic Controller	EEE
3	20BM7O02	Business Skill Development	MBA
4	20EC7O02	Remote Sensing	ECE
5	20ME7O02	Green Engineering System	MECH
6	20CS7O02	Software Testing Techniques	CSE
7	20IT7O01	Introduction To Software Project Management	IT

MINOR DEGREE IN COMPUTER SCIENCE AND ENGINEERING

Minor Degree in Computer Science and Engineering (For non CSE/IT Students)

S.No	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	20CS4N01	Data Structures Using C	3	1	0	4	30	70	100
2	20CS5N01	Database Management Systems	3	1	0	4	30	70	100
3	20CS6N01	Operating Systems	3	1	0	4	30	70	100
4	20CS7N01	Computer Networks	3	1	0	4	30	70	100
5	20CS7X01 20CS7X02	02 MOOCS courses @ 2credits each (Any CSE/IT related Program Core subject from NPTEL/ SWAYAM course of 8 weeks (2 credits) other than the courses listed above needs to be taken)				4			

B. TECH 1st SEMESTER	L	T	P	C
	3	0	0	3.0
20MA1T01: LINEAR ALGEBRA				

Course Objectives:

- This course will illuminate the students in the concepts of calculus and linear algebra.
- This course equips the students with standard concepts and tools an intermediate level to advanced level and to develop the confidence; ability to handle various real world problems and their applications.

Bridge Course: Limits, continuity, Types of matrices

Unit I: Matrix Operations and Solving Systems of Linear Equations

Rank of a matrix by Echelon form, Normal form - solving system of homogeneous and non-homogeneous linear equations- Gauss Elimination, Jacobi and Gauss Seidel methods

Learning Outcomes:

At the end of this unit, the student will be able to

- solve system of linear equations. (K2)
- determine the rank of a matrix. (K2)

Unit II: Eigen values and Eigen vectors

Eigen values and Eigen vectors - and their properties (without proof). Cayley-Hamilton theorem (without proof), Finding inverse and powers of a matrix by Cayley-Hamilton theorem - Reduction of a matrix to diagonal form.

Learning Outcomes:

At the end of this unit, the student will be able to

- find eigen values and eigen vectors of a matrix. (K2)
- find inverse and powers of a matrix by Cayley-Hamilton theorem.(K2)

Unit III: Quadratic forms

Quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical form by orthogonal transformation.

Learning Outcomes:

At the end of this unit, the student will be able to

- reduce a matrix to diagonal form and identify special properties of a matrix, such as positive definite, etc., and use this information to facilitate the calculation of matrix characteristics; (K3)

Unit IV: Multivariable calculus

Expansions of functions: Taylor's and Maclaurin's series - Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

Learning Outcomes:

At the end of this unit, the student will be able to

- expand the given function as Taylor's and Maclaurin's series. (K3)
- find partial derivatives numerically and symbolically and use them to analyze and interpret the way in which a function varies. (K3)
- acquire the knowledge in maxima and minima of functions of several variables (K1)
- utilize Jacobian of a coordinate transformation to deal with the problems in change of variables (K3)

Unit V: Multiple Integrals

Double Integrals: Change of order of integration, double integrals in polar coordinates, areas enclosed by plane curves.

Triple Integrals: Evaluation of triple integrals, change of variables.

Learning Outcomes:

At the end of this unit, the student will be able to

- evaluate double integrals of functions of several variables in two dimensions using Cartesian and polar coordinates. (K3)
- apply double integration techniques in evaluating areas bounded by a region. (K4)

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 43/e, Khanna Publishers, 2015.

References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2013.
2. B.V. RAMANA, Higher Engineering Mathematics, Tata McGraw Hill, 2007.

Course Outcomes:

At the end of the course, the student will be able to

1. develop the use of matrix algebra techniques that is needed by engineers for practical applications (K3)
2. familiarize with functions of several variables which is useful in optimization (K3)
3. learn important tools of calculus in higher dimensions. Students will become familiar with double integral(K3)
4. familiarize with triple integral and also learn the utilization of special functions. (K4)

B. TECH 1st SEMESTER	L	T	P	C
	3	0	0	3.0
20BS1T02: ENGINEERING CHEMISTRY				

COURSE OUTCOMES

At the end of semester, the students will be able to

CO1: Explain the impurities present in raw water, problems associated and how to avoid them (K2)
CO2: Explain the advantages of Polymers in daily life (K2)
CO3: Explain the theory of construction of battery and fuel cells and theories of corrosion and prevention methods. (K2)
CO4: Differentiate conventional and non-conventional energy sources and their advantages and disadvantages. (K2)
CO5: Identify the usage of advanced materials in day to day life (K2)

UNIT I: WATER TECHNOLOGY [9 Hours]

Part-A

Hard water-Types of hardness-Units of Hard Water-Disadvantages of hard water-Determination of hardness by EDTA complex metric method. Portable water- its specifications-steps involved in purification of water (Sedimentation, Filtration, Disinfection)-chlorination, break point of chlorination.

Boiler Feed Water-Boiler troubles: Scale and sludge-priming and foaming-boiler corrosion-caustic embrittlement.

Part-B

Industrial Water Treatment: Softening methods: zeolite process-ion exchange process.
Brackish water treatment (desalination methods): Reverse osmosis - electro dialysis.

Learning Outcomes: At the end of this unit, the students will be able to Explain

The impurities present in raw water, problems associated with them and how to avoid them

UNIT-II: POLYMERS AND COMPOSITE MATERIALS [9 Hours]

Part-A

Polymers-degree of polymerization-functionality-preparation, properties and applications of individual polymers-Bakelite-PVC-Poly styrene.

Plastics: Types (thermosetting and thermoplastic)-compounding of plastics-moulding Process. (Injection moulding, Compression moulding, Extrusion moulding, Transfer moulding)

Part-B

Rubbers and elastomers: Introduction-natural rubber-vulcanization of rubber-synthetic rubbers-Buna-N, Buna-S.

Composite materials: Fiber reinforced plastics-biodegradable polymers-biomedical polymers, Recycling of e-waste.

Learning Outcomes: At the end of this unit, the students will be able to

- **Outline** the properties of polymers and various additives added and different methods of forming plastic materials.
- **Explain** the preparation, properties and applications of some plastic materials.
- **Discuss** natural and synthetic rubbers and their applications.

UNIT III: ELECTRO CHEMICAL CELLS AND CORROSION [12 Hours]

Electrochemical Cells: Introduction–single electrode potential - electrochemical cell-electrochemical series and applications. Reference electrodes-standard hydrogen electrode and calomel electrode-construction of glass electrode. Batteries: Construction, working and cell reaction of primary (dry cell) and Secondary (Pb acid and Li-ion) battery. Fuel cells (H_2-O_2, Methanol-Air cells).

Corrosion: Cause and consequences of corrosion-theories of corrosion (Chemical and Electrochemical corrosion)-types of corrosion (Galvanic, Differential aeration (waterline and pitting corrosion), stress Corrosion). Factors influencing rate of corrosion-nature of metal-nature of corrosive atmosphere. Corrosion Prevention methods: Cathodic Protection-Sacrificial anodic method-Impressed voltage method. Metallic coatings: Galvanization-Tinning-Electro Plating-Electro less plating.

Learning Outcomes: At the end of this unit, the students will be able to

- **Explain** the theory of construction of battery and fuel cells.
- **Categorize** the reasons for corrosion and study some methods of corrosion control.

UNIT IV: CONVENTIONAL AND NONCONVENTIONAL ENERGY RESOURCES [9 Hours]

Conventional energy sources: Classification and characteristics of fuels-solid, Liquid and gaseous fuels-advantages and disadvantages-calorific value-higher and lower calorific values-construction and working of bomb calorimeter-analysis of coal-proximate and ultimate analysis-numerical problems related to bomb calorimeter, Dulong's formula and coal analysis-petroleum refining-cracking – petrol and diesel knocking – octane number and cetane number – gaseous fuels – Natural gas – CNG - LPG

Non-conventional energy sources: Solar energy: Advantages-disadvantages of solar cells-construction and working of photo voltaic cell -Introduction to hydro power-geo thermal power-tidal and wave power.

Learning Outcomes: At the end of this unit, the students will be able to

1. **Differentiate** conventional and non-conventional energy sources and their advantages and disadvantages.
2. **design** sources of energy by different natural sources

UNIT V: CHEMISTRY OF MATERIALS [9 Hours]

Part-A

Nano materials: Introduction-sol-gel method-characterization by SEM and TEM methods- carbon nanotubes and fullerenes: Types, preparation and applications

Semiconductors: Preparation (Distillation, Zone refining)

Part-B

Cement: Constituents of cement -Setting and Hardening of cement - Decay of Cement.

Refractories: Definition of refractory-classification and properties of refractoriness-applications of refractories.

Learning Outcomes: At the end of this unit, the students will be able to

- **Outline** the awareness of materials like nanomaterials and fullerenes and their uses.
- **Explain** the techniques that detect and measure the surface properties of materials.
- **Illustrate** the commonly used industrial materials.

Text Books:

T1. A Text Book of Engineering Chemistry - N. Y. S. Murthy, V. Anuradha & K. Ramana Rao, Maruthi Publications. (2018)

T2. A Text Book of Engineering Chemistry - K. Sesha Maheswaramma, Mridula Chugh, Pearson Publications (2018).

Reference Books:

R1. Engineering Chemistry – Jain & Jain, Dhanpat Rai Publishing Company (Latest Edition)

R2. Text Book of Engineering Chemistry - Shashi Chawla, Dhanpat Rai & Co. (P) Limited ((Latest Edition))

R3. Chemistry –Prasanta Rath, Subhendu Chakroborthy, Cengage publications (2018)

B. TECH 1st SEMESTER	L	T	P	C
	3	0	0	3.0
20HS1T01: ENGLISH				

A. PROGRAMME CONTENT

1 Intensive and extensive reading
2 Written communication
3 Listening and oral communication
4 Vocabulary consolidation and expansion
5 Practicing grammar

B. ELABORATION OF THE PROGRAMME CONTENT

1. Intensive and Extensive Reading

a. Identifying the main theme/the central idea of a passage
b. Understanding the meaning of words, phrases and sentences in context
c. Understanding the logical relationship between sentences (through recognition of grammatical structures such as linkers and connectors)
d. Distinguishing statements of fact from beliefs, opinions, hypotheses, and expressions of probability and certainty
e. Inferring facts, opinions, instances, reasons, causes, results, requests, conclusions, and general statements
f. Skimming passages to identify general ideas and information
g. Scanning passages to locate specific detail
h. The use of one's knowledge, opinions, and imagination to provide information / situations related to that given in the text; and comparison and contrast.

2. Written Communication

a. Writing outlines and summaries
b. Writing paragraphs with attention to topic sentences and supporting sentences
c. Writing paragraphs with attention to coherence and cohesion
d. Practicing clutter-free writing

3. Listening and Oral Communication

a. Effective listening involving
   - Identification of key words and phrases and specific information, application of one's previous knowledge of to understand the ideas dealt with in the text being listened to.
   - Attention to communication strategies such as approaching another person and opening a conversation with him/her, making friends with a stranger, thanking, apologizing, paying a compliment, seeking clarification, making enquiries, and creating an appropriate context for a formal discussion.

b. Taking part in speaking activities for interactional purposes such as,
   - Introducing oneself to others, introducing others, making enquiries, seeking information
   - Responding to enquiries, supplying information
   - Expressing agreement/disagreement in information situations

c. Taking part in speaking activities for transactional purposes with attention to the communication strategies listed in 1 (a) above.

4. Vocabulary consolidation and expansion

a. Inferring word meaning from available clues
b. Distinguishing words with similar meanings
c. Using connecting words
d. Learning one-word substitutes

Developing a verbal repertoire with the following dimensions:

- Contexts of use

- Collocations
- Differences in speaking and writing
- Strategic use

e. Using strategic vocabulary to organize and manage both oral and written communication successfully in academic, professional, and social contexts

f. Raising one's knowledge of redundancy, circumlocution, and imprecise and confusing expressions in order to avoid them in one's own speech and writing.

5. Practicing grammar

a. Consolidation as well as remediation in the following areas:

Parts of speech, Tenses and usage of grammar in context

b. Learning to avoid some of the common pitfalls in the area of grammar in Indian usage of English (e.g. using the present continuous tense to describe actions which happen regularly; using state verbs in the continuous form; tense mixing)

C. TEXT BOOK: Building Effective Communication Skills

By Maruthi Publications (2019)

Syllabus:

S No	Content
UNIT –I	**Vocabulary Building** **1.1** Video Lesson 1.2.1 Word formation 1.2.2. Root words 1.2.3. Prefixes and Suffixes 1.2.4. Synonyms and Antonyms **1.3 Parts of Speech** **1.4 Note- making, Note-taking**
UNIT -II	**Basic Writing Skills** **2.1 Video** Lesson 2.2.1 Basic sentence structure 2.2.2. Clauses and Phrases 2.2.3 Punctuations 2.2.4 Creating coherence 2.2.5 Organizing principles of paragraph documents 2.2.6 Techniques for writing precisely **2.3 Tenses** **2.4 Letter Writing**
UNIT-III	**Identifying Common Errors in Writing** **3.1** Video Lesson 3.2.1 Sub + verb agreement 3.2.2 Noun pronoun agreement 3.2.3 Articles 3.2.4 Preposition 3.2.5 Redundancies 3.2.6 Clichés **3.3.1 Active - Passive Voice** **3.3.2 Reported Speech** **3.4 Resume Writing**
UNIT-IV	**Nature and Style of sensible Writing** **4.1** Video Lesson 4.2.1 Describing 4.2.2 Classifying 4.2.3 Writing Introduction and conclusion

	4.3.1 Conditional Sentences **4.3.2** Degrees **of Comparison** **4.4 Email writing**
UNIT-V	**Writing Practice** **5.1** Video Lesson 5.2.1 Comprehension 5.2.2 Precise writing 5.2.3 Essay Writing **5.3** Simple **Compound and Complex Sentences** **5.4 Report Writing**

B. TECH 1st SEMESTER	L	T	P	C
	3	0	0	3.0
20CS1T01 - PROBLEM SOLVING USING C PROGRAMMING				

COURSE OUTCOMES

UNIT-I

Contact Hours: 10

INTRODUCTION TO PROGRAMMING: What is computer, Block diagram of Computer, Development of Computer languages, Translators, Computer Codes, Computer Arithmetic, Programming Techniques, Algorithm, Flowchart

BASICS OF C: History of C, Character Set, Identifiers, Keywords, Tokens, Variables, constants, operators, Data types, expressions, expression evaluation, operator precedence and associativity, typecasting C program structure.

UNIT-II

Contact Hours : 8

CONSOLE I/O OPERATIONS : Formatted I/O - printf & scanf, Unformatted I/O functions.

CONTROL FLOW STATEMENTS: Branching Statements - if, if – else, switch. **Looping statements-** while, do – while, for, nested for. **Unconditional Statements -** break, continue, goto, exit.

UNIT-III

Contact Hours : 12

ARRAYS: Array declaration, initialization and Accessing, Types of Arrays: 1-D and 2-D Arrays, Arrays as Function Arguments

FUNCTIONS: Introduction to Functions, Types of Function, Function prototypes, parameter passing techniques, Scope of variables, Storage classes, Recursion

UNIT-IV

Contact Hours : 8

STRINGS: Reading String from terminal, Writing string to Screen, String Handling Functions.

POINTERS: Pointer Declaration, Initialization and Accessing, Types of Pointers, Pointer Arithmetic, Dynamic memory allocation

UNIT-V

Contact Hours: 10

STRUCTURE: Introduction to structures, Definition of structure, declaration of structure variable, accessing of structure members, array of structures, **Union, enum, bit fileds, typedef**

FILES: Introduction to Files, Types of File, File Modes, Writing and Reading Files, File management I/O functions

At the end of the course, student will be able to

CO1: Analyse a computational problem and develop an algorithm/flowchart to find its solution **(K2)**

CO2: Develop C programs with branching and looping statements, which uses Arithmetic, Logical, Relational or bitwise operators **(K3)**

CO3: Divide a given computational problem into a number of modules and develop C program with

arrays(K3)

CO4: Write C programs which use pointers for array processing and parameter passing **(K3)**

CO5: Develop C programs with structure or union and files for storing the data to be processed. **(K3)**

Text books

- Programming in ANSI C by E. Balguruswamy, Tata Mc-Graw Hill
- Programming With C, Schaum Series

Reference Books

- The 'C' programming language by Kernighan and Ritchie, Prentice Hall
- Computer Programming in 'C' by V. Rajaraman , Prentice Hall
- Programming and Problem Solving by M. Sprankle, Pearson Education
- How to solve it by Computer by R.G. Dromey, Pearson Education

Online Practice and Reference Material

http://www2.its.strath.ac.uk/courses/c/
http://www.princeton.edu/~achaney/tmve/wiki100k/docs/C_%28programming_language%29.html
http://www.stat.cmu.edu/~hseltman/Computer.html
http://projecteuler.net/

B. TECH 1st SEMESTER	L	T	P	C
	0	0	3	1.5
20BS1L02 - ENGINEERING CHEMISTRY LAB				

Outcomes: The experiments introduce volumetric analysis: Acid-Base, complexometric, Redox, Conductometric and potentiometric titrations. Then they are exposed to a few instrumental methods of chemical analysis.

Thus, at the end of the lab course, the student is exposed and able to

1. Identify the concentration of given solution by different methods of chemical analysis (**K3**)
2. Analyze the water purity by checking hardness, DO and Acidity. (**K4**)
3. Estimate the Cu^{+2}, Fe^{+3}, Ca^{+2}, Mg^{+2} ions and Ascorbic acid present in given solution. (**K4**)
4. Identify the pour and cloud point of lubricants. **(K3)**
5. Understand the principles of conductometric and potentiometric titrations. (**K2**)

Syllabus:

1. Estimation of HCl using standard Na_2CO_3 through acid-base titration.
2. Estimate the total hardness of water using standardized EDTA solution through complexometric titration.
3. Estimation of $KMnO_4$ using standard $H_2C_2O_4$ through redox titration method.
4. Estimation of Dissolved Oxygen in given water sample by Wrinkler's Method
5. Determination of Ferric (Fe^{+3}) ions using standard $K_2Cr_2O_7$ solution
6. Determination of Copper (II) using standard hypo solution.
7. Estimation of strong acid by using strong base through conductometric titration method.
8. Estimation of strong acid by using strong base through potentiometric titration method.
9. Preparation of polymer (Demo).
10. Determination of Vitamin 'C'.
11. Determination of Pour and Cloud Point of lubricating oils

Reference Books

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.

B. TECH 1st SEMESTER	L	T	P	C
	-	-	3	1.5
20HS1L01-ENGLISH PROFICIENCY LAB				

COURSE OBJECTIVES

- To improve the language proficiency of technical under graduates in English with emphasis on LSRW Skills.
- To provide learning environment to practice Listening, Speaking, Reading and Writing Skills within and beyond the classroom environment.
- To assist students to carry on the tasks and activities through guided instructions and materials.
- To effectively integrate English language learning with employability skills and training.
- To design the main course material and exercises with authentic materials drawn from everyday use to cater to everyday needs.
- To provide hands-on experience through case-studies, mini-projects, group and individual presentations.

COURSE OUTCOMES

a) Reading Skills.

- Addressing explicit and implicit meaning of a text.
- Understanding the context.
- Learning new words and phrases.
- Using words and phrases in different contexts.

b) Writing Skills:

- Using the basic structure of a sentence.
- Applying relevant writing formats to create paragraphs, essays, letters, E-Mails, reports and presentations.
- Retaining a logical flow while writing.
- Planning and executing an assignment creatively.

c) Interactive skills:

- Analyzing a topic of discussion and relating to it.
- Participating in discussions and influencing them.
- Communicating ideas effectively.
- Presenting ideas coherently within a stipulated time.

d) Life Skills and Core Skills:

- Examining self-attributes and identifying areas that require improvement self-diagnosis, self-motivation.

- Adopting to a given situation and developing a functional approach to find solutions-adaptability, problem-solving.
- Understanding the importance of helping others-community service, enthusiasm.

RELATIONSHIP OF COURSE TO PROGRAMME OUTCOMES

A	Ability to apply knowledge of mathematics, science, and engineering.	
B	Ability to design and conduct experiments, as well as to analyze and interpret data.	
C	Ability to design an Engineering system, component, or process.	
D	Ability to function on multi-disciplinary teams	
E	Ability to identify, formulate and solve engineering problems.	
F	Understanding of professional and ethical responsibility.	
G	Ability to communicate effectively	√
H	Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.	√
I	Recognition of the need for and an ability to engage in life-long learning.	
J	Knowledge of contemporary issues.	
K	Ability to use the techniques, skills, and modern engineering tools necessary for engineering practices.	
L	Ability to find location of substations and benefits derived through their optimal location.	

COURSE DESCRIPTION

Communicating in a language is also a skill. So a student has to look for an opportunity to practice English language in order to acquire proficiency in English. 'Enrich your interactive Skills: Part - A' is designed to provide opportunities for engineering students to revise and consolidate the basic skills in listening, speaking, reading and writing in addition to giving ample practice in various communicative functions and Life skills.

PRE-REQUISITES

The student is expected to have basic knowledge in English language and must be able to write in English. He is also expected to possess fundamental knowledge of general English grammar and vocabulary.

Syllabus

Unit	TOPIC
1	Vowels, Consonants, Pronunciation, Phonetic transcripts
2	Word stress and syllables
3	Rhythm and Intonation
4	Contrastive Stress –Homographs
5	Word Stress: Weak and Strong forms, Stress in compound words

Text Book:

"InfoTech English" by Maruthi Publications

Reference Books:

1. Better English Pronunciation by O' Connor
2. Phonetics and Phonology – Peter Roach
3. A Grammar of Spoken English – Harold Palmer
4. English Phonetics – Bansal and Harrison

Testing Pattern:

A) Internal lab Exam:	**30 Marks**
Regular performance in the language /communication /lab completion in the lab manual	15M
Written test	15M
B) External lab Exam Pattern:	**70 Marks**
Written test	30M
Oral test	30M
Viva (during exam marks will be awarded by external examiner)	10M

B. TECH 1st SEMESTER	L	T	P	C
	-	-	3	1.5
20CS1L01-C PROGRAMMING LAB				

Course Objectives:

- To impart knowledge on various Editors, Raptor.
- To make the students understand the concepts of C programming.
- To nurture the students on Control Structures and develop different operations on arrays.
- To make use of String fundamentals and modular programming constructs.
- To implement programs using dynamic memory allocation.
- To explain the concepts of Structure, Unions and files for solving various problems.

List of Experiments:

1. Introduction to Algorithms and Flowcharts

1.1) Implement Algorithm Development for Exchange the values of Two numbers.

1.2) Given a set of n student's examination marks (in the range 0-100) make a count of the number of students that passed the examination. A Pass is awarded for all of 50 and above.

1.3) Given a set of n numbers design an algorithm that adds these numbers and returns the resultant sum. Assume N is greater than or equal to zero.

2. Introduction to C Programming

2.1) Exposure to Turbo C, Code Blocks IDE, Dev C++, Falcon C++.

2.2) Writing simple programs using printf(), scanf() .

3. Raptor

3.1) Introduction to Raptor.

3.2) Draw a flow chart to find the Sum of 2 numbers.

3.3) Draw a flow chart to find Simple interest.

4. Basic Math

4.1) Write a C Program to convert Celsius to Fahrenheit and vice versa.

4.2) Write a C Program to find largest of three numbers using ternary operator.

4.3) Write a C Program to Calculate area of a Triangle using Heron's formula.

5. Control Flow- I

5.1) Write a C Program to Find Whether the Given Year is a Leap Year or not.

5.2*)* Write a C program to find the roots of a Quadratic Equation.

5.3) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide Using Switch…case.

6. Control Flow- II

6.1) Write a C Program to Find Whether the Given Number is Prime number or not.

6.2) Write a C Program to Find Whether the Given Number is Armstrong Number or not.

6.3) Write a C program to print Floyd Triangle.

7. Control Flow- III

7.1) Write a C program to find the sum of individual digits of a positive integer.

7.2) Write a C program to check whether given number is palindrome or not.

7.3) Write a C program to read two numbers, x and n, and then compute the sum of the geometric progression $1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$.

Practice Programs:

Write a C program to print all natural numbers from 1 to n. - using while loop

Write a C program to print all natural numbers in reverse (from n to 1). - using while loop

Write a C program to print all alphabets from a to z. - using while loop
Write a C program to print all even numbers between 1 to 100. - using while loop
Write a C program to print sum of all even numbers between 1 to n.
Write a C program to print sum of all odd numbers between 1 to n.
Write a C program to print table of any number.
Write a C program to find first and last digit of any number.
Write a C program to count number of digits in any number.
Write a C program to calculate sum of digits of any number.
Write a C program to calculate product of digits of any number.
Write a C program to swap first and last digits of any number.
Write a C program to enter any number and print its reverse.
Write a C program to enter any number and check whether the number is palindrome or not.
Write a C program to find frequency of each digit in a given integer.
Write a C program to enter any number and print it in words.
Write a C program to print all ASCII character with their values.
Write a C program to enter any number and print all factors of the number.
Write a C program to enter any number and calculate its factorial.
Write a C program to find HCF (GCD) of two numbers.
Write a C program to find LCM of two numbers.
Write a C program to check whether a number is Prime number or not.
Write a C program to check whether a number is Armstrong number or not.
Write a C program to check whether a number is Perfect number or not.
Write a C program to check whether a number is Strong number or not.
Write a C program to print Fibonacci series up to n terms.

8. Arrays

8.1) Write a C program to search an element in the given array (Linear Search).
8.2) Write a C program to perform matrix addition.
8.3) Write a C program to perform matrix multiplication.

Practice Programs:

Write a C program to read and print elements of array.
Write a C program to find sum of all array elements. - using recursion.
Write a C program to find maximum and minimum element in an array. - using recursion.
Write a C program to find second largest element in an array.
Write a C program to copy all elements from an array to another array.
Write a C program to insert an element in an array.
Write a C program to delete an element from an array at specified position.
Write a C program to print all unique elements in the array.
Write a C program to print all negative elements in an array.
Write a C program to count total number of even and odd elements in an array.
Write a C program to count total number of negative elements in an array.
Write a C program to count total number of duplicate elements in an array.
Write a C program to delete all duplicate elements from an array.
Write a C program to count frequency of each element in an array.
Write a C program to merge two arrays to third array.
Write a C program to find reverse of an array.
Write a C program to convert lowercase string to uppercase.
Write a C program to convert uppercase string to lowercase.

Write a C program to toggle case of each character of a string.

Write a C program to find total number of alphabets, digits or special character in a string.

9. Pointers

9.1) Write a C Program to Perform Addition, Subtraction, Multiplication and Division of two numbers using Command line arguments.

9.2) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.

9.3) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function.

10. Functions, Array & Pointers

10.1) Write a C Program to demonstrate parameter passing in Functions.

10.2) Write a C Program to find Fibonacci, Factorial of a number with Recursion and without recursion.

10.3) Write a C Program to find the sum of given numbers with arrays and pointers.

Practice Programs:

Program to change the value of constant integer using pointers.

Program to print a string using pointer.

Program to count vowels and consonants in a string using pointer.

Program to read array elements and print with addresses.

11. Strings

11.1) Implementation of string manipulation operations with library function:

a) copy
b) concatenate
c) length
d) compare

11.2) Implementation of string manipulation operations without library function:

a) copy
b) concatenate
c) length
d) compare

11.3) Verify whether the given string is a palindrome or not.

12. Structures

12.1) Write a C Program to Store Information of a book Using Structure.

12.2) Write a C Program to Add Two Complex Numbers by Passing Structure to a Function.

13. Files

13.1) Write a C program to open a file and to print the contents of the file on screen.

13.2) Write a C program to copy content of one file to another file.

13.3) Write a C program to merge two files and store content in another file.

14. Application

Creating structures to capture the student's details save them in file in proper record format, search and prints the student details requested by the user.

Note: Draw the flowcharts using Raptor from Experiment 3 to Experiment 6.

Course Outcomes:

- Implement basic programs in C and design flowcharts in Raptor.
- Use Conditional and Iterative statements to solve real time scenarios in C.
- Implement the concept of Arrays and Modularity and Strings.

- Apply the Dynamic Memory Allocation functions using pointers.
- Develop programs using structures, and Files.

Reference Books:

1. Let Us C Yashwanth Kanetkar, 16th edition, BPB Publications.
2. Programming in C A-Practial Approach Ajay Mittal. Pearson Education.
3. The C programming Language, Dennis Richie and Brian Kernighan, Pearson Education.
4. Problem solving using C , K Venugopal,3rd Edition,TMG Publication.

Web Links:

1. https://www.hackerrank.com/
2. https://www.codechef.com/
3. https://www.topcoder.com/
4. https://code-cracker.github.io/
5. https://raptor.martincarlisle.com/
6. https://nptel.ac.in/courses/106105085/2

B. TECH 1st SEMESTER	L	T	P	C
	0	0	3	1.5
20IT1L01-IT WORKSHOP				

Course Objectives:

1. The course focuses on enhancing student knowledge in computer peripherals and assembling.
2. To install operating system on computers and create new email account.
3. To understand basic software like WinRAR, WinZip, PDF readers and web browser.
4. To provide technical training to the students on Google tools like forms, calendar, drive, and classroom.

Course Outcomes:

Upon successful completion of the course, students will be able to
5. Attain complete knowledge of a computer hardware
6. Able to install basic computer engineering software.
7. Able to do document task through MS office.
8. Attain technically strong usage of Google Tools and Email handling.
9. Able to understand network troubleshooting.

LIST OF EXPERIMENTS

1. Components of Computer & Assembling a computer:
Learning about the different parts of the computer and its advancement
Processor
Memory – Types
Motherboard
Peripheral interfaces – I/O devices

2. Components of Computer & Assembling a computer:
Learn about the proper connectivity among the devices inside the PC
Assembling the different parts of the computer inside the cabinet

3. Productivity Tools - Learning Basic Software:
Installation of Productivity tools like WinRAR, WinZip, and PDF Reader.
Installation of Application programs like Microsoft Office, Image Editor and Web browsers.
Connect the Printer and Scanner Devices perform printing and scanning operation.

4. Productivity Tools:
Microsoft-Word orientation – To create project certificate, Formatting Fonts, Drop Cap, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option.

5. Productivity Tools:
Microsoft-Word orientation- Mail Merge, Macros, References.

6. Productivity Tools:
Microsoft-PowerPoint utilities - PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Hyperlinks, Inserting Images, Clip Art, Audio, Video, Objects, Tables and Charts.

7. Productivity Tools:
Microsoft-Excel orientation - Gridlines, Format Cells, Summation, auto fill, Formatting Text, Cell Referencing, Formulae in excel – average, std.deviation etc., Macros.

8. Productivity Tools:
Microsoft-Excel orientation- Charts, Hyper linking, Split cells, freeze panes, group and outline, Conditional formatting, Sort and Filter, .csv file.

9. Introduction to Google Tools:
Design a Google form and collect a response data among students using Google Form.
Schedule one day of your activities using Google Calendar.
Store and retrieve data from cloud storage using Google Drive.
Orientation towards Google Classroom.

10. Network basics:
Introduction, Types of networks, IP addressing, LAN, Network troubleshooting.

B. TECH 2nd SEMESTER	L	T	P	C
	3	0	0	3.0
20MA2T02: DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS				

Course Objectives:

- To enlighten the learners in the concept of differential equations.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

Unit I: Linear differential equations of higher order:

Solutions of Non-homogeneous equations of higher order with constant coefficients – with non-homogeneous terms of the type e^{ax}, sin ax, cos ax, polynomials in x^n, e^{ax} V(x) and x^nV(x) – Method of Variation of parameters.

Learning Outcomes:
At the end of this unit, the student will be able to

- identify the essential characteristics of linear differential equations with constant coefficients (K3)
- solve the linear differential equations with constant coefficients by appropriate method (K3)

Unit –II: Partial Differential Equations of First Order:

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equations and nonlinear (standard types) equations.

Learning Outcomes:
At the end of this unit, the student will be able to

- apply a range of techniques to find solutions of standard PDEs (K3)
- outline the basic properties of standard PDEs (K2)

Unit III: Interpolation

Finite differences, Differences of a polynomial, relation between operators, to find one or more missing terms, Newton's interpolation formulae, and interpolation with unequal intervals- Lagrange's formula.

Learning Outcomes:
After the completion of this unit student will be able to

- explain various discrete operators and find the relation among operators (K2)
- apply Newton's forward and backward formulas for equal and unequal intervals (K3)

Unit IV: Numerical Solution of Equations and Numerical integration

Numerical Solution of Equations: Solution of algebraic and transcendental equations - Bisection Method, Method of False Position, Newton-Raphson Method, useful deduction from Newton-Raphson Method.

Numerical Integration – Trapezoidal rule, Simpson's $\frac{1}{3}$ rule and Simpson's $\frac{3}{8}$ rule.

Learning Outcomes:
After the completion of this unit student will be able to

- find approximate roots of an equation by using different numerical methods (K3)
- find integral of a function by using different numerical methods (K3)

Unit V: Numerical Methods to Solve Ordinary Differential Equations

Numerical Methods to Solve Ordinary Differential Equations - Taylor's series, Euler's and modified Euler's methods, Runge-kutta method of fourth order for solving first order equations.

Learning Outcomes:
After the completion of this unit student will be able to

- solve ordinary differential equations by using different numerical schemes (K3)

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 43/e, Khanna publishers,2015.

References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2013.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.

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

1. solve the differential equations related to various engineering fields (K3)
2. identify solution methods of partial differential equations that model physical processes (K3)
3. evaluate the approximate roots of polynomial and transcendental equations by different algorithms(K3)
4. solve integrate and ordinary differential equations by various numerical techniques. (K3)

B. TECH 2nd SEMESTER	L	T	P	C
	3	0	3	3.0
20BS2T01: ENGINEERING PHYSICS				

COURSE OUTCOMES

After completion of course student able to:

1. Describe Basic crystal systems and determination of crystal structures
2. Explain Magnetic and Dielectric Materials properties
3. Describe Concept of Magnetic Induction and Super Conducting properties
4. Explain Pure & Doped Semiconductor materials for better utility
5. Describe Optical fibers and Optical properties of materials and their applications

SYLLABUS

UNIT –I: CRYSTAL STRUCTURE AND X-RAY DIFFRACTION

CRYSTAL STRUCTURE:
Introduction – Space lattice – Basis – Unit Cell – Lattice parameters – Bravais lattices – Crystal systems – Structures and packing fractions of SC, BCC and FCC.

X-RAY DIFFRACTION:
Directions in crystals- planes in crystals- Miller indices and procedure to find Miller indices- Various planes in crystals- Separation between successive (h k l) planes-Bragg's law-Bragg's Spectrometer.

Learning Outcomes: At the end of this unit, the students will be able to

- **Explain** the seven crystal systems
- **Interpret** the crystal structure based on Bragg's law

UNIT – II: MAGNETIC AND DIELECTRIC PROPERTIES

MAGNETIC PROPERTIES: Introduction-Magnetic permeability – Magnetization – Relation between three magnetic vectors - Origin of magnetic moment – Classification of Magnetic materials- Dia, Para, Ferro, Anti-Ferro and Ferri-magnetism – Hysteresis- soft and Hard Magnetic materials.

DIELECTRIC PROPERTIES: Introduction-Dielectric constant- Relation between three electric vectors- Electronic and ionic polarizations (Quantitative) - orientation polarization (Qualitative) - Internal fields in solids- Clausius - Mossotti equation.

Learning Outcomes: At the end of this unit, the students will be able to

- **Classify** the magnetic materials into dia, para, ferro, anti-ferro and ferri
- **Explain** the importance of hysteresis
- **Explain** the concept of polarization in dielectric materials.
- **Summarize** various types of polarization of dielectrics.
- **Interpret** Lorentz field and Claussius- Mosotti relation in dielectrics.

UNIT-III: ELECTROMAGNETIC WAVES AND SUPERCONDUCTIVITY

ELECTROMAGNETIC WAVES: Introduction-Electric flux –magnetic flux- Gauss law in electrostatics- Gauss law in magnetostatics- Ampere's law - B for a Solenoid - Biot-Savart's law-Magnetic Induction due to current carrying circular loop- Faraday's law - Maxwell's equations (Integral and differential forms).

SUPERCONDUCTIVITY: General and Thermal properties –Meissner effect – Type-I and Type-II superconductors – Flux quantization – BCS Theory of Superconductivity - Josephson effects – Applications of Superconductors.

Learning Outcomes: At the end of this unit, the students will be able to

- **Illustrate** the concept of electro magnetism based on fundamental laws of electro magnetism
- **Explain** Maxwell's equations
- **Summarize** various properties and applications of superconductors

UNIT-IV: PHYSICS OF SEMICONDUCTORS:

Classification of solids based on band theory - Intrinsic semiconductors- density of charge carriers- Equation for conductivity – Extrinsic semiconductors- P-type and N-type- density of charge carriers- Drift and diffusion – Einstein's equation – Hall Effect- Hall coefficient – Applications of Hall effect– direct & indirect band gap semiconductors.

Learning Outcomes: At the end of this unit, the students will be able to

- **Summarize** various types of solids based on band theory.
- **Outline** the properties of n-type and p-type semiconductors.
- **Identify** the type of semiconductor using Hall effect

UNIT-V: LASERS AND OPTICAL FIBERS

LASERS: Introduction– Characteristics of lasers – Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion - Three level and four level laser pumping schemes - Ruby laser – Helium-Neon laser- Applications of Laser.

FIBER OPTICS: Introduction to Optical fibers- Critical angle of propagation- Total internal reflection- Acceptance angle and acceptance cone- Numerical aperture- Classification of optical fibers based on refractive index profile-Classification of optical fibers based on modes- Attenuation in optical fibers - Applications of optical fibers.

Learning Outcomes: At the end of this unit, the students will be able to

- **Design** various types of lasers
- **Explain** the principle and propagation of light through Optical fibers
- **Discuss** the application of lasers and Optical fibers

B. TECH 2nd SEMESTER	L	T	P	C
	3	0	0	3.0
20CS2T03: OBJECT ORIENTED PROGRAMMINGS WITH PYTHON				

Course Objectives:

I. Acquire programming skills in core Python.
II. Acquire Object-Oriented Programming features implementation in Python.
III. To understand data structures in Python
IV. Develop the ability to use Operating System functions in python applications
V. Able to use exception handling in python programs

Course Outcomes:
CO1: Recognize core programming basics and program design with functions using Python programming language.
CO2: Interpret the high-performance programs designed to strengthen the practical expertise.
CO3: Develop applications for real time problems by applying python data structure concepts.
CO4: Understand and apply the concepts of packages, handling, multithreading and socket programming.
CO5: Analyze the importance of object-oriented programming over structured programming.

UNIT – I:
Introduction to Python: Features of Python, History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.
Data types: Integers, Strings, Booleans.

UNIT – II:
Operators and Expressions: Types - Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations
Control Flow: if, if-elif-else, for, while, break, continue, pass

UNIT – III:
Data Structures: Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions.
Functions: Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.

UNIT – IV:
Object Oriented Programming in Python: Classes, Data hiding, 'self-variable', Methods, Constructor, methods, and inheritance: Various Types of Inheritance and Function Overloading, Overriding Methods.

UNIT – V:
Error and Exceptions: Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions
Brief Tour of the Standard Library: Operating System Interface - String Pattern Matching, Mathematics, Internet Access, Dates and Times

Text Books:

1. Learning Python, Mark Lutz, Orielly
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
3. R Nageswara Rao, "Core Python Programming", Dream tech press, 2017 Edition
4. Dusty Philips, "Python 3 Object Oriented Programming", PACKT Publishing, 2nd Edition, 2015

Reference Books:

1. Think Python, Allen Downey, Green Tea Press
2. Core Python Programming, W.Chun, Pearson.
3. Introduction to Python, Kenneth A. Lambert, Cengage
4. Michael H.Goldwasser, David Letscher, "Object Oriented Programming in Python", Prentice Hall, 1st Edition, 2007.

Web References:

1. https://realpython.com/python3-object-oriented-programming/
2. https://python.swaroopch.com/oop.html
3. https://python-textbok.readthedocs.io/en/1.0/Object_Oriented_Programming.html
4. https://www.programiz.com/python-programming

B. TECH 2nd SEMESTER	L	T	P	C
	3	0	0	3.0
20IT2T01: IT Essentials				

COURSE OUTCOMES:

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

1. Understand the concepts of operating systems.
2. Demonstrate the implementation of various software engineering tools.
3. Understand the basics of Internet.
4. Understand the orientation towards web basics.
5. Demonstrate the implementation of various computer graphics concepts.

UNIT-1

Operating Systems: Introduction, Functions of an operating System, Classification of Operating Systems, System programs, Application programs, Utilities, Installation of Operating Systems, The Unix Operating System, Basic Unix commands.

UNIT-2

Software Engineering: The evolving role of software, changing nature of software, software myths, Structure of Software Life Cycle, Software engineering methodologies, software requirements, various software engineering tools.

UNIT-3

Internet Basics: Introduction, Features of Internet, Internet applications, Services of Internet, Logical and physical addresses, Internet Service Providers, Domain Name System, Security- Forms of attacks, legal approaches to network security.

UNIT-4

Web Basics: Introduction to web, web browsers, web servers, Protocol, HTTP/HTTPS, TCP/IP, Email, FTP, SMTP, SNMP, URL, HTML and CSS.

UNIT-5

Computer Graphics: Scope of Computer Graphics, Overview of 3D Graphics, Modelling- modelling individual objects, modelling entire scenes. Dealing with global lighting - Ray tracing, Radiosity. Rendering and Animation.

TEXT BOOKS

1. J. Glenn Brookshear, "Computer Science: An Overview", Addision-Wesley, TwelfthEdition, 2014.
2. Pradeep K Simha, "Computer Fundamentals- Concepts, Systems & Applications", 8th edition, BPB.

B. TECH 2nd SEMESTER	L	T	P	C
	3	-	0	3
20EE2T01: BASIC ELECTRICAL AND ELECTRONICS ENGINEERING				

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

CO1 : Analyze different electrical networks using KVL, KCL and Theorems.

CO2 : Understand the basic concepts of single-phase system for simple AC circuit.

CO3 : Demonstrate the construction, working and operating characteristics of AC & DC machines.

CO4 : Study the construction details, operation and characteristics of various semiconductor devices, digital and logic operations.

SYLLABUS

UNIT-I : ELECTRICAL CIRCUITS

Basic definitions – types of network elements Electrical Circuit Elements (R, L and C), Voltage and Current Sources, Ohms Laws, Kirchoff's Laws and Star/Delta Conversion, Series-Parallel- Series and Parallel (Only Resistor), Superposition, Thevenin's and Norton's Theorems, Problems in Simple Circuits with DC Excitation.

UNIT-II : AC FUNDAMENTALS

Representation of Sinusoidal Waveforms, Peak and RMS Values. Real Power, Reactive Power, Apparent Power, Power Factor. Concept of phase angle and phase difference Single phase Circuits - Voltage and Current Relations in Star/Delta Connections-Simple Problems.

UNIT-III : ELECTRICAL MACHINES

Electrical Machines: DC Machines: Classification of DC Machines-DC Generator and Motor Construction-Principle of operation –EMF Equation-Performance Characteristics-Simple problems AC Machines: Classification of AC Machines-Transformers-Synchronous Machines, Induction motor Performance Characteristics-Starting Methods-Simple problems.

UNIT- IV : Semi -Conductor Devices and Its Characteristics

Characteristics of PN Junction Diode — Zener Diode- Intrinsic and Extrinsic Semiconductors – Semiconductor Diodes– Bipolar Junction Transistors-CB, CE, CC Configurations and Characteristics – FET – MOSFET – Silicon-controlled Rectifier – DIAC – TRIAC-Half waveand Full wave Rectifiers-Voltage Regulation.

UNIT-V : INTRODUCTION TO DIGITAL ELECTRONICS

Binary Number System – Logic Gates – Boolean Algebra -De Morgan's Theorem-Simplification of Boolean Expressions using De Morgan's Theorem – Half and Full Adders – A/D and D/A Conversion.

TEXT BOOKS:

1. Basic Electrical Engineering, D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGraw Hill.
2. Basic Electrical Engineering, P. V. Prasad, S. Sivanagaraju, K. R. Varmah, and Chikku Abraham, Cengage, 2019.
3. Basic Electrical & Electronics Engineering – J. B. Gupta, S. K. Kataria & Sons Publications, 2019 edition.

REFERENCE BOOKS:

1. Basic Electrical Engineering - D.C. Kulshreshtha, 2009, Tata McGraw Hill.
2. Fundamentals of Electrical Engineering, L.S. Bobrow, Oxford University Press, 2011
3. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010.
4. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice Hall India, 1989.
5. Principles of Electrical Engineering and Electronics", V K Mehta & Rohit Mehta,S Chand Publishers,2019 edition.

B. TECH 2nd SEMESTER	L	T	P	C
	-	-	3	1.5
20CS2L03: OBJECT ORIENTED PROGRAMMING LAB WITH PYTHON				

COURSE OUTCOMES:

CO1: Apply core programming basics and program design with functions using Python programming language.
CO2: Interpret the high-performance programs designed to strengthen the practical expertise.
CO3: Develop applications for real time problems by applying python data structure concepts.
CO4: Test and apply the concepts of packages, handling, multithreading and socket programming.
CO5: Divide the importance of object-oriented programming over structured programming.

Exercise 1 - Basics

a) Running instructions in Interactive interpreter and a Python Script
b) Write a program to purposefully raise Indentation Error and Correct it

Exercise 2 - Operations

a) Write a program to compute distance between two points taking input from the user.
b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

Exercise - 3 Control Flow

a) Write a Program for checking whether the given number is a even number or not.
b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . .1/10
c) Write a program using a for loop that loops over a sequence. What is sequence?
d) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

Exercise 4 - Control Flow - Continued

a) Find the sum of all the primes below two million. Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be: 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...
b) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

Exercise - 5 - DS

a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure
b) Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.

Exercise - 6 DS - Continued

a) Write a program combine lists that combines these lists into a dictionary.
b) Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

Exercise - 7 Files

a) Write a program to print each line of a file in reverse order.
b) Write a program to compute the number of characters, words and lines in a file.

Exercise - 8 Functions

a) Write a function ball collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.

Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius

If (distance between two balls centers) <= (sum of their radii) then (they are colliding)

b) Find mean, median, mode for the given set of numbers in a list.

Exercise - 9 Functions - Continued

a) Write a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.

b) Write a function dups to find all duplicates in the list.

c) Write a function unique to find all the unique elements of a list.

Exercise - 10 - Functions - Problem Solving

a) Write a function cumulative product to compute cumulative product of a list of numbers.

b) Write a function reverse to reverse a list. Without using the reverse function.

c) Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.

Exercise 11 - Multi-D Lists

a) Write a program that defines a matrix and prints

b) Write a program to perform addition of two square matrices

c) Write a program to perform multiplication of two square matrices

Exercise - 12 - Modules

a) Install packages requests, flask and explore them. using (pip)

b) Write a script that imports requests and fetch content from the page.

c) Write a simple script that serves a simple HTTP Response and a simple HTML Page

Exercise - 13 OOP

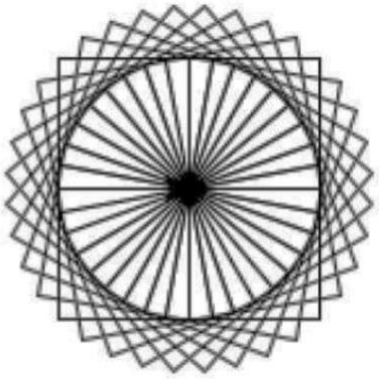
a) Class variables and instance variable and illustration of the self-variable

i) Robot ii) ATM Machine

Exercise - 14 GUI, Graphics

a) Write a GUI for an Expression Calculator using tk

Write a program to implement the following figures using turtle



B. TECH 2nd SEMESTER	L	T	P	C
	-	-	3	1.5
20EE2L01: BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB				

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

CO1 : Acquire knowledge on electrical networks by using KVL, KCL.

CO2 : Analyze the performance characteristics and to determine efficiency of DC machines

CO3 : Understand the characteristics of AC machines

CO4 : Apply knowledge on PN junction diode, transistor and Rectifiers

LIST OF EXPERIMENTS

SECTION A: ELECTRICAL ENGINEERING:

1. Verification of KCL & KVL.
2. Open circuit Characteristics of DC Shunt generator.
3. Swinburne's test on DC Shunt Motor.
4. Brake test on DC Shunt motor.
5. Speed control of D.C. Shunt motor by a) Armature Voltage control b) Field flux control method
6. Open circuit and short circuit test on a Single-Phase Transformers.
7. Draw the Torque-Slip Characteristic of a Three Phase Induction Motor.
8. Regulation of Synchronous Machine using EMF Method.

SECTION B: ELECTRONICS ENGINEERING:

The following experiments are required to be conducted as compulsory experiments:

1. PN junction diode characteristics a) Forward bias b) Reverse bias (Cut in voltage and Resistance calculations)
2. Transistor CE characteristics (input and output)
3. Half wave rectifier with and without filters.
4. Full wave rectifier with and without filters.

Any 10 Experiments has to be conducted from Section A & B

REFERENCE BOOKS:

1. Department lab manual.

B. TECH 2nd SEMESTER	L	T	P	C
	0	0	3	1.5
20BS2L01: ENGINEERING PHYSICS LAB				

COURSE OUTCOMES

At the end of the course, student will be able to

CO1: Demonstrate the basic knowledge to know the frequency of a vibrator, hall coefficient, (K3)

CO2: Attain knowledge to verify some of the properties of physical optics. (K4)

CO3: Develop skills to plot various characteristic curves and to calculate the physical properties of given materials. (K4)

CO4: Calculate some the properties of semiconducting materials. (K2)

STUDENT HAS TO DO ANY TEN OF THE FOLLOWING

1. Determination of wavelength of Laser using diffraction grating.
2. Determination of Numerical Aperture and Acceptance angle of an Optical Fiber.
3. Determination of the charge carrier density by using Hall Effect.
4. Determination of the Band Gap of a Semiconductor using a p-n junction diode.
5. Study of Characteristic curves (l/V) of a Zener diode to determine its Breakdown voltage.
6. Determination of Temperature coefficient of resistance of a Thermistor by using its Characteristic curve.
7. Study the variation of intensity of magnetic field along the axis of a circular current carrying coil by using Stewart and Gee's experiment.
8. Study of Characteristic curves (l/V) of a P-N diode.
9. Determine Frequency of given electrically driven tuning fork in Transverse and Longitudinal modes by using Melde's apparatus
10. Determine frequency of A.C. supply by using Sonometer.
11. Determination of the Time Constant for a C-R Circuit
12. Determination of the Planck's constant by using Photo-Cell
13. Determination of dielectric constant of a given material

B. TECH 2nd SEMESTER	L	T	P	C
	0	0	3	1.5
20HS2L02: ENGLISH COMMUNICATIONS LAB				

COURSE OBJECTIVES

- To improve the language proficiency of technical under graduates in English with emphasis on LSRW Skills.
- To provide learning environment to practice Listening, Speaking, Reading and Writing Skills within and beyond the classroom environment.
- To assist students to carry on the tasks and activities through guided instructions and materials.
- To effectively integrate English language learning with employability skills and training.
- To design the main course material and exercises with authentic materials drawn from everyday use to cater to everyday needs.
- To provide hands-on experience through case-studies, mini-projects, group and individual presentations.

COURSE OUTCOMES

e) Reading Skills.

- Addressing explicit and implicit meaning of a text.
- Understanding the context.
- Learning new words and phrases.
- Using words and phrases in different contexts.

f) Writing Skills:

- Using the basic structure of a sentence.
- Applying relevant writing formats to create paragraphs, essays, letters, E-Mails, reports and presentations.
- Retaining a logical flow while writing.
- Planning and executing an assignment creatively.

g) Interactive skills:

- Analyzing a topic of discussion and relating to it.
- Participating in discussions and influencing them.
- Communicating ideas effectively.
- Presenting ideas coherently within a stipulated time.

h) Life Skills and Core Skills:

- Examining self-attributes and identifying areas that require improvement self-diagnosis, self-motivation.
- Adopting to a given situation and developing a functional approach to find solutions-adaptability, problem-solving.
- Understanding the importance of helping others-community service, enthusiasm.

RELATIONSHIP OF COURSE TO PROGRAMME OUTCOMES

A	Ability to apply knowledge of mathematics, science, and engineering.	
B	Ability to design and conduct experiments, as well as to analyze and interpret data.	
C	Ability to design an Engineering system, component, or process.	
D	Ability to function on multi-disciplinary teams	
E	Ability to identify, formulate and solve engineering problems.	
F	Understanding of professional and ethical responsibility.	
G	Ability to communicate effectively	√
H	Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.	√
I	Recognition of the need for and an ability to engage in life-long learning.	
J	Knowledge of contemporary issues.	
K	Ability to use the techniques, skills, and modern engineering tools necessary for engineering practices.	
L	Ability to find location of substations and benefits derived through their optimal location.	

COURSE DESCRIPTION

Communicating in a language is also a skill. So a student has to look for an opportunity to practice English language in order to acquire proficiency in English. 'Enrich your interactive Skills: Part - A' is designed to provide opportunities for engineering students to revise and consolidate the basic skills in listening, speaking, reading and writing in addition to giving ample practice in various communicative functions and Life skills.

PRE REQUISITES

The student is expected to have basic knowledge in English language and must be able to write in English. He is also expected to possess fundamental knowledge of general English grammar and vocabulary.

SYLLABUS

UNIT	TOPIC
1	Vowels, Consonants, Pronunciation, Phonetic transcripts
2	Word stress and syllables
3	Rhythm and Intonation
4	Contrastive Stress –Homographs
5	Word Stress : Weak and Strong forms , Stress in compound words

Text Book:

"InfoTech English" by Maruthi Publications

Reference Books:

1. Better English Pronunciation by O' Connor
2. Phonetics and Phonology – Peter Roach
3. A Grammar of Spoken English – Harold Palmer
4. English Phonetics – Bansal and Harrison

Testing Pattern:

B) Internal lab Exam: 30 Marks

Regular performance in the language /communication /lab completion in the lab manual	15M
Written test	15M

B) External lab Exam Pattern: 70 Marks

Written test	30M
Oral test	30M
Viva (during exam marks will be awarded by external examiner)	10M

B. TECH 3nd SEMESTER	L	T	P	C
	3	0	0	3
20IT3T01-DISCRETE MATHEMATICS				

COURSE OUTCOMES:

At the end of the lab students are able to

1. Identify programming errors efficiently through enhanced logical capabilities. (K2)
2. Calculate a general solution of recurrence equation. (K4)
3. Discover set theory, graph of the relations which are used in data structures. (K2)
4. Summarize the concepts in graph theory. (K2)
5. Develop graph theory concepts in core subjects such as data structures and network theory effectively. (K3)

Unit 1: Mathematical logic

Connectives, negation, conjunction, disjunction, statement formula and Truth Tables, conditional and bi-conditional, well-formed formulae, tautologies, equivalence of formulae, duality, tautological implications, functionally complete set of connectives, other connectives, principal disjunctive and conjunctive normal forms, inference calculus, rules of inference, consistency of premises, indirect method of proof, Theory of inference for the statement calculus, validity using Truth tables.

Unit 2: Recurrence relations

Generating Function of Sequences, Calculating Coefficient of generating functions, Recurrence relations, solving recurrence relation by substitution and Generating functions, the method of Characteristic roots, Solution of Inhomogeneous Recurrence Relation.

Unit 3: Set theory and Relations

Relations and ordering, Relations, Properties of binary Relations in a set, Relation Matrix and the Graph of a Relation, partition and covering of a set, Equivalence, Compatibility Relations, Composition of Binary Relations, Partial ordering, Hasse diagram, Principle of Inclusion-Exclusion, Pigeonhole Principle and its applications.

Unit 4: Graph theory

Basic Concepts, Representation of Graph, Sub graphs, Multigraphs, Planar graphs, Euler Paths, Euler circuits, Hamiltonian Graphs and Graph Isomorphism and its related Problems, Chromatic Number.

Unit 5: Trees

Spanning Trees, minimal Spanning Trees, BFS, DFS, Kruskal's Algorithm, Prim's Algorithm, Binary trees, Planar Graphs.

Text Books:

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 1997.
2. Joe L. Mott, Abraham Kandel and T. P. Baker, Discrete Mathematics for computer scientists & Mathematicians, 2/e, Prentice Hall of India Ltd, 2012.

References:

1. Keneth. H. Rosen, Discrete Mathematics and its Applications, 6/e, Tata McGraw-Hill, 2009.
2. Richard Johnsonburg, Discrete Mathematics, 7/e, Pearson Education, 2008
3. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science, Prentice Hall of India, 2006.

B. TECH 3nd SEMESTER	L	T	P	C
	3	0	0	3
20CS3T01-DATA STRUCTURES				

COURSE OUTCOMES:

At the end of the lab students are able to

1. Show applications using stacks and implement various types of queues.(K2)
2. Analyze the operations on linked lists and demonstrate their applications. (K4)
3. Observe the various operations on trees. (K2)
4. Practice various types of Graphs and Graph Traversals. (K3)
5. Categorize various searching and sorting techniques. (K4)

UNIT-I:

Introduction: Definition of data structure, types and overview of data structures.

Algorithm: Preliminaries of algorithm, Algorithm analysis and complexity

Stacks and Queues: Stack Representation using Arrays, operations on stack, Applications of stacks - Factorial Calculation, Infix to postfix Transformation, Evaluating Arithmetic Expressions. Queue Representation using Arrays, operations on queues, Applications of queues, Circular queues, Priority queues, Implementation of queue using stack

UNIT-II:

Linked Lists: Introduction, Single linked list, representation of a linked list in memory**,** Operations on a single linked list. Double linked list, Operations on a double linked list. Circular linked list, Operations on a circular linked list. Applications of single linked list

UNIT-III:

Trees: Basic tree concepts. **Binary Trees:** Properties, Representation of Binary Trees using Arrays and Linked List, Binary Tree Traversals, Creation of binary tree from pre-order, in-order and post order traversals, threaded binary tree. **Binary search trees:** Basic concepts, BST operations: Search, insertion, deletion and traversals, Creation of binary search tree from in-order and pre (post)order traversals.

AVL Trees: Self Balanced Trees, Height of an AVL Trees and AVL Tree Rotations

UNIT-IV:

Graphs: Basic concepts, Representations of Graphs: using Linked list and adjacency matrix, Graph Traversals - BFS & DFS, Applications: Dijkstra's shortest path algorithm, Minimum Spanning Tree using Prim's algorithm and Kruskal's algorithm, Transitive closure, Warshall's algorithm.

UNIT-V:

Searching: Linear Search, Binary Search and Fibonacci search.

Sorting: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort and Radix sort.

Hashing: Introduction, Hash Function, Collision Resolution Techniques: Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Separate Chaining, Extendible Hashing

TEXT BOOKS:

1. Richard F. Gilberg and Behrouz.A. Forouzan, "Data Structures: A Pseudo code approach with C", 2nd edition, Cengage, 2012.
2. Reema Thareja, "Data Structures using C", 2nd Edition, Oxford, 2015.
3. Yashavant Kanetker, "Data Structures through C", 2nd edition BPB publications, 2017.
4. Alfred V Aho, John E Hopcraft, Jeffery D Ullman, "Data Structures & Algorithms", Second Edition, Pearson Education. Ltd., 2016.

REFERENCE BOOKS:

1. Seymour Lipschutz, "Data Structure with C", TMH, 2017
2. G. A. V. Pai, "Data Structures and Algorithms", TMH, 2017.
3. Horowitz, Sahani, Anderson Freed, "Fundamentals of Data Structure in C", 2nd Edition, University Press, 2018.

B. TECH 3nd SEMESTER	L	T	P	C
	3	0	0	3
20CS3T02-DATABASE MANAGEMENT SYSTEMS				

COURSE OUTCOMES:

At the end of the lab students are able to

1. Apply basic concepts of database management system and design an Entity- Relationship (E-R) model and convert E-model to relational model. (K3)
2. Construct database using Relational algebra and SQL.(K3)
3. Classify Normalization techniques to normalize the database. (K2)
4. Show transaction management using different concurrency control protocols and recovery algorithms. (K3)
5. Illustrate Different file organization and indexing methods. (K4)

UNIT-1

Introduction-Database System Applications, Purpose of Database Systems, View of Data - Data Abstraction, Instances and Schemas, Data Models, Database Languages, 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 the ER Model.

Relational Model: Introduction to the Relational Model - Integrity Constraints over Relations.

Enforcing Integrity constraints, querying relational data, Logical data base Design, Views.

UNIT-II

Relational Algebra: Relational Algebra - Selection and Projection, Set operations, Renaming, Joins, Division.

SQL: Form of Basic SQL Query - Examples of Basic SQL Queries, UNION, INTERSECT, and EXCEPT, Introduction to Nested Queries, Correlated Nested Queries, Set Comparison Operators, Aggregate Operators, NULL values - Comparison using Null values - Logical connectives - AND, OR and NOT - Outer Joins, Disallowing NULL values, Triggers.

UNIT-III

SCHEMA REFINEMENT AND NORMAL FORMS: Introduction to Schema Refinement - Problems Caused by redundancy, Decompositions - Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms - FIRST, SECOND, THIRD Normal forms - BCNF - Properties of Decompositions - Loss less join Decomposition, Dependency preserving Decomposition, Multi valued Dependencies - FOURTH Normal Form, Join Dependencies, FIFTH Normal form.

UNIT-IV

Transaction Management - The ACID Properties - Transactions and Schedules- Concurrent Execution of Transactions- Lock-Based Concurrency Control- 2PL, Serializability, and Recoverability- Dealing With Deadlocks - Concurrency Control without Locking.

CRASH RECOVERY: Introduction to ARIES- The Log - The Write-Ahead Log Protocol – Checkpoints - Recovering from a System Crash(ARIES) - Media Recovery.

UNIT-V

Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing- Clustered Indexes, Primary and Secondary Indexes, Index data Structures - Hash Based Indexing, Tree based Indexing, Comparison of File Organizations.

Tree Structured Indexing: Intuitions for tree indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

TEXT BOOKS:

1. Raghurama Krishnan, Johannes Gehrke, "Data base Management Systems", 3rd Edition, McGrawHill Education, 2014.
2. A.Silberschatz, H.F. Korth, S.Sudarshan, "Data base System Concepts", 6th edition, McGraw Hill, 2016.
3. Brahmankar Pankajb, Sadaf Lqbal Shaikh, Raut Bhakti, "Database Management System", 1st Edition, tech-neo, 2019.

REFERENCE BOOKS:

1. Ramez Elmasri, Shamkant B Navathe "Fundamentals of Database Systems", 7th Edition, 2016.
2. C.J. Date, "Introduction to Database Systems", 8/e, Pearson, 2012.
3. Rob, Coronel, "Database System Design, Implementation and Management", 5/e, Thomson, 2012.

B. TECH 3nd SEMESTER	L	T	P	C
	3	0	0	3
20EC3T06-DIGITAL LOGIC DESIGN				

COURSE OUTCOMES:

At the end of the lab students are able to

1. Observe the functions of digital systems. (K2)
2. Analyze Boolean functions with basic theorems and properties. (K4)
3. Examine the behavior of various combinational circuits. (K3)
4. Construct digital systems using sequential circuits (K3)

UNIT- I

Digital Systems and Binary Numbers: Digital Systems, Binary Numbers, Octal and Hexadecimal Numbers, Complements of Numbers, Signed Binary Numbers, Arithmetic addition and subtraction, 4-bit codes: BCD, EXCESS 3, alphanumeric codes, 9's complement, 2421, etc.

UNIT -II

Concept of Boolean algebra: Basic Theorems and Properties of Boolean algebra, Boolean Functions, Canonical and Standard Forms, Minterms and Maxterms.

Gate level Minimization: Map Method, Three-Variable K-Map, Four Variable K-Maps. Products of Sum Simplification, Sum of Products Simplification, don't – Care Conditions, NAND and NOR Implementation, Exclusive-OR Function.

UNIT- III

Combinational Logic: Introduction, Analysis Procedure, Binary Adder–Subtractor, Binary Multiplier, Decoders, Encoders, Multiplexers, Demultiplexers, Priority Encoder, Code Converters, Magnitude Comparator, Realization of Switching Functions Using PROM, PAL and PLA.

UNIT- IV

Synchronous Sequential Logic: Introduction to Sequential Circuits, Storage Elements: Latches, Flip-Flops, RS- Latch Using NAND and NOR Gates, Truth Tables. RS, JK, T and D Flip Flops, Truth and Excitation Tables, Conversion of Flip Flops.

UNIT –V

Registers and Counters: Registers, Shift Registers, Ripple Counters, Synchronous Counters, Ring Counter, Johnson Counter.

TEXT BOOKS:

1. M.Morris Mano, "Digital Design", 5/e, Michael D Ciletti, PEA.
2. Roth, "Fundamentals of Logic Design", 5/e, Cengage.
3. BHOLDSWORTH, AND RC. WOODS, "Digital Logical Desing", edition 4th,2003.

REFERENCE BOOKS:

1. Digital Logic and Computer Design, M.Morris Mano, PEA.
2. Digital Logic Design, Leach, Malvino, Saha, TMH.
3. Modern Digital Electronics, R.P. Jain, TMH.

B. TECH 3nd SEMESTER	L	T	P	C
	3	0	0	3
20CS3T03-COMPUTER ORGANIZATION AND ARCHITECTURE				

COURSE OUTCOMES:

At the end of the course the student able to

1. Sketch the basic structure of computer organization and its instruction sets. (K3)
2. Observe the CPU operations and language concepts. (K2)
3. Apply the arithmetic algorithms and decimal arithmetic operations. (K3)
4. Develop input/output and memory organization in the computer systems. (K3)
5. Express the concept of pipelining and various processor families. (K2)

UNIT I:

Basic Structure of Computers and Machine Instructions:

Basic Organization of Computers, Von Newmann Computers, Functional Units, Basic Operational Concepts, Generation of computers.

Numbers, Arithmetic Operations and Instructions, Memory Locations and Addresses, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Basic Input / Output Operations, Stacks and Queues, Case study – Arithmetic & Logic Instructions, Branch Instructions, I/O Operations of ARM Processor

UNIT II:

Central Processing Unit and Programming the basic Computer:

CPU - General Register and Stack Organizations, Instructions Formats, Addressing Modes, Data Transfer and Manipulation, RISC, Programming the Basic Computer – Machine Language, Assembly Language, Programming Arithmetic and Logic Operations, Micro Program Examples, Case Study – Design of Control Unit.

UNIT III:

Computer Arithmetic:

Addition, Subtraction, Multiplication Algorithms, Division Algorithms, Floating Point Arithmetic operations, Decimal Arithmetic Unit, Decimal Arithmetic Operations.

UNIT IV:

Input-Output and Memory Organization:

Accessing I/O Devices, Interrupts, Direct Memory Access, Buses, Interface Circuits, Standard I/O interfaces, Case Study – Processor Examples Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

UNIT V:

Pipelining and Processor Families:

Basic Concepts, Data Hazards, Instruction Hazards, Influence on Instruction sets, Data Path and control consideration, Superscalar Operation, Performance Considerations. ARM family, Motorola 680X0 and Coldfire families, Intel IA 64 Family, SPARC Family.

TEXT BOOKS:

1. Carl Hamacher, Zvonks Varanesic, SafeaZaky, "Computer Organization", Fifth Edition, McGraw Hill, 2015
2. M. Moris Mano, Revised, "Computer System Organization", Third Edition, Pearson PTE academic, 2019
3. Pynabananda Chskraborty, "Computer Organization &Architecture", 1st Edition, Chapman and Hallkrc, 2020.

REFERENCE BOOKS:

1. William Stallings, "Computer Organization and Architecture", Sixth Edition, Pearson/PHI, 2016.
2. John L. Hennessy and David A. Patterson, "A quantitative approach, Computer Organization", Fourth Edition, Elsevier, 2009.
3. Andrew S.Tanenbaum, "Structured Computer Organization", 4th Edition, Pearson, 1998
4. Sivaraama, Dandamudi, "Fundamentals of Computer Organization and Design", Springer Int. Edition, 2014.

B. TECH 3nd SEMESTER	L	T	P	C
	0	0	3	1.5
20CS3L01-DATA STRUCTURES LAB				

COURSE OUTCOMES:

At the end of the lab students are able to

1. Illustrate various linked lists and its operations. (K4)
2. Complete operations on stack application using arrays and linked lists.(K3)
3. Show Queue operations and applications using arrays and linked lists. (K2)
4. Identify and develop various operations on binary trees. (K2)
5. Articulate various searching and sorting techniques for user data.(K3)

Note: Students has to complete at least 20 Programs

Write C Program for the following

Exercise – I: Linked Lists

1. Program to create and display a singly linked list.
2. Program to create a singly linked list of n nodes and count the number of nodes
3. Program to create a singly linked list of n nodes and display it in reverse order
4. Program to delete a new node from the beginning of the singly linked list
5. Program to delete a new node from the middle of the singly linked list
6. Program to delete a node from the end of the singly linked list
7. Program to find the maximum and minimum value node from a singly linked list
8. Program to insert a new node at the middle of the singly linked list
9. Program to insert a new node at the beginning of the singly linked list
10. Program to insert a new node at the end of the singly linked list
11. Program to remove duplicate elements from a singly linked list
12. Program to search an element in a singly linked list
13. Program to sort the elements of the singly linked list
14. Program to Search an element in a Linked List (Iterative and Recursive)
15. Program to Nth node from the end of a Linked List

Exercise – II: Stacks and Queues

Stacks

1. Program to implement STACK operations using Arrays.
2. Program to implement STACK operations using Linked List.
3. Program to implement STACK operations using QUEUE operations.
4. Program to Reverse the list using STACK operations.
5. Program to convert Infix expression into Postfix expression.
6. Program to evaluate Postfix expression.
7. Program to calculate factorial of a given number using STACK operations.

Queues

1. Program to implement QUEUE operations using Arrays.
2. Program to implement QUEUE operations using Linked List
3. Program to implement QUEUE operations using STACK operations.
4. Program to implement Circular Queues using Arrays.
5. Program to implement Priority Queue using Arrays.

Exercise – III: Tress

1. To create a Binary Search Tree of integers, insert, delete and search integers into (from) Binary search tree.
2. Use recursive functions to traverse a binary search tree in preorder, in-order and post-order.
3. Program to Construct a Binary Search Tree and Perform Deletion and In-order Traversal
4. Program to Find the Largest Element in a Binary Tree
5. Program to Find the Smallest Element in a Binary Tree
6. Program to Find the Sum of all the Nodes of a Binary Tree
7. Program to Implement Binary Tree using the Linked List
8. Program to Search a Node in a Binary Tree.

Exercise – IV: Searching Techniques

10. Program to search an element in the array using iterative Linear Search.
11. Program to search an element in the array using recursive Linear Search.
12. Program to search an element in the array using iterative Binary Search.
13. Program to search an element in the array using recursive Binary Search.
14. Program to search an element in the array using iterative Fibonacci Search.
15. Program to search an element in the array using recursive Fibonacci Search

Exercise – V: Sorting Techniques

1. Program to implement Bubble Sort, to sort a given list of integers in ascending order.
2. Program to implement Selection Sort, to sort a given list of integers in ascending order.
3. Program to implement Insertion Sort, to sort a given list of integers in ascending order.
4. Program to implement Quick Sort, to sort a given list of integers in ascending order.
5. Program to implement Quick Sort, to sort a given list of integers in ascending order using recursion method.
6. Program to implement Merge Sort, to sort a given list of integers in ascending order.
7. Program to implement Merge Sort, to sort a given list of integers in ascending order using recursion method.
8. Program to implement Radix Sort, to sort a given list of integers in ascending order.
9. Program to implement Merge Sort., to sort a given list of integers in ascending order.
10. Program to implement Heap Sort, to sort a given list of integers in ascending order.

Exercise – VI: Graphs

1. Program to Implementation of Breadth-First Search Techniques.
2. Program to Implementation of Depth- First Search Techniques.
3. Program to Implementation of Prim's Algorithm.
4. Program to Implementation of Dijkstra's Algorithm.
5. Program to Implementation of Kruskal's Algorithm.

B. TECH 3nd SEMESTER	L	T	P	C
	0	0	3	1.5
20CS3L02-DATABASE MANAGEMENT SYSTEMS LAB				

COURSE OUTCOMES:

At the end of the course student able to

1. Observe different issues involved in design and implementation of a database system (K2)
2. Employ entity relationship, convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data. (K3)
3. Develop to Create, manipulate tables and query database commands using SQL. (K3)
4. Summarize the use of structured query language and its syntax, transactions, database recovery and techniques for query optimization. (K2)
5. Practice to acquire knowledge of database systems and use design databases for different applications. (K3)

List of Programs:

1. Create a table STUDENT with appropriate data types and perform the following queries.
   Regdno , student name, date of birth, branch and year of study.
   a. Insert 5 to 10 rows in a table
   b. List all the students of all branches
   c. List student names whose name starts with ‘s’
   d. List student names whose name contains ‘s’ as third literal
   e. List student names whose contains two ‘s’ anywhere in the name
   f. List students whose branch is NULL
   g. List students of CSE who born after 1985
   h. List all students in reverse order of their names
   i. Delete students of any branch whose name starts with ‘s’
   j. Display student name padded with ‘*’ after the name of all the students

2. Create the following tables with appropriate data typesand constraints.
   EMPLOYEE (Fname, Mname, Lname, SSN, Bdate, Address, Gender, Salary, SuperSSN,Dno)
   DEPARTMENT (Dnumber, Dname, MgrSSN, Mgrstartdate)
   DEPENDENT (ESSN, Dependent_Name, Gender, Bdate, Relationship)
   a. Insert 5 to 10 rows into all the tables.
   b. Display all employee’s names along with their department names.
   c. Display all employee’s names along with their dependent details.
   d. Display name and address of all employees who work for ‘CSE’ department.
   e. List the names of all employees with two or more dependents.
   f. List the names of employee who have no dependents.
   g. List the names of employees who have at least one dependent.
   h. List the names of the employees along with names of their supervisors using aliases.
   i. Display name of the department and name of manager for all the departments.
   j. Display the name of each employee who has a dependent with the same first name and gender as the employee.
   k. List the names of managers who have at least one dependent.

l. Display the sum of all employees' salaries as well as maximum, minimum and average salary in the entire departments department wise if the department has more than two employees.
m. List the departments of each female employee along with her name.
n. List all employee names and also the name of the department they manage if they happen to manage a dept

3. Consider the following schema for a Library Database:
BOOK (Book_id, Title, Publisher_Name, Pub_Year)
BOOK_AUTHORS (Book_id, Author_Name)
PUBLISHER (Name, Address, Phone)
BOOK_COPIES (Book_id, Branch_id, No-of_Copies)
BOOK_LENDING (Book_id, Branch_id, Card_No, Date_Out,Due_Date)
LIBRARY_BRANCH (Branch_id, Branch_Name, Address)

Write SQL queries to
a. Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each branch
b. Get the particulars of borrowers who have borrowed more than 3 books in particular period.
c. Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation
d. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query
e. Create a view of all books and its number of copies that are currently available in the library.
f. Apply Drop, Alter, Order by, Group By clauses on the above tables

.

4. Create the following tables for university database
Department (deptname, building, budget, primary key (dept name))
Course (courseid, title, deptname, credits, primary key (course id))
Instructor (ID, name, deptname, salary, primary key (ID), foreign key (deptname) references department);
Section (courseid, sec id, semester, year, building, room number, time slot id, primary key (courseid, sec id, semester, year), foreign key (course id) references course);
Teaches (ID, course id, sec id, semester, year numeric, primary key (ID, course id, sec id, semester, year), foreign key (course id, sec id, semester, year) references section, foreign key (ID) references instructor);
a. List the names of instructors along with the titles of courses that they teach
b. Find the names of all instructors whose salary is greater than at least one instructor in the CSE department
i. To find the set of all courses taught in the Even as well as in odd semester
j. Find the average salary of instructors in the Computer Science department
k. Find the average salary in each department
l. To find all the courses taught in the Even semester in current year but not in previous year in the same semester
m. Delete all instructors with a salary between 15,000 and 35,000.

5. Create the following tables based on the above Schema Diagram with appropriate data types and constraints and perform the following queries.
SAILORS (Saild, Salname, Rating, Age)
RESERVES (Sailid, boatid, Day)

BOATS (Boatid, Boat-name, Color)

a. Insert 5 to 10 rows in all tables?
b. Find the name of sailors who reserved boat number 3.
c. Find the name of sailors who reserved green boat.
d. Find the colors of boats reserved by Particular Sailor
e. Find the names of sailors who have reserved at least one boat.
f. Find the all sailid of sailors who have a rating of 10 or have reserved boated 104.
g. Find the Sailid's of sailors with age over 20 who have not registered a red boat.
h. Find the names of sailors who have reserved a red or green boat.
i. Find sailors whose rating is better than some sailor called _Salvador '.
j. Find the names of sailors who are older than the oldest sailor with a rating of 10.

6. Queries on Working with Index, Sequence, Synonym, Controlling Access and Locking Rows for Update, Creating Password and Security features
   a. Write a PL/SQL Block to find whether the number is Armstrong or not.
   b. Write a PL/SQL program for generating Fibonacci series
   c. Write a PL/SQL program to print given number in reverse
   d. print different patterns using PL/SQL program
   e. Print Floyd's triangle in PL/SQL
   f. Count odd and even digits in a number in PL/SQL

7. Write a program that updates salaries of all employees with 10 % hike (use cursors).
8. Write a program to fetch salary and employee name from employee table for a given user input. When no data found raise an exception that prints the message "no data found".
9. Write a program to find the number of records of any given table using % ROWCOUNT.
10. Write a database trigger on employee table so that the trigger fires when all the DML statements are executed (print appropriate message).
11. Write a trigger in such a way that it should not allow insert or update or delete on Saturday and Sunday and display the proper message.
12. Write a database trigger on employee table so that the trigger fires when all the DML statements are executed (print appropriate message)
13. Write a cursor to display the list of employees and total salary department wise.
14. Write a procedure to display the name and salary of employee when user inputs SSN using IN/OUT parameters.
15. Write a function to check the validity of the given employee number from the employee table (print the appropriate message using PL/SQL block)
16. Write a PL/SQL Code Creation of forms for any Information System such as Student Information System, Employee Information System etc.

B. TECH 3nd SEMESTER	L	T	P	C
	0	0	3	1.5
20EC3L05-DIGITAL LOGIC DESIGN LAB				

COURSE OUTCOMES:

At the end of the course student able to

1.Show the truth tables of different Combinational & Sequential circuits(K2)

2. Construct Boolean functions using logic gates. (K3)

3. Analyse different Combinational & Sequential circuits. (K4)

4. Employ different Combinational & Sequential circuits. (K3)

List of Experiments

1. Verification of Basic Logic Gates.
2. Implementing all individual gates with Universal Gates NAND & NOR.
3. Design a circuit for the given Canonical form, draw the circuit diagram and verify the De-Morgan laws.
4. Design a Combinational Logic circuit for 4x1 MUX and verify the truth table.
5. Design a Combinational Logic circuit for 1x4 De- MUX and verify the truth table.
6. Construct Half Adder and Full Adder using Half Adder and verify the truth table.
7. Verification of truth tables of the basic Flip- Flops with ***Synchronous*** and ***Asynchronous*** modes.
8. I implementation of Master Slave Flip-Flop with J-K Flip- Flop and verify the truth table for ***race around*** condition**.**
9. Design a Decade Counter and verify the truth table.
10. Ripple counter using-JK Flip -Flop.
11. Construct 4-bit ring counter with T-Flip –Flop and verify the truth table.
12. Design a 8 – bit right Shift Register using D-Flip -Flop and verify the truth table.

B. TECH 3nd SEMESTER	L	T	P	C
	1	0	2	2
20CS3S01-DATA ANALYTICS USING MS EXCEL				

COURSE OUTCOMES:

At the end of the lab students are able to

1. Observe the basics of Excel as business analytics. (K2)
2. Show basic functions and statistical functions in Excel (K2)
3.Extend knowledge about using of pivot tables and charts. (K2)
4. Articulate the advanced business analytics related charts. (K3)
5. Interpret about statistical concepts for data analysis and basics of Power BI. (K3)

UNIT – I:

Introduction to spreadsheets: reading data, manipulating data.Basic spreadsheet operations and functions.
Introduction to Business analytics: Introduction, Types of Analytics, Area of Analytics.

UNIT – II:

Spreadsheet Functions to Organize Data: Conditional formatting, Logical functions: Lookup and reference functions, IF, Nested IF, VLOOKUP, HLOOKUP, MATCH, INDEX and OFFSET functions in Excel.

Statistical functions: Introduction, SUMIFS, COUNTIF, PERCENTILE, QUARTILE, STDEV, MEDIAN

and RANK Function

UNIT – III:

Introduction to Filtering, Pivot Tables, and Charts: Introduction to the data filtering capabilities of Excel, the construction of Pivot Tables to organize data and introduction to charts in Excel.

Pivot Table Introduction: Creating a Pivot Table, Grouping in Pivot Table, Custom Calculated Field and

Calculated Item, Slicer Introduction, Creating a Slicer

UNIT – IV:

Advanced Graphing and Charting: Constructing various Line, Bar and Pie charts. Using the Pivot chart features of Excel. Understanding and constructing Histograms and Scatterplots.

Business analytics with Excel: Introduction, Histogram, Data Table, Descriptive Statistics.

UNIT – V:

Data Analysis Using Statistics: Introduction, Moving Average, Hypothesis Testing, ANOVA, Covariance, Correlation, Regression, Normal Distribution.

Power BI: Introduction, Power Pivot, Power View, Power Query, Power Map.

TEXT BOOK:

1. Ash Narayansah, "Data Analytics using MS Excel", 1st Edition, 2009.

REFERENCE BOOKS:

1. Manisha Nigam, "Advanced Analytics with Excel 2019: Perform Data Analysis using Excel's Most Popular Features" English Editions, 2020
2. Paul Cornell, "Beginning Excel What-If Data Analysis Tools: Getting Started with Goal Seek, Data Tables, Scenarios, and Solver – Illustrated", 2005.

Website Link for Reference:

1. https://www.excel-easy.com/data-analysis.html

B. TECH 3rd SEMESTER	L	T	P	C
	2	0	0	0
20CE3M01- ENVIRONMENTAL SCIENCE				

UNIT-I: Multidisciplinary nature of Environmental Studies:
Definition, Scope and Importance –Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects; Role of information technology in environment and human health.
Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT-II: Natural Resources:
Natural resources and associated problems. Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.
Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.
Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.
Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.
Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; equitable use of resources for sustainable lifestyles.

UNIT-III: Biodiversity and its conservation:
Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

UNIT – IV Environmental Pollution:
Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his wellbeing.
Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT – V Social Issues and the Environment:
Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.
Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.
The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Text Books:

1. K. V. S. G. Murali Krishna, Environmental Studies,VGS Publishers, Vijayawada, 2010
2. R. Rajagopalan, Environmental Studies, 2nd Edition, Oxford University Press, 2011
3. P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani, Environmental Studies, 2nd Edition , Pearson Education, Chennai,2015

Reference:

1. Deeshita Dave & P. Udaya Bhaskar Text Book of Environmental Studies, Cengage Learning, 2011
2. Shaashi Chawla, A Textbook of Environmental Studies, TMH, New Delhi,2017
3. Benny Joseph, Environmental Studies, Tata McGraw Hill Co, New Delhi, 2006
4. Anubha Kaushik, C P Kaushik , Perspectives in Environment Studies, New Age International Publishers, 2014

B. TECH 4th SEMESTER	L	T	P	C
	3	0	0	3
20MA4T07-PROBABILITY AND STATISTICS				

COURSE OUTCOMES:

At the end of the lab students are able to

1. Compute probability based on practical situations by discrete and continuous probability Distributions. (K3)
2. Practice sampling distribution of means for large and small samples and apply the concept of hypothesis testing for large samples. (K3)
3. Articulate the concept of hypothesis testing for small samples(K3)
4. Express regression and correlation between two variables ,least square approximation to find The best fit curve for bivariate data. (K2)

Unit-1 Probability:

Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.

Unit-2 Probability distributions:

Probability distribution-Binomial, Poisson approximation to the binomial distribution and normal distribution –their properties.

Unit-3 Sampling distribution and Testing of hypothesis, large sample tests:

Basic terminology in sampling, sample techniques (with and without replacement), sampling distribution of means for large and small samples (with known and unknown variance).
Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors.
Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems

Unit-4 Small sample tests:

Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variance (F- test),Chi-square test for goodness of fit and independence of attributes.

Unit-5 Curve Fitting and Correlation:

Curve Fitting: Method of least squares -Fitting a straight-line, Second-degree parabola -exponential curve-power curves
Correlation: Simple correlation, correlation coefficient (for ungrouped data), rank correlation. Linear regression, regression lines, regression coefficients.

Books:

1. Probability and Statistics by Dr. K. Murugesan &P.Gurusamy, Anuradha Publications,2011
2. Higher Engineering Mathematics, 42nd Edition, Khanna Publications by Dr. B.S.Grewal,2012

Reference:

1. Ramana B.V., Higher Engineering Mathematics, Tata Mc Graw Hill New Delhi 11th Reprint2010
2. Probability and statistics for engineers by Miller & Freund

B. TECH 4th SEMESTER	L	T	P	C
	3	0	0	3
20CS4T01-OPERATING SYSTEMS				

COURSE OUTCOMES:

At the end of the course student are able to

1. Show the basic concepts about Operating System and its functions. (K2)
2. Generalize the Process management, CPU scheduling and Deadlocks. (K2)
3. Analyze the concepts of Memory management. (K4)
4. Observe the File systems & Disk Structures. (K2)
5. Illustrate Case Study on LINUX, WINDOWS and Android OS. (K4)

UNIT – I:

OPERATING SYSTEMS OVERVIEW:

Introduction: OS Concepts – Evolution of OS, OS Structures- Kernel, Shell. Operating-System Services, System Calls, Types of System Calls, System Structure. UNIX- Introduction-Architecture, Logging In, Files and Directories, Input and Output, Programs and Processes, Error Handling, User Identification, Time Values, System Calls and Library Functions, Command-Line Arguments, UNIX File API'S.

UNIT – II:

PROCESS MANAGEMENT:

Process: Concept, Operations on Processes, Inter Process Communication, Threads-Multithreading Models, Threading Issues, Pthreads.

Synchronization: The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Critical Regions, Monitors, Classic Problems of Synchronization,

Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms- CPU (Uniprocessor) scheduling algorithms, Multiprocessor and Real-time scheduling algorithms.

Deadlocks: Characterization – Prevention – Avoidance - Detection and Recovery

UNIT – III:

MEMORY MANAGEMENT: Basic Memory Management, Swapping, Contiguous Memory Allocation, Virtual Memory Concept, Demand Paging - Page Interrupt Fault, Page Replacement Algorithms, Segmentation – Simple, Multi-level, Segmentation with Paging, Memory Management.

UNIT – IV:

INFORMATION MANAGEMENT:

File system Interface: The concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection.

File System implementation: File system structure, allocation methods, free-space management

Mass-storage structure: Overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling, Disk Management, Swap-Space Management, RAID Structure.

UNIT – V:

CASE STUDY:

The Linux System, Microsoft Windows 7, Android Software Platform**:** Android Architecture, Operating System Services, Android Runtime Application Development, Application Structure.

TEXT BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Inc., 2018.
2. William Stallings, "Operating Systems– Internals and Design", 7th Edition, Prentice Hall, 2016.
3. Alex A Aravind, Operating Systems-S Halder, Second Edition, Pearson Education, 2016.
4. Andrew Tanenbaum, Herbert Bos, "Operating Systems", 4th Edition, 2015.

REFERENCE BOOKS:

1. Ann McIver McHoes Ida M. Flynn, "Understanding Operating Systems" Sixth Edition, Course Technology-Cengage Learning, 2011.
2. Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Addison Wesley, 2001.
3. Andrew S. Tanenbaum, Albert S. Woodhull - Amherst, "Operating Systems Design and Implementation", Third Edition, Prentice Hall, 2006.
4. W. Richard Stevens, "Advanced Programming in UNIX Environment", 2nd Ed, Pearson Education, 2005.
5. Terrence Chan, "UNIX System Programming Using C++", Prentice Hall India, 1999.
6. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIScBANG/Operating%20Systems/New_index1.html

B. TECH 4th SEMESTER	L	T	P	C
	3	0	0	3
20CS4T02-JAVA PROGRAMMING				

COURSE OUTCOMES:

At the end of the lab students are able to
1. Solve real world problems using OOP techniques. (K3)
2. Identify the use of abstract classes. (K2)
3. Observe problems using java collection framework and I/O classes. (K2)
4. Show the multithreaded applications with synchronization. (K2)
5. Apply applets for web applications and plan to apply the GUI based applications. (K3)

UNIT – I:

Object-oriented thinking- A way of viewing world – Agents and Communities, messages and methods, Responsibilities, Classes and Instances, Class Hierarchies- Inheritance, Method binding, Overriding and Exceptions, Summary of Object-Oriented concepts. Java buzzwords, An Overview of Java, Data types, Variables and Arrays, operators, expressions, control statements, Introducing classes, Methods and Classes, String handling.

Inheritance– Inheritance concept, Inheritance basics, Member access, Constructors, Creating Multilevel hierarchy, super uses, using final with inheritance, Polymorphism-ad hoc polymorphism, pure polymorphism, method overriding, abstract classes, Object class, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance.

UNIT – II:

Packages- Defining a Package, CLASSPATH, Access protection, importing packages.

Interfaces- defining an interface, implementing interfaces, Nested interfaces, applying interfaces, variables in interfaces and extending interfaces.

Stream based I/O(java.io) – The Stream Classes-Byte streams and Character streams, reading console Input and Writing Console Output, File class, Reading and writing Files, Random access file operations, The Console class, Serialization, Enumerations, auto boxing, generics.

UNIT – III:

Exception handling - Fundamentals of exception handling, Exception types, Termination or presumptive models, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built- in exceptions, creating own exception sub classes.

Multithreading- Differences between thread-based multitasking and process-based multitasking, Java thread model, creating threads, thread priorities, synchronizing threads, inter thread communication.

UNIT – IV:

The Collections Framework (java.util)- Collections overview, Collection Interfaces, The Collection classes- Array List, Linked List, Hash Set, Tree Set, Priority Queue, Array Deque. Accessing a Collection via an Iterator, Using an Iterator, The For-Each alternative, Map Interfaces and Classes, Comparators, Collection algorithms, Arrays, The Legacy Classes and Interfaces- Dictionary, Hashtable,Properties, Stack, Vector

More Utility classes, String Tokenizer, Bit Set, Date, Calendar, Random, Formatter, Scanner

UNIT – V:

GUI Programming with Swing – Introduction, limitations of AWT, MVC architecture, components, containers. Understanding Layout Managers, Flow Layout, Border Layout, Grid Layout, Card Layout, Grid Bag Layout.

Event Handling- The Delegation event model- Events, Event sources, Event Listeners,

Event classes, Handling mouse and keyboard events, Adapter classes, Inner classes, Anonymous Inner classes. A Simple Swing Application,

Applets – Applets and HTML, Security Issues, Applets and Applications, passing parameters to applets. Creating a Swing Applet, Painting in Swing, A Paint example, Exploring Swing Controls- JLabel and Image Icon, JText Field, The Swing Buttons- JButton, JToggle Button, JCheck Box, JRadio Button, JTabbed Pane, JScroll Pane, JList, JCombo Box, Swing Menus, Dialogs.

TEXT BOOKS:

1. Herbert Schildt, "Java The complete reference", 9th edition, McGraw Hill Education (India) Pvt. Ltd.
2. T. Budd, "Understanding Object-Oriented Programming with Java", updated edition, Pearson Education.
3. James Gosling, David Holmes, "Java Programing", 4th Edition,.Addision Wesley, 2005

REFERENCE BOOKS:

1. J. Nino and F.A. Hosch, "An Introduction to programming and OO design using Java", John Wiley & sons.
2. Y. Daniel Liang, "Introduction to Java programming", Pearson Education.
3. P. Radha Krishna, "Object Oriented Programming through Java", Universities Press.
4. S. Malhotra, S. Chudhary, "Programming in Java", 2nd edition, Oxford Univ. Press.
5. R. A. Johnson, "Java Programming and Object-oriented Application Development", Cengage Learning.

B. TECH 4th SEMESTER	L	T	P	C
	3	0	0	3
20CS4T03 - DESIGN & ANALYSIS OF ALGORITHMS				

COURSE OUTCOMES:

At the end of the lab students are able to

1. Observe the correctness of algorithms using inductive proofs and invariants. (K2)

2. Analyze asymptotic runtime complexity of algorithms for real world problems. (K4)

3. Identify the optimal solutions by using advanced design and analysis of algorithm techniques. (K2)

4. Illustrate and derive dynamic-programming paradigm and apply when an algorithmic design Situation calls for it. (K3)

5. Categorize the search space and optimization problem techniques. (K4)

UNIT I:

Introduction- Algorithm definition, Algorithm Specification, Performance Analysis-Space complexity, Time complexity, Randomized Algorithms. **Divide and conquer**- General method, applications - Binary search, Merge sort, Quick sort, Strassen's Matrix Multiplication.

UNIT II:

Greedy method- General method, applications- Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees, Single source shortest path problem.

UNIT III:

Dynamic Programming- General Method, applications- Chained matrix multiplication, All pairs shortest path problem, Optimal binary search trees, 0/1 knapsack problem, Reliability design, Traveling sales person problem.

UNIT IV:

Backtracking-General method, applications The 8-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.

UNIT V:

Branch and Bound- General Method, applications-0/1 Knapsack problem, LC Branch and Bound solution, FIFO Branch and Bound solution, Traveling sales person problem. **NP-completeness**-NP-Hard and NP-Complete problems- Basic concepts, non-deterministic algorithms, NP - Hard and NP- Complete classes, Cook's theorem.

TEXT BOOKS:

1. Ellis Horowitz, Sartaj Sahni and S. Rajasekharan, "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press, 2008.
2. P. H. Dave, H.B.Dave, "Design and Analysis of Algorithms", 2nd Edition, Pearson Education, 2013.
3. Anany Levith, "Deaign & Analysis of Algorithms", 3rd Edition, Pearson Education, 2017.

REFERENCE BOOKS:

1. M. T. Goodrich and R. Tomassia, "Algorithm Design: Foundations, Analysis and Internet examples", John Wiley and sons, 2001.

B. TECH 4th SEMESTER	L	T	P	C
	3	0	0	3
20BM4T01: MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS				

COURSE OUTCOMES:
At the end of the lab students are able to

1. Show the importance of Managerial Economics and its utility in decision making. (K2)
2. Generalize the meaning and usefulness of production function and cost function. (K2)
3. Express the concept of market structure, different types of markets and pricing policies. (K2)
4. Identify different forms of business organizations and analyze merits and demerits. (K2)
5. Evaluate the investment proposals through techniques of capital budgeting and financial Performance. (K4)

UNIT–I Managerial Economics and Demand Analysis: Definition – Nature and Scope of Managerial Economics - Relation with other disciplines - Concept of Demand-Types-Determinants - Law of Demand - Elasticity of Demand - Types and Measurement-Demand forecasting.

UNIT–II Production and Cost Analysis: Production function - Law of Variable proportions - Isoquants and Iso costs -Law of returns- Economies of Scale - Cost Concepts - Cost Volume Profit Analysis – Applications of BEP (Simple Problems).

UNIT-III Market Structures and Pricing Policies: Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly – Features – Price & Output Determination - Pricing Methods

UNIT-IV Forms of Organizations and Business Cycles: Business Organization- Sole Trader – Partnership - Joint Stock Company - State/Public Enterprises and their forms - Business Cycles: Meaning and Features - Phases of Business Cycle.

UNIT–V Capital Budgeting and Accounting: Concept and sources-Techniques of evaluating capital budgeting (Simple problems)
Introduction to Accounting: Branches-Systems of Accounting-Single Entry-Double Entry System-Journal-Ledger-Trail Balance-Final Accounts-Ratio Analysis (Simple problems)

TEXTBOOKS:
1. Aryasri: Managerial Economics and Financial Analysis, 2/e, TMH, 2005.
2. T.V.Ramana& B. Kuberudu: Managerial Economics and Financial Analysis, Himalaya Publishing House,Mumbai
3. Varshney &Maheswari: Managerial Economics, Sultan Chand, 2003.

REFERENCE BOOKS:
1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, PHI, 4th Ed.
3. Suma Damodaran, Managerial Economics, Oxford University Press.
4. Lipsey &Chrystel, Economics, Oxford University Press.
5. S. A. Siddiqui & A. S. Siddiqui, Managerial Economics & Financial Analysis, New age International Space Publications.

6. Domnick Salvatore: Managerial Economics in a Global Economy, 4th Edition, Thomson. 7. Narayanaswamy: Financial Accounting A Managerial Perspective, PHI.
8. Raghunatha Reddy &Narasimhachary: Managerial Economics& Financial Analysis, Scitech.
9. S.N.Maheswari& S.K. Maheswari, Financial Accounting, Vikas.

B. TECH 4th SEMESTER	L	T	P	C
	0	0	3	1.5
20CS4L01-IOT LAB USING PYTHON				

COURSE OUTCOMES (COs):

1. Show the concept of Internet of Things and connected world. (K2)
2. Identify various hardware and sensing technologies to build IoT applications. (K2)
3. Illustrate the architecture of Internet of Things and python. (K4)
4. Practice the working of python on Raspberry pi. (K3)
5. Plan on Interacting with digital outputs with python. (K4)

List of Experiments:

1. Getting started with Raspberry Pi, Install Raspbian on your SD card.
2. Linux basic commands.
3. Coding simple programs in Python.
4. How to use Python-based IDE (integrated development environments) for the Raspberry Pi and how to trace and debug Python code on the device
5. How to have your Raspberry Pi interact with online services through the use of public APIs and SDKs
6. Connect an LED to GPIO pin and control it through command line.
7. Connect an LED to GPIO pin and a Switch to GPIO and control the LED with the switch.
8. Understanding the connectivity of Raspberry-Pi with IR sensor. Write an application to detect obstacle and notify user using LEDs.
9. The state of LED should toggle with every press of the switch Use DHT11 temperature sensor and print the temperature and humidity of the room with an interval of 15 seconds
10. Use Light Dependent Resistor (LDR) and control an LED that should switch-on/off depending on the light.
11. Create a traffic light signal with three colored lights (Red, Orange and Green) with a duty cycle of 5-2-10 seconds.
12. Switch on and switch of a DC motor based on the position of a switch.
13. Create a door lock application using a reed switch and magnet and give a beep when the door is opened.
14. Control a 230V device (Bulb) with Raspberry Pi using a relay.
15. Control a 230V device using a threshold temperature, using temperature sensor.
16. Create an application that has three LEDs (Red, Green and white). The LEDs should follow the cycle (All Off, Red On, Green On, White On) for each clap (use sound sensor).
17. Create a web application for the above applications wherever possible with suitable modifications to get input and to send output.
18. Design APP Using MIT App Inventor and Connect to Temperature Sensor.

TEXT BOOK:

1. Gaston C. Hallar Gaston C.Hillar, “IoT Lab Using Python”, 1st Edition, Ingram Short Title, 2016.

B. TECH 4th SEMESTER	L	T	P	C
	0	0	3	1.5
20CS4L02-OPERATING SYSTEMS USING LINUX LAB				

COURSE OUTCOMES:

At the end of the course students are able to

1. Observe fundamentals of shell scripting with UNIX/LINUX environment (K2)
2. Develop CPU scheduling and cite programs on it. (K3)
3. Practice Bankers Algorithm for Dead Lock Avoidance. (K3)
4. Show Disk allocation methods and cite programs on it. (K2)
5. Predict Page Replacements algorithms and develop programs. (K3)

LIST OF PROGRAMS:

1. a) Study of Vi editor, Bash Shell, Bourne Shell and C Shell in UNIX/LINUX Operating System.
   b) Study of UNIX/LINUX general purpose utility command list man,who,cat, cd, cp, ps, ls, mv,rm,mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown.
   c) Study of Unix/Linux file system (tree structure).
   e) Study of .bashrc, /etc/bashrc and Environment variables.
2. UNIX/LINUX based exercises to practice/simulate File system related system calls and some of the process management concepts in LINUX Environment.
   a) Write a C program that makes a copy of a file using standard I/O, and system calls
   b) Write a C program to emulate the UNIX ls –l command.
   c) Write a C program that illustrates how to execute two commands concurrently with a command pipe Ex: - ls –l | sort.
   d) Write a C program that illustrates two processes communicating using shared memory.
   e) Write a C program to simulate producer and consumer problem using semaphores.
   f) Write C program to create a thread using pthreads library and let it run its function.
   g) Write a C program to illustrate concurrent execution of threads using pthreads library.
3. Simulate FCFS and SJF CPU scheduling algorithm.
4. Simulate Priority CPU scheduling algorithm.
5. Simulate Round Robin CPU scheduling algorithm.
6. Simulate Bankers Algorithm for Dead Lock Avoidance.
7. Simulate Sequential file allocation strategy.
8. Simulate Linked file allocation strategy.
9. Simulate Indexed file allocation strategy.
10. Simulate First In First Out page replacement algorithm.
11. Simulate Least Recently used page replacement algorithm.
12. Simulate optimal page replacement algorithm.

B. TECH 4th SEMESTER	L	T	P	C
	0	0	3	1.5
20CS4L03-JAVA PROGRAMMING LAB				

COURSE OUTCOMES:

1. Identify java compiler installation and JVM execution process in various environments. (K2)
2. Practice hands on experience with oops in java using console and eclipse environment. (K3)
3. Simulate Basics of java programming, multi-threaded programs and Exception handling. (K3)
4. Apply OOP in Java programming in problem solving. (K3)
5. Develop applet programming for web applications on GUI based events. (K3)

Exercise - 1 (Basics)

a) Write a JAVA program to display default value of all primitive data type of JAVA
b) Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate the discriminate D and basing on value of D, describe the nature of root.
c) Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Take as input the speed of each racer and print back the speed of qualifying racers.
d) Write a case study on public static void main (250 words)

Exercise - 2 (Operations, Expressions, Control-flow, Strings)

a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
b) Write a JAVA program to sort for an element in a given list of elements using bubble sort
c) Write a JAVA program to sort for an element in a given list of elements using merge sort.
d) Write a JAVA program using String Buffer to delete, remove character.

Exercise - 3 (Class, Objects)

a) Write a JAVA program to implement class mechanism. – Create a class, methods and invoke them inside main method.
b) Write a JAVA program to implement constructor.

Exercise - 4 (Methods)

a) Write a JAVA program to implement constructor overloading.
b) Write a JAVA program implement method overloading.

Exercise - 5 (Inheritance)

a) Write a JAVA program to implement Single Inheritance
b) Write a JAVA program to implement multi level Inheritance
c) Write a java program for abstract class to find areas of different shapes

Exercise - 6 (Inheritance - Continued)

a) Write a JAVA program give example for “super” keyword.
b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?

Exercise - 7 (Exception)

a) Write a JAVA program that describes exception handling mechanism
b) Write a JAVA program Illustrating Multiple catch clauses

Exercise – 8 (Runtime Polymorphism)

a) Write a JAVA program that implements Runtime polymorphism
b) Write a Case study on run time polymorphism, inheritance that implements in above problem

Exercise – 9 (User defined Exception)

a) Write a JAVA program for creation of Illustrating throw
b) Write a JAVA program for creation of Illustrating finally
c) Write a JAVA program for creation of Java Built-in Exceptions
d) Write a JAVA program for creation of User Defined Exception

Exercise – 10 (Threads)

a) Write a JAVA program that creates threads by extending Thread class .First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds ,(Repeat the same by implementing Runnable)
b) Write a program illustrating **isAlive** and **join ()**
c) Write a Program illustrating Daemon Threads.

Exercise - 11 (Threads continuity)

a) Write a JAVA program Producer Consumer Problem
b) Write a case study on thread Synchronization after solving the above producer consumer problem

Exercise – 12 (Packages)

a) Write a JAVA program illustrate class path
b) Write a case study on including in class path in your os environment of your package.
c) Write a JAVA program that import and use the defined your package in the previous Problem

Exercise - 13 (Applet)

a) Write a JAVA program to paint like paint brush in applet.
b) Write a JAVA program to display analog clock using Applet.
c) Write a JAVA program to create different shapes and fill colors using Applet.

Exercise - 14 (Event Handling)

a) Write a JAVA program that display the x and y position of the cursor movement using Mouse.
b) Write a JAVA program that identifies key-up key-down event user entering text in a Applet.

Exercise - 15 (Swings)

a) Write a JAVA program to build a Calculator in Swings
b) Write a JAVA program to display the digital watch in swing tutorial.

Exercise – 16 (Swings - Continued)

a) Write a JAVA program that to create a single ball bouncing inside a JPanel.
b) Write a JAVA program JTree as displaying a real tree upside down.

B. TECH 4th SEMESTER	L	T	P	C
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20CS4S01-FUNDAMENTALS OF NETWORKING-CCNA				

COURSE OUTCOMES:

At the end of this course the learner is expected:

1. Discover to learn the fundamental concepts of computer networking. (K2)
2. Observe with basic CISCO networking Packet Tracer software. (K2)
3. Illustrate various networking devices and configure basic router and switch (K4)
4. Show configuration of network topology using packet tracer software. (K2)
5. Practice two different networks using packet tracer. (K3)

CCNA Modules:

Module-1 basic network connectivity and communication

Module 2: Ethernet concepts

Module 3: communication between networks

Module 4: IP - addressing

Module 5: Network application communications

Experiments list

1. introductions to Packet Tracer software
2. Study of Networking Commands (Ping, ipconfig, Tracert, TELNET, nslookup, netstat, ARP,
3. Using packet tracer connect computers in LAN and show the packet transfer simulation between the systems
4. Study of network IP and implementing IP address scheme (IPv4, IPv6)
5. Study and practice basic networking commands and network configuration commands using packet tracer
6. Study of various Networking devices in detail using packet tracer software perform initial switch configuration
7. using packet tracer software perform initial router configuration
8. Configure a Network topology using packet tracer software using two different networks

B. TECH 4th SEMESTER	L	T	P	C
	1	0	0	0
20BM4M01 – INDIAN CONSTITUTION				

UNIT I: Introduction to Indian Constitution-Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT II: Union Government and Administration Structure of the Indian Union: Federalism, Centre State relationship, President: Role, powers and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions

UNIT III: State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

UNIT IV:.Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions of Pachayat Raj Institution: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy.

UNIT V:Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate -State Election Commission: Functions of Commissions for the welfare of SC/ST/OBC and women.

TEXTBOOKS:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India Pvt. Ltd.
2. SubashKashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics

REFERENCE BOOKS:

1. D.C. Gupta, Indian Government and Politics
2. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
3. J.C. Johari, Indian Government andPolitics Hans
4. J. Raj IndianGovernment and Politics
5. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
6. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012.

e-Resources:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

B. TECH 5th SEMESTER	L	T	P	C
	3	0	0	3
20CS5T01- COMPUTER NETWORKS				

COURSE OUTCOMES:

At the end of the course students are able to

1. Differentiate network reference models such as OSI, TCP/IP. (K3)
2. Show various Data Link Layer protocols such as Error Detection and correction. (K2)
3. Distinguish various MAC sub layer Protocols such as ALOHA, CSMA, CSMA/CD. (K2)
4. Apply various Network layer and Transport layer protocols and Its Applications. (K3)
5. Illustrate various application layer protocols such as WWW and HTTP etc. (K4)

UNIT 1:

Data Communication: Components, Data Representation, Data flow (Simplex, Half-duplex and Full-Duplex), Types of connections: Point to Point and Multipoint, Various Categories of Topologies, Categories of Networks, Protocols and Standards, OSI network model, TCP/IP Protocol Suite, Transmission Media (Twisted pair cable, Coaxial cable and Fiber-optic cable).

UNIT 2:

Data Link Layer: Error Detection and Error Correction -Introduction, Block coding: Error Detection, Error Correction, Hamming Distance, Minimum Hamming Distance, Cyclic Codes: Cyclic Redundancy check (CRC), Checksum, Framing, Flow control and Error control.

UNIT3:

Medium Access Sub Layer: Random Access protocols – ALOHA, Pure ALOHA, Slotted ALOHA, Carrier Sense Multiple Access (CSMA),1-persistent CSMA, Nonpersistent CSMA, p-Persistent CSMA, CSMA/CD, CDMA/CA.

Network Layer: Logical addressing – IPV4 Addresses: Classful and Classless Addressing, Subnetting, Network Address Translation (NAT), IPV6 Addresses-Structure and Address space, Address Mapping: ARP, RARP, BOOTP and DHCP.

UNIT 4:

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), UDP Format, uses of UDP, Transmission Control Protocol (TCP), TCP Services, TCP Features, TCP Segment, Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

UNIT 5:

Application Layer: Domain Name System (DNS), Domain Name Space, Distribution of Name Space, Remote Logging: TELNET, ELECTRONIC MAIL, SMTP, File Transfer Protocol (FTP), WWW, HTTP.

TEXT BOOKS:

1. Data Communication and Networking, 5th Edition, Behrouz A. Forouzan, McGrawHill, 2017
2. Computer Networks, 6th Edition, Andrew S. Tanenbaum, Pearson New International Edition, 2021.
3. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India, 2017

REFERENCE BOOKS:

1. Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India.
TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.

B. TECH 5th SEMESTER	L	T	P	C
	3	0	0	3
20CS5T02- DATA SCIENCE				

COURSE OUTCOMES:

At the end of the course, the student should be able to

1. Discover to gain knowledge in the basic concepts of Data Analysis (K2)
2. Apply the relationships between data dependencies using statistics (K3)
3. Show data using primary tools used for data science in Python (K2)
4. Analyze the skills of data inspecting and cleansing (K4)
5. Determine and practice statistical inference for Regression and Classification (K3)

UNIT-I

INTRODUCTION: Need for data science – benefits and uses – facets of data – data science process – setting the research goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models – presenting and building applications

UNIT-II

EXPLORATORY ANALYSIS

Types of Variables: Nominal, Ordinal, Categorical and Interval data.

Central Tendency: Mean (Weighted, Trimmed, Interquartile, Truncated), Median, Mode

Measure of Statistical dispersions: Variance, Standard Deviation, IQR, Standard Error, Range, Absolute difference and deviation, Coefficient of variation.

DATA SAMPLING AND DISTRIBUTION

Normalization, Sampling Data-Simple Random sampling, Stratified, Cluster Sampling, Sampling Error/Bias. Bootstrapping, Central Limit Theorem, Confidence intervals, Normal distribution, Binomial distribution, Poisson distribution

UNIT-III

INTRODUCTION TO NUMPY:

NumPy Basics: Arrays and Vectorized Computation- The NumPy ndarray- Creating ndarrays- Data Types for ndarrays- Arithmetic with NumPy Arrays- Basic Indexing and Slicing - Boolean Indexing-Transposing Arrays and Swapping Axes. Universal Functions: Fast Element-Wise Array Functions- Mathematical and Statistical Methods-Sorting Unique and Other Set Logic.

DATA MANIPULATION WITH PANDAS

Introduction to pandas Data Structures: Series, Data Frame, Essential Functionality: Dropping Entries, Indexing, Selection, and Filtering- Function Application and Mapping- Sorting and Ranking. Summarizing and Computing Descriptive Statistics- Unique Values, Value Counts, and Membership. Reading and Writing Data in Text Format.

UNIT-IV

DATA CLEANING, PREPARATION AND VISUALIZATION

Data Cleaning and Preparation: Handling Missing Data - Data Transformation: Removing Duplicates, Transforming Data Using a Function or Mapping, Replacing Values, Detecting and Filtering Outliers- String Manipulation: Vectorized String Functions in pandas. Plotting with pandas: Line Plots, Bar Plots, Histograms and Density Plots, Scatter or Point Plots.

UNIT-V

REGRESSION AND PREDICTION

Simple Linear Regression, Multiple Linear Regression, Confidence and Prediction Intervals, Categorical Variables, Multi-collinearity, Polynomial Regression.

Exploratory Data Analysis: Univariate and Bivariate analysis.

CLASSIFICATION

Naive Bayes, Discriminant Analysis, Logistic Regression, Evaluating Classification Models, Strategies for Imbalanced Data

Text Books:

1. Robert S. Witte and John S. Witte, “Statistics”, Eleventh Edition, Wiley Publications, 2017.
2. David Cielen, Arno D. B. Meysman, and Mohamed Ali, “Introducing Data Science”, 1st Edition, Manning Publications, 2016.
3. Jake VanderPlas, “Python Data Science Handbook”, O’Reilly, 2016
4. Bruce, Peter, and Andrew Bruce. Practical statistics for data scientists: 50 essential concepts. " O'Reilly Media, Inc.", 2017.

B. TECH 5th SEMESTER	L	T	P	C
	3	0	0	3
20CS5T03-SOFTWARE ENGINEERING				

COURSE OUTCOMES:

At the end of the course, the student should be able to

1. Identify & Formulate the various software engineering concepts(K2)
2. Observe and develop different software development process models. (K2)
3. Analyze and specify software requirements with various stakeholders of software development project(K4)
4. Apply systematic procedures for software design and deployment.(K3)
5. Compare and contrast various testing methods and art of debugging(K2)

UNIT I

SOFTWARE AND SOFTWARE ENGINEERING: The nature of Softwaree: Define software (Software Characteristics), Software Application Domains, Legacy software, **Software Engineering**: Definition, Llayered Technology, **Software Process:** Generic Process framework activities, Umbrella activities, software engineering Practice: the essence of Practice, general principles, Software Myths and Reality, Generic Process model, Capability Maturity Model Integration (CMMI).

UNIT-II

PROCESS MODELS: Process Assessment and improvement. Prescriptive Process models: Waterfall Model, Incremental Process Model**,** Evolutionary Process Models: Prototyping, Spiral model, The Unified Process.Personal and Team process models: Personal software process (PSP), Team software process (TSP), Product and Process,

Agile Process: Agility and the cost of change, Agility Principles, the politics of agile development, Human Factors.

UNIT-III

REQUIREMENTS ANALYSIS AND SPECIFICATION: Functional Requirements, Non- Functional Requirements, Software Requirements Document (Software Requirements Specification SRS), Requirements Specification, Requirements Engineering**,** Establishing the Ground work, Eliciting Requirements(elicitation), Developing Use cases, Validating Requirements, Requirements Management: Requirements Planning, Requirements Change management.

UNIT-IV

SOFTWARE DESIGN: Design process**, Design concepts**: Abstraction, Architecture, Patterns, Separation of Concerns, Modularity, Information hiding, Functional independence, Refinement, Aspects, refactoring, Object oriented design concepts, Design classes.

The Design Model: Data Design Elements, Architectural Design elements, Interface Design Elements, Component-Level Design Elements, Deployment-Level Design Elements. Designing Class Based Components: Basic Design Principles, Component-Level Design guidelines, Cohesion and coupling.
User Interface Design: The Golden Rules

UNIT-V

TESTING: Elements of software quality assurance, SQA Tasks and Goals. The strategies for Conventional Strategies: Unit Testing – Integration Testing. Test Strategies for Object-Oriented Software,
Software testing fundamentals, white box testing- Basis path testing: Flow graph Notation, independent Program paths, Deriving test cases, Graph Matrices. control structure testing. black box testing: Graph Based Testing Methods, Equivalence Partitioning, Boundary value Analysis. Validation Testing, System Testing. Art of Debugging: The Debugging process, Psychological Considerations, Debugging Strategies, Correcting the error.

TEXT BOOK:

1. Software Engineering, A practitioner's Approach- Roger S. pressman, 8th edition, McGraw-Hillinternational Edition, 2014.
2. Software Engineering, Ian Sommerville, 10th Edition, Pearson Education Asia, 2016.

REFERENCE BOOKS:

1. Software Engineering, Pankaj Jalote, A Precise Approach", Wiley India, 2010.
2. Systems Analysis and Design- Shely Cash man Rosenblatt, 9th Edition, Thomson publications, 2016.
3. Software Project Management, Bob Hughes, Mike Cotterell and Rajib Mall, Fifth Edition, Tata McGrawHill, New Delhi, 2012.
4. https://nptel.ac.in/courses/106101061/

B. TECH 5th SEMESTER	L	T	P	C
	3	-	-	3
PROFESSIONAL ELECTIVE-I 20CS5E01-COMPUTER GRAPHICS				

COURSE OUTCOMES:

1. Observe the operations of Display Devices and develop algorithms for graphics primitives(K2)
2. Sketch lines, circles, ellipse and design 2D-object Transformations and Viewing.(K3)
3. Illustrate 3D-object representations, transformations and viewing. (K4)
4. Analyze different Visibility Detection methods(K4)
5. Develop simple Graphics Animation Applications. (K3)

UNIT- I: Introduction: Application areas of Computer Graphics, Overview of Graphics Systems: video-display devices, raster-scan systems, random scan systems, storage tube graphics display, Raster scan display and input devices. **Output primitives:** Points and lines, line drawing algorithms: DDA, Bresenhams, Mid-point circle and ellipse algorithms. Filled area primitives: Scan line polygon fill algorithm, boundary-fill and flood-fill algorithms.

UNIT- II:2-D geometrical transforms: Translation, scaling, rotation, reflection and shear transformations, homogeneous coordinates, composite transforms, transformations between coordinate systems. **2-D viewing:** The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, Cohen-Sutherland and Liang-Barsky line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm

UNIT- III:3-D Object Representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and Surfaces. 3-D Geometric transformations: Translation, Rotation, Rotation about an arbitrary axis in space, scaling, reflection and shear transformations, composite transformations

UNIT- IV:3-D Viewing: Viewing pipeline, Viewing Coordinates, View Volume, Projections: Parallel Projection, Perspective Projections Clipping.

Visible Surface Detection Methods: Classification, back-face detection, depth-buffer, scan-line, depth sorting, BSP-tree methods, Area Sub-division and Octree methods

UNIT -V Computer Animation: Design of Animation Sequence, General Computer Animation Functions, Raster Animation, Computer Animation Languages, Key Frame, Motion Specifications. Introduction to Multimedia.

TEXT BOOKS:

1 Computer Graphics C version, Donald Hearn, M.Pauline Baker, Pearson

2. Z. Xiang, R. Plastock – "Schaum's outlines Computer Graphics (2nd Ed.)" – TMH

REFERENCE BOOKS:

1. Computer Graphics Principles & practice, 2/e, Foley, VanDam, Feiner, Hughes, Pearson.

2. Computer Graphics, Zhigandxiang, Roy Plastock, Schaum's outlines, 2/E, TMH.

3. Procedural elements for Computer Graphics, David F Rogers, 2/ e, TMH.

4 Principles of Interactive Computer Graphics, Neuman, Sproul, TMH

5. Principles of Computer Graphics, ShaliniGovil, Pai, 2005, Springer

B. TECH 5th SEMESTER	L	T	P	C
	3	-	-	3
PROFESSIONAL ELECTIVE-I 20CS5E02- THEORY OF COMPUTATION				

COURSE OUTCOMES:

1. Show the concept of abstract machines and their power to recognize the languages. (K2)
2. Develop finite state machines for modelling and solving computing problems. (K3)
3. Show context free grammars for formal languages.(K2)
4. Distinguish between decidability and undecidability.(K2)
5. Compute with mathematical tools and formal methods to gain proficiency.(K3)

UNIT-I:

Introduction to Finite Automata: Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems.

Deterministic Finite Automata: Definition of DFA, How A DFA Process Strings, The language of DFA.

Nondeterministic Finite Automata: Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions Conversion of NFA with €-transitions to NFA without €-transitions. Conversion of NFA to DFA, Moore and Melay machines

UNIT-II

Regular Expressions: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.

Pumping Lemma for Regular Languages: Statement of the pumping lemma, Applications of the Pumping Lemma.

UNIT-III

Context-Free Grammars: Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Sentential Forms, Parse Tress, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages.

Push Down Automata: Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state, Acceptance by empty stack, Deterministic Pushdown Automata. From CFG to PDA, From PDA to CFG.

UNIT-IV

Normal Forms for Context- Free Grammars: Eliminating useless symbols, Eliminating €-Productions. Chomsky Normal form Griebech Normal form.

Pumping Lemma for Context-Free Languages: Statement of pumping lemma, Applications

Turing Machines: Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine

UNIT-V

Types of Turing machine: Turing machines and halting

Undecidability: Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines, Recursive languages, Properties of recursive languages, Post's Correspondence Problem, Counter machines.

TEXT BOOKS:

1. Introduction to Automata Theory, Languages, and Computation, 3nd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Theory of Computer Science – Automata languages and computation, Mishra and Chandrashekaran, 2nd edition, PHI.

REFERENCE BOOKS:

1. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
2. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
3. A Text book on Automata Theory, P. K. Srimani, Nasir S. F. B, Cambridge University Press.
4. Introduction to the Theory of Computation, Michael Sipser, 3rd edition, Cengage Learning.
5. Introduction to Formal languages Automata Theory and Computation Kamala Krithivasan, Rama R, Pearson.

B. TECH 5th SEMESTER	L	T	P	C
	3	-	-	3
PROFESSIONAL ELECTIVE-I 20CS5E03- BLOCK CHAIN TECHNOLOGIES				

Course Outcomes (COs):

At the end of this course students will be able to..

1. Describe the basic concepts and technology used for blockchain.
2. Describe the primitives of the distributed computing and cryptography related to blockchain.
3. Illustrate the concepts of Bitcoin and their usage.
4. Implement Ethereum block chain contract.
5. Apply security features in blockchain technologies.

UNIT-I

Introduction: Need for Distributed Record Keeping, Modeling faults and adversaries, Byzantine Generals problem, Consensus algorithms and their scalability problems, Nakamoto's concept with Blockchain based cryptocurrency,Technologies Borrowed in Blockchain – hash pointers, consensus, byzantine fault-tolerant distributed computing, digital cash etc

UNIT-II

Basic Distributed Computing & Crypto primitives:
Atomic Broadcast, Consensus, Byzantine Models of fault tolerance, Hash functions, Puzzle friendly Hash, Collison resistant hash, digital signatures, public key crypto, verifiable random functions, Zero-knowledge systems

UNIT-III

Bitcoin basics:

Bitcoin blockchain, Challenges and solutions, proof of work, Proof of stake,alternatives to Bitcoin consensus, Bitcoin scripting language and their use

UNIT IV

Ethereum basics:
Ethereum and Smart Contracts, The Turing Completeness of Smart Contract Languages and verification challenges, using smart contracts to enforce legal contracts, comparing Bitcoin scripting vs. Ethereum Smart Contracts, writing smart contracts using Solidity & JavaScript

UNIT V

Privacy, Security issues in Blockchain:
Pseudo-anonymity vs. anonymity, Zcash and Zk-SNARKS for anonymity preservation, attacks on Blockchains: Sybil attacks, selfish mining, 51% attacks advent of algorand; Sharding based consensus algorithms to prevent these attacks

List of References:

1. Narayanan, Bonneau, Felten, Miller and Goldfeder, "*Bitcoin and Cryptocurrency Technologies – A Comprehensive Introduction*", Princeton University Press.
2. Josh Thompson, '*Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technologyand Blockchain Programming'*, Create Space Independent Publishing Platform, 2017.
3. Imran Bashir, "*Mastering Blockchain: Distributed ledger technology, decentralization, andsmart contracts explained*", Packt Publishing.
4. Merunas Grincalaitis, "*Mastering Ethereum: Implement Advanced Blockchain ApplicationsUsing Ethereum-supported Tools, Services, and Protocols*", Packt Publishing.
5. Prof. Sandip Chakraborty, Dr. Praveen Jayachandran, "*Blockchain Architecture Design AndUse Cases*"[MOOC], NPTEL: https://nptel.ac.in/courses/106/105/106105184/

B. TECH 5th SEMESTER	L	T	P	C
	3	-	-	3
PROFESSIONAL ELECTIVE-I 20CS5E04- ADVANCED DATA STRUCTURES				

COURSE OUTCOMES:

At the end of the course student are able to:

1. Illustrate several sub-quadratic sorting algorithms. (K4)
2. Observe and demonstrate various hashing methods. (K2)
3. Apply advanced data structures such as priority queues, Heaps.(K3)
4. Organize to show various search trees.(K4)
5. Develop advanced data structures and its applications(K3)

UNIT – I

INTRODUCTION:

The String Abstract Data Type-Introduction-Pattern Matching: Brute force, Boyer-More and Knuth-Morries - Prath Algorithms. Sorting: Medians and order Static, External Sorting, Introduction, K-way Merging, Buffer Handling for parallel Operation, Run Generation, Optimal Merging Runs.

UNIT – II

HASHING: Hashing - Basic Hashing- Perfect Hashing –Universal Hashing. Static Hashing, Hash Table, Hash Functions, Secure Hash Function, Overflow Handling, Theoretical Evaluation of Overflow Techniques, Dynamic Hashing- Motivation for Dynamic Hashing, Dynamic Hashing Using Directories, Directory less Dynamic Hashing, Alternate hash functions (mid-square, folding, digit analysis).

UNIT – III

PRIORITY QUEUES AND ADVANCE HEAPS: Priority Queues and Advance Heaps: Double Ended Priority queues, Leftist Trees: Height Biased, Weight Biased. Binomial Heaps: Cost Amortization, Definition of Binomial Heaps, Insertion, Melding two Binomial Heaps, deletion of min element. Fibonacci Heaps: Definition, Deletion from an F-heap, Decrease key, Cascading Cut.

UNIT – IV

ADVANCED SEARCH TREES I: Advanced and Efficient Binary Search Trees: Optimal Binary Search Trees, AVL Trees- rotations, insertion, deletion operations, Red-Black Trees-Definition, Representation, Searching, Insertion, Deletion, Joining, Splitting operations. Multi-way Search Trees: M-Way Search Trees, Definition and Properties, Searching an M-Way Search Tree.

UNIT – V

ADVANCED SEARCH TREES II AND APPLICATIONS: Digital Search Structures: Digital Search Trees: Definition, Search, Insert and Delete, B and B+ Tree - Searching - Insertion - Removal - Amortized analysis of B trees - B+ tree. Tries-Insertion-Searching-Deletion-Complexity-Compact trie-Patricia-Suffix tree. Applications-Block Chains, Digital Signature, Data Science, Cloud and IOT, Databases - Database Problems - B trees in databases and file systems.

TEXT BOOKS:

1. Horowitz, Sahani, Anderson-freed, "Fundamentals of Data Structures in C", 2nd edition, Universities Press,2011.
2. Richard F Gilberg, Behrouz A Forouzan, "Data Structures a Pseudo code Approach with C", 2nd edition Cengage, 2005.
3. Suman Saha, Shailendra Shukla, "Advanced Data Structures: Theory and Applications", CRC Press Taylor & Francis 2020.

REFERENCE BOOKS:

1. Mark Allen Weiss, Pearson, Data structures and Algorithm Analysis in C, 2nd edition,Tata McGraw Hill, 2000.
2. T. Cormen, R.Rivest, C. Stein, C. Leiserson, Introduction to Algorithms, Second Edition ,PHI publication, 2004.

e-Resources:

1. Web: http://lcm.csa.iisc.ernet.in/dsa/dsa.html
2. http://utubersity.com/?page_id=878
3. http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures
4. http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms
5. https://nptel.ac.in/courses/106/102/106102064

V SEMESTER (OPEN ELECTIVE –I)	L	T	P	C
	3	-	-	3
20EE5O01 - NON-CONVENTIONAL ENERGY SOURCES				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Analyze solar radiation data and solar thermal systems (k4)
CO2	:	Identify the methods and analysis of wind energy generation systems (k3)
CO3	:	Explain the biomass and geothermal energy, its mechanism of production and its applications (k2)
CO4	:	Explain basic principle and working of hydro, tidal energy systems. (k2)
CO5	:	Explain basics of Chemical Energy Sources(k2)

SYLLABUS

UNIT-I	**:**	**Solar Energy:**
Introduction - Renewable Sources - prospects, Solar radiation at the Earth Surface - Equivalent circuit of a Photovoltaic (PV) Cell - I-V & P-V Characteristics - Solar Energy Collectors: Flat plate Collectors, concentrating collectors - Solar Energy storage systems and Applications: Solar Pond - Solar water heating - Solar Green house.		
UNIT-II	**:**	**Wind Energy**:
Introduction - basic Principles of Wind Energy Conversion, the nature of Wind - the power in the wind - Wind Energy Conversion - Site selection considerations - basic components of Wind Energy Conversion Systems (WECS) - Classification - Applications.		
UNIT-III	**:**	**Biomass and Geothermal Energy:**
Introduction - Biomass conversion technologies - Photosynthesis, factors affecting Bio digestion - classification of biogas plants - Types of biogas plants - selection of site for a biogas plant **Geothermal Energy**: Introduction, Geothermal Sources – Applications - operational and Environmental problems		
UNIT-IV	**:**	**Energy From hydro, oceans, Waves & Tides:**
Hydro: Basic working principle – classification of hydro – types of turbines **Oceans:** Introduction - Ocean Thermal Electric Conversion (OTEC) – methods - prospects of OTEC		

in India.

Waves: Introduction - Energy and Power from the waves - Wave Energy conversion devices.

Tides: Basic principle of Tide Energy -Components of Tidal Energy.

UNIT-V	**:**	**Chemical Energy Sources:**

Fuel Cells: Introduction - Fuel Cell Equivalent Circuit - operation of Fuel cell - types of Fuel Cells - Applications.

Hydrogen Energy: Introduction - Methods of Hydrogen production - Storage and Applications

Magneto Hydro Dynamic (MHD) Power generation: Principle of Operation - Types.

TEXT BOOKS:

1. G.D.Rai, Non-Conventional Energy Sources, Khanna Publications, 2011.
2. John Twidell& Tony Weir, Renewable Energy Sources, Taylor & Francis, 2013.

REFERENCE BOOKS:

1. S.P.Sukhatme&J.K.Nayak, Solar Energy-Principles of Thermal Collection and Storage, TMH, 2011.
2. John Andrews & Nick Jelly, Energy Science- principles, Technologies and Impacts, Oxford, 2nd edition, 2013.
3. Shoba Nath Singh, Non- Conventional Energy Resources, Pearson Publications, 2015.

V SEMESTER (OPEN ELECTIVE –I)	L	T	P	C
	3	-	-	3
20ME5O01 - WASTE TO ENERGY CONVERSION				

COURSE OBJECTIVES

1. To enable students to understand of the concept of waste to energy.
2. To link technical and management principles for production of energy from waste.
3. To learn about the best available technologies for waste to energy.
4. To facilitate the students in developing skills in the decision-making process.

COURSE OUTCOMES: Students are able to

CO1. Describe of the concept of waste to energy, classifications and principles. [K2]
CO2. Explain management principles for production of energy from waste. [K2]
CO3. Explain the best available technologies for waste to energy. [K2]
CO4. Describe the waste to energy options landfill gas, and energy from plastics.[K2]
CO5. Apply the knowledge in planning and operations of waste to energy plants [K3]

UNIT-I INTRODUCTION

Waste - types of waste, Principles of waste management, Waste utilization, Waste management hierarchy, 3R Principle of Reduce, Reuse and Recycle, Waste as a resource, alternate energy source.

UNIT-II WASTE SOURCES & CHARACTERIZATION

Source of waste, Waste production in different sectors such as domestic, industrial, agriculture, postconsumer waste etc, Waste management tools and techniques for reducing waste segregation and scientific disposal, Characterization of waste for energy utilization, Waste selection criteria.

UNIT-III TECHNOLOGIES FOR WASTE TO ENERGY

Energy biochemical conversion – energy production from organic waste through anaerobic digestion, fermentation, Thermo-chemical conversion – combustion, incineration, heat recovery, pyrolysis, gasification, plasma arc technology, other newer technologies, Case studies.

UNIT-IV WASTE TO ENERGY OPTIONS

Waste to energy options - landfill gas, methane emission, collection and recovery, Refuse Derived Fuel (RDF), Fluff, Briquettes, Pellets, Alternate Fuel Resource (AFR) – production and use in cement plants, Energy from plastic wastes, Non-recyclable plastic wastes for energy recovery, Energy recovery from wastes and optimization of its use, Energy analysis.

UNIT-V WASTE TO ENERGY PLANTS & ENVIRONMENTAL IMPLICATIONS

Wasteto Energy Plants: Waste management activities – collection, segregation, transportation and storage requirements, Location and Site of waste to energy plants.

Environmental Implications: Environmental impact of waste to energy, Safety and environmental standards, Savings on non-renewable fuel resources, Carbon credits and its types.

TEXT BOOKS:

1. Marc Rogoff Francois Screve, Waste-to-Energy, 3rd Edition, William Andrew, 2019.
2. B.T. Nijaguna, Biogas Technology, 1st Edition, New Age International Pvt. Ltd, 2002.

REFERENCE BOOKS:

1. Vishal Prasad, BarkhaVaish, Advances in Waste-to-Energy Technologies, 1st Edition, CRC Press, 2019.
2. Dev Vrat Kamboj, Manoj Kumar Solanki, Waste to Energy: Prospects and Applications, 1st Edition, Springer, 2021.
3. P. Jayarama Reddy, Energy Recovery from Municipal Solid Waste by Thermal Conversion Technologies, 1st Edition, CRC Press/ Balkema, 2016.

WEB REFERENCE:

1. https://archive.nptel.ac.in/courses/103/107/103107125/

V SEMESTER (OPEN ELECTIVE –I)	L	T	P	C
	3	-	-	3
20CS5O01 - INTERNET OF THINGS AND APPLICATIONS				

Course Outcome:

At the end of the course students are able to

1. Explain Arduino IDE tool and Arduino Programming concept.
2. Illustrate concept hardware configuration with Firmata protocols.
3. Explain the knowledge Arduino pin configuration.
4. Differentiate various sensors configuration and workflows.
5. Define architecture of IoT.

UNIT-I (Introduction to Arduino)

Introduction to Arduino, history of Arduino, variants, Uno board block diagram, installation of Arduino, Arduino IDE, Arduino programming, functions and statements.

UNIT-II (Configuration)

Connecting Arduino borad, introducing the Firmata Protocol, uploading a Firmata sketch to the Arduino board, testing the Firmata protocol.

UNIT-III (Components)

List of components, software flow design, hardware flow design, hardware prototyping software, designing the hardware prototype, Arduino sketch default functions and custom function, setting Arduino board, pin configuration, working with pins.

UNIT-IV (Prototype)

Potentiometer-continuous observation from an analog input connection, Buzzer-generating sound alarm pattern, DC motor-controlling motor speed using PWM, LED- controlling LED brightness using PWM, Servomotor- moving the motor to a certain angle.

UNIT-V (Networking and cloud)

Arduino and computer networking, networking fundamentals, Obtaining the IP address, Networking extensions for Arduino with libraries and class, architecture of IoT web applications, IoT cloud platforms, develop cloud-based IoT applications.

Textbooks:

1. Python programming for Arduino by Pratik desai, Packt Publishing.
2. Internet of Things with Arduino Cookbook by Marco Schwartz.
3. Introduction to Arduino by Alan G. Smith.

References

1. Beginning Arduino by Michael McRoberts, 2e.
2. Getting Started with Arduino Massimo Banzi Second Edition.

V SEMESTER (OPEN ELECTIVE –I)	L	T	P	C
	3	-	-	3
20CS5O02 - DATA ENGINEERING				

Course Outcomes:

Student able to state and analyze:

1. Preprocessing techniques for various datasets,
2. Standard database systems concepts like tables, relations, query,NoSQL
3. Information retrieval techniques such as **Relevance Ranking,Indexing etc**
4. Data processing algorithms and data structures
5. Visualization techniques like Table, graph, histogram, pie-chart

UNIT- I:

Data Engineering: introduction, importance of data engineering, Data engineering vs data science
Data Collection: Various sources of data, types of data: text, video, audio, biology etc.
Data Preprocessing: data Cleaning: missing values, noise elimination, data integration, data transformation: Normalization, Data Reduction: data cube aggregation, dimensionality reduction.

UNIT-II

Data bases: Database Schema, ER diagram, introduction to SQL, functions and stored procedures, indexing: B+tree index files, data base system architecture: Client-Server Architecture, introduction to MongoDB,
NoSQL: The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Standard Model, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL

UNIT-III

Information Retrieval: Relevance Ranking Using Terms, Relevance Using Hyperlinks, Synonyms, Homonyms, and Ontologies, Indexing of Documents, Measuring Retrieval Effectiveness, Crawling and Indexing the Web, Information Retrieval: Beyond Ranking of Pages, Directories and Categories

UNIT-IV

Data Analysis: correlation analysis: bivariate correlation, partial correlation, correlation coefficients.
Regression: simple linear regression, multiple linear regression, principal component analysis, analysis of variance

UNIT- V

Data Visualization: Table, graph, histogram, pie-chart, area-plot, box-plot, scatter-plot, bubble-plot, waffle charts, word clouds.

Text Books:

1. Data mining concepts and techniques Jiawei Han and Micheline Kamber (UNIT-I)
2. Silberschatz, Korth, Sudarshan, "Database System Concepts" McGraw Hill Education, Sixth edition, 2010, ISBN-13: 978-9332901384 (UNIT-II, UNIT-III)
3. "NoSQL distilled" A Brief Guide to the Emerging World of Polyglot Persistence Pramod J. Sadalage Martin Fowler, Addison Wesley (UNIT-II)
4. correlation and regression analysis by Dr. Mohamed Ahmed Zaid (UNIT-IV)

Reference Books:

1. Brian Shive, "Data Engineering: A Novel Approach to Data Design", Technics Publications, 2013. ISBN-13: 978-1935504603.
2. Joel Grus, "Python Data Science Handbook: Essential Tools for Working with Data", 1st Edition, O'Reilly, 2016. ISBN-13: 978-9352134915.

Web links:

https://chartio.com/learn/charts/essential-chart-types

V SEMESTER (OPEN ELECTIVE –I)	L	T	P	C
	3	-	-	3
20BM5O01 - INNOVATIONS AND ENTREPRENEURSHIP				

UNIT-I INNOVATION MANAGEMENT: Concept–Objectives-types of Innovation process of Innovation-sources of Innovation-Levels of Innovation -barriers of Innovation-– Open and Closed Innovation-challenges faced while managing innovation.

UNIT-IICREATIVE INTELLIGENCE: Concept of Creativity-Importance Characteristics-Types of Creativity-Traits Congenial to Creativity-Triarchic theory of Intelligence – Creative thinking –Types-process of creative thinking-Sources and techniques for generating ideas.

UNIT-III ENTREPRENEURSHIP: Concept- characteristics-Importance classification-Theories of Entrepreneurship-entrepreneurship development-entrepreneurial process- challenges-Women Entrepreneurs.

UNIT-IVPROJECT FORMULATION AND APPRAISAL: Concept -Need Significance-steps - Economic Analysis; Financial analysis; Market analysis; Technical feasibility-project Appraisal-techniques of project appraisal.

UNIT-V INSTITUTIONS PROMOTING SMALL BUSINESS ENTERPRISES: Central level Institutions; SIDBI, NSIC, KVIC,SSIDC - State level Institutions- DICs – SFC SSIDC- other financial assistance, Government policy and taxation benefits- government policy for SSIs

TEXT BOOKS:

1. Vasanth Desai, –Entrepreneurship, Himalaya Publishing House, New Delhi, 2012 2. Arya Kumar: –Entrepreneurship, Pearson, Publishing House, New Delhi, 2012. 3. Keith Goffin and Rick Mitchell-Innovation Management,Springer,2016

REFERENCES BOOKS:

1. Pradip N Khandwalla, Lifelong Creativity, An Unending Quest, Tata McGraw Hill, 2004.
2. Vinnie Jauhari, SudanshuBhushan, Innovation Management, Oxford Higher Education, 2014

V SEMESTER (OPEN ELECTIVE –I)	L	T	P	C
	3	-	-	3
20BM5O03 - DIGITAL MARKETING				

UNIT I- Introduction to Digital Marketing: Concept – scope- importance of digital marketing - Traditional marketing versus digital marketing – Types of digital marketing marketing mix and its implications for digital marketing--Challenges and opportunities for digital marketing

UNIT II- Content Marketing: Understanding Content Marketing, Content Creation Framework, Content marketing strategy and planning- Types of content marketing - Measuring and Analyzing Your Content-Viral Marketing-Blog Marketing.

Unit III- Search Engine Optimization (SEO): What is SEO? SEO Importance and Its Growth in recent years, Ecosystem of a search Engine , kinds of traffic, Keyword Research & Analysis (Free and Paid tool & Extension), Recent Google Updates

UNIT IV-Email and Mobile Marketing: Introduction, process, design, content, email marketing metrics. Mobile Marketing: Concept, Process-tools-opportunities and challenges.

UNIT V-Social Media Marketing: Concepts- Process - Tools- Google and the Search Engine, Facebook, Twitter, YouTube and LinkedIn- Issues: Credibility, Fake News, Paid Influencers; social media and Hate/ Phobic campaigns.

TEXT BOOKS:

1.Puneet Singh Bhatia, “Fundamentals of Digital Marketing”, Pearson Education Publications, 2nd edition 2019

2. Seema Gupta, “Digital Marketing”, McGraw Hill Publications”, 2nd edition 2020 3.Ryan Deiss, Russ Henneberry, “Digital Marketing For Dummies”, Wiley Publications, 2020

REFERENCES BOOKS:

1. Joe Pulizzi, “Epic Content Marketing”, McGraw Hill Education, 2019 2. Puneet Singh Bhatia , “Social Media & Mobile Marketing”, Wiley Publications, 2019

V SEMESTER (OPEN ELECTIVE –I)	L	T	P	C
	3	-	-	3
20BM5O04 - BUSINESS ENVIRONMENT				

Unit-I Business Environment: Components and Significance – Economic Scope – Factors Influencing Business Environment – Dimensions of International Business Environment – Challenges.

Unit-II: Structure of Indian Economy: Economic systems- Economic planning with special reference to last three plans, public, private joint and cooperative sectors - Industrial Policy - Policy Resolutions of 1991- Economic Reforms-PPP

Unit-III Indian Business Environment: Competitiveness, Changes and Challenges, Sustainable Development, Social Responsibilities, Ethics in Business- Competition Act 2002 - Emerging Trend in Indian Business Environment

Unit-IV: International Trade: Balance of Payments – Concepts, Disequilibrium in BOP: Methods of Correction - Trade Barriers and Trade Strategy - Free Trade vs. Protection - World Financial Environment: Foreign Exchange Market Mechanism, Exchange Rate Determination, and Euro Currency.

Unit-V: Globalization: International Economic Integration, Country Evaluation and Selection, Foreign Market Entry Methods, International Trading Blocks – WTO Origin, Objectives, Organisation, Structure and Functioning – WTO and India.

TEXT BOOKS:

1. Chidambaram, Indian Business Environment, Vikas, New Delhi

2. Suresh Bedi: Business Environment, Excel, New Delhi.

3. K.V.Sivayya and VBM Das: Indian Industrial Economy, Sultan Chand Publishers, Delhi.

REFERENCES BOOKS:

1. Pandey G.N., Environmental Management, Vikas Publishing House.

2. Sundaram& Black, International Business Environment – The Text and Cases, Prentice Hall of India.

3. Ghosh PK., Business Environment,Sultan Chand & Sons, New Delhi

4. Daniel John D and Redebough, Lee. H., International Business, AddisionWesley India

5. Saleem, Business Environment, Pearson, New Delhi.

6. Bhalla, V.K., & S. Sivaramu, International Business Environment and Business, Annual Publications

V SEMESTER (JOB ORIENTED ELECTIVE-I)	L	T	P	C
	3	-	-	3
20IT5J01 - LINUX ADMINISTRATION				

Course Outcomes:

At the end of the course, the students will be able to:

1. Use various Linux commands that are used to manipulate system operations at admin level.

2. Write Shell Programming using Linux commands.

3. Design and write application to manipulate internal kernel level Linux File System.

4. Explain the user, group and storage management.

5. Configure SSH client and server.

UNIT – I

Introduction To Linux And Linux Utilities: A brief history of LINUX, architecture of LINUX, features of LINUX, introduction to vi editor. Linux commands- PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip, unlink, du, find, unmask, ulimit, ps, finger, tail, head, sort, nl, uniq, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, cpio, apt.

UNIT – II

Introduction to Shells: Linux Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell/Environment Customization.

Filters: Filters and Pipes, Concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Files with Duplicate Lines, Count Characters, Words or Lines, Comparing Files.

UNIT - III

Grep: Operation, grep Family(grep, egrep, fgrep), Searching for File Content.

Sed: Scripts, Operation, Addresses, commands, Applications, grep and sed.

Unix File Structure: Introduction to UNIX file system, inode (Index Node), file descriptors, system calls and device drivers.

UNIT – IV

User and Group Management: User accounts, local groups and group memberships, Configure networking and hostname resolution statically or dynamically, start, stop, and check the status of network services and network related commands.

Storage Management: List, create, delete, and modify physical storage partitions and tools

UNIT – V

Configuring SSH: Enabling the SSH Server, Using the SSH Client, Configuring Key- Based SSH Authentication, Using Graphical Applications with SSH.

Practical Learning: Installation of Any open source Linux Distribution, AWS Instance Creation and Learn How to Access through SSH.

TEXT BOOKS:

1. W. Richard. Stevens, Advanced Programming in the UNIX Environment, 3rd edition,

Pearson Education, New Delhi, India.

2. Behrouz A. *Forouzan, Richard F. Gilberg,* Unix and shell Programming Thomson

REFERENCES:

1. *Robert Love, O'Reilly*, Linux System Programming, SPD.

2. *W.R.Stevens*, Advanced Programming in the UNIX environment, 2nd Edition, PearsonEducation.

3. *W.R. Stevens*, UNIX Network Programming, PHI.

4. *Graham Glass, King Ables*, UNIX for Programmers and Users, 3rd Edition, Pearson Education.

V SEMESTER (JOB ORIENTED ELECTIVE-I)	L	T	P	C
	3	-	-	3
20CS5J01 - FULL STACK WITH JAVA				

COURSE OUTCOMES:

At the end of the course, the student should be able to:

1.Develop simple web pages using markup languages like HTML and CSS.(K3)

2. Organize dynamic web pages using DHTML and java script that is easy to navigate and use.(K2)

3.Develop web pages using AngularJS. .(K3)

4.Develop web applications using Servlet and JSP. .(K3)

5.Summarize various operations on Mongo Database. .(K2)

UNIT-I:

HTML: An Introduction to HTML, Basic XHTML Syntax and Semantics, Basic HTML Elements: Images, Links, Lists, Tables, Forms, Frames, Division and Spanning, HTML 5.0.

CSS: Levels of Style sheets, Style specification formats, Selector forms, CSS Colors and Backgrounds,CSS Text and Font Properties, The Box Model, CSS Margins, Padding, and Borders Conflict Resolution.

UNIT-II:

Client-Side Scripting using Java Script and DOM

Java Script: The Basics of Java Script, Objects, Primitive operations and Expressions, Screen output and Keyboard input, Control statements, Object Creation and modification, Arrays, functions, Constructors, Pattern matching using Regular Expressions, DHTML: Positioning moving and Changing Elements.

DOM: Introduction to the Document Object Model DOM, HTML DOM Event Handling, Modifying Element Style, Document Tree, DOM Event Handling

UNIT-III:

Angular JS

Introduction to AngularJS: Expressions, Modules, Data Binding, Scopes, Directives & Events, Controllers, Filters, Services, HTTP, Tables, Select, Fetching Data from MySQL.

UNIT-IV:

Servlet and JSP

Servlet: Servlet Basics, Need of Server Side Programming,Servlet Life Cycle, Servlet Hello World Application, Web.xml Structure, Servlet Directives-include (), forward(), sendRedirect(), HttpServletRequest and HttpServlet Response in Servlet, Servlet and JDBC Integration.

JSP: JSP Basics, JSP Scripting Elements (Declaration, Expression, Scriptlet), Directive Elements (page,include,taglib) , Action Elements (jsp:forward, jsp: include,jsp:useBean), JSP Implicit Objects.

UNIT-V

Mongo DB: Introduction to Mongo DB, Mongo DB Environment, Create Database, Drop Database, Create Collection, Drop Collection, Read Operations, Write Operations.

TEXT BOOKS:

1. Programming the World Wide Web, Robet W Sebesta, 7ed, Pearson.
2. Web Technologies, Uttam K Roy, Oxford
3. Head First Servlet and JSP
4. Node.js, MongoDB, and AngularJS Web Development by Brad Dayley

REFERENCE BOOKS:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
2. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage
3. Pro Angular JS by Adam Freeman
4. MEAN Web Development by Amos Q. Haviv

V SEMESTER	L	T	P	C
	-	-	3	1.5
20CS5L01-COMPUTER NETWORKS LAB				

COURSE OUTCOMES:

At the end of this course, students are able to

1.Show and practice various networking commands. (K2)
2 .Discover and implement different network cables.. (K2)
3. Illustrate various networking commands in packet trace software.(K4)
4.Show configuration of a network using packet trace software.(K2)
5. Observe various routing algorithms using packet tracer.(K2)

LIST OF PROGRAMS:

1. Study of Networking Commands (Ping, Tracert, TELNET, nslookup, netstat, ARP) and Network Configuration Files.
2. Study of different types of network cables and practically implement the cross wired cable and straight through cable using crimping tool
3. Implementing Data link layer farming methods such as bit stuffing and character stuffing.
4. Connect the computers in LAN network
5. Study and practice basic network command and network configuration commands using packet tracer
6. Performing initial Switch and Router configuration using packet tracer
7. Configure a network topology using packet tracer software using two different networks
8. Configure a network topology using RIP protocol
9. Configure a network topology using link state vector routing protocol
10. Observing static routing and dynamic routing using packet tracer
11. Static NAT configuration using cisco packet tracer

V SEMESTER	L	T	P	C
	-	-	3	1.5
20CS5L02- DATA SCIENCE LAB				

COURSE OUTCOMES:

Upon completion of the course, the students will be able to

1. Develop the relevant programming abilities. (K3)
2. Infer knowledge of statistical data analysis techniques(K2)
3. Estimate proficiency to build and assess data-based models. (K2)
4. Illustrate data management & processing tasks using Python(K4)
5. Apply data science concepts and methods to solve problems in real-world contexts and communicate solutions effectively(K3)

NUMPY:

Practical Component:

1. Create NumPy arrays from Python Data Structures, Intrinsic NumPy objects and Random Functions.
2. Manipulation of NumPy arrays- Indexing, Slicing, Reshaping, Joining and Splitting.
3. Computation on NumPy arrays using Universal Functions and Mathematical methods.
4. Import a CSV file and perform various Statistical and Comparison operations on rows/columns.
5. Load an image file and do crop and flip operation using NumPy Indexing

PANDAS

1. Create Pandas Series and Data Frame from various inputs.
2. 2. Import any CSV file to Pandas Data Frame and perform the following:
   (a) Visualize the first and last 10 records
   (b) Get the shape, index and column details
   (c) Select/Delete the records(rows)/columns based on conditions.
   (d) Perform ranking and sorting operations.
   (e) Do required statistical operations on the given columns.
   (f) Find the count and uniqueness of the given categorical values.
   (g) Rename single/multiple columns.

DATA CLEANING, PREPARATION AND VISUALIZATION

1.Import any CSV file to Pandas Data Frame and perform the following:

(a) Handle missing data by detecting and dropping/ filling missing values.

(b) Transform data using apply () and map () method. (c) Detect and filter outliers.

(d) Perform Vectorized String operations on Pandas Series.

(e) Visualize data using Line Plots, Bar Plots, Histograms, Density Plots and Scatter Plots.

REGRESSION AND PREDICTION

1. Create a Linear Regression model for a dataset and display the error measures
2. Chose a dataset with categorical data and apply linear regression model

CLASSIFICATION

1. Apply Naïve Bayes algorithm on a dataset and estimate the accuracy
2. Apply Logistic Regression algorithm on a dataset and estimate the accuracy

V SEMESTER	L	T	P	C
	1	-	2	2
20HS5S01- ADVANCED COMMUNICATION SKILLS LAB				

COURSE OUTCOMES:

At the end of the course students will be able to

1. Show to gather ideas and organize information relevantly and coherently.(K2)
2. Prepare group discussions and face interviews with confidence.(K3)
3. Observe Resume with covering letter.(K2)
4. Review and prepare to make oral presentations and public speaking.(K2)
5. Differentiate social and professional communication. (K2)

The following course content is prescribed for the **Advanced English Communication Skills Lab:**

UNIT- I

Communication Skills

- Introduce Yourself
- JAM
- J2M

➢ Identifying one's career objective, projecting strengths and skills, organization of ideas within given time.

UNIT-II

Interaction Skills

- Body Language
- Role- Plays

➢ Students start a conversation - Respond appropriately and relevantly in different situations with right body language.

UNIT-III

Oral Skills

- Presentations
- Public Speaking

➢ Planning preparation and presentation - organization of ideas with clarity , coherence and style.

UNIT-IV

Writing Skills

- Covering Letter
- Resume Writing

➢ To communicate the ideas relevantly and coherently in writing.

UNIT-V

Team Work Skills

- Group Discussion

➢ Dynamics of Group Discussion - Modulation of voice, Body language, relevance, fluency and coherence.

UNIT VI

Interview Skills

- Pre-interview planning, opening strategies, answering strategies, interview through tele and video conference.

Reference Books:

1. Ashraf Rizvi- Effective Technical Communication - McGraw Hill Education- 2017.

2. Madhavi Apte - A Course in English Communication – Prentice - Hall of India- 2007.

3. Dr. Shalini Verma - Body Language – Your Success Mantra- S. Chand- 2006.

4. Sunita Mishra & C. Murali Krishna- Communication Skills for Engineers - Pearson Education - 2007.

V **SEMESTER**	**L**	**T**	**P**	**C**
	2	**-**	**-**	**-**
20BM5M01 – ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE				

UNIT-I:

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge

UNIT-2:

Protection of traditional knowledge: The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

UNIT-3:

Legal framework and TK: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016.

UNIT-4:

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge

UNIT-5:

Traditional Knowledge in Different Sectors: Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK

Text books:

1. Traditional Knowledge System in India, by Amit Jha, 2009.

Reference Books:

1. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.
2. "Knowledge Traditions and Practices of India" Kapil Kapoor1, Michel Danino2.

Web Links:

1.https://www.youtube.com/watch?v=LZP1StpYEPM
2.http://nptel.ac.in/courses/121106003/

V **SEMESTER**	**L**	**T**	**P**	**C**
	2	**-**	**-**	**1.5**
20CS5I01 – INTERNSHIP I				

COURSE OUTCOMES:

1.Identify theory and practical knowledge.(K2)
2. Develop work habits and attitudes necessary for internship success.(K3)
3. Discover communication ,interpersonal and other critical skills in the internship process.(K2)
4.Practice wite down and carry out performance objectives related to their task assignment.(K3)

VI **SEMESTER**	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**
20CS6T01- COMPILER DESIGN				

COURSE OUTCOMES:

At the end of the course students are able to

1. Apply language processors with its phases and demonstrate about scanning of tokens.(K3)
2. Identify the syntax analysis by using parsing techniques(K2)
3. Discover and perform Semantic analysis using attribute grammar(K2)
4. Compare different memory Management techniques in runtime environment(K2)
5. Ask various optimization techniques for intermediate code forms and code generation.(K2)

UNIT 1:

Overview of language processing: – preprocessors–compiler–assembler–Linkers &loaders, difference between compiler and interpreter- structure of a compiler –phases of a compiler. **Lexical Analysis**: - Role of Lexical Analysis – Input Buffering – Specification of Tokens – Recognition of Token – The Lexical Analyzer Generator Lex.

UNIT 2:

Syntax Analysis: – Role of a parser, Functions of parser, Context Free Grammar.**Top-Down Parsing**: – Recursive Descent Parsing — Non recursive Predictive Parsing- FIRST and FOLLOW – LL(1) Grammar – Error Recovery in Predictive Parsing.

UNIT 3:

Bottom-up Parsing: – Reductions–Handle Pruning - Shift Reduce Parsing - Introductionto simple LR – Why LR Parsers – Model of an LR Parsers — Construction of SLR Tables.

More powerful LR parsers: - Construction of CLR (1) - LALR Parsing tables.

UNIT 4

Runtime Environment: - Storage organization - Stack allocation–Static allocation - Heapmanagement - Parameter passing mechanisms.

Intermediate code: - DAG - Three address code–Quadruples - Triples - Indirect Triples.

UNIT 5

Common Optimization techniques : - Folding, Copy Propagation, Common Sub expression elimination, Frequency reduction, Strength reduction etc.

Machine dependent code optimization: - Peephole optimization–Register allocation -Instruction scheduling - Inter Procedural Optimization - Garbage collection via reference counting.

Text Books:

1.Compilers: Principles, Techniques and Tools: 2nd Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ulman; 2nd Edition, Pearson Education.

2.Modern Compiler Implementation in C- Andrew N. Appel, Cambridge University Press

References:

1. lex&yacc – John R. Levine, Tony Mason, Doug Brown, O‟reilly

2 . Modern Compiler Design- Dick Grune, Henry E. Bal, Cariel T. H. Jacobs, Wiley reamtech.

3. Engineering a Compiler-Cooper & Linda, Elsevier.

4. Compiler Construction, Louden, Thomson.

Principles of compiler design, V. Raghavan, 2nd ed, TMH, 2011

VI SEMESTER	L	T	P	C
	3	0	-	3
20CS6T02-OBJECT ORIENTED ANALYSIS AND DESIGN				

COURSE OUTCOMES:

At the end of the course students are able to

1. Identify the importance of modeling and object-oriented systems analysis and design. (K2)
2. Develop the basic structural modeling techniques using building blocks of UML. (K3)
3. Apply common modeling techniques for class and object diagrams. (K3)
4. Generalize the basic behavioral and advanced behavioral modeling diagrams. (K2)
5. Illustrate the components and deployment diagrams. (K4)

UNIT I

Introduction to UML: Importance of modeling, principles of modeling, object-oriented modeling, An Overview of the UML, A conceptual model of the UML, Architecture, Software Development Life Cycle.

UNIT II

Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. **Advanced Structural Modeling**: Advanced classes, advanced relationships.

UNIT III

Class & Object Diagrams: Terms and conceptsofClass Diagram, Terms and conceptsof**Object** Diagram, common modeling techniques for Class & Object Diagrams.

UNIT IV

Basic Behavioral Modeling: Interactions, Interaction diagrams, Use cases, Use case Diagrams, Activity Diagrams.

Advanced Behavioral Modeling: Events and signals, state machines, state chart diagrams.

UNIT V

Architectural Modeling: Components, Deployment, Component diagrams and Deployment diagrams.

AGILE PROCESSES

Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

TEXT BOOKS:

1. The Unified Modeling Language User Guide, Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education.

2. UML 2 Toolkit, Hans - Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, WILEY - Dreamtech India Pvt.

3.Agile and Iterative Development: A Manager_s Guide, Craig Larman ,Addison-Wesley.

REFERENCES:

Ref1: http://en.wikipedia.org/wiki/Software_development_process

Ref2: http://en.wikipedia.org/wiki/Rational_Unified_Process

Ref3: http://www.uml-diagrams.org/profile-diagrams.html

VI SEMESTER	L	T	P	C
	3	0	-	3
20CS6T03- MACHINE LEARNING				

COURSE OUTCOMES:

On completion of the course, the student will be able to

1. Observe the concepts and types of models in machine learning(K2)
2. Identify to reduce the dimension of the dataset using machine learning techniques(K2)
3. Apply to implement a classification model for any real scenario(K3)
4. Develop an unsupervised learning application using clustering techniques. (K3)
5. Predict methods of ensemble models by applications of ensemble learning. (K3)

UNIT-I:

INTRODUCTION TO MACHINE LEARNING:

What is machine learning, Problems Machine Learning Can Solve, Framework for developing Machine Learning Models, Examples of Machine Learning Applications - Learning Associations, Classification, Regression, Unsupervised Learning, and Reinforcement Learning

UNIT-II

DIMENSIONALITY REDUCTION*:*

Introduction, Feature Selection-Forward selection, Bidirectional Elimination, Principal Component analysis, L1 and L2 regularization, Linear Discriminant Analysis**,** Basics of t-SNE, Information value and Weight of evidence

UNIT-III:

CLASSIFICATION: What is Classification, General Approach to Classification, Multi-class classification, multi-label classification, Binary Classification, , Logistic Regression, Decision Trees,k-Nearest Neighbor Algorithm, Naive Bayesian Classifier and SVM classifier

MODEL METRICS: ROC Curves, Confusion matrix, Holdout Method, Cross Validation, Bootstrap

UNIT-IV

CLUSTERING: Basic Clustering Methods: Partitional Clustering, Hierarchical Clustering, K-Means Clustering. Expectation-Maximization (EM) Algorithm and Gaussian Mixtures Clustering

INTRODUCTION TO NEURAL NETWORKS: Neural Network Representations, Appropriate Problems for Neural Network Learning, Perceptrons, Multilayer Networks and the Back propagation Algorithm, Remarks on Back Propagation Algorithm,

UNIT-V

Ensemble Methods:

Introduction-What is Ensembling methods, Why Ensembling methods,, Applications of Ensemble methods, Boosting, Bagging, Combinational Methods-Benefits of combination, Averaging, Voting

TEXT BOOKS:

1.EthemAlpaydin, "Introduction to Machine Learning", 3rd edition, PHI,2014

2.Tom M. Mitchell,''Machine Learning'',MGH

REFERENCE BOOKS:

1.Zhi-Hua Zhou, "Ensemble Methods: Foundations and Algorithms", CRC Press, 2012

2.Andreas Muller, "Introduction to Machine Learning with Python: A Guide for Data Scientists", 1st Edition, O'Reilly, 2016

3..Applied Machine Learning, M. Gopal, McGraw Hill Education,2019

VI SEMESTER PPROFESSIONAL ELECTIVE-II	L	T	P	C
	3	0	-	3
20CS6E01: SOFTWARE TESTING METHODOLOGIES				

COURSE OUTCOMES:

By the end of the course, the student should have the ability to:

1. Identify and understand various software testing problems, apply software testing knowledge and engineering methods and solve these problems by designing and selecting software test models, criteria, strategies, and methods(K2)
2. Construct a software test process for a software project(K3)
3. Analyze the needs of software test automation(K4)
4. Interpret various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects(K2)
5. Apply contemporary issues in software testing, such as component-based, web based and object-oriented software testing problems. (K3)

UNIT I

Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, definition, Model for testing, Effective Vs Exhaustive Software Testing.

Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle, Software Testing Methodology.

Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, High level and low-level designs, verifying code, Validation.

UNIT II

Dynamic Testing-Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table-based testing, Cause-Effect Graphing based testing, Error guessing.

White-Box Testing: need, Logic Coverage criteria, Basis Path testing, Graph matrices, Loop testing, data flow testing, mutation testing.

UNIT III

Static Testing: Inspections, Structured Walkthroughs, Technical Reviews.

Validation activities: Unit testing, Integration Testing, Function testing, system testing, acceptance testing.

Regression testing: Progressives Vs regressive testing, Regression test ability, Objectives of regression testing, Regression testing types, Regression testing techniques.

UNIT IV

Efficient Test Suite Management: growing nature of test suite, Minimizing the test suite and its benefits, test suite prioritization, Types of test case prioritization, prioritization techniques, measuring the effectiveness of a prioritized test suite, Software Quality Management: Software Quality metrics, SQA models. Debugging: process, techniques, correcting bugs.

UNIT V

Automation and Testing Tools: need for automation, categorization of testing tools, selection of testing tools, Cost incurred, Guidelines for automated testing, overview of some commercial testing tools such as Win Runner, Load Runner, Jmeter and JUnit. Test Automation using Selenium tool.

Testing Object Oriented Software : Basics, Object oriented testing Web based Systems: Challenges in testing for web-based software, quality aspects, web engineering, testing of web-based systems.

Text Books:

1) Software Testing, Principles and Practices, Naresh Chauhan, Oxford

2) Software Testing, Yogesh Singh, CAMBRIDGE

Reference Books:

1) Foundations of Software testing, Aditya P Mathur, 2ed, Pearson

2) Software testing techniques – BarisBeizer, Dreamtech, second edition.

3) Software Testing, Principles, techniques and Tools, M G Limaye, TMH

4) Effective Methods for Software testing, Willian E Perry, 3ed, Wiley e-Resources:

1) https://www.tutorialspoint.com/software_testing_dictionary/test_tools.htm

VI SEMESTER PPROFESSIONAL ELECTIVE-II	L	T	P	C
	3	0	-	3
20AM6E01 : HUMAN COMPUTER INTERACATION				

COURSE OUTCOMES:

At the end of the course students are able to

1. Explain the capabilities of both humans and computers from the viewpoint of human information processing.
2. Describe typical human–computer interaction (HCI) models, styles, and various historic HCI paradigms.
3. Apply an interactive design process and universal design principles to designing HCI systems.
4. Describe and use HCI design principles, standards and guidelines.
5. Analyze and identify user models, user support, socio-organizational issues, and stakeholder requirements of HCI systems.

UNIT I:

Introduction: Usability of Interactive Systems- introduction, usability goals and measures, usability motivations, universal usability, goals for our profession Managing Design Processes: Introduction, Organizational design to support usability, Four pillars of design, development methodologies, Ethnographic observation, Participatory design, Scenario Development, Social impact statement for early design review, legal issues, Usability Testing and Laboratories

UNIT II:

Menu Selection, Form Fill-In and Dialog Boxes: Introduction, Task- Related Menu Organization, Single menus, Combinations of Multiple Menus, Content Organization, Fast Movement Through Menus, Data entry with Menus: Form Fill-in, dialog Boxes, and alternatives, Audio Menus and menus for Small Displays

UNIT III:

Command and Natural Languages: Introduction, Command organization Functionality, Strategies and Structure, Naming and Abbreviations, Natural Language in Computing Interaction Devices: Introduction, Keyboards and Keypads, Pointing Devices, Speech and Auditory Interfaces, Displays- Small and large.

UNIT IV:

Quality of Service: Introduction, Models of Response-Time impacts, Expectations and attitudes, User Productivity, Variability in Response Time, Frustrating Experiences Balancing Function and Fashion: Introduction, Error Messages, Nonanthropomorphic Design, Display Design, Web Page Design, Window Design, Color.

UNIT V:

User Documentation and Online Help: Introduction, Online Vs Paper Documentation, reading from paper Vs from Displays, Shaping the content of the Documentation, Accessing the Documentation, Online tutorials and animated documentation, Online communities for User Assistance, The Development Process.

Text Books

1. Designing the User Interface, Strategies for Effective Human Computer Interaction, 5ed, Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven M Jacobs, Pearson
2. The Essential guide to user interface design,2/e, Wilbert O Galitz, Wiley DreamaTech.

Reference Books

1. Human Computer, Interaction Dan R.Olsan, Cengage ,2010.
2. Designing the user interface. 4/e, Ben Shneidermann , PEA.
3. User Interface Design, SorenLauesen , PEA.
4. Interaction Design PRECE, ROGERS, SHARPS, Wiley.

VI SEMESTER PPROFESSIONAL ELECTIVE-II	L	T	P	C
	3	-	-	3
20CS6E02 - MOBILE APPLICATION DEVELOPMENT				

COURSE OUTCOMES:

1. Show Hexagonal shaped cells and how these are implemented in real world.(K2)
2. Identify different types of antenna systems in mobile communication. (K2)
3. Analyze Handoffs and different types of handoffs and Dropped call rates and their evaluation. (K4)
4. Show the Parameters of Mobile multipath channels, Types of small scale fading. (K2)

UNIT-I

Android Introduction: What is Android, AN OPEN PLATFORM FOR MOBILE DEVELOPMENT, NATIVE ANDROID APPLICATIONS, ANDROID SDK FEATURES, History and version, Android Architecture, Application Core Building Blocks**.**

DEVELOPING FOR ANDROID: Downloading and Installing the Android SDK,Downloading and Installing Updates to the SDK

UNIT-II

Creating Your First Android Application: Creating a New Android Project, Creating an Android Virtual Device, Creating Launch Configurations, Running and Debugging Your Android, Install Android, Understanding Android Hello World example, Internal Details of Hello Android example, Types of Android Applications

Android Development Tools, The Android Virtual Device Manager, Android SDK Manager, The Android Emulator, The Dalvik Debug Monitor Service, The Android Debug Bridge

UNIT-III

BUILDING USER INTERFACES: Fundamental Android UI Design**,** Views, View Groups , Fragments, Activities, Android User Interface Fundamentals, Assigning User Interfaces to Activities, Introducing Layouts**:** Frame Layout, Linear Layout, Relative Layout, Grid Layout.

UNIT-IV

Intents and Broadcast Receivers: Introducing Intents, Implicit intent and Explicit intent, Using Intents to Launch Activities, Explicitly Starting New Activities

Android Widgets: UI widgets, working with button, working with Button, Toast

Android UI controls- Text View, Edit Text, Button, Checkbox, Radio button (Refer Android links)

UNIT-V

Android Event handling- onclicklistener, Android custom components- creating a simple custom component (Refer Android links)

Android advanced concepts: Sending Email, Sending SMS, Phone calls, Android SQLite, SQLite Spinner, working with buttons, Android Graphics, Android RSS Feed Reader (Refer Android links)

TEXT BOOKS:

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) , 2017

2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2017

REFERENCES:

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox)

Android Useful Links:

https://www.javatpoint.com/android-tutorial
https://www.tutorialspoint.com/android/index.htm

VI SEMESTER PPROFESSIONAL ELECTIVE-II	L	T	P	C
	3	-	-	3
20CS6E03 : ARTIFICIAL INTELLIGENCE TOOLS AND TECHNIQUES				

COURSEOUTCOMES:

After undergoing this course, the students will be able to:

1. Observe build intelligent agents for search and games (K2)
2. Construct AI problems through Python/Prolog/etc(K3)
3. Illustrate learning optimization and inference algorithms for model learning(K4)
4. Develop programs for an agent to learn and act in a structured environment.(K3)
5. Apply to enhance the MDP concepts(K3)

UNIT 1:

Introduction: Concept of AI, history, scope, agents, environments, State space representation, Problem Formulations, Constraint satisfaction problem.

UNIT 2:

Search Algorithms: Uninformed search strategies (Breadth FirstSearch and Depth first),Informed search strategies (Best first search, A* search algorithm and Hill climbing), Game Search (Minimax algorithm, alpha-beta pruning).

UNIT 3:

Probabilistic Reasoning: Probability, conditional probability, Bayes Rule, Inference in Bayesian Network, temporal model, hidden Markov model.

UNIT 4:

MarkovDecisionprocess:MDPformulation,utilitytheory,utilityfunctions,valueiteration,policyiterationand partially observable MDPs.

UNIT 5:

ReinforcementLearning:Passivereinforcementlearning,directutilityestimation,adaptivedynamicprogramming,temporaldifferencelearning, active reinforcement learning-Q learning.

Textbooks:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: AModern Approach", 3rd Edition, Prentice Hall. 2010.
2. Elaine Richard Kevin Knight, "ArtificialIntelligence",3rd Edition, Tata McGraw Hill.2017.

Reference Books:

1. Trivedi, M.C."A ClassicalApproachtoArtificialIntelligence",2nd edition,KhannaBookPublishing,2018
2. Saroj Kaushik,"Artificial Intelligence",1st edition, CengageLearningIndia,2011

VI SEMESTER: OPEN ELECTIVE - II	L	T	P	C
	3	-	-	3
20CE6O01:: ENVIRONMENTAL POLLUTION AND CONTROL				

COURSEOUTCOMES: Students are able to

1. Identify the air pollutant causes and control devices. (K2)
2. Differentiate the treatment techniques used for sewage and industrial wastewater treatment methods. (K2)
3. Understand the fundamentals of solid waste management, practices adopted in his town/village and its importance in keeping the health of the city. (K2)
4. know the causes for noise pollution and ISO14000 standards. (K2)
5. know Treatment and management of hazardous waste. (K2)

UNIT – I: Air Pollution

Air pollution causes-control methods–particulate control devices – methods of controlling Gaseous Emissions – Air quality standards.

UNIT –II: Industrial wastewater Management

Strategies for pollution control – Volume and Strength reduction – Neutralization – Equalization – Proportioning – Common Effluent Treatment Plants – Recirculation of industrial wastes – Effluent standards.

UNIT – III: Solid Waste Management

Solid waste characteristics–basics of on-site handling and collection–separation and processing – Incineration-Composting-Solid waste disposal methods – fundamentals of land filling.

UNIT – IV: Noise Pollution

Noise standards, Measurement and control methods – Reducing residential and industrial noise – ISO14000

UNIT – V: Hazardous Waste

Characterization – Nuclear waste – Biomedical wastes – Electronic wastes – Chemical wastes – Treatment and management of hazardous waste-Disposal and Control methods.

Text books

1. K. Sasi Kumar, S.A. Gopi Krishna ,"Solid Waste Management",PHI New Delhi,2014.
2. D. Srinivasan, "Environmental Engineering", PHI Learning Private Limited, New Delhi, 2011.

References books

1. Ruth F. Weiner and Robin Matthews, 'Environmental Engineering ', 4th Edition Elesevier, 2003.
2. J.G. Henry and G.W. Heinke,'Environmental Science and Engineering'– Pearson Education,2002
3. Mackenzie L Davis & David A Cornwell, "Environmental Engineering ',McGraw Hill Publishing,2002.
4. Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus,"Environmental Engineering", Mc-Graw-Hill Book Company, New Delhi, 1985.

E-Resources

https://nptel.ac.in/courses/123105001

VI SEMESTER: OPEN ELECTIVE - II	L	T	P	C
	3	-	-	3
20CE6O02 :: DISASTER MANAGEMENT				

Course Outcomes:

Students are able to

1. identify the tools of integrating disaster management principles in disaster mitigation process. (K2)
2. discuss about different approaches needed to manage pre and post- disaster activities**. (K2)**
3. prepare the process of risk management and develop a basic understanding method for the role of public in risk management. (K2)
4. administer the role of technology in Disaster management. (K2)
5. conclude the planning strategies for education and community preparedness programmes. (K2)

UNIT-I : Natural Hazards and Disaster management:

Introduction of DM – Inter disciplinary nature of the subject- Disaster Management cycle- Five priorities for action. Case study methods of the following: floods, draughts -Earthquakes- global warming, cyclones & Tsunamis- Post Tsunami hazards along the Indian coast - landslides.

UNIT-II: **Man Made Disaster and their management along with case study methods of the following**: Fire hazards - transport hazard dynamics -Solid waste management- post disaster – Bio terrotirism -threat in mega cities, rail and air craft's accidents, and Emerging infectious diseases & Aids and their management.

UNIT-III: **Risk and Vulnerability**:

Building codes and land use planning - social vulnerability - environmental vulnerability - Macroeconomic management and sustainable development, climate change risk rendition - financial management of disaster - related losses.

UNIT-IV: **Role of Technology in Disaster managements**:

Disaster management for infra structures, taxonomy of infrastructure - treatment plants and process facilities- electrical substations- roads and bridges- mitigation programme for earth quakes -flowchart, geospatial information in agriculture drought assessment-multimedia technology in disaster risk management and training transformable indigenous knowledge in disaster reduction.

UNIT-V: **Education and Community Preparedness**

Education in disaster risk reduction-Essentials of school disaster education-Community capacity and disaster resilience-Community based disaster recovery -Community based disaster management and social capital-Designing resilience- building community capacity for action.

Text Books

1. Jagbir Singh , 'Disaster Management - Future Challenges and Opportunities' , I K International Publishing House Pvt. Ltd-2017
2. Tushar Bhattacharya, 'Disaster Science & Management', Tata McGraw Hill Education Pvt. Ltd., New Delhi.-2012.

References Books

1. Prof. R.B. Singh , "Disaster Management and Mitigation", World Focus 2016.
2. Rajib shah & R. Krishnamurthy, 'Disaster Management - Global Challenges and Local Solutions' Universities press-2009.
3. H K Gupta , **'**Disaster Management', Universities press-2003

E-resources

1. https://archive.nptel.ac.in/courses/105/104/105104183/

VI SEMESTER: OPEN ELECTIVE - II	L	T	P	C
	3	-	-	3
20EE6O01 :: FUNDAMENTALS OF ELECTRIC VEHICLES				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Illustrate different types of electric vehicles
CO2	:	Select suitable power converters for EV applications
CO3	:	Design HEV configuration for a specific application
CO4	:	Choose an effective method for EV and HEV applications
CO5	:	Analyse a battery management system for EV and HEV

SYLLABUS

UNIT-I	**:**	**INTRODUCTION**
Fundamentals of vehicles - Components of conventional vehicles - drawbacks of conventional vehicles – Need for electric vehicles - History of Electric Vehicles – Types of Electric Vehicles – Advantages and applications of Electric Vehicles		
UNIT-II	**:**	**COMPONENTS OF ELECTRIC VEHICLES**
Main components of Electric Vehicles – Power Converters - Controller and Electric Traction Motor – Rectifiers used in EVs – Bidirectional DC–DC Converters – Voltage Source Inverters – PWM inverters used in EVs.		
UNIT-III	**:**	**HYBRID ELECTRIC VEHICLES**
Evolution of Hybrid Electric Vehicles – Advantages and Applications of Hybrid Electric Vehicles – Architecture of HEVs - Series and Parallel HEVs – Complex HEVs – Range extended HEVs – Examples - Merits and Demerits.		
UNIT-IV	**:**	**MOTORS FOR ELECTRIC VEHICLES**
Characteristics of traction drive - requirements of electric machines for EVs – Different motors suitable for Electric and Hybrid Vehicles – Induction Motors – Synchronous Motors – Permanent Magnetic Synchronous Motors – Brushless DC Motors – Switched Reluctance Motors (Construction details and working only)		
UNIT-V	**:**	**ENERGY SOURCES FOR ELECTRIC VEHICLES**
Batteries - Types of Batteries – Lithium-ion - Nickel-metal hydride - Lead-acid – Comparison of Batteries - Battery Management System – Ultra capacitors – Flywheels – Fuel Cell – it's working.		

TEXT BOOKS:

1. Iqbal Hussein - Electric and Hybrid Vehicles: Design Fundamentals - CRC Press - 2021.

2. Denton - Tom. Electric and hybrid vehicles. Routledge - 2020.

REFERENCE BOOKS:

1. Kumar - L. Ashok - and S. Albert Alexander. Power Converters for Electric Vehicles. CRC Press - 2020.

2. Chau - Kwok Tong. Electric vehicle machines and drives: design - analysis and application. John Wiley & Sons - 2015.

3. Berg - Helena. Batteries for electric vehicles: materials and electrochemistry. Cambridge university press - 2015.

VI SEMESTER: OPEN ELECTIVE - II	L	T	P	C
	3	-	-	3
20EC6O01: MOBILE COMMUNICATION AND IT'S APPLICATIONS				

COURSE OUTCOMES:

Students are able to

CO1. Design Hexagonal shaped cells and how these are implemented in real world.

CO2. Explain different types of antenna systems in mobile communication.

CO3. Analyze Handoffs and different types of handoffs and Dropped call rates and their evaluation.

CO4. Describe the Parameters of Mobile multipath channels, Types of small scale fading.

UNIT-I

INTRODUCTION :

Evolution of Mobile Communications, Mobile Radio Systems around the world, First, Second, Third Generation Wireless Networks, Wireless Local Loop(WLL), Wireless LANs, Bluetooth, Personal Area Networks(PANs), A Simplified Reference Model, Applications.

UNIT-II

ELEMENTS OF MOBILE COMMUNICATIONS:

General description of the problem, concept of frequency channels, Co-channel Interference Reduction Factor, desired C/I from a normal case in a Omni directional Antenna system, Cell splitting, consideration of the components of Cellular system.

UNIT-III

THE MOBILE CONCEPT :

Introduction, Frequency reuse, Handoff strategies, Interference and System Capacity: Co- Channel Interference, Channel Planning, Adjacent Channel Interference, Power control for reducing interference, Trunking and Grade of Service, Cell Splitting, Sectoring.

UNIT-IV

MOBILE RADIO PROPAGATION :

Introduction, Free space propagation model, The three basic propagation models-Reflection, Diffraction and Scattering, Two-ray model, Outdoor propagation models, Indoor propagation models, Signal Penetration into building, Small scale multipath Propagation, Parameters of Mobile multipath channels, Types of small scale fading.

UNIT-V

FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT:

Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells, non fixed channel assignment.

TEXTBOOKS:

1. Wireless Communications by Theodore S. Rappaport, principles and practice,2nd Editions. (**Unit-I, III, IV & V)**

2. Mobile Cellular Communication by Gottapu Sasibhushana Rao, Pearson International, 2012.

(UNIT - I, II, III &IV)

3. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2rd Edn., 2006. **(UNIT - V & VI)**

REFERENCES:

1. Wireless and Mobile Communications-Lee, McGraw Hill, 3rd Edition, 2006.

2. Wireless Communications and Networks-William Stallings, Pearson Education, 2004.

VI SEMESTER: OPEN ELECTIVE - II	L	T	P	C
	3	-	-	3
20ME6O01: BASICS OF 3D PRINTING				

COURSEOBJECTIVES:

- To explore technology used in additive manufacturing.
- ToacquireknowledgeforselectingcorrectCADformatsinmanufacturingprocess.
- To understand the operating principles and limitations of liquid, solid and laser based additive manufacturing system.
- To design the process of additive manufacturing including tools used for design.
- Toacquireknowledgeonimportantprocessparametersforbio-manufacturing

COURSEOUTCOMES: Students are able to

CO1: To impart the fundamentals of Additive Manufacturing Technologies for engineering applications[K2]
CO2: Select and use correct CAD for mats in the manufacture of a3D printed part. [K2]
CO3: Explain the operating principles, capabilities, and limitations of liquid, solid and laser based additive manufacturing system. [K2]
CO4: Enumerate the design process for additive manufacturing including tools used for design and some features required for design. [K2]
CO5: Describe the important process parameters for bio-manufacturing and determine the suitable additive technique for bio-manufacturing, aerospace and manufacturing engineering. [K2]

UNIT I
INTRODUCTION
3D printing Overview, History, Need, Classification, Additive Manufacturing Technology in product development, Materials for Additive Manufacturing Technology.

UNIT II
REVERSE ENGINEERING
Basic Concept–3DScanning Digitization techniques, Model Reconstruction, Data Processing for Additive Manufacturing Technology, Part Orientation and support generation, Model Slicing, Tool path Generation.

UNIT III
ADDITIVE MANUFACTURING SYSTEMS
SOLID& LIQUID BASED- Classification, Stereo lithography Apparatus (SLA) - Principle, process, advantages, Fused Deposition Modeling –Principle, process, advantages.
LASERBASED- Selective Laser Sintering–Principle, Process, advantages, Three-Dimensional Printing –Principle, process, advantages – Laser Engineered Net Shaping (LENS).

UNIT IV
DESIGN FOR AM
Motivation, Design for Manufacturing and Assembly (DFMA)-concepts and objectives, AM unique capabilities, Exploring design freedoms, Design tools for AM-Part Orientation, Removal of Supports,

Hollowing out parts, Inclusion of Undercuts, Other Manufacturing Constraining Features, Interlocking Features, Reduction of Part Count in an Assembly, Identification of markings/numbers etc.

UNIT V

APPLICATIONS OF 3D PRINTING

Customized implants and prosthesis: Design and development, Bio-Additive Manufacturing- Computer Aided Tissue Engineering (CATE), Applications of 3D Printing in Aerospace, Automotive, Manufacturing and Architectural Engineering.

TEXTBOOKS:

1. Patri K. Venuvinod., and Weiy in Ma., Rapid prototyping Laser based and other Technologies, First Edition, Springer Science +Business Media, LLC, 2004.
2. Chua C.K., Leong K.F., and Lim C.S., Rapid prototyping: Principles and applications, Third Edition, World Scientific Publishers, 2016.
3. Gebhardt A, Rapid prototyping, Hanser Gardener Publications,2017.
4. Chee Kai Chua, Kah Fai Leong, 3D Printing and Additive Manufacturing: Principles and Applications, World Scientific Publishers, Fourth Edition of Rapid Prototyping, 2018.

REFERENCES:

1. LiouL.W.and LiouF.W.,Rapid Prototyping and Engineering applications:A toolbox for prototype development, CRC Press, 2017.
2. Kamrani A.K. and Nasr E.A., Rapid Prototyping: Theory and practice, Springer, 2016.
3. Hilton P.D. and Jacobs P.F., Rapid Tooling: Technologies and Industrial Applications, CRC press, 2015.

WEB REFERENCES:

1. https://all3dp.com/
2. https://www.thingiverse.com/
3. https://additivemanufacturing.com/

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	1							2	3	
CO2	2	1	2	3	2							3	3	
CO3	2	2	3	3	2							3	3	1
CO4	3	3	3	2	2							2	2	
CO5	3	3	2	3	2							2	2	1
Avg	**2.4**	**2.2**	**2.4**	**2.6**	**1.8**							**2.4**	**2.6**	**0.4**

VI SEMESTER: OPEN ELECTIVE - II	L	T	P	C
	3	-	-	3
20ME6O02 :: FARM MACHINERY				

COURSE OBJECTIVES: The objectives of this course are

- To impart the students to understand the fundamentals of machinery in farming.
- To enable the students to acquire knowledge on tillage and equipment used.
- To introduce the students about various types of earth moving equipment.
- To enable the students to acquire knowledge on seeding and spraying equipment.
- To introduce the fundamentals of transplanting machinery and fertilizer equipment.

COURSE OUTCOMES: Students will be able to

CO1. Explain various types of machinery in farming. [K2]
CO2. Illustrate types of farm operation for craft cultivation with scientific understanding. [K2]
CO3. Explain various types of earth moving equipment. [K2]
CO4. Summarize various seeding methods and sprayer types. [K2]
CO5. Explain transplanting methods and fertilizer equipment. [K2]

UNIT I
FARM MECHANIZATION:
Farm mechanization- objectives of farm mechanization, sources of farm power, classification of farm machines. Materials of construction and heat treatment. principles of operation and selection of machines used for production of crops, Field capacities of different implements and their economics, Problems on field capacities and cost of cultivation

UNIT II
TILLAGE EQUIPMENT:
Tillage equipment - classification and types of tillage, Primary tillage implements-mould board plough and its parts, disc plough, and other ploughs, Secondary tillage equipment- disc harrows, Implements- cultivators, intercultural implements. Forces acting on tillage tools, Problems on forces analysis, Draft measurement of tillage equipment, Draft and unit draft related problems.

UNIT III
EARTH MOVING EQUIPMENT
Earth moving equipment - terminology, construction and their working principles, shovels, bulldozers, trenches and elevators.

UNIT IV
SEED DRILLS AND SPRAYER:
Seeding - methods, types of seed metering mechanism, types of furrow openers. Calibration of seed drills, Adjustment of seed drills – objectives, uses of plant protection equipment
Sprayers - types of sprayers and dusters, sprayer calibration and selection, Constructional features of different components of sprayers and dusters

UNIT V

TRANSPLANTING AND FERTILIZER:

Transplanting and fertilizer - transplanting methods, different types of transplanting machinery, working principle, adjustments in transplanting equipment

Fertilizer - application equipment, fertilizer meeting mechanism calibration of fertilizer equipment.

TEXTBOOKS

1. Fakir Chara Das, Kishore Chandra and Shishira Kanth, Farm Machinery and Equipment, 1st Edition, Akinik Publications, 2020
2. Triveni Prasad Singh, Farm Machinery, 1st Edition, Prentice Hall India Pvt, Limited, 2016.

REFERENCES

1. Surendra Singh, Farm Machinery Principal And Applications, 1st Edition, ndian Council of Agricultural Research, 2017
2. Smith H P, Farm Machinery and Equipment, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2007.

WEB REFERENCE:

1. https://nptel.ac.in/courses/126105009

CO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2			1	2					1	1	
CO2	3	2	2			1	2					1	1	
CO3	3		2			1	2					1	1	
CO4	3		1			1	2					1	1	
CO5	3		2			1	2					1	1	
Avg	**3**	**0.8**	**1.8**			**1**	**2**					**1**	**1**	

VI SEMESTER: OPEN ELECTIVE - II	L	T	P	C
	3	-	-	3
20CS6O01: FUNDAMENTALS OF SOFTWARE ENGINEERING				

COURSE OUTCOMES:

At the end of the course, the student should be able to

1. Identify, formulate the various software engineering concepts
2. different software development process models.
3. analyze and specify software requirements with various stakeholders of a software development project
4. Apply systematic procedure for software design and deployment.
5. Compare and contrast the various testing methods and art of debugging

UNIT I

SOFTWARE AND SOFTWARE ENGINEERING: The nature of Softwaree: Define software (Software Characteristics), Software Application Domains, **Software Engineering**: Definition, Llayered Technology, **Software Process:** Generic Process framework activities, Umbrella activities, Software Myths and Reality, Generic Process model, Capability Maturity Model Integration (CMMI).

UNIT-II

PROCESS MODELS: Process Assessment and improvement. Prescriptive Process models: Waterfall Model, Incremental Process Model**,** Evolutionary Process Models: Prototyping, Spiral model, The Unified Process.Personal and Team process models: Personal software process (PSP), Team software process (TSP), Product and Process,

UNIT-III

REQUIREMENTS ANALYSIS AND SPECIFICATION: Functional Requirements, Non- Functional Requirements, Software Requirements Document (Software Requirements Specification SRS), Requirements Specification, Requirements Engineering**,** Eliciting Requirements(elicitation), Developing Use cases, Validating Requirements, Requirements Management: Requirements Planning, Requirements Change management.

UNIT-IV

SOFTWARE DESIGN: Design process**, Design concepts**: Abstraction, Architecture, Patterns, Separation of Concerns, Modularity, Information hiding, Functional independence, Refinement, Aspects, refactoring, Object oriented design concepts, Design classes.

The Design Model: Data Design Elements, Architectural Design elements, Designing Class Based Components: Basic Design Principles, Component-Level Design guidelines, Cohesion and coupling.

User Interface Design: The Golden Rules

UNIT-V

TESTING: The strategies for Conventional Strategies: Unit Testing – Integration Testing. Test Strategies for Object-Oriented Software, Software testing fundamentals, white box testing- Basis path testing: Flow graph Notation, independent Program paths, Deriving test cases, Graph Matrices. control structure testing.
black box testing: Graph Based Testing Methods, Equivalence Partitioning, Boundary value Analysis. Validation Testing, System Testing. Art of Debugging: The Debugging process.

TEXT BOOK:

3. Software Engineering, A practitioner's Approach- Roger S. pressman, 8th edition, McGraw-Hillinternational Edition, 2014.

4. Software Engineering, Ian Sommerville, 10th Edition, Pearson Education Asia, 2016.

REFERENCE BOOKS:

5. Software Engineering, Pankaj Jalote, A Precise Approach", Wiley India, 2010.

6. Systems Analysis and Design- Shely Cash man Rosenblatt, 9th Edition, Thomson publications, 2016.

7. Software Project Management, Bob Hughes, Mike Cotterell and Rajib Mall, Fifth Edition, Tata McGrawHill, New Delhi, 2012.

8. https://nptel.ac.in/courses/106101061/

VI SEMESTER: OPEN ELECTIVE - II	L	T	P	C
	3	-	-	3
20CS6O02: FUNDAMENTALS OF COMPUTER NETWORKS				

COURSE OUTCOMES

At the end of the course students are able to

1. Differentiate network referenc**e** models such as OSI**,** TCP/IP
2. Classify variousData Link Layer protocols such as sliding window.
3. Distinguish various MAC sublayer protocols such as ALOHA, CSMA, CSMA/CD
4. Differentiate Network layer protocols IPv4 and IPv6
5. Distinguish various Transport layer protocols and its applications

UNIT 1:

Data communication Components: Representation of data and its flow of networks, Categories of Networks, Various Connection Topologies, Protocols and Standards, OSI network model, TCP/IP Protocol suit, addressing

UNIT 2:

Physical Layer: Transmission Media: Guided Media, Unguided Media

Data Link Layer: Error Detection and Error Correction -Fundamentals, Block coding, Hamming Distance, CRC, Flow Control and Error control protocols: Stop and Wait, Go back – N ARQ, Selective Repeat ARQ

UNIT 3:

Medium Access Sub Layer: Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA. Controlled Access protocols: Reservation, Polling, Token passing

UNIT 4:

Network Layer: IPv4 address: Address Space, Notations, Classful Addressing, Classless Addressing, Network Address Translation (NAT) **IPv6 Addresses**: Structure, Address Space

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP)

UNIT 5:

Application layer:

Domain name system (DNS), E-mail, File Transfer Protocol (FTP), www and HTTP

Text Books:

4. Data Communication and Networking, 5th Edition, Behrouz A. Forouzan, McGrawHill, 2017
5. Computer Networks, 6th Edition, Andrew S. Tanenbaum, Pearson New International Edition, 2021.
6. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India, 2007

Reference Books:

2. Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India.
3. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.

VI SEMESTER: OPEN ELECTIVE - II	L	T	P	C
	3	-	-	3
20BM6O01 :: STRESS AND WORK LIFE MANAGEMENT				

UNIT-I

Understanding stress**:** Meaning – Symptoms – Works Related Stress – Individual Stress –Reducing Stress – Burnout. Setting to Stress- Stress: Meaning - Approaches to stress, Good Stress Vs Bad Stress, The individual and work.

UNIT-II

Common stress factors time & career plateauing**:** Time Management – Techniques – Importance of planning the day – Time management schedule – Developing concentration – Organizing the Work Area – Prioritizing – Beginning at the start – Techniques for conquering procrastination – Sensible delegation – Taking the right breaks – Learning to say 'No

UNIT-III

Introduction to Work-Life Balance - Importance of Work-Life Balance - Benefits of Work-Life Balance to Employees - Benefits of Work-Life Balance for Organization - Effects of Poor Work-Life Balance on Employees - Relation between Work-Life Balance & Stress - Outline for Work-Life Balance Planning- Approaches to Work-Life Balance planning - Process of Work-Life Balance - Steps of Work-Life Balance Planning

UNIT-IV

Work place humour**: Developing** a sense of Humour – Learning to laugh – Role of group cohesion and team spirit – Using humour at work – Reducing conflicts with humour.

UNIT-V

Self-development: Improving Personality – Leading with Integrity – Enhancing Creativity – Effective decision making – Sensible Communication – The Listening Game – Managing Self – Meditation for peace – Yoga for Life. Organization and Stress Management - Recognize the signs, Approaches to the problem, Providers Assistance.

References

1. Cooper, Managing Stress, Sage, 2011
2. Walt Schafer, Stress Management, Cengage Learning, 4th Edition 2009.
3. Jeff Davidson, Managing Stress, Prentice Hall of India, New Delhi, 2012.
4. Juan R. Alascal, Brucata, Laurel Brucata, Daisy Chauhan. Stress Mastery. Pearson
5. Argyle. The Psychology of Happiness. Tata McGraw Hill. 2012
6. Bartlet. Stress – Perspectives & Process. Tata McGraw Hill. 2012
7. Handbook on Work –Life Balance-A New Approach, 2017, Dr. C Swarnalatha,Mrs.S. Rajalakshmi, Lulu Press.

VI SEMESTER: OPEN ELECTIVE - II	L	T	P	C
	3	-	-	3
20BM6O02 :: BANKING AND INSURANCE				

UNIT I

Origin of banking: Definition, Types of deposits, Origin, and growth of commercial banks in India. India's Approach to banking Sector Reforms, International security standards in banking, Global Financial Crisis and India's banking Sector.

UNIT II

Introduction to E-Banking-Impact of Information Technology on Banking Changing Financial Environment and IT as a strategic response Hardware and Software.

UNIT III

Delivery Channels-ATM, EFTPOS, Phone Banking, Internet Banking, SMS Banking, Mobile Banking, Credit/Debit Cards, Smart Cards E-Commerce-Secure Electronic Transfer (SET), Payment Gateways (Credit card/Debit cards), Authentication of payments, etc.

UNIT IV

Principles and Practice of Insurance-Introduction to Risk and Insurance, Types of Insurance-General and Life, Basic principles of General and Life Insurance,

UNIT V

General insurance products, underwriting concepts, standard conditions and warranties with respect to Fire, Marine, Motor, Engineering and Miscellaneous products.

Reference Books:

1. Agarwal, OP, Banking & Insurance, Himalaya Publishing House, Mumbai
2. George E Rejda, Principles of Risk Management & Insurance, Pearson Education, New Delhi
3. Balachandran S., General Insurance, Insurance Institute of India, Mumbai
4. Arthur C., William Jr., Michael Smith, Peter Young, Risk Management and Insurance, Tata McGraw Hill Publishing Company, New Delhi
5. Tripathy Nalini Prava & Prabir Pal, Insurance Theory & Practice, Prentice Hall of India Pvt. Ltd., New Delhi
6. Balachandran S., Life Insurance, Insurance Institute of India, Mumbai

VI SEMESTER: OPEN ELECTIVE - II	L	T	P	C
	3	-	-	3
20MA6O01 : OPERATION RESEARCH				

COURSE OBJECTIVES:

1.Ability to understand and analyze managerial problems in industry so that they are able to use resources (capitals, materials, machines etc) more effectively.

2.Knowledge of formulating mathematical models for quantitative analysis of managerial problems in industry

UNIT—I

LINEAR PROGRAMMING:

Introduction-General formulation LPP- Formulation of LP problems - Graphical solution –Slack and Surplus and Artificial variables-simplex method (simple problems) - artificial variable techniques – twophase method, Big-M-method(simple problems) –Concept of Duality-general rules for converting any primal into its dual.

UNIT – II

TRANSPORTATION PROBLEM:

Introduction-mathematical formulation-Feasible, Basic Feasible and Optimum solution -Methods for initial basic feasible solution to transportation problem-optimal Test by u, v method(MODI)-Degeneracy in Transportation problems –.Unbalanced Transportation problems

UNIT – III

SEQUENCING PROBLEM:

Introduction –Johnson's Algorithm for n jobs 2 machines- Optimal Solution for processing n jobs through two machines- processing n jobs through three machines - processing n jobs through m machines - processing two jobs through m machines

UNIT – IV

REPLACEMENT PROBLEMS:

Introduction – replacement policy for items whose maintenance cost increases with time, and money value is constant – Money value, present worth Factor and Discount Rate- replacement policy when maintenance cost increases with time and money value changes with constant rate – Individual Replacement Policy-group replacement of items that fail completely.

UNIT – V

WAITING LINES:

Introduction- transient and steady states-Probability Distributions in Queening systems-Kendall's notation for Representing Queening models- Single channel-Poisson arrivals Exponential service times-with infinite population model (M/M/1: FIFO/∞/∞)

INVENTORY:

Introduction – types of inventory models – Costs involved in Inventory problems-Variables in inventory problem-Classification of Inventory Models-Concept of EOQ-The EOQ model without shortage – Quantity Discounts-purchase inventory models with one price break - purchase inventory models with two price breaks-purchase inventory models with any number of price breaks-shortages are not allowed

COURSE OUTCOMES: Students can able to

CO1: Formulate the resource management problem and identify appropriate methods to solve them. [K3]

CO2: Apply transportation model to optimize the industrial resources. [K3]

CO3: Solve sequencing problems using operation research techniques. [K3]
CO4: Apply the replacement model to increase the efficiency of the system. [K3]
CO5: Apply the inventory and queuing model to increase the efficiency of the system. [K4]

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TEXT BOOKS:

1. Operations Research / S.D.Sharma, Ramnath co,Meerut
2. Operations Research, P.K.Gupta, D.S.Hira,S.Chand

REFERENCE BOOKS:

1. Operations Research /A.M.Natarajan,P.Balasubramani, A.Tamilarasi/PearsonEducation.
2. Operations Research / R. Pannerselvam, PHI Publications.

VI SEMESTER: OPEN ELECTIVE - II	L	T	P	C
	3	-	-	3
20IT6O01: INTRODUCTION TO CLOUD COMPUTING				

Course Outcomes:

Upon completion of the course, it is expected that student will be able to:

1. Articulate the main concepts, key technologies, strengths and limitations of cloud computing.

2. Learn the key and enabling technologies that help in the development of cloud.

3. Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.

4. Explain the core issues of cloud computing such as resource management and security.

5. Evaluate and choose the appropriate technologies, algorithms and approaches for implementation and use of cloud.

UNIT-I:

Introduction: Introduction to Cloud Computing, Definition of Cloud, Evolution of Cloud Computing, Underlying Principles of Parallel and Distributed Computing, Cloud Characteristics, Elasticity in Cloud – On-Demand Provisioning.

UNIT-II:

Cloud Enabling Technologies: Service Oriented Architecture, REST and Systems of Systems, Web Services, Publish-Subscribe Model, Basics of Virtualization, Types of Virtualizations, Implementation Levels of Virtualization, Virtualization Structures, Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices, Virtualization Support and Disaster Recovery.

UNIT-III:

Cloud Architecture, Services And Storage: Layered Cloud Architecture Design, NIST Cloud Computing Reference Architecture, Public, Private and Hybrid Clouds, IaaS, PaaS, SaaS, Architectural Design Challenges, Cloud Storage, Storage-as-a-Service, Advantages of Cloud Storage, Cloud Storage Providers, S3.

UNIT-IV:

Resource Management And Security In Cloud: Inter Cloud Resource

Management, Resource Provisioning and Resource Provisioning Methods, Global Exchange of Cloud Resources, Security Overview, Cloud Security Challenges, Software-as-a-Service Security, Security Governance, Virtual Machine Security, IAM, Security Standards.

UNIT-V:

Cloud Technologies And Advancements: Hadoop, MapReduce, Virtual Box, Google App Engine, Programming Environment for Google App Engine, Open Stack, Federation in the Cloud, Four Levels of Federation, Federated Services and Applications, Future of Federation.

Text Books:

1. Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, Morgan Kaufmann Publishers.

2. Cloud Computing: Implementation, Management and Security, Rittinghouse, John W., and James F. Ransome, CRCPress.

References:

1. Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Tata McgrawHill.

2. Cloud Computing - A Practical Approach, Toby Velte, Anthony Velte, Robert Elsenpeter, Tata McGraw-Hill.

3. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), George Reese, O'Reilly.

VI SEMESTER: OPEN ELECTIVE - II	L	T	P	C
	3	-	-	3
20IT6O02: E-COMMERCE				

COURSE OUTCOMES

After the completion of the course the students are able to

1. Define the fundamentals E-commerce framework.
2. Explain the basics of Consumer Oriented Electronic models.
3. Distinguish different electronic payment systems and their issues.
4. Demonstrate Inter-organizational and intra-organizational electronic commerce.
5. Explain advertising and marketing on the Internet, consumer search and resource discovery and key multimedia concepts.

UNIT-I

Electronic Commerce-Frame work, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications.

UNIT-II

Consumer Oriented Electronic commerce - Mercantile Process models, Electronic payment systems - Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems.

UNIT-III

Inter Organizational Commerce - EDI, EDI Implementation, Value added networks. Intra Organizational Commerce - work Flow, Automation Customization and internal Commerce, Supply chain Management.

UNIT-IV

Corporate Digital Library - Document Library, digital Document types, corporate Data Warehouses. Advertising and Marketing - Information based marketing, Advertising on Internet, on-line marketing process, market research.

UNIT-V

Consumer Search and Resource Discovery - Information search and Retrieval, Commerce Catalogues, Information Filtering.

Multimedia - key multimedia concepts, Digital Video and electronic Commerce, Desktop video processing, Desktop video conferencing.

Text Books:

1. Frontiers of electronic commerce – Kalakata, Whinston, Pearson.

References Books:

1. E-Commerce fundamentals and applications Hendry Chan, Raymond Lee, TharamDillon,Ellizabeth Chang, John Wiley.
2. E-Commerce, S.Jaiswal – Galgotia.E-Commerce, Efrain Turbon, Jae Lee, David King, H.Michael Chang.
3. Electronic Commerce – Gary P.Schneider – Thomson.
4. E-Commerce – Business, Technology, Society, Kenneth C.Taudon, Carol GuyericoTraver.

VI SEMESTER : JOB ORIENTED ELECTIVE - II	L	T	P	C
	3	-	-	3
20CS6J01: AWS CLOUD PRACTITIONER				

COURSEOUTCOMES:

After completing this course, students should be able to

1. Show AWS cloud and identify the Global Infrastructure components of AWS. (K2)
2. Observe when to use Amazon EC2, AWS Lambda and AWS Elastic Beanstalk. (K2)
3. Differentiate Storage Services and demonstrate when to use AWS Database services. (K2)
4. Illustrate the Networking and Content Delivery Services. (K3)
5. Analyze to understand the Cloud economics and security. (K4)

UNIT 1:

CLOUD CONCEPTS OVERVIEW – Introduction to cloud computing, Cloud service models, Cloud computing Deployment models , Advantages of the cloud, Introduction to AWS.
AWS GLOBAL INFRASTRUCTURE OVERVIEW: AWS GLOBAL INFRASTRUCTURE, AWS Services and Service categories

UNIT 2:

COMPUTE – Compute services overview, Amazon EC2, Amazon EC2 pricing models, Benefits, use cases, four pillars of cost optimization, Container services, Introduction to AWS Lambda, Benefits of Lambda, Introduction to AWS Elastic Beanstalk, Benefits.

UNIT 3:

STORAGE: Amazon Elastic Block Store (EBS), Amazon Simple Storage Service (Amazon S3), Amazon Elastic File System (Amazon EFS), Amazon Simple Storage Service Glacier (Amazon S3 Glacier).

DATABASES: Amazon Relational Database Service (Amazon RDS), Amazon DynamoDB, Amazon RedShift, Amazon Aurora.

UNIT 4:

Networking and Content Delivery: Networking Basics, Amazon VPC, VPC Networking, VPC SECURITY, Amazon ROUTE-53, Amazon Cloud Front

UNIT 5:
CLOUD ECONOMICS AND BILLING: Fundamentals of pricing, AURI,PURI,NURI ,Total cost of Ownership (TOC).
AWS CLOUD SECURITY: AWS Shared Responsibility Model, AWS IAM (Identity and Access Management),Elastic Load Balancing (ELB), Amazon CloudWatch.

Web references and AWS LMS portal :

https://aws.amazon.com/ec2
https://aws.amazon.com/ecs/
https://aws.amazon.com/about-aws/global-infrastructure/

VI SEMESTER : JOB ORIENTED ELECTIVE - II	L	T	P	C
	3	-	-	3
20CS6J02: SOFTWARE TESTING TOOLS				

COURSE OUTCOMES:

At the end of the course students are able to

1. learn Manual testing techniques and software test levels
2. practice Java Programme for Selenium and Test frame works
3. learn Apache JMeter and Building a JMeter Test Plan
4. Running Multiple Scripts with JMeter and Different Types of JMeter Test Plans
5. practicing JIRA and Test Management In JIRA (Using Zephyr Plug-in)

UNIT-I:

Manual Testing : Software Development Life Cycle (Requirements Gathering, Analysis and Planning, Software Design, Coding/Implementation, Testing, and Release and Maintenance Phase)

Software Test Levels (Unit Testing, Integration Testing, System Testing, and Acceptance Testing)
Software Test Types
Software Test Design Techniques
Software Test Life Cycle
Software Documents
Software Testing Standards
Software Testing certification/s

UNIT-II:

'Selenium with Java' : Java Programme for Selenium (Data Types, Variables, Operators, Control Flow, Strings, Arrays, IO, Methods, Exception Handling, and Object-Oriented Programming.)

- Selenium WebDriver (Web/HTML Elements, Inspecting Web Elements, Locating Elements, Selenium WebDriver API commands, Wait statements, and Page Object Model.)
- TestNG Testing Framework (Create Test cases, Prioritise Test cases, Grouping Test Cases, Batch Testing, and Generating Test Results.)
- Automation Framework

UNIT-III:

JMeter:

- Introduction to Apache JMeter

- Elements of JMeter Test Plan

- Building a JMeter Test Plan
- Recording Tests Using JMeter
- Enhancements in Test Scripts

UNIT-IV:

JMeter Result Analysis

- Running Multiple Scripts with JMeter
- Different Types of JMeter Test Plans
- JMeter Distributed (Remote) Testing
- JMeter Functions, Variables and Regular Expressions
- JMeter Best Practices

UNIT-V:

Jira Tool Syllabus:

- Introduction of JIRA
- Getting started with JIRA
- Test Management In JIRA (Using Zephyr Plug-in)
- Defect Management In JIRA
- Advanced Search Using JQL
- Generating Reports In JIRA

Web references:

https://www.lambdatest.com/blog/selenium-with-java/
https://www.gcreddy.com/2021/09/apache-jmeter-syllabus.html
https://www.javatpoint.com/jira-tutorial

VI SEMESTER: JOB ORIENTED ELECTIVE - II	L	T	P	C
	3	-	-	3
20IT6J01 : FULL STACK DEVELOPMENT				

COURSEOUTCOMES:

At the end of the course students will be able to

1. Identify the Basics concepts of Web Page and Markup Languages. (K2)
2. Develop web Applications using Scripting languages and Frameworks. (K3)
3. Construct and Run Applications using PHP.(K3)
4. Practice Creating First Controller and Unit Testing in AngularJS. (K3)
5. Discover Working with the Files in React JS and Constructing Elements with Data.(K2)

Unit- 1: HTML

Web Essentials: Clients, Servers, and Communication. The Internet-Basic Internet Protocols- The World Wide Web-HTTP request message-response message-Web clients Web Servers. Markup Languages: XHTML, an introduction to HTML, History, Versions, Basics, XHTML Syntax and semantics some fundamentals of HTML Elements-Relative URLs-Lists-Tables-Frames-Forms-HTML 5.0

Unit- 2: Cascading Style Sheets (CSS)

Style Sheets: CSS-Introduction to Cascading Style Sheets- Features-Core Syntax-Style Sheets and HTML-Style Rule Cascading and Inheritance- Text Properties-Box Model Normal Flow Box Layout beyond the Normal Flow-CSS3.0, Introducing to Java Script, JavaScript basics, JavaScript objects, JSON.

Unit- 3: PHP

Introduction to PHP, Language Basics, Functions, Strings, Arrays. MYSQL Installation, Accessing MySQL Using PHP, Form Handling, Cookies, Sessions, and Authentication, Tables, Inserting Data into Tables, Selecting Data from a Table, Updating Table, Deleting data from Table, Webpage creation.

Unit- 4: Angular JS

Introducing Angular JS, Starting out with Angular JS, Basic AngularJS, Directives and Controllers, AngularJS Modules, Creating First Controller, working with and Displaying, Arrays, more Directives, working with ng-repeat, Unit Testing in AngularJS, Forms, inputs and Services, Working with ng-model, Working with Forms, Leverage Data-Binding and Models, Form Validation and States, Error Handling with Forms, ngModelOptions, Nested Forms with ng-form, Other Form Controls.

Unit- 5: React JS

Introduction to react, Obstacles and Roadblocks, keeping Up with the Changes, Working with the Files, Pure React, Page Setup, The Virtual DOM, React Elements, React DOM, Children, Constructing Elements with Data, React Components, DOM Rendering , Factories

Text Books:

1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006
2. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007
3. Brad Green, Shyam Seshadri, AngularJS, Up and Running Enhanced Productivity with Structured Web Apps, Publisher O'Reilly Media
4. Alex Banks, Eve Porcello,Learning React, Functional Web Development with React and Redux Publisher O'Reilly Media

Reference Books:

1. Bert Bates, Kathy Sierra,Head First Java, 2nd Edition Publisher O'Reilly Media, Inc

VI SEMESTER: JOB ORIENTED ELECTIVE - II	L	T	P	C
	3	-	-	3
20IT6J02: BLOCK CHAIN TECHNOLOGY				

Course Outcomes

After the completion of the course the students are able to

CO1 Discover the secure and efficient transactions with crypto-currencies

CO2 Experiment with cryptocurrency trading and crypto exchanges

CO3 Explain bitcoin usage and applications

CO4 Develop private block chain environment and develop a smart contract on Ethereum

CO5 Build the hyper ledger architecture and the consensus mechanism applied in the hyperledger

Unit-I

CRYPTOCURRENCY AND BLOCKCHAIN- INTRODUCTION:

Blockchain- An Introduction, Distinction between databases and blockchain, Distributed ledger. Blockchain ecosystem - Consensus Algorithms & Types, Blockchain structure, Distributed networks- Distributed Applications (DApps) – Web 3.0 - DApps Ecosystems. Working - Permissioned and permission-less Blockchain – Cross Chain Technologies. – IOT & Blockchain - Digital Disruption in Industries – Banking, Insurance, Supply Chain, Governments, IP rights, Creation of trustless Ecosystems – Block chain as a Service – Open Source Block chains

Unit-II

CRYPTO CURRENCIES: Crypto Currencies - Anonymity and Pseudonymity in Cryptocurrencies - Digital Signatures - Cryptocurrency Hash Codes -Need for Crypto Currencies – Crypto Markets – Explore Crypto Currency Ecosystems - ICOs – Crypto Tokens - Atomic Swaps – Crypto Currency Exchanges – Centralised and Decentralized Crypto exchanges – Regulations on Crypto Currencies & exchanges – Downside of non-regulated currencies – crypto Scams – Exchange hacks

Unit-III

BITCOIN: Bitcoin – history- Bitcoin- usage, storage, selling, transactions, working- Invalid Transactions Parameters that invalidate the transactions- Scripting language in Bitcoin- Applications of Bitcoin script- Nodes and network of Bitcoin- Bitcoin ecosystem

Unit-IV

ETHEREUM: The Ethereum ecosystem, DApps and DAOs - Ethereum working- Solidity- Contract classes, functions, and conditionals- Inheritance & abstract contracts- Libraries- Types & optimization of Ether- Global variables- Debugging- Future of Ethereum- Smart Contracts on Ethereum- different stages of a contract

deployment- Viewing Information about blocks in Blockchain- Developing smart contract on private Blockchain- Deploying contract from web and console

Unit-V

HYPERLEDGER: Hyperledger Architecture- Consensus- Consensus & its interaction with architectural layers Application programming interface- Application model -Hyperledger frameworks- Hyperledger Fabric - Various ways to create Hyperledger Fabric Block chain network- Creating and Deploying a business network on Hyperledger Composer Playground- Testing the business network definition- Transferring the commodity between the participants

TEXT BOOKS

1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas M Antonopoulos 2018

2. Henning Diedrich, Ethereum: Block chains, Digital Assets, Smart Contracts, Decentralized Autonomous Organizations-2016

ONLINE REFERENCES

1. https://www.coursera.org/learn/ibm-blockchain-essentials-for-developers

2. https://museblockchain.com/

3. https://www.provenance.org/

4. https://www.coursera.org/learn/blockchain-basics

5. https://steemit.com/

6. https://101blockchains.comhttps://followmyvote.com/

VI SEMESTER	L	T	P	C
	-	-	3	1.5
20CS6L01 : MACHINE LEARNING LAB				

COURSEOUTCOMES:

At the end of the course, the student will be able to,

1. Observe the implementation procedures for the Machine Learning algorithms.(K2)
2. Develop python programs for various learning algorithms.(K3)
3. Apply appropriate data sets to the Machine Learning algorithms.(K3)
4. Identify and apply Machine Learning algorithms to solve real world problems. (K2)
5. Illustrate various clustering algorithms for various applications.(K2)

LIST OF EXPERIMENTS:

1.Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

2.Implement Simple Linear Regression

3.Implement Multi Linear Regression

4.Implement Logistic Regression

5.Data preprocessing for classification

6.Confusion matrix for a binary classifier.

7.Implement Support Vector Machines.

8.Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

9.Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.

10.Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.

11.Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

12.Implement k-Mean's algorithm to cluster a set of data stored in a .CSV file.

13. Implement Random Forest models for automatic classification

14. Implement Ensemble Model to perform classification.

VI SEMESTER	L	T	P	C
	-	-	3	1.5
20CS6L02 : OBJECT ORIENTED ANALYSIS & DESIGN LAB				

COURSE OUTCOMES:

At the end of the course students are able to

1. Sketch various UML diagrams.(K3)

2. Show the importance of systems analysis and design in solving computer-based problems.(K2)

3. Develop software architecture for a mini project problem.(K3)

4. Classify dynamic and static aspects of various case studies. (K2)

5. Transform model to code and code to model through Forward engineering. (K2)

Introduction about ARGO UML tool

Do the following List of UML CASE STUDY(S): USING ARGO UML tool

1) Model the UML diagrams of ATM Application.

2) Model the UML diagrams of Library Management System.

3) Model the UML diagrams of Online Book Shop.

4) Model the UML diagrams of Railway Reservation System.

5) Model the UML diagrams of Banking System.

6) Model the UML diagrams of Credit Card Processing.

7)Model the UML diagrams of PAYTM Application.

8) Model the UML diagrams of GOOGLE-PAY Application.

9) Model the UML diagrams of PHONE-PAY Application.

10) Model the UML diagrams of Ticket Vending Machine.

11) Model the UML diagrams of Airport Check-In.

12) Model the UML diagrams of Recruitment Application

NOTE: Must Draw the Use case, Class, Sequence, Activity Diagrams

VI SEMESTER	L	T	P	C
	-	-	3	1.5
20CS6L01: COMPAILER DESIGN LAB				

Course Outcomes:
At the end of the course students are able to

1 . Show Lexical analyzer for given language using C and LEX tools. (K2)
2. Identify to design and convert BNF rules into YACC form to generate various parsers. (K2)
3. Predict and design Predictive parser for the given language . (K2)
4 . Generalize machine code from the intermediate code forms . (K2)
5. Sketch Symbol table and design machine code from the abstract syntax tree . (K3)

Syllabus:
1. Design a Lexical analyzer for the given language. The lexical analyzer should ignore redundant spaces, tabs and new lines. It should also ignore comments. Although the syntax specification states that identifiers can be arbitrarily long, you may restrict the length to some reasonable value.

2. Implement the lexical analyzer using JLex, flex or lex or other lexical analyzer generating stools.

3. Design Predictive parser for the given language.

4. Design LALR bottom-up parser for the given language.

5. Convert the BNF rules into Yacc form and write code to generate abstract syntax tree.

6. Write program to generate machine code from the abstract syntax tree generated by the parser.

7. Implementation of Symbol Table.

8. Generation of Code for a given Intermediate Code.

Text Books:
1.Compilers: Principles, Techniques and Tools: 2nd Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ulman; 2nd Edition ,Pearson Education.

2.Modern Compiler Implementation in C- Andrew N. Appel, Cambridge University Press.

Reference Books:

1.lex&yacc – John R. Levine, Tony Mason, Doug Brown, O‟reilly
2.Modern Compiler Design- Dick Grune, Henry E. Bal, Cariel T. H. Jacobs, Wiley dreamtech.
3.Engineering a Compiler-Cooper & Linda, Elsevier.
4.Compiler Construction, Louden, Thomson.
5. Principles of compiler design, V. Raghavan, 2nd ed, TMH, 2011.

VI SEMESTER	L	T	P	C
	2	-	-	2
20CS6S01-: WEB DESIGN AND DEVELOPMENT				

COURSE OUTCOMES:

At the end of the course, the student should be able to:

1. Show simple web pages using ReactJS.(K2)
2. Observe to gain an intermediate level of expertise in Spring Boot. (K2)
3. Practice various Servlet Programs and Implement Servlets technology for simple applications(K3)
4. Illustrate various operations on Mongo Database. (K2)
5. Develop Applications using ReactJS, MongoDB and Servlets(K3)

UNIT-I: ReactJS

ReactJS: An Introduction to ReactJS, Installation, Architecture, Creating A React Application, JSX, Components, Styling, Properties(props), Event Management, State Management, Http Client Programming, Form Programming, Routing, Redux, Animation, CLI Commands, Building and Deployment, Example.

UNIT-II Mongo DB

Introduction to Mongo DB: Mongo DB Environment, Create Database, Drop Database, Create Collection, Drop Collection, Read Operations, Write Operations.

UNIT-III: Servlet and JSP

Servlet: Servlet Basics, Need of Server-Side Programming, Servlet Life Cycle, Servlet Hello World Application, Web.xml Structure, Servlet Directives- include(), forward(), sendRedirect(), HttpServletRequest and HttpServletResponse in Servlet, Servlet and JDBC Integration.
JSP: JSP Basics, JSP Scripting Elements(Declaration, Expression, Scriptlet), Directive Elements(page, include, taglib), Action Elements(jsp:forward,jsp:include,jsp:useBean), JSP Implicit Objects.

UNIT-IV: Spring Boot

Spring Boot: An Introduction to Spring Boot, Quick Start, Bootstrapping, Tomcat Deployment, Build System, Code Structure, Spring Beans and Dependency Injection, Runners, Application Properties, Logging, Building Restful Web Services, Exception Handelling, Interceptor.

UNIT-V: Spring Boot(Continue)

Servlet Filter, Tomcat Port Number, File Handling, Service Components, Scheduling, Enabling HTTPS, Database Handling, Securing Web Applications.

Case Studies:

1. IISc Website Design and Development
2. JEEE Entrance Test and Admission
3. Amazon Website Model
4. You tube Website Model
5. TOEFL and GRE Test conduction and results

VI SEMESTER	L	T	P	C
	2	-	-	-
20HS6T01 : PROFESSIONAL ETHICS AND INTELLECTUAL PROPERTY RIGHTS				

COURSE OUTCOMES:

Students are able to

CO1.Identify the professional roles played by an engineer and illustrate the process of Social experimentation

CO2.Determine Engineer's responsibilities and rights towards the society

CO3.Analyze various aspects of Intellectual Property Rights and recognize the process of protecting the copyrights

CO4.Describe the registration process of Patents and trademarks and also demonstrate the concept of trade secrets and cybercrimes

UNIT-I

ENGINEERING ETHICS:

Importance of Engineering Ethics-–Professional and Professionalism –Professional Roles to be played by an Engineer –Professional Ethics.

UNIT-II

ENGINEERING AS SOCIAL EXPERIMENTATION :

Role of engineering in knowledge society- Knowledge acquired – Conscientiousness – Relevant Information Engineers as Managers, Consultants, and Leaders.

ENGINEERS' RESPONSIBILITY FOR SAFETY AND RISK: Role and importance of Safety and risk Types of Risks –Threshold Levels for Risk– Risk Benefit Analysis.

UNIT-III

ENGINEERS' RESPONSIBILITIES AND RIGHTS:

Collegiality-Conflict of Interest-solving conflict problems – Ethical egoism-Collective bargaining - Confidentiality-Acceptance of Bribes/Gifts--Occupational Crimes-industrial espionage-Whistle Blowing types of whistle blowing.

UNIT IV

INTELLECTUAL PROPERTY AND COPY RIGHTS:

Introduction to Intellectual Property Law - Types of Intellectual Property – Infringement, Copyrights: Introduction to Copyrights – Principles of Copyright – Rights Afforded by Copyright Law –Copyright Formalities and Registration.

UNIT-V

PATENTS AND TRADEMARKS:

Introduction to Patent Law –Rights under Patent Law – Patent Requirements – Patent Application Process and Granting of Patent – Double Patenting – Patent Cooperation Treaty. Trademarks:Introduction to Trade Mark – Trade Mark Registration Process – Trade Markmaintenance – Likelihood of confusion

TEXT BOOKS:

1. M.Govindarajan, S.Natarajan and V.S.SenthilKumar- "Engineering Ethics and Human Values" by PHI Learning Pvt. Ltd-2009.

2. Deborah E.Bouchoux, "Intellectual Property". Cengagelearning , NewDelhi, BS Publications (Press)

3. Prabhuddha Ganguli,' Intellectual Property Rights" Tata Mc-Graw – Hill, New Delhi

B. TECH 7th SEMESTER	L	T	P	C
	3	-	-	3
Professional Elective –III **20CS7E01:CRYPTOGRAPHY AND NETWORK SECURITY**				

Course Outcomes:

At the end of the course, student will be able to

1. Apply different security threats, countermeasures and foundation course of cryptography mathematics. (K3)
2. Classify basic principles of symmetric key algorithms and operations of some symmetric key algorithms and asymmetric key cryptography(K2)
3. Restate basic principles of Public key algorithms and Working operations of some Asymmetric key algorithms(K2)
4. Show applications of hash algorithms, digital signatures and key management techniques(K3)

Determine the knowledge of Application layer, Transport layer and Network layer security Protocols(K3)

UNIT I:

Basic Principles: Security Goals, Security Attacks, Security Services, Security Mechanisms, Symmetric Cipher Model, Substitution Techniques, Transposition Technique, Phishing and Defensive Measure, Web-Based Attacks, Structured Query Language(SQL) Injection attacks.

UNIT II:

Traditional Block Cipher Structure: Stream Cipher and Block Cipher. **Symmetric Encryption:** Mathematics of Symmetric Key Cryptography, Introduction to ModernSymmetric Key Ciphers, Data Encryption Standard, IDEA(International Data Encryption Algorithm),Advanced Encryption Standard.

UNIT III:

Asymmetric Encryption: Mathematics of Asymmetric Key Cryptography, Asymmetric Key Cryptography, RSA Algorithm, Algorithm for Diffe-Hellman Key Exchange, Elliptic CurveCryptography.

UNIT IV:

Data Integrity, Digital Signature Schemes & Key Management: Hash Function**,** Applicationsof Cryptographic Hash Functions, SHA(Secure Hash Algorithm),Message Integrity and Message Authentication, , Digital Signature, Key Management and Distribution.

UNIT V:

Network Security-I: Remote User Authentication Principles, Kerberos, Web Security, Security at application layer: PGP and S/MIME, Security at the Transport Layer: SSLand TLS, **Network Security-II:** Secure Shell(SSH)**,**Security at the Network Layer: IPSec, System Security

Text Books:

1. Cryptography and Network Security, 3rd Edition Behrouz A Forouzan, Deb deep Mukhopadhyay,McGraw Hill,2015
2. Cryptography and Network Security,4th Edition, William Stallings, (6e) Pearson,2006
3. Everyday Cryptography, 1st Edition, Keith M. Martin, Oxford,2016

Reference Books:

1. Network Security and Cryptography, 1st Edition, Bernard Meneges, Cengage Learning,2018

B. TECH 7th SEMESTER	L	T	P	C
	3	-	-	3
Professional Elective –III **20CS7E02: DESIGN PATTERNS**				

Course Outcomes

CO1. Identify the appropriate design patterns to solve object-oriented design problems.

CO2. Develop design solutions using creational patterns.

CO3. Use refactoring to compose the methods for proper code packaging

CO4. Apply structural patterns to solve design problems.

CO5. Construct design solutions by using behavioural patterns.

UNIT – I

Introduction: What is a design pattern? design patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

UNIT - II

Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary.

UNIT - III

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

UNIT - IV

Structural Pattern: Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy

UNIT - V

Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Strategy, Template Method, Visitor.

TEXT BOOK:

1. Design Patterns, Erich Gamma, Pearson Education

REFERENCE BOOKS:

1. Pattern's in Java, Vol –I, Mark Grand, Wiley Dream Tech.

2. Patterns in Java, Vol-II, Mark Grand, Wiley Dream Tech.

3. Java Enterprise Design Patterns Vol-III, Mark Grand, Wiley Dream Tech.

4. Head First Design Patterns, Eric Freeman, O'reily publications

B. TECH 7th SEMESTER	L	T	P	C
	3	-	-	3
Professional Elective –III **20CS7E03: ARTIFICIAL NEURAL NETWORKS**				

Course Outcomes:

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

1. Understands basic neuron models: McCulloch-Pitts model and the generalized one,
2. compute distance or similarity-based neuron model, radial basis function model, etc.
3. design basic neural network models: multilayer perceptron, distance or similarity basedneural networks, etc.
4. implement basic learning algorithms: the delta learning rule, the back propagation algorithm, self-organization learning, the r4-rule, etc.
5. develop applications: pattern recognition, function approximation, information visualization, etc.

UNIT I

Introduction, ANN Terminology, learning strategy(supervised, unsupervised and reinforced), Structure and Functions of Biological and Artificial Neuron models, Neural network architecture, Neural networks learning rules, Learning of a single neuron and single layer feed forward neural networks.

UNIT II

Perceptron model, Multi-layer feed forward neural networks, Generalized delta rule, back-propagation algorithm, Introduction to CNN, Architecture, ANN vs CNN, Applications of CNN.

UNIT III

Self-organizing neural networks, Self-organizing feature map, Data visualization with self-organizing feature map

Classical **and Fuzzy Set**s: Introduction to classical sets- properties, Operations and relations;Fuzzy sets, Membership, Operations, Properties, Fuzzy relations, Cardinalities, Membership functions.

UNIT IV

Associative memory , Image restoration based on associative memory, Fuzzification, Defuzzification methods, Neural network applications, Fuzzy logic applications.

UNIT V

Generic Alogorithms : Introduction, Genetic Algorithm ,Fitness computing, Cross-over mutation, Evolutionary Programming ,Classifier Systems, Genetic Programming Parse Tress , Variation of Genetic Algorithm.

TEXTBOOKS:

1. Jacek M. Zurada, Introduction to Artificial Neural Systems, PWS Publishing Company,1995.
2. Simon Haykin, Neural Networks: A Comprehensive Foundation, Macmillan CollegePublishing Company, 1994.
3. Mohamad H. Hassoun, Fundamentals of Artificial Neural Networks, The MIT Press,1995.
4. Laurene Fausett, Fundamentals of Neural Networks: Architectures, Algorithms, andApplications, Prentice Hall International, Inc., 1994.
5. B. D. Ripley, Pattern Recognition and Neural Networks, Cambridge University Press.,1996.
6. "Deep learning," by Ian Goodfellow, Yoshua Bengio, and Aaron Courville. MIT Press,2016 (Free online version at: http://www.deeplearningbook.org/)

B. TECH 7th SEMESTER	L	T	P	C
	3	-	-	3
Professional Elective –III **20CS7E04: INFORMATION RETRIEVAL SYSTEMS**				

COURSE OUTCOMES:

At the end of this course student is able to:

1. Identify the basic information storage and retrieval concepts(K2)
2. Observe various data structures to store and represent information(K2)
3. Analyze effective information retrieval system using automatic indexing and clustering techniques .(K4)
4. Classify clustering techniques for different data base systems.(K2)
5. Record various information visualization technologies.(K3)

UNIT I

Introduction: Definition, Objectives, Functional Overview, Relationship to DBMS, Digital Libraries and Data Warehouses, Information Retrieval System Capabilities: Search, Browse, Miscellaneous

UNIT II

Data Structures: Introduction, Stemming Algorithms, Inverted File Structure, N-Gram data Structure, PAT data structure, Signature file structure, Hypertext data structure.

UNIT III

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural language, Concept indexing, Hypertext linkages.
Document and Term Clustering: Introduction, Thesaurus Generation, Item Clustering, Hierarchy of clusters

UNIT IV

User Search Technique Search statements and binding, Similarity measures and ranking, Relevance feedback, Selective dissemination of information search, Weighted searches of Boolean systems, Searching the internet and Hypertext

UNIT V

Information Visualization: Introduction, Cognition and Perception, InformationVisualization Technologies

Text Search Algorithms: Introduction, Software Text Search Algorithms, Hardware Text Search Systems

Text Books:

1. Kowalski, Gerald, Mark T May bury: Information Retrieval Systems Theory and Implementation, Kluwer Academy Press, 2006

References:

1. **Modern** Information Retrieval by Yates, Pearson Education
2. Information Storage and Retrieval by Robert Korfhage - John Wiley and Sons

B. TECH 7th SEMESTER	L	T	P	C
	3	-	-	3
Professional Elective –IV **20CS7E05: QUANTUM COMPUTING**				

COURSE OUTCOMES:

At the end of the course the students will be able to

1. Identify the quantum computing techniques
2. Identify the mathematics using on quantum computing
3. Develop quantum logic gate circuits
4. Develop quantum algorithm
5. Develop programs using various toolkits

UNIT–I

Introduction to Quantum Computing: Motivation for studying Quantum Computing, Major players In the industry (IBM, Microsoft, Rigetti, D-Wave etc.), Origin of Quantum Computing, Overview of Major concepts in Quantum Computing: Qubits and multi-qubits states, Bra-ket notation, Bloch Sphere representation, Quantum Super position, Quantum Entanglement.

UNIT–II

Math Foundation for Quantum Computing: Matrix Algebra: basis vector sand orthogonality,inner product and Hilbert spaces, matrices and tensors, unitary operators and projectors, Dirac notation, Eigenvalues and Eigenvectors.

UNIT–III

Building Blocks for Quantum Program: Architecture of a Quantum Computing platform, Detailsof q-bit system of information representation: Block Sphere, Multi-qubits States, Quantum superposition of qubits (valid and invalid superposition), Quantum Entanglement, Useful states from quantum algorithmic perceptive. g.Bell State, Operation on qubits: Measuring and transforming using gates, Quantum Logic gates and Circuit: Pauli, Hadamard, phase shift, controlled gates, Ising, Deutsch, swap etc, Programming model for a Quantum Computing Program: Steps performed on classical computer, Steps performed on Quantum Computer, Moving data between bits and qubits.

UNIT–IV

Quantum Algorithms: Basic techniques exploited by quantum algorithms, Amplitude amplification, Quantum Fourier Transform, Phase Kick-back, Quantum Phase estimation, Quantum Walks, Major Algorithms: Shor's Algorithm, Grover's Algorithm, Deutsch's Algorithm, Deutsch-Jozsa Algorithm,

UNIT–V

OSS Toolkits for implementing Quantum program: IBM quantum experience, Microsoft Q,Rigetti PyQuil (QPU/QVM)

TEXTBOOKS& REFERENCES:

1. Michael A. Nielsen, “Quantum Computation and Quantum Information”, CambridgeUniversityPress.
2. David McMahon, “Quantum Computing Explained”, Wiley.
3. IBM Experience: https://quantumexperience,ng,bluemix. net
4. Microsoft Quantum Development Kit https://www.microsoft.com/en-us/quantum/development-kit
5. Forest SDK PyQuil: https://pyquil.readthedocs.io/en/stable/

B. TECH 7th SEMESTER	L	T	P	C
	3	-	-	3
Professional Elective –IV **20CS7E06: NATURAL LANGUAGE PROCESSING**				

COURSE OUTCOMES:

On completion of the course, student will be able to

1. Understand NLP problems and survey the literature about that problem
2. Understand language modeling
3. Describe automated natural language generation and machine translation
4. Learn the natural language generation.
5. Analyze and compare the use of different statistical approaches for different types of NLP applications.

UNIT I

INTRODUCTION: Introduction and challenges of natural language processing, Phases in natural language processing, an outline of English syntax, Grammars and parsing, Features Augmented Grammar.

UNIT II

SYNTACTIC PROCESSING: Grammar for natural language, Toward efficient parsing, Ambiguity resolution: Statistical Methods.

UNIT III

SEMANTIC INTERPRETATION: Semantics and Logical Form, Linking syntax and semantics, Ambiguity resolution, other strategies for semantic interpretation.

UNIT IV

CONTEXT AND WORLD KNOWLEDGE: Knowledge representation and reasoning, Using World Knowledge, Discourse Structure.

UNIT V

WORLD KNOWLEDGE AND SPOKEN LANGUAGE: Defining conversational agent - An introduction to logic model-Theoretic semantics, Speech Recognition and Natural Language Understanding.

Applications: Machine Translation, Text classification and Sentimental Analysis.

TEXT BOOKS:

1. James Allen, -Natural Language Understanding, 2nd Edition, Pearson Education, LPE, 2005.
2. Daniel Jurafsky, James H. Martin―Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014

REFERENCE BOOKS:

1. U. S. Tiwary and Tanveer Siddiqui, Natural Language Processing and Information Retrieval, Oxford University Press, 2008.
2. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.

B. TECH 7th SEMESTER	L	T	P	C
	3	-	-	3
Professional Elective –IV **20CS7E07: MOBILE COMPUTING**				

COURSE OUTCOMES:

On completion of this course, the students will be able to

1. Analyze the Mobile Computing limitations and applications.(K4)
2. Develop applications that are mobile-device specific and demonstrate current practice in mobile computing contexts.(K3)
3. Construct the GSM services and system architecture.(K3)
4. Articulate of Mobile IP network layer protocols.(K3)
5. Focus about Mobile ad-hoc and wireless sensor networks.(K4)

UNIT I

Mobile Computing (MC): Introduction to MC, Novel applications, limitations of Mobile Computing, Mobile Computing Architecture. Mobile system networks: Cellular network, WLAN network and Mobile IP, Ad-hoc networks, Mobile application development platform: Android- Introduction and Android Architecture

UNIT II

Mobile devices and systems: Cellular networks and frequency reuse- Cellular networks for mobile smartphones, frequency reuse in networks

Mobile smartphones, smart mobiles and systems: smartphone features, Bluetooth and Wi-Fi, GPS, Handheld devices: Windows CE based devices, Mac OS based devices, Symbian OS based devices, Linux based mobile devices

UNIT III

GSM-services and system architecture: Services, Subsystems of GSM architecture- RSS,NSS,OSS, GSM architecture, Localization and Call Handling, Handover-types of Handover in GSM,GPRS:GPRS System architecture, LONG-TERM EVOLUTION(LTE),WiMAX Rel 1.0 IEEE 802.16,4G NETWORKS.

UNIT IV

Mobile IP Network Layer: OSI Layers Functions, TCP/IP and Internet protocol, Mobile internet protocol-Working of Mobile IP, Packet delivery and Handover management, Security, Location Management: Agent Discovery, Agent advertisement, Registration, Dynamic Host Configuration Protocol (DHCP).

UNIT V

MOBILE AD-HOC and WIRELESS SENSOR NETWORKS

Introduction to Mobile AD-HOC Networks: Fixed Infrastructure Architecture, MANET Infrastructure Architecture, MANET Properties, MANET applications, Security in Ad-hoc networks, Wireless sensor networks, Sensor Network Applications

Wireless LAN, 802.11 Architecture, Protocol layers, Wireless Application Protocol (WAP), WAP 1.1 Architecture

Text Books

1. Mobile computing ,RAJ KAMAL, Second Edition, Oxford University Press
2. Jochen Schiller, "Mobile Communications", Addison-Wesley.), second edition, 2018.
3. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing",Wiley, 2018.

Reference Books:

4. Reza Behravanfar, "Mobile Computing Principles: Designing and Developing MobileApplications with UML and XML", Cambridge University Press.
5. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden, Schwiebert, Loren, "Fundamentals of Mobile and Pervasive Computing", McGraw-Hill Professional.

VII SEMESTER – PROFESSIONAL ELECTIVE - IV	L	T	P	C
	3	-	-	3
20IT7E04 : DISTRIBUTED SYSTEMS				

COURSE OUTCOMES

After the completion of the course the students are able to

1. Explain the concept of distributed systems and various distributed models.
2. Elaborate knowledge on inter-process communication mechanisms used in distributed systems and Compare RPC and RMI.
3. Explain Global states and replication.
4. Define distributed file systems and name services.
5. Examine distributed transactions and concurrency control.

UNIT-I

Characterization of Distributed Systems: Introduction, Examples of Distributed Systems, Resource Sharing and the Web, Challenges.

System Models: Introduction, Architectural Models, Fundamental Models.

UNIT-II

Inter Process Communication (IPC): Introduction, The API for the Internet Protocols, External Data Representation and Marshalling, Client-Server Communication, Group Communication.

Distributed Objects and Remote Invocation: Introduction, Communication between Distributed Objects, Remote Procedure Call, Events and Notifications, Case Study: JAVA RMI.

UNIT-III

Time and Global States: Introduction - Clocks, events and process states - Synchronizing physical clocks- Logical time and logical clocks - Global states – Coordination and Agreement – Introduction - Distributed mutual exclusion – Elections – Replication.

UNIT-IV

Distributed File Systems: Introduction, File Service Architecture, Case Study 1: Sun Network File System, Case Study 2: The Andrew File System. **Name Services:** Introduction, Name Services and the Domain Name System, Directory Services, Case Study of the Global Name Services.

Process & Resource Management: Process Management: Process Migration: Features, Mechanism - Threads: Models, Issues, Implementation. Resource Management: Introduction- Features of Scheduling Algorithms –Task Assignment Approach – Load Balancing Approach – Load Sharing Approach.

UNIT-V

Transactions and Concurrency Control: Introduction, Transactions, Nested Transactions, Locks, Optimistic Concurrency Control, Timestamp Ordering, Comparison of Methods for Concurrency Control.

Distributed Transactions: Introduction, Flat and Nested Distributed Transactions, Atomic Commit Protocols, Concurrency Control in Distributed Transactions, Distributed Deadlocks, Transaction Recovery.

Text Books:

1. Distributed Systems, Concepts and Design, George Coulouris, J Dollimore and Tim Kindberg, Pearson Education, 5th Edition. 2012.

Reference Books:

1. Distributed Systems, Principles and Paradigms, Andrew S. Tanenbaum, Maarten Van Steen, 3rd Edition, PHI, 2017.
2. Distributed Systems, An Algorithm Approach, Sukumar Ghosh, Chapman & Hall/CRC, Taylor & Fransis Group, 2nd Edition, 2011.
3. Distributed systems: Software Design and Implementation, Albert Fleischmann, 1st Edition, Springer, 2011.

B. TECH 7th SEMESTER	L	T	P	C
	3	-	-	3
Professional Elective –V **20CS7E08: EDGE COMPUTING**				

Course Outcomes:

On completion of this course, the students will be able to

1. Understand various edge computing hardware architectures and edge platforms.
2. Differentiate IoT Vs Machine-to-Machine Vs SCADA.
3. Configure RaspberryPi, Program
4. Explore MQTT architecture details, state transitions, packet structure, datatypes,communication formats,
5. Apply edge computing with RaspberryPi.

UNIT-I

IoT and Edge Computing Definition and Use Cases: Introduction to Edge Computing Scenario' sand Use cases-Edge computing purpose and definition, Edge computing use cases, Edge computing hardware architectures, Edge platforms, Edgevs Fog Computing, Communication Models-Edge, FogandM2M.

UNIT-II

IoT Architecture and Core IoT Modules-A connected ecosystem, IoT versus machine-to-machine versus, SCADA, The value of a network and Metcalfe's and Backstrom's laws, IoT and edge architecture, Role of an architect, Understanding Implementations with examples-Exampleuse case and deployment, Case study – Telemedicine palliative care, Requirements, Implementation, Use case retrospective.

UNIT-III

cPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout and Pinouts, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi, Connecting Raspberry Pi via SSH, Remote access tools, Interfacing DHT Sensor with Pi, Pias Webserver, PiCamera, Image& Video Processing using Pi.

UNIT-IV

Implementation of Microcomputer RaspberryPi and device Interfacing, Edge to Cloud Protocols-Protocols, MQTT, MQTT publish-subscribe, MQTT architecture details, MQTT state transitions,MQTTpacketstructure,MQTTdatatypes,MQTTcommunicationformats,MQTT3.1.1wo rking example.

UNIT-V

Edge computing with RaspberryPi, Industrial and Commercial IoT and Edge, Edge computingand solutions.

TEXTBOOKS

1. IoT and Edge Computing for Architects-Second Edition, by Perry Lea, Publisher:PacktPublishing,2020, ISBN: 9781839214806
2. RaspberryPiCookbook,3rdEdition, by Simon Monk, Publisher: O'ReillyMedia,Inc.,2019,ISBN: 978149204322.

REFERENCES

1. Fog and Edge Computing: Principles and Paradigms by Rajkumar Buyya, SatishNarayana Sriram, Wiley publication, 2019, ISBN: 9781119524984.
2. David Jensen, "Beginning Azure IoT **Edge Computing:** Extending the Cloud to theIntelligent **Edge**, MICROSOFTAZURE,2019

B. TECH 7th SEMESTER	L	T	P	C
	3	-	-	3
Professional Elective –V **20CS7E09: WIRELESS SENSOR NETWORKS**				

COURSE OUTCOMES:

At the end of the course the student should be able to:
1. Create a Sensor network environment for different type of applications.(K2)
2. Design ad-hoc and sensor network architectures using QoS and Congestion Control mechanisms. (K3)
3. Apply appropriate routing algorithms for different network environments. (K3)
4. Analyze the various applications of sensor networks and deploy security mechanisms. (K4)
5. Evaluate the QoS related performance measurements of ad hoc and sensor networks. (K5)

UNIT – I

Introduction: Fundamentals of wireless communication technology, the electromagnetic spectrum radio propagation, characteristics of wireless channels, modulation techniques, multiple access techniques, wireless LANs, PANs, WANs, and MANs, Wireless Internet.

UNIT – II

Introduction to Ad-hoc / Sensor Networks: Key definitions of adhoc/sensor networks, unique constraints and challenges, advantages of ad-hoc/sensor network, driving applications, issues in adhoc wireless networks, issues in design of sensor network, sensor network architecture, data dissemination and gathering.

UNIT –III

MAC Protocols : Issues in designing MAC protocols for adhoc wireless networks, design goals, classification of MAC protocols, MAC protocols for sensor network, location discovery, quality, other issues, S-MAC, IEEE 802.15.4.

UNIT – IV

Routing Protocols: Issues in designing a routing protocol, classification of routing protocols, table-driven, on-demand, hybrid, flooding, hierarchical, and power aware routing protocols.

UNIT – V

QoS and Energy Management : Issues and Challenges in providing QoS, classifications, MAC, network layer solutions, QoS frameworks, need for energy management, classification, battery, transmission power, and system power management schemes.

TEXT BOOKS:

1. C. Siva Ram Murthy and B. S. Manoj, “Ad-hoc Wireless Networks”, Pearson Education,2008.
2. Carlos De Morais Cordeiro and Dharma Prakash Agrawal, “Ad-hoc and Sensor Networks: Theory and Applications”, World Scientific Publishing Company, 2006.

REFERENCE BOOKS:

1. Holger Karl and Andreas willig, “Protocols and Architectures for Wireless Sensor Networks”, John Wiley & Sons, Inc., 2005.
2. C.K.Toh, “Ad-hoc Mobile Wireless Networks”, Pearson Education, 2002.

3. Erdal Cayirci and Chunming Rong, “Security in Wireless Ad Hoc and Sensor Networks”,John Wiley and Sons, 2009.
4. Charles E.Perkins, “Ad-hoc Networking”, Pearson Education, 2001.
5. Shih-Lin Wu and Yu-Chee Tseng, “Wireless Ad-hoc Networking”, Auerbach Publications, Taylor & Francis Group, 2007.

Web Resources:

1. https://www.intechopen.com/books/wireless-sensor-networks-technology-and-rotocols/overview-of-wireless-sensor-network
2. https://www.elprocus.com/architecture-of-wireless-sensor-network-and-applications/
3. https://www.wisdomjobs.com/e-university/wireless-sensor-networks-interview-questions.html
4. https://www.elprocus.com/architecture-of-wireless-sensor-network-and-applications/
5. https://www.wisdomjobs.com/e-university/wireless-sensor-networks-interview-questions.html

B. TECH 7th SEMESTER	L	T	P	C
	3	-	-	3
Professional Elective –V **20IT7E06 : COMPUTER VISION**				

Course Outcomes

After the completion of the course the students are able to

1. Implement fundamental image processing techniques required for computer vision.
2. Perform shape analysis and Implement boundary tracking techniques.
3. Apply Hough Transform for line, circle and ellipse detections.
4. Apply 3D vision techniques and Implement motion related techniques.
5. Develop applications using computer vision techniques.

UNIT-I

Image Processing Foundations: Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture.

UNIT-II

Shapes And Regions: Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments.

UNIT-III

Hough Transform: Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation.

UNIT-IV

3D Vision And Motion: Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion.

UNIT-V

Applications: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.

Text Books:

1. D. L. Baggioeal, ―Mastering OpenCV with Practical Computer Vision Projects‖, Packt Publishing, 2012.
2. E. R. Davies, ―Computer & Machine Vision‖, Fourth Edition, Academic Press, 2012.
3. Jan Erik Solem, ―Programming Computer Vision with Python: Tools and algorithms for analyzing images‖, O'Reilly Media, 2012.

Reference Books:

1. Mark Nixon and Alberto S. Aquado, ―Feature Extraction & Image Processing for Computer Vision‖, Third Edition, Academic Press, 2012.
2. R. Szeliski, ―Computer Vision: Algorithms and Applications‖, Springer 2011.
3. Simon J. D. Prince, ―Computer Vision: Models, Learning, and Inference‖, Cambridge University Press, 2012.

B. TECH 7th SEMESTER	L	T	P	C
	3	-	-	3
Professional Elective –V 20AM7E07 : SOCIAL NETWORK ANALYSIS				

COURSE OBJECTIVES:

1. Formalize different types of entities and relationships as nodes and edges and represent this information as relational data
2. Plan and execute network analytical computations
3. Use advanced network analysis software to generate visualizations and perform empirical investigations of network data
4. Interpret and synthesize the meaning of the results with respect to a question, goal, or task
5. Collect network data in different ways and from different sources while adhering to legal standards and ethics standards

COURSE OUTCOMES:

After the completion of the course the students are able to,

CO1: Know basic notation and terminology used in network science
CO2: Be able to visualize, summarize and compare networks
CO3: Illustrate basic principles behind network analysis algorithms
CO4: Develop practical skills of network analysis in R programming language
CO5: Be capable of analyzing real work networks

UNIT -I:

Social Network Analysis: Preliminaries and definitions, Erdos Number Project, Centrality measures, Balance and Homophily.

UNIT -II:

Random graph models: Random graphs and alternative models, Models of network growth, Navigation in social Networks, Cohesive subgroups, Multidimensional Scaling, Structural equivalence, roles and positions.

UNIT -III:

Network topology and diffusion, Contagion in Networks, Complex contagion, Percolation and information, Navigation in Networks Revisited.

UNIT -IV:

Small world experiments, small world models, origins of small world, Heavy tails, Small Diameter, Clustering of connectivity, The Erdos Renyi Model, Clustering Models.

UNIT -V:

Network structure -Important vertices and page rank algorithm, towards rational dynamics in networks, basics of game theory, Coloring and consensus, biased voting, network formation games, network structure and equilibrium, behavioral experiments, Spatial and agent-based models.

Text Books:

1. S. Wasserman and K. Faust. “Social Network Analysis: Methods and Applications”, Cambridge University Press.
2. D. Easley and J. Kleinberg, “Networks, Crowds and Markets: Reasoning about a highly connected world” , Cambridge University Press, 1st edition,2010

Reference Books:

1. Maarten van Steen. “Graph Theory and Complex Networks. An Introduction”, 2010.
2. Reza Zafarani, Mohammed Ali Abbasi, Huan Liu. “Social Media Mining: An Introduction”. Cambridge University Press 2014.
3. Maksim Tsvetovat and Alexander Kouznetsov. “Social Network Analysis for Startups”. O’Reilly Media, 2011.

E-Resources:

1. https://www.classcentral.com/course/edx-social-network-analysis-sna-9134
2. https://www.coursera.org/learn/social-network-analysis

VII SEMESTER: OPEN ELECTIVE - III	L	T	P	C
	3	-	-	3
20CE7O01: SOLID WASTE MANAGEMENT				

Course Outcomes:

Students are able to

1. Recall classification of solid waste generated.
2. Know the collection systems of solid waste of a town.
3. Analyze the importance of transfer and transport of solid waste.
4. Apply the knowledge in processing of solid waste.
5. Design treatment of municipal solid waste and landfill.

SYLLUBUS:

UNIT- I

Introduction to Solid Waste Management:

Goals and objectives of solid waste management, Classification of Solid Waste – Factors Influencing generation of solid waste - sampling and characterization – Future changes in waste composition, major legislation, monitoring responsibilities.

UNIT- II

Collection of Solid Waste:

Type and methods of waste collection systems, analysis of collection system optimization of collection routes– alternative techniques for collection system.

UNIT- III

Transfer and Transport:

Need for transfer operation, compaction of solid waste - transport means and methods, transfer station types and design requirements.

UNIT- IV

Processing and Treatment:

Processing of solid waste – Waste transformation through combustion and composting, anaerobic methods for materials recovery and treatment – Energy recovery – biogas generation and cleaning– Incinerators.

UNIT- V

Disposal of Solid Waste:

Methods of Disposal, Landfills: Site selection, design and operation, drainage and leachate collection systems –designated waste landfill remediation.

Text/ Reference books:

1. George Techobanoglous, Frank Kreith , Integrated Solid Waste Management- McGraw Hill Publication, 1993.
2. R.Saravanan, R.Dinesh Kumar, A.Suriya , Muncipal solid waste management, Lakshmi publications- 2015.
3. Vesilind, P.A., Worrell, W., Reinhart, D.,"Solid Waste Engineering", Cenage learning, New Delhi, 2004.

VII SEMESTER: OPEN ELECTIVE - III	L	T	P	C
	3	-	-	3
20CE7O02: BUILDING PLANNING AND DRAWING				

COURSE OUTCOMES

Students are able to

1. Understand the building bye-laws, plan various buildings as per the building by-laws.
2. Plan the individual rooms with reference to functional and furniture requirements.
3. prepare different sign conventions and bonds
4. Learn the skills of drawing building elements like doors and windows.
5. Develop the skills of Drawing Plans, Sections and Elevations of different buildings.

UNIT-I

BUILDING BYELAWS AND REGULATIONS: Introduction - terminology - objectives of building Bye laws - floor area ratio - floor space index - principles under laying building bye laws - classification of buildings - open space requirements - built up area limitations- height of buildings- wall thickness - lightening and ventilation requirements.

UNIT -II

RESIDENTIAL AND PUBLIC BUILDINGS

Residential buildings: Minimum standards for various parts of buildings -requirements of different rooms and their grouping- characteristics of various types residential buildings.
Public buildings: Planning of educational institutions, hospitals, dispensaries, office buildings, banks, industrial buildings, hotels & motels, buildings for recreation.

UNIT-III

SIGN CONVENTIONS AND BONDS: Brick, stone, plaster, sand filling, concrete, glass, steel, cast iron, copper alloys, aluminum alloys etc., lead, zinc, tin etc., earth, rock, timber and marbles. English bond and Flemish bond- odd and even courses for one, one-half, two and two & half brick walls in thickness at the junction of a corner.

UNIT- IV

DOORS, WINDOWS, VENTILATORS AND ROOFS: Panelled door, panelled and glassed door, glassed windows, paneled windows, swing ventilators, fixed ventilators, coupled roof, collar roofs. King Post truss, Queen Post truss Sloped and flat roof buildings: drawing plans, Elevations and Cross Sections of given sloped roof buildings.

UNIT-V

PLANNING AND DESIGNING OF BUILDINGS: Draw the Plan, Elevation and sections of a Residential & Public buildings from the given line diagram.

TEXT /REFERENCE BOOKS:

1. Y.S. Sane., Planning and Design of buildings, 2010.
2. Gurucharan Singh and Jagadish Singh , Planning, designing and scheduling, 2015.
3. M. Chakravarthi., Building planning and drawing, 2015.
4. ‘A’ Series & ‘B’ Series of JNTU Engineering College, Anantapur.
5. Shah and Kale , Building drawing, 2013.

VII SEMESTER : OPEN ELECTIVE - III	L	T	P	C
	3	-	-	3
20EE7O01 :: ENERGY AUDITING, CONSERVATION AND MANAGEMENT				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Understand the principles of energy audit
CO2	:	Explain the role of Energy Manager and Energy Management program.
CO3	:	Design a energy efficient motors and good lighting system
CO4	:	Evaluate the methods to improve the power factor
CO5	:	Estimate the computational techniques with regard to economic aspects.

SYLLABUS

UNIT-I	**:**	**PRINCIPLES OF ENERGY AUDIT**
Energy audit- definitions - concept - types of audit - energy index - cost index - pie charts – Sankey diagrams and load profiles - Energy conservation schemes and energy saving potential - Energy audit of industries- energy saving potential - energy audit of process industry - thermal power station - building energy audit– Numerical problems.		
UNIT-II	**:**	**ENERGY MANAGEMENT**
Principles of energy management - organizing energy management program - initiating – planning - controlling - promoting - monitoring - reporting. Energy manager - qualities and functions – language - Questionnaire – check list for top management.		
UNIT-III	**:**	**ENERGY EFFICIENT MOTORS AND LIGHTING**
Energy Efficient Motors: Energy efficient motors - factors affecting efficiency - loss distribution - constructional details - characteristics – variable speed - RMS - voltage variation-voltage unbalance-over motoring-motor energy audit. **Lighting:** lighting system design and practice - lighting control - lighting energy audit.		
UNIT-IV	**:**	**POWER FACTOR IMPROVEMENT AND ENERGY INSTRUMENTS**
Power factor – methods of improvement - location of capacitors - Power factor with non-linear loads - effect of harmonics on p.f - p.f motor controllers – Energy Instruments- watt meter - data loggers - thermocouples - pyrometers - lux meters - tongue testers.		
UNIT-V	**:**	**ECONOMIC ASPECTS AND COMPUTATION**
ECONOMIC ASPECTS: Economics Analysis depreciation Methods - time value of money - rate of return - present worth method - replacement analysis - lifecycle costing analysis. **COMPUTATION ASPECTS:** Calculation of simple payback method - net present value method- Power factor correction - lighting – Applications of life cycle costing analysis - return on investment.		

TEXT BOOKS:

1. Energy management by W.R.Murphy & G.Mckay Butter worth - Heinemann publications - 1982.
2. Energy management hand book by W.CTurner - John wiley and sons - 1982.

REFERENCE BOOKS:

1. Energy efficient electric motors by John.C.Andreas - Marcel Dekker Inc Ltd-2nd edition – 1995.
2. Energy management by Paul o' Callaghan - Mc-graw Hill Book company-1st edition – 1998.
3. Energy management and good lighting practice: fuel efficiency- booklet12

VII SEMESTER : OPEN ELECTIVE - III	L	T	P	C
	3	-	-	3
20EC7O01 :: INTRODUCTION TO GLOBAL POSITIONING SYSTEMS				

COURSE OUTCOMES:

After completion of this course, the students are able to,

CO1: Describe global navigation satellite systems (K1)

CO2: Understand GNSS Satellite signal characteristics (K2)

CO3: Develop GNSS Receiver (K3)

CO4: Analyze the impact of various error sources on the precision of positioning. (K4)

UNIT I : FUNDAMENTALS OF SATELLITE NAVIGATION:

Concept of Ranging using Time of arrival Measurements: Two-Dimensional Position Determination, Principle of Position Determination via Satellite-Generated Ranging signals, Fundamentals of satellite orbits: Orbital Mechanics, Constellation Design, Positioning determination using Ranging codes: Determining Satellite-to-User Range, Indian Developed GNSS- Indian Regional Navigation Satellite System (IRNSS) : NavIC and its applications, GPS-Aided Geo-Augmented Navigation (GAGAN)

UNIT II : GLOBAL POSITIONING SYSTEM SEGMENTS:

Space Segment Description: GPS Satellite Constellation Description, Constellation Design Guidelines, Space Segment Phased Development, Control Segment: Current Configuration, CS Planned Upgrades , User Segment: GPS Set Characteristics, GPS Receiver Selection

UNIT-III : GPS SATELLITE SIGNAL CHARACTERISTICS:

Modulations for Satellite Navigation: Modulation Types, Multiplexing Techniques, Signal Models and Characteristics, Legacy GPS Signals: Frequencies and Modulation Format, Power Levels, Autocorrelation Functions and Power Spectral Densities, Cross-Correlation Functions and CDMA Performance, Navigation Message Format.

UNIT-IV : GNSS RECEIVER:

Acquisition: Single Trial Detector, Tong Search Detector, M of N Search Detector, Combined Tong and M of N Search Detectors, FFT-Based Techniques, Direct Acquisition of GPS Military Signals, Vernier Doppler and Peak Code Search, carrier tracking, code tracking: Carrier Loop Discriminator, sequence of initial receiver operation.

UNIT-V: GNSS ERRORS: Introduction, Measurement errors: satellite clock error, ephemeris error, relative effects, atmospheric effects, receiver noise and resolution, multipath and shadowing effects, hardware bias errors, Pseudo range error budgets.

TEXTBOOKS:

1. Elliott D. Kaplan, Christopher J. Hegarty, Understanding **GPS/GNSS** principles and applications, third edition, artech house publishers, Boston, 2017
2. G S Rao, Global Navigational satellite system, Tata McGraw-Hill education private Ltd, New Delhi, 2015.

REFERENCES:

1. ISRO-IRNSS-ICD-SPS-1.1, Bangalore, 2017
2. Bhatta, B. ". Global Navigation Satellite Systems: Insights Into GPS, Glonass, Galileo, Compass, and Others", BS Publications, New Delhi, 2015.

E-REFERENCES:

1. https://archive.nptel.ac.in/courses/105/107/105107194/
2. https://d1.amobbs.com/bbs_upload782111/files_33/ourdev_584835O21W59.pdf

VII SEMESTER : OPEN ELECTIVE - III	L	T	P	C
	3	-	-	3
20BM7O01 :: INDUSTRIAL SOCIOLOGY AND PSYCHOLOGY				

UNIT I: Industrial Sociology: Nature and Scope of Industrial Sociology-Development of Industrial Sociology, Factors of social change – the technological factors, the cultural factors, effects of technology on major social institutions, social relations in industry.

UNIT II: Group Dynamics: Concept- factors influencing individual behaviour- Work Teams & Groups, Group Behavior, Group formation & development, Decision Making by Individuals, Groups Decision making process-techniques.

UNIT III: Industrial Psychology: Nature and Meaning of Industrial Psychology, Role of Industrial Psychology, Organizational Attitude, Motivation at work-Theories of Motivation (Theory X and Y, McClelland's Theory, Maslow's Need Theory, Herzberg's Two Factor Theory), Cultural Differences in Motivation.

UNIT IV: Organizational Design and Leadership: Organizational Design & Structure- organizational design- process, Structural differentiations, factors influencing design of organizations, Leadership-concept, types, Leadership vs. Management, Leadership Theories, Emerging issues in Leadership.

UNIT V: Organizational Conflicts and Change management: - Causes and Consequences of Conflict-Conflict handling techniques, Managing Change, Forces for change in Organization, Resistance to change.

TEXT BOOKS:

1. Nelson, Quick and Khandelwal, ORGB : An innovative approach to learning and teaching Organizational Behaviour. A South Asian Perspective, Cengage Learning, 2012
2. Luthans, Fred, Organizational Behavior, McGraw Hill, 2008.
3. Stephen P. Robins, Organisational Behavior, PHI Learning / Pearson Education, 11th edition, 2008.

REFERENCES BOOKS:

1. Schneider Engno V., Industrial Sociology 2nd Edition, McGraw Hill Publishing Co., New Delhi,2011.
2. Ivancevich, Konopaske & Maheson, Organisational Behaviour & Management, 7th edition, Tata McGraw Hill, 2008.
3. L.M.Prasad.,Organisational Behaviour, 5th Edition, Sulthan Chand & Sons.,2014

VII SEMESTER : OPEN ELECTIVE - III	L	T	P	C
	3	-	-	3
20ME7O01 :: BIO-MECHANICAL ENGINEERING				

COURSE OBJECTIVES: The main objectives of this course are

- To make the student familiar with fundamentals of bio mechanics.
- To gain knowledge about musculoskeletal system.
- To impart knowledge about linear kinetics and angular kinetics
- Make the student to illustrate the mathematical models used in the analysis of biomechanical systems

COURSE OUTCOMES: Students are able to

CO1: Explain about fundamentals of Bio mechanics. [K2]
CO2: Describe the mechanics of musculoskeletal system. [K2]
CO3: Relate the concept of kinetics with human motion. [K3]
CO4: Explain mechanical analysis of human motion. [K3]
CO5: Analyze human movements. [K4]

UNIT-I
INTRODUCTION TO BIO MECHANICS

Principles of mechanics in human movement, Qualitative and quantitative Analysis, Key mechanical concepts of mechanics and basic units, Nine fundamentals of biomechanics, Nine principles for application of Biomechanics.

UNIT-II
MECHANICS OF MUSCULOSKELETAL SYSTEM

Principles of joint motions, Muscle structures, Mechanical method of muscle action analysis, Tissue loads and forces, Biomechanics of bones and ligaments, Three mechanical characters of muscle, stretch-shortening cycle (SSC).

UNIT-III
LINEAR KINETICS AND ANGULAR KINETICS

Vector analysis of angle of pull and muscle angle pull, Contact forces, Impulse-Momentum Relationship, Force-Time Principle, Work-Energy relationship, Segmental interaction principle, Torque, Equilibrium, Center of gravity and Principle of balance.

UNIT-IV
MECHANICAL ANALYSIS OF HUMAN MOTION

Linear kinematics - linear kinematic analysis, position and displacement, velocity and speed, acceleration, differentiation and integration, kinematics of running, kinematics of projectiles, equations of constant acceleration, Angular kinematics - angular motion, measurements of angles, types of angles, representation of angular motion vectors, lower extremity joint angles, relationship between angular and linear motion, angular kinematics of running.

UNIT-V
APPLICATIONS OF MEDICAL REHABITATION

Qualitative analysis of kicking technique, batting, catching, throwing techniques, injury risk assessment, equipment design for strength training, Injury mechanics, injury prevention.

TEXT BOOKS:

1. Ronald L. Huston, Principles of Biomechanics,1st edition CRC Press, 2019
2. Joseph E. Muscolino, " Kinesology", 3rd edition, Mosby, 2016.
3. Subrata Pal, "Textbook of Biomechanics", 1st edition, Springer US, 2016.

REFERENCE BOOKS:

1. Duane Knudson, "Fundamentals of Biomechanics", 2nd edition, Springer, 2013.
2. Ajay Bahl, "Basics of Biomechanics", 1st edition, Jaypee Brothers Medical Publishers, 2010.
3. Robert frost, "Applied Kinesiology", 1st edition, North Atlantic Books, 2013
4. David A. Winter, "Biomechanics and Motor Control of Human Movement", John Wiley & sons, 2009.

WEB REFERENCE:

1. https://archive.nptel.ac.in/courses/112/105/112105305/
2. https://archive.nptel.ac.in/courses/112/106/112106248/

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2			1						2	2	
CO2	3	2	2			1						2	2	
CO3	3	2	2			1						2	2	
CO4	3	2	2			1						2	2	
CO5	3	1	1			1						2	2	
Avg	3	1.8	1.8			1						2	2	

VII SEMESTER : OPEN ELECTIVE - III	L	T	P	C
	3	-	-	3
20CS7O01 :: FULL-STACK DEVELOPMENT				

COURSE OUTCOMES:

At the end of the course, the student should be able to:

1. Identify the Basics concepts of Web Page and Markup Languages(K2)
2. Develop web Applications using Scripting languages and Frameworks(K3)
3. Construct and Run Applications using PHP.(K3)
4. Practice Creating First Controller and Unit Testing in AngularJS(K3)
5. Visualize Working with the Files in React JS and Constructing Elements with Data.(K1)

UNIT-I: HTML and CSS

HTML: An Introduction to HTML, Basic XHTML Syntax and Semantics, Basic HTML Elements: Images, Links, Lists, Tables, Forms, Frames, Division and Spanning, HTML 5.0.

CSS: Levels of Style sheets, Style specification formats, Selector forms, CSS Colors and Backgrounds, CSS Text and Font Properties, The Box Model, CSS Margins, Padding, and Borders Conflict Resolution.

UNIT-II: Client-Side Scripting using Java Script and DOM

Java Script: The Basics of Java Script, Objects, Primitive operations and Expressions, Screen output and Keyboard input, Control statements, Object Creation and modification, Arrays, functions, Constructors, Pattern matching using Regular Expressions, DHTML: Positioning moving and Changing Elements.

DOM: Introduction to the Document Object Model DOM, HTML DOM Event Handling, Modifying Element Style, Document Tree, DOM Event Handling

UNIT-III: Angular JS

Introduction to AngularJS: Expressions, Modules, Data Binding, Scopes, Directives & Events, Controllers, Filters, Services, HTTP, Tables, Select, Fetching Data from MySQL.

UNIT-IV: Servlet and JSP

Servlet: Servlet Basics, Need of Server Side Programming, Servlet Life Cycle, Servlet Hello World Application, Web.xml Structure, Servlet Directives- include(), forward(), sendRedirect(), HttpServletRequest and HttpServletResponse in Servlet, Servlet and JDBC Integration.

JSP: JSP Basics, JSP Scripting Elements(Declaration, Expression, Scriptlet), Directive Elements(page, include, taglib), Action Elements(jsp:forward,jsp:include,jsp:useBean), JSP Implicit Objects.

M

UNIT-V Mongo DB

Introduction to Mongo DB: Mongo DB Environment, Create Database, Drop Database, Create Collection, Drop Collection, Read Operations, Write Operations.

Text Books:

1. Programming the World Wide Web, Robet W Sebesta, 7ed, Pearson.
2. Web Technologies, Uttam K Roy, Oxford
3. Head First Servlet and JSP
4. Node.js, MongoDB, and AngularJS Web Development by Brad Dayley

Reference Books:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
2. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage
3. Pro Angular JS by Adam Freeman
4. MEAN Web Development by Amos Q. Haviv

VII SEMESTER : OPEN ELECTIVE - IV	L	T	P	C
	3	-	-	3
20CE7O03 :: INTRODUCTION TO WATERSHED MANAGEMENT				

Course Outcomes:

Students are able to

1. Analyze watershed characteristics to take appropriate management action.
2. Quantify soil erosion and design control measures.
3. Apply land grading techniques for proper land management.
4. Suggest suitable harvesting techniques for better watershed management.
5. Apply appropriate models for watershed management.

UNIT-I: Introduction:

Concept of watershed development, objectives of watershed development, need for watershed development, Characteristics of Watersheds: Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics.

UNIT-II: Principles of Erosion:

Types and causes of erosion, factors affecting erosion, estimation of soil loss due to erosion. Measures to Control Erosion: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, check dams, rock-fill dams, brushwood dam, Gabion.

UNIT-III: Water Harvesting:

Techniques of rain water harvesting- rain water harvesting from roof top, surface flow harvesting, farm ponds and dugout ponds, percolation tanks.

UNIT-IV: Land Management:

Land use and Land capability classification, management of forest, agricultural, grassland and wild land, Reclamation of saline and alkaline soils.

UNIT-V: Watershed Modeling:

Data of watershed for modeling, model calibration and validation, advances of watershed models. Integrated and multidisciplinary approach for watershed management.

Text/ References books:

1. Abrar Yousuf and Manmohanjit Singh, 'Watershed Hydrology, Management and Modeling', Taylor & Francis Ltd; 1st edition, 2021.
2. Das MM and M.D Saikia , 'Watershed Management', PHI Learning Pvt. Ltd, 2013.
3. Murthy VVN , 'Land and Water Management', Kalyani Publications, 2007.
4. Murthy J V S, 'Watershed Management', New Age International Publishers, 2006.
5. Wurbs R A and James R A 'Water Resource Engineering', Prentice Hall Publishers, 2002.

VII SEMESTER : OPEN ELECTIVE - IV	L	T	P	C
	3	-	-	3
20EE7O02 :: INTRODUCTION TO PROGRAMMABLE LOGIC CONTROLLER				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1	:	Illustrate I/O modules of PLC systems and ladder diagrams
CO2	:	Demonstrate various types registers and programming instructions.
CO3	:	Examine various types of PLC functions and its applications
CO4	:	Assess different data handling functions and its applications.
CO5	:	Describe the analog operations and PID modules

SYLLABUS

UNIT-I	**:**	**INTRODUCTION TO PLC SYSTEMS**
I/O modules and interfacing - CPU processor - programming Equipment - programming formats - construction of PLC ladder diagrams - Devices connected to I/O Modules. Digital logic gates - programming in the Boolean algebra system - conversion examples Ladder Diagrams for process control: Ladder diagrams & sequence listings - ladder diagram construction and flowchart for spray process system		
UNIT-II	**:**	**PLC PROGRAMMING & REGISTERS**
PLC Programming: Input instructions - outputs - operational procedures - programming examples using contacts and coils. Drill press operation. **PLC Registers:** Characteristics of Registers - module addressing - holding registers - Input Registers - Output Registers.		
UNIT-III	**:**	**PLC FUNCTIONS**
Timer functions & Industrial applications - counters - counter function industrial applications - Arithmetic functions - Number comparison functions - number conversion functions		
UNIT-IV	**:**	**DATA HANDLING FUNCTIONS**
SKIP - Master control Relay - Jump - Move - FIFO - FAL - ONS – CLR & Sweep functions and their applications. Bit Pattern and changing a bit shift register – sequence functions and applications - controlling of two-axis & three axis Robots with PLC - Matrix functions		
UNIT-V	**:**	**ANALOG PLC OPERATION**
Analog modules & systems - Analog signal processing - Multi bit Data Processing - Analog output Application Examples - PID principles - position indicator with PID control - PID Modules - PID tuning - PID functions.		

TEXT BOOKS:

1. Programmable Logic Controllers- Principles and Applications by John W. Webb & Ronald A. Reiss - Fifth Edition – PHI.
2. Programmable Logic Controllers- Programming Method and Applications –JR.Hackworth & nF.D Hackworth Jr. –Pearson - 2004

REFERENCE BOOKS:

1. Introduction to Programmable Logic Controllers- Gary A. Dunning - 3rd edition – Cengage Learning - 2005.
2. Programmable Logic Controllers –W.Bolton - 5th Edition - Elsevier publisher - 2009.

VII SEMESTER : OPEN ELECTIVE - IV	L	T	P	C
	3	-	-	3
20BM7O02 :: BUSINESS SKILL DEVELOPMENT				

UNIT- I

Communication in Business Objectives of communication - The Process of Human Communication – Types of Communication-Written, Oral, Visual, Audio Visual - Developing Listening Skills – Types, essentials of good listening and tips.

UNIT -II

Managing Organizational Communication– Formal and Informal Communication – Intra- personal–Inter-Personal Communication-Communication Models - Johari Window, Transactional Analysis, and Social Exchange theory. Role of emotion, barriers to interpersonal communication- Gateways to effective interpersonal communication.

UNIT -III

Nonverbal communication and Body language: Kinesics, Proxemics, Paralanguage, Haptics, handshakes, Appropriate body language and Mannerisms for interviews: business etiquettes- cultural effects of communication. Communication styles.

UNIT- IV

Business Correspondence- Essentials of Effective Business Correspondence, Norms for business letters-Letter for different kinds of situations- Business Letter and Forms, Resume writing, Meeting, Telephonic Communication – Use of Technology in Business Communication.

UNIT -V

Report Writing and Presentation skills – Formal and Informal Reports-Reports and Proposals Prerequisites for effective presentation -Types and Stages of presentation – Communication skills for group discussion and interviews-interview techniques.

Text / Reference Books

1. K Bhardwaj, Professional Communication, IK Int Pub House, New Delhi
2. Rayudu, CS: “Communication”, Himalaya Publishing House, Mumbai.
3. Krizan: “Essentials of Business Communication”, Cengage Learning, New Delhi.
4. UrmilaRai& S.M. Rai, Business Communication, Himalya Publishers,
5. Dalmar Fisher: “Communication in Organizations”, JAICO Publishing House, New Delhi, 2007.
6. Paul Turner: “Organisational Communication”, JAICO Publishing House, New Delhi.
7. Meenakshi Rama: “Business Communication”, Oxford University Press, New Delhi.

VII SEMESTER : OPEN ELECTIVE - IV	L	T	P	C
	3	-	-	3
20EC7O02 :: REMOTE SENSING				

COURSE OUTCOMES:

After Completion of this course, students are able to

CO1: Understand the subject of satellite communication and remote sensing with the core knowledge of space and satellite, communication and the international space laws.

CO2: Comprehend different remote sensing signaling techniques, capable of interpreting signature of satellite communication from bodies like soil, vegetation and ocean.

CO3: Analyze various components used in satellite communication and remote sensing applications.

CO4: Acquire and keep abreast of designing satellite remote sensing system and also analyze the sensor data for drawing inference and conclusions.

UNIT I

Introduction: Historical background, International space laws, Advantages of space based observations, Global coverage, Multi scale observation, repeat observation immediate transmission and digital format, Source of information on remote sensing region.

UNIT II

Principles of remote sensing: Fundamentals of remote sensing signals, The electromagnetic spectrum, Terms and units of measurements, EM radiation laws, Spectral signature in the solar spectrum, vegetation reflectance, soil reflectance, water in the solar spectrum, The thermal infrared domain, characteristics of EM radiation in thermal infrared, Thermal properties of vegetation, Soils thermal domain, thermal signature of water and snow, The microwave region, Atmospheric interaction.

UNIT III

Sensors and remote sensing satellite: Type of sensors, Resolution of sensor systems, spatial, spectral, radiometric, temporal, angular - resolution, passive sensors, photographic cameras, cross and along track - scanners, active sensors, Radar and Lidar, satellite remote missions, Satellite orbits, Landsat programs, SPOT satellites, IRS program, High resolution commercial satellites, Polar orbiting meteorological satellites, Terra Aqua, Geostationary meteorological satellites.

UNIT IV

Basis for interpretations of remote sensing images: Constraints in using remote sensing data, types of interpretation, Costs of data acquisitions, end-user requirements, Thematic classification, Generation of biophysical variables, Change detection, spatial patterns, organization of remote sensing project, interpretation phase, presentation of study cases.

UNIT V

Characteristic of photographic images, Feature identification, criteria for visua interpretation, Brightness, color, texture, spatial contexts, shadows, spatial patterns, shap and size, stereoscopic view, period of acquisition, elements of visual analysis, Geometric characteristics of satellite image, Color composites, Multitemporal approaches.

TEXTBOOKS:

1. Emilio Chuvieco, “Fundamentals of Satellite Remote Sensing”, CRC press, Edition,2009.

REFERENCES:

1.C. H. Chen, “Signal Processing for Remote Sensing‖, CRC press, Edition-2007.

2. R. N Mutagi, “Satellite Communication Principles and Applications”, Oxford University press, 2016.

3. Enrico Del Re, and Marina Ruggieri, “Satellite communications and navigation systems”, Springer.

VII SEMESTER : OPEN ELECTIVE - IV	L	T	P	C
	3	-	-	3
20ME7O02 :: GREEN ENGINEERING SYSTEM				

COURSE OBJECTIVES

- To understand the basic concept of solar energy.
- To gain knowledge about renewable energy.
- To learn about the best energy efficient systems.
- To impart knowledge about energy efficient processes

COURSE OUTCOMES: Students are able to

CO1: Recognize the energy scenario and explain solar radiation conversion and collection phenomena. [K3]
CO2: Illustrate solar energy storage methods and applications and also explain the principles of wind energy, classification, conversion and applications [K4]
CO3: Explain the principle, classification, conversion and applications of Bio mass, geothermal energy and ocean energy. [K3]
CO4: Describe the importance of energy efficient systems and interpret working of a few mechanical and electrical efficient systems. [K2]
CO5: Identify the need of energy efficient processes and analyze their significance in view of their importance in the current scenario and their potential future applications. [K4]

UNIT – I

INTRODUCTION: Energy chain and common forms of usable energy – Present energy scenario – World energy status – Energy scenario in India, Traditional energy systems, Renewable energy – sources and features.

SOLAR RADIATION:

Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems. Photo voltaic energy conversion – types of PV cells, I-V characteristics.

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT – II

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.

UNIT – III

BIO-MASS: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, bio fuels, I.C. engine operation and economic aspects.

GEOTHERMAL ENERGY: Resources, types of wells, methods of harnessing the energy, potential in India.

OCEAN ENERGY: OTEC, Principles of utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT – IV

ENERGY EFFICIENT SYSTEMS:

ELECTRICAL SYSTEMS: Energy efficient motors, energy efficient lighting and control, selection of luminaire, variable voltage variable frequency drives (adjustable speed drives), controls for HVAC (heating, ventilation and air conditioning), demand site management.

MECHANICAL SYSTEMS: Fuel cells- principle, thermodynamic aspects, selection of fuels & working of various types of fuel cells, environmentally friendly and energy efficient compressors and pumps

GREEN BUILDINGS: Definition features and benefits.

UNIT – V

ENERGY EFFICIENT PROCESSES: Environmental impact of the current manufacturing practices and systems, benefits of green manufacturing systems, selection of recyclable and environment friendly materials in manufacturing, design and implementation of efficient and sustainable green production systems - vegetable based cutting fluids, zero waste manufacturing.

TEXT BOOKS:

1. Sukhatme S.P. and J. K. Nayak, Solar Energy – Principles of Thermal Collection and Storage, Tata McGraw Hill, 2018.
2. Khan B.H., Non-Conventional Energy Resources, Tata McGraw Hill, New Delhi, 2015.
3. Green Manufacturing Processes and Systems, Edited by J. Paulo Davim, Springer 2016.

REFERENCES:

1. Alternative Building Materials and Technologies, K. S. Jagadeesh, B.V. Venkata Rama Reddy and K. S. Nanjunda Rao, New Age International (P) Ltd.
2. Principles of Solar Engineering, Yogi Goswami, Frank Krieth and John F Kreider, Taylor and Francis
3. Non-Conventional Energy , Ashok V Desai, Wiley Eastern
4. Renewable Energy Technologies, Ramesh & Kumar, Narosa
5. Non-Conventional Energy Sources, G. D. Rai, Kanna Publishers, New Delhi, 2018.

WEB REFERENCE:

1. https://archive.nptel.ac.in/courses/112/104/112104225/
2. https://archive.nptel.ac.in/courses/105/102/105102195/

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	2	1	3	3	-	-	2	3	2	-	3
CO2	3	3	1	2	1	3	3	-	-	2	3	2	-	3
CO3	3	3	1	2	1	3	3	-	-	2	3	2	-	3
CO4	3	3	1	2	1	3	3	-	-	2	3	2	-	3
CO5	3	3	1	2	1	3	3	-	-	2	3	2	-	3
Avg	3	3	1	2	1	3	3	-	-	2	3	2	-	3

VII SEMESTER : OPEN ELECTIVE - IV	L	T	P	C
	3	-	-	3
20CS7O02 :: SOFTWARE TESTING TECHNIQUES				

COURSE OUTCOMES:

At the end of the course, the student should be able to:

1. Design simple web pages using markup languages like HTML and CSS.
2. Create dynamic web pages using DHTML and java script that is easy to navigate and use.
3. Create web pages using AngularJS.
4. Build web applications using Servlet and JSP.
5. Understand various operations on Mongo Database.

UNIT-I: HTML and CSS

HTML: An Introduction to HTML, Basic XHTML Syntax and Semantics, Basic HTML Elements: Images, Links, Lists, Tables, Forms, Frames, Division and Spanning, HTML 5.0.

CSS: Levels of Style sheets, Style specification formats, Selector forms, CSS Colors and Backgrounds, CSS Text and Font Properties, The Box Model, CSS Margins, Padding, and Borders Conflict Resolution.

UNIT-II: Client-Side Scripting using Java Script and DOM

Java Script: The Basics of Java Script, Objects, Primitive operations and Expressions, Screen output and Keyboard input, Control statements, Object Creation and modification, Arrays, functions, Constructors, Pattern matching using Regular Expressions, DHTML: Positioning moving and Changing Elements.

DOM: Introduction to the Document Object Model DOM, HTML DOM Event Handling, Modifying Element Style, Document Tree, DOM Event Handling

UNIT-III: Angular JS

Introduction to AngularJS: Expressions, Modules, Data Binding, Scopes, Directives & Events, Controllers, Filters, Services, HTTP, Tables, Select, Fetching Data from MySQL.

UNIT-IV: Servlet and JSP

Servlet: Servlet Basics, Need of Server-Side Programming, Servlet Life Cycle, Servlet Hello World Application, Web.xml Structure, Servlet Directives- include(), forward(), sendRedirect(), HttpServletRequest and HttpServletResponse in Servlet, Servlet and JDBC Integration.

JSP: JSP Basics, JSP Scripting Elements(Declaration, Expression, Scriptlet), Directive Elements(page, include, taglib), Action Elements(jsp:forward,jsp:include,jsp:useBean), JSP Implicit Objects.

UNIT-V Mongo DB

Introduction to Mongo DB: Mongo DB Environment, Create Database, Drop Database, Create Collection, Drop Collection, Read Operations, Write Operations.

Text Books:

1. Programming the World Wide Web, Robet W Sebesta, 7ed, Pearson.
2. Web Technologies, Uttam K Roy, Oxford
3. Head First Servlet and JSP
4. Node.js, MongoDB, and AngularJS Web Development by Brad Dayley

Reference Books:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
2. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage
3. Pro Angular JS by Adam Freeman
4. MEAN Web Development by Amos Q. Haviv

VII SEMESTER : OPEN ELECTIVE - IV	L	T	P	C
	3	-	-	3
20IT7O01 :: INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT				

Course Outcomes:

Upon the completion of the course students will be able to:-

1. Apply the process to be followed in the software development life-cycle models.
2. Apply the concepts of project management & planning.
3. Implement the project plans through managing people, communications and change
4. Conduct activities necessary to successfully complete and close the Software projects
5. Implement communication, modeling, and construction & deployment practices in software development.

UNIT – I:

Conventional Software Management: The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation.

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT – II:

The Old Way and The New: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Life Cycle Phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

Artifacts of The Process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT – III:

Model Based Software Architectures: A Management perspective and technical perspective.

Work Flows of the Process: Software process workflows, Iteration workflows.

Checkpoints of the Process: Major mile stones, Minor Milestones, Periodic status assessments.

UNIT – IV:

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

UNIT – V:

Process Automation: Automation Building blocks, The Project Environment.

Project Control and Process Instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

Project Estimation and Management: COCOMO model, Critical Path Analysis, PERT technique, Monte Carlo approach (Text book 2)

Text Books:

1. Software Project Management, Walker Royce, Pearson Education, 2005.
2. Software Project Management, Bob Hughes, 4th edition, Mike Cotterell, TMH.

Reference Books:

1. Software Project Management, Joel Henry, Pearson Education.
2. Software Project Management in practice, Pankaj Jalote, Pearson Education, 2005.
3. Effective Software Project Management, Robert K.Wysocki, Wiley,2006.

B. TECH 7th SEMESTER	L	T	P	C
	3	-	-	3
20HS7T01: UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY				

COURSE OUTCOMES:

Students are able to
CO1: Understand the need, basic guidelines, content and process of value education; explore the meaning of happiness and prosperity.
CO2: Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.
CO3: Analyze the value of harmonious relationship based on trust and respect in life and profession
CO4: Examine the role of a human being in ensuring harmony in society and nature.
CO5: Apply the understanding of ethical conduct to formulate the strategy for ethical life and profession.

Unit 1: Introduction-Basic Human Aspiration
Understanding the need, basic guidelines, content and process for Value Education-Self-Exploration, its content and process - 'Natural Acceptance' and 'Experiential Validation' as the mechanism for self exploration-Continuous Happiness and Prosperity the basic requirements for fulfillment of aspirations of every human being with their correct priority- Understanding Happiness and Prosperity correctly-Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Unit 2: Harmony in the Human Being
Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I'- Understanding the characteristics and activities of 'I' and harmony in 'I'.

Unit 3: Human-Human relationships
Understanding values in human-human relationship-Meaning of justice-Nine universal values in relationship-Meaning of trust and respect-Difference between respect and differentiation-Harmony in society-undivided society-from family to world family.

Unit 4: Nature and existence
Self-exploration – self-awareness and self-evaluation- Self-realization-Understanding and contemplation in the Self - Realization of Co-existence- Understanding of harmony in Nature and contemplation of participation of Human in development of harmony.

Unit 5: Implications of Harmony on professional ethics
Basis for Humanistic Education-Humanistic Constitution and Humanistic Universal Order- Case studies of typical holistic technologies-management models-Production systems-Strategy for transition from the present state to universal human order.

TEXT BOOKS:
1. R R Gaur, R Sangal, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", Excel Books, 2010.

REFERENCES

1. A.N. Tripathi, “Human Values”, New Age Intl. Publishers, New Delhi, 2004.
2. Mahadev Desai, Shriman Narayan, “The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi”, Navajivan Mudranalaya, Ahemadabad, India.1925
3. A Nagaraj, Jeevan Vidya: Ek Parichaya, Jeevan Vidya Prakashan, Amarkantak, 1999.
4. P. L. Dhar& R. R. Gaur, “Science & Humanism – towards a unified worldview”, Commonwealth Publishers, New Delhi-1990.
5. J. C. Kumarappa, “Economy of Permanence – (a quest for social order based on non-violence)”, Sarva-Seva-Sangh-Prakashan, Varansi, India-2010.

VII SEMESTER : SKILL COURSE	L	T	P	C
	3	-	-	3
20CS7S01 :: ADVANCED PYTHON PROGRAMMING				

Course Outcomes:
On completion of this course, the students will be able to

1. State to Design and devolvement of GUI(K1)
2. Apply and Develop network programming using python(K3)
3. Illustrate Database Programming Using Python(K2)
4. Practice the Image Processing using Python (K3)

UNIT-I
GUI Programming(Tkinter))
Introduction, Components and Events, An Example GUI, The root Component, Adding a Button
Entry Widgets, Text Widgets, Check buttons

UNIT-II
(Network Programming Using Python)
Socket, Socket Module, Methods, Client and server, Internet modules

UNIT-III
(Database Programming Using Python)
Introduction, Connections, Executing queries, Transactions, Handling error

UNIT-IV
(Image Processing using Python)
Introduction to digital image processing, Basic operations on an imge, Crop, Scale
Rotate, Flip, Changing contrast, brightness and color, Edge detection, blur, sharpening

UNIT-V
(DJANGO)
Django Overview, Django Installation, Creating a Project, Usage of Project in depth Discussion
Creating an Application, Understanding Folder Structure, Creating a Hello World Page
Database and Views, Static Files and Forms, API and Security

References :
1. https://flaviocopes.pages.dev/python-tkinter/
2. https://www.freecodecamp.org/news/python-networking-course/
3. https://realpython.com/tutorials/databases/
4. https://likegeeks.com/python-image-processing/
5. https://www.djangoproject.com/

VII SEMESTER	L	T	P	C
	-	-	-	3
20CS7I01 :: INTERNSHIP II				

COURSE OUTCOMES:

1. Observe theory and practical.knowledge.(K2)

2.Develop work habits and attitudes necessary for internship success.(K3)

3. Discover communication and interpersonal and other critical skills in the internship process.(K2)

4.Identify ,write down , and carry out performance objectives related to their task assignment.(K2)

VIII SEMESTER	L	T	P	C
	-	-	-	8
20CS8P01 :: PROJECT WORK, SEMINAR AND INTERNSHIP IN INDUSTRY				

COURSE OUTCOMES:

1. Develop and map the technical knowledge acquired in the previous semesters for solving real world problems. (K3)
2. Articulate new technologies & design techniques (platform, database, etc.) concerned for devising a solution for a given problem statement (K3)
3. Illustrate project management skills (scheduling work, procuring parts and documenting Expenditures and working within the confines of a deadline). (K4)
4. Practice to work with team mates, sharing due and fair credits and collectively apply effort for making project successful. (K3)

IV SEMESTER - MINOR COURSES	L	T	P	C
	3	1	-	4
20CS4N01 : DATA STRUCTURES USING C				

Course Outcomes:

At the end of the course, the students will be able to:

1. Student will be able to choose appropriate data structure as applied to specified problem definition.
2. Student will be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
3. Students will be able to apply concepts learned in various domains like DBMS, compiler construction etc.
4. Students will be able to use linear and non-linear data structures like stacks, queues, linked list.

UNIT-I

Time and space complexity, Data Structures – Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on Linear list, circular linked list implementation, Double linked list implementation, insertion, deletion and searching operations. Applications of linked lists.

UNIT –II

Stacks-Operations, array and linked representations of stacks, stack applications -infix to post fix conversion, postfix expression evaluation, recursion implementation.

UNIT-III

Queues-operations, array, and linked representations. Circular Queue operations, Dequeues, applications of queues.

UNIT-IV

Searching and Sorting – Sorting- selection sort, bubble sort, insertion sort, quick sort, merge sort, shell sort, radix sort, Searching-linear and binary search methods, comparison of sorting and searching methods.

UNIT-V

Trees – Definitions, tree representation, properties of trees, Binary tree, Binary tree representation, binary tree properties, binary tree traversals, binary tree implementation, applications of trees. Minor courses

Text Books:

1. Fundamentals of Data structures in C, 2nd Edition, E.Horowitz, S.Sahniand Susan Anderson Freed, Universities Press.
2. Data structures A Programming Approach with C, D.S.Kushwaha and A.K.Misra, PHI.

References:

1. Data structures: A Pseudocode Approach with C, 2nd edition,
2. R.F.GilbergAndB.A.Forouzan, CengageLearning.
3. Data structures and Algorithm Analysis in C, 2nd edition, M.A.Weiss, Pearson.
4. Data Structures using C, A.M.Tanenbaum,Y. Langsam, M.J.Augenstein, Pearson.
5. Data structures and Program Design in C, 2nd edition, R.Kruse, C.L.Tondoand B.Leung,Pearson

V SEMESTER - MINOR COURSES	L	T	P	C
	3	1	-	4
20CS5N01 :: DATABASE MANAGEMENT SYSTEMS				

Course Outcomes:

At the end of the course, the students will be able to:

1. Describe a relational database and object -oriented database.
2. Create, maintain, and manipulate a relational database using SQL
3. Describe ER model and normalization for database design.
4. Examine issues in data storage and query processing and can formulate appropriate solutions.
5. Understand the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage and Design and build database system for a given real world problem

UNIT - I: INTRODUCTION -Database system, Characteristics (Database Vs File System), Database Users (Actors on Scene, Workers behind the scene), Advantages of Data base systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

UNIT - II: RELATIONAL MODEL: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions (Date and Time, Numeric, String conversion).

UNIT - III: ENTITY RELATIONSHIP MODEL: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams. SQL: Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation , ordering, implementation of different types of joins, view(updatable and non - updatable), relational set operations.

UNIT - IV: SCHEMA REFINEMENT (NORMALIZATION): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce –codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF).

UNIT V: TRANSACTION CONCEPT: Transaction State, Implementation of atomicity and Durability, Concurrent Executions, Serializability, Recoverability , Implementation of Isolation, Testing for Serializability, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.

B+ Trees: Search, Insert, Delete algorithms, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes , Index data Structures, Hash Based Indexing :Tree base Indexing, Comparison of File Organizations, Indexes and Performance Tuning

Text Books:

1. Data base Management Systems, 3/ e, Raghurama Krishnan, Johannes Gehrke, TMH
2. Data base System Concepts,5/ e, Silberschatz, Korth, TMH
3. Introduction to Database Systems, 8/ e C J Date, PEA.

References:

1. Database Management System, 6/ e Ramez Elmasri, Shamkant B. Navathe, PEA
2. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

VI SEMESTER - MINOR COURSES	L	T	P	C
	3	1	-	4
20CS6N01 :: OPERATING SYSTEMS				

Course Outcomes:

At the end of the course, the students will be able to:

1. Understand the importance of operating systems and different types of system calls.
2. Analyze the communication between processes and various process scheduling algorithms.
3. Understand the process synchronization, different ways for deadlocks handling.
4. Analyze various memory mapping techniques and different page replacement methods.
5. Evaluate various file allocation and disk scheduling algorithms.

UNIT-I: Operating Systems Overview:

Introduction: what is an operating system, Types of operating systems, operating systems concepts, operating systems services, Introduction to System call, System call types, Operating System Generation.

UNIT–II: Process Management:

Process concept: Process Concept, Process Scheduling, Operations on Processes, Inter process Communication.

Multithreaded Programming: Overview, Multithreading models, Threading Issues. Process scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms.

UNIT-III: Synchronization:

Process Synchronization: The Critical-Section Problem, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors, Synchronization examples.

Principles of deadlock – System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

UNIT-IV: Memory Management:

Memory Management strategies: Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table.

Virtual Memory Management: Virtual Memory, Demand Paging, Page-Replacement Algorithms, Thrashing.

UNIT-V: File system Interface The concept of a file, Access Methods, Directory and Disk structure, File system mounting.

File System implementation: File system structure, allocation methods, free-space management.

Mass-storage structure: Overview of Mass-storage structure, Disk scheduling, Device drivers.

Text Books:

1. Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition,Wiley 2013.
2. Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (for Inter process Communication and File systems).

References:

1. Tanenbaum A S, Woodhull A S, Operating Systems Design and Implementation, 3rdedition, PHI, 2006.
2. Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, TataMcGrawHill, 2012.
3. Stallings W, Operating Systems -Internals and Design Principles, 6th edition, PearsonEducation, 2009.
4. Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004.

VII SEMESTER - MINOR COURSES	L	T	P	C
	3	1	-	4
20CS7N01 :: COMPUTER NETWORKS				

Course Outcomes:

At the end of the course, the students will be able to:

1. Understand OSI and TCP/IP reference models with an emphasis to Physical Layer, Data Link Layer and Network Layer.
2. Analyze the issues related to data link, medium access and transport layers by using channel allocation and connection management schemes.
3. Solve problems related to Flow control, Error control, Congestion control and Network Routing.
4. Design and compute subnet masks and addresses for networking requirements Understand how internet works.
5. Understand the Application Layer protocols

UNIT-I:

Introduction: Network Hardware and software Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models, Examples of **Networks:** Novell Networks, Arpanet, Internet, Network Topologies WAN, LAN, MAN.

Physical Layer: Guided Transmission Media, Digital Modulation and Multiplexing: frequency division multiplexing, wave length division multiplexing, synchronous time division multiplexing, statistical time division multiplexing.

UNIT-II:

The Data Link Layer - Design Issues, Services Provided to the Network Layer – Framing – Error Control – Flow Control, Error Detection and Correction – Error-Correcting Codes – Error Detecting Codes, Elementary Data Link Protocols, Sliding Window Protocols.

Channel allocation methods: TDM, FDM, ALOHA, Carrier sense Multiple access protocols, Collision Free protocols – IEEE standard 802 for LANS – Ethernet, Token Bus, Token ring, Bridges and IEEE 802.11 and 802.16. Data link layer switching, virtual LANs.

UNIT-III:

Network layer Routing Algorithms: Design Issues, Routing Algorithms-Shortest path, Flooding, Flow based Distance vector, Link state, Hierarchical, Broadcast routing, Congestion Control algorithms-General principles of congestion control, Congestion prevention polices, Choke packets, Load shedding, and Jitter Control.

Internet Working : Tunnelling, internetworking, Fragmentation, Network layer in the internet – IP protocols, IP address, Subnets, Internet control protocols, OSPF, BGP, Internet multicasting, Mobile IP, IPV6.

UNIT IV:

The Transport Layer: Elements of transport protocols – addressing, establishing a connection, releasing connection, flow control and buffering and crash recovery, End to end protocols: UDP, Real Time Tran sport Protocol.

The Internet Transport Protocol: TCP- reliable Byte Stream (TCP) end to end format, segment format, connection establishment and termination, sliding window revisited, adaptive retransmission, TCP extension, Remote Procedure Call.

UNIT – V:

Application Layer: WWW and HTTP: Architecture- Client (Browser), Server, Uniform Resource Locator HTTP: HTTP Transaction, HTTP Operational Model and Client/Server Communication, HTTP Generic Message Format, HTTP Request Message Format, HTTP Response Message Format.

The Domain Name System: The DNS Name Space, Resource Records, Name Servers, Electronic Mail: Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery.

Text Books:

1. Data Communications and Networks – Behrouz A. Forouzan, Third Edition TMH.
2. Computer Networks, 5ed, David Patterson, Elsevier
3. Computer Networks: Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI
4. Computer Networks, Mayank Dave, CENGAGE

References:

1. Tanenbaum and David J Wetherall, Computer Networks, 5th Edition, Pearson Edu,2010
2. Computer Networks: A Top-Down Approach, Behrouz A. Forouzan,
3. Firouz Mosharraf, McGraw Hill Education
4. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, PearsonEducation
5. Understanding communications and Networks, 3rd Edition, W.A. Shay,Thomson The TCP/IP Guide, by Charles M. Kozierok,

Free online Resource,

1. http://www.tcpipguide.com/free/index.htm