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

# R20

# Information Technology

**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.**

## Institute Vision

To produce global competent, ethical and dynamic professionals by creating Centre of Excellence in Technical Education for societal empowerment.

## Institute Mission

**M1:** To provide quality education with knowledge and skills for rural and urban students.

**M2:** To collaborate the industries with academia for empowering the students to meet global standards.

**M3:** To induce highly ethical entrepreneurship in young minds with good leadership quality for the society.

**M4:** To enhance the institution in Research and Development by human intellectual capability.

## Department Vision

To be a premier center in Information Technology education, research and a source of qualitative, innovative, successful software professionals who cater the needs of industry and society.

## Department Mission

**M1:** To provide outcome based education through well-designed curriculum, innovative teaching, collaborative learning and industry interaction.

**M2:** To promote state-of-the-art research facilities and consultancy in the thrust areas of Information Technology.

**M3:** To impart the necessity of continuing education in order to grow proficiently in the focused areas.

**M4:** To inculcate professional behavior, leadership qualities and ethical values to serve the society.

## Program Educational Objectives (PEOs)

**PEO-1:** To pursue career in Information Technology and allied organizations.

**PEO-2:** To exhibit research temper for providing solutions to real time problems and continuing lifelong learning.

**PEO-3:** To showcase leadership skills with ethical values and social responsibilities.

## Program Specific Outcomes (PSOs)

**PSO-1:** Comprehend core knowledge using algorithms, mathematical foundation for modeling and analysis of software systems.

**PSO-2:** Design and develop software solutions using emerging technologies.

# 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 the 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 up skilling 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 |

## 5 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 mid exams 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 mid exams** 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 in charge.
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 programs 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 interdisciplinary 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-7 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<br>(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.9.**

(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 $4^{th}$ to $5^{th}$ Semester ($2^{nd}$ year to $3^{rd}$ year), if he/she fulfills the academic requirements of 40% of the credits up to either $3^{rd}$ or $4^{th}$ Semester from all the examinations (Regular and supplementary) whether or not the candidate takes the examinations.

(iv) A student will be promoted from $6^{th}$ to $7^{th}$ Semester ($3^{rd}$ year to $4^{th}$ year), only if he/she fulfills the academic requirements of 40% of the credits up to either $5^{th}$ or$6^{th}$ 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-8 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.

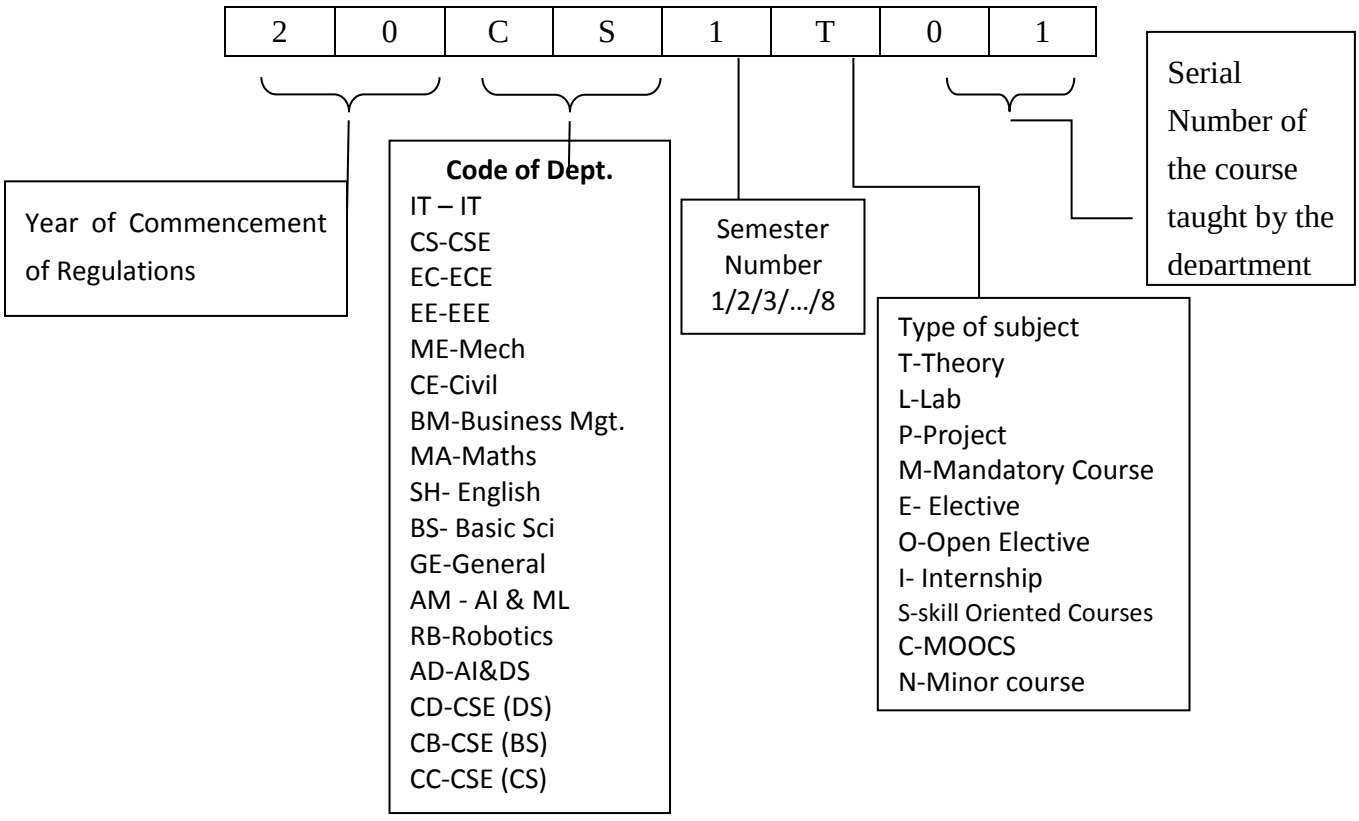
(ix) Courses like Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc., shall be included in the curriculum as non-credit mandatory courses. Environmental Sciences is to be offered compulsorily as mandatory course for all branches. 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. 23 & 24)

## 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 $i^{th}$ 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 satisfies 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 9.

**Table -9**

| 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 -10**

| 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 up to 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. <u>MINOR PROGRAMME:</u>**

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 $4^{th}$ 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) up to the end of $2^{nd}$ semester without any history of backlogs. It is expected that the $3^{rd}$ semester results may be announced after the commencement of the $4^{th}$ semester. If a student fails to acquire 7.75 CGPA up to $3^{rd}$ semester or failed in any of the courses, his registration for Minors program shall stand cancelled. A 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.

**SEMESTER-I**

| S. No. | Course Code | Course Title | L | T | P | C | IM | EM | TM |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 20MA1T01 | Linear Algebra | 3 | - | - | 3 | 30 | 70 | 100 |
| 2 | 20BS1T02 | Engineering Chemistry | 3 | - | - | 3 | 30 | 70 | 100 |
| 3 | 20HS1T01 | English | 3 | - | - | 3 | 30 | 70 | 100 |
| 4 | 20CS1T01 | Problem Solving Using C Programming | 3 | - | - | 3 | 30 | 70 | 100 |
| 5 | 20BS1TL02 | Engineering Chemistry Lab | - | - | 3 | 1.5 | 30 | 70 | 100 |
| 6 | 20HS1L01 | English Proficiency Lab | - | - | 3 | 1.5 | 30 | 70 | 100 |
| 7 | 20CS1L01 | C Programming Lab | - | - | 3 | 1.5 | 30 | 70 | 100 |
| 8 | 20IT1L01 | IT Work shop | - | - | 3 | 1.5 | 30 | 70 | 100 |
| | | **Total** | **12** | **-** | **12** | **18** | **240** | **560** | **800** |

**SEMESTER-II**

| S. No. | Course Code | Course Title | L | T | P | C | IM | EM | TM |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 20MA2T02 | Differential Equation and Numerical Methods | 3 | - | - | 3 | 30 | 70 | 100 |
| 2 | 20BS2T01 | Engineering Physics | 3 | - | - | 3 | 30 | 70 | 100 |
| 3 | 20CS2T03 | Object Oriented Programming with Python | 3 | - | - | 3 | 30 | 70 | 100 |
| 4 | 20IT2T01 | IT Essentials | 2 | 1 | - | 3 | 30 | 70 | 100 |
| 5 | 20EE2T01 | Basic Electrical and Electronics Engineering | 3 | - | - | 3 | 30 | 70 | 100 |
| 6 | 20CS2L03 | Object Oriented Programming Lab with Python | - | - | 3 | 1.5 | 30 | 70 | 100 |
| 7 | 20EE2L01 | Basic Electrical and Electronics Engineering Lab | - | - | 3 | 1.5 | 30 | 70 | 100 |
| 8 | 20BS2L01 | Engineering Physics Lab | - | - | 3 | 1.5 | 30 | 70 | 100 |
| 9 | 20HS2L02 | English Communications Lab | - | - | 3 | 1.5 | 30 | 70 | 100 |
| | | **Total** | **14** | **1** | **12** | **21** | **270** | **630** | **900** |

**L**-LECTURE HOURS, **T**- TUTORIAL HOURS, **P**-PRACTICAL HOURS, **C**-CREDITS,
**IM**- INTERNAL MARKS, **EM**- EXTERNAL MARKS, **TM**- TOTAL MARKS

**SEMESTER-III**

| S. No. | Course Code | Course Title | L | T | P | C | IM | EM | TM |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 20IT3T01 | Discrete Mathematics | 3 | - | - | 3 | 30 | 70 | 100 |
| 2 | 20BM3T01 | Managerial Economics and Financial Analysis | 3 | - | - | 3 | 30 | 70 | 100 |
| 3 | 20IT3T02 | Computer Organization | 3 | - | - | 3 | 30 | 70 | 100 |
| 4 | 20CS3T01 | Data Structures | 3 | - | - | 3 | 30 | 70 | 100 |
| 5 | 20IT3T03 | Java Programming | 3 | - | - | 3 | 30 | 70 | 100 |
| 6 | 20CS3L01 | Data Structures Lab | - | - | 3 | 1.5 | 30 | 70 | 100 |
| 7 | 20IT3L01 | Computer Organization Lab | - | - | 3 | 1.5 | 30 | 70 | 100 |
| 8 | 20IT3L02 | Java Programming Lab | - | - | 3 | 1.5 | 30 | 70 | 100 |
| 9 | 20CE3M01 | Environmental Science | 1 | - | - | - | - | - | - |
| 10 | 20IT3S01 | Data Analysis and Visualization Lab | 1 | - | 2 | 2 | 30 | 70 | 100 |
| | | **Total** | **17** | **0** | **11** | **21.5** | **270** | **630** | **900** |

**SEMESTER-IV**

| S. No. | Course Code | Course Title | L | T | P | C | IM | EM | TM |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 20MA4T07 | Probability & Statistics | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2 | 20IT4T01 | Object Oriented Software Engineering | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 3 | 20CS4T01 | Operating Systems | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4 | 20IT4T02 | Theory of Computation | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 5 | 20IT4T03 | Data Base Management Systems | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 6 | 20IT4L03 | Operating Systems Lab in Linux | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 7 | 20IT4L01 | UML Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 8 | 20IT4L02 | Data Base Management Systems Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 9 | 20BM4M01 | Indian Constitution | 1 | - | - | - | - | - | - |
| 10 | 20IT4S01 | Android Programming Lab | 1 | 0 | 2 | 2 | 30 | 70 | 100 |
| | | **Total** | **17** | **0** | **11** | **21.5** | **270** | **630** | **900** |

**L**-LECTURE HOURS, **T**- TUTORIAL HOURS, **P**-PRACTICAL HOURS, **C**-CREDITS,
**IM**- INTERNAL MARKS, **EM**- EXTERNAL MARKS, **TM**- TOTAL MARKS

## SEMESTER-V

| S. No. | Course Code | Course Title | L | T | P | C | IM | EM | TM |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 20CS5T01 | Computer Networks | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2 | 20IT5T01 | Web Technologies | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 3 | 20IT5T02 | Artificial Intelligence | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4 | | Professional Elective-1 | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 5 | | Open Elective-I / Job Oriented Elective-I | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 6 | 20IT5L01 | Network Programming Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 7 | 20IT5L02 | Web Technologies Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 8 | 20BM5M01 | Essence of Indian Traditional Knowledge | 2 | 0 | 0 | 0 | - | - | - |
| 9 | 20HS5S01 | Advanced Communication Skills Lab | 1 | 0 | 2 | 2 | 30 | 70 | 100 |
| 10 | 20IT5I01 | Internship I | 0 | 0 | 0 | 1.5 | 50 | - | 50 |
| | | Total | 18 | 0 | 8 | 21.5 | 290 | 560 | 850 |

## SEMESTER-VI

| S. No. | Course Code | Course Title | L | T | P | C | IM | EM | TM |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 20IT6T01 | Machine Learning | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2 | 20IT6T02 | Internet of Things | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 3 | 20IT6T03 | Cloud Computing | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4 | | Professional Elective-II | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 5 | | Open Elective / Job Oriented Elective-II | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 6 | 20IT6L01 | Machine Learning Lab | 0 | 1 | 2 | 1.5 | 30 | 70 | 100 |
| 7 | 20IT6L02 | Internet of Things Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 8 | 20IT6L03 | Cloud Computing Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 9 | 20BM6M01 | Professional Ethics and Intellectual Property Rights | 1 | 0 | 0 | 0 | - | - | - |
| 10 | 20IT6S01 | Skill Course-4 (Advanced Level) Artificial Intelligence Lab | 1 | 0 | 2 | 2 | 30 | 70 | 100 |
| 11 | 20IT6C01 | Community Service Project | 0 | 0 | 0 | 4 | 100 | - | 100 |
| | | Total | 17 | 1 | 10 | 25.5 | 370 | 630 | 1000 |

## SEMESTER-VII

| S. No. | Course Code | Course Title | L | T | P | C | IM | EM | TM |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | Professional Elective-III | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2 | | Professional Elective-IV | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 3 | | Professional Elective-V | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4 | | Open Elective-III /<br>Job Oriented Elective-III | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 5 | | Open Elective-IV /<br>Job Oriented Elective-IV | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 6 | 20HS7T01 | Universal Human Values 2 –<br>Understanding Harmony | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 7 | 20IT7S01 | R-Programming | 1 | 0 | 2 | 2 | 30 | 70 | 100 |
| 8 | 20IT7I02 | Internship II | 0 | 0 | 0 | 3 | 50 | - | 50 |
| | | Total | 19 | 0 | 2 | 23 | 260 | 490 | 750 |

## SEMESTER-VIII

| S. No. | Course Code | Course Title | L | T | P | C | IM | EM | TM |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 20IT8P01 | Project Work, Seminar and<br>Internship in Industry | 0 | 0 | 0 | 8 | 60 | 140 | 200 |
| | | Total | 0 | 0 | 0 | 8 | 60 | 140 | 200 |

## PROFESSIONAL ELECTIVE – I :: V SEMESTER

| S. No. | Course Code | Course Title | L | T | P | C | IM | EM | TM |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 20IT5E01 | Compiler Design | 3 | - | - | 3 | 30 | 70 | 100 |
| 2 | 20IT5E02 | Software Project Management | 3 | - | - | 3 | 30 | 70 | 100 |
| 3 | 20IT5E03 | Digital Image Processing | 3 | - | - | 3 | 30 | 70 | 100 |
| 4 | 20IT5E04 | Virtual Reality | 3 | - | - | 3 | 30 | 70 | 100 |

## OPEN ELECTIVE –I :: V SEMESTER

| 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 :: V SEMESTER

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

## PROFESSIONAL ELECTIVE – II :: VI SEMESTER

| S. No. | Course Code | Course Title | Semester |
|---|---|---|---|
| 1 | 20IT6E01 | Design & Analysis of Algorithms | VI |
| 2 | 20IT6E02 | Agile Technology | VI |
| 3 | 20IT6E03 | Embedded Systems | VI |
| 4 | 20IT6E04 | Robotics | VI |

## OPEN ELECTIVE – II :: VI SEMESTER

| 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 :: VI SEMESTER

| 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 :: VII SEMESTER

| S. No. | Course Code | Course Title | Semester |
|---|---|---|---|
| 1 | 20IT7E01 | Bio-Informatics | VII |
| 2 | 20IT7E02 | DevOps | VII |
| 3 | 20IT7E03 | Deep Learning | VII |
| 4 | 20CS7E01 | Cryptography and Network Security | VII |

## PROFESSIONAL ELECTIVE – IV :: VII SEMESTER

| S. No. | Course Code | Course Title | Semester |
|---|---|---|---|
| 1 | 20IT7E04 | Distributed Systems (Common for IT & CSE) | VII |
| 2 | 20IT7E05 | Big Data Analytics (Common for IT, AIML & EEE) | VII |
| 3 | 20CS7E05 | Quantum Computing | VII |
| 4 | 20AM7E03 | NOSQL Databases | VII |

## PROFESSIONAL ELECTIVE – V :: VII SEMESTER

| S. No. | Course Code | Course Title | Semester |
|---|---|---|---|
| 1 | 20IT7E06 | Computer Vision (Common for IT & CSE) | VII |
| 2 | 20IT7E07 | Advanced Computer Networks | VII |
| 3 | 20IT7E08 | Cyber Security | VII |
| 4 | 20CS7E08 | Edge Computing | VII |

## OPEN ELECTIVE – III

| S. No | Course Code | Course Title | Offering Dept. |
|---|---|---|---|
| 1 | 20CE7O01 | Solid Waste Management | CIVIL |
| 2 | 20CE7O02 | Building Planning and Drawing | CIVIL |
| 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 |

## JOB ORIENTED ELECTIVE - III

| S. No | Course Code | Course Title | Offering Dept. |
|---|---|---|---|
| 1 | 20IT7J01 | Mobile Application Development | IT |
| 2 | 20IT7J02 | Natural Language Processing | IT |

## OPEN ELECTIVE – IV

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

## JOB ORIENTED ELECTIVE - IV

| S. No. | Course Code | Course Title | Offering Dept. |
|---|---|---|---|
| 1 | 20IT7J03 | AWS | IT |
| 2 | 20IT7J04 | R Programming | IT |

## MINOR DEGREE IN INFORMATION TECHNOLOGY

**(For non IT/CSE Students)**

| S. No. | Course Code | Course Title | L | T | P | C | IM | EM | TM |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 20IT4N01 | Data Structures | 3 | 1 | - | 4 | 30 | 70 | 100 |
| 2 | 20IT5N01 | Software Engineering | 3 | 1 | - | 4 | 30 | 70 | 100 |
| 3 | 20IT6N01 | Introduction to Artificial Intelligence and Machine Learning | 3 | 1 | - | 4 | 30 | 70 | 100 |
| 4 | 20IT7N01 | Web Technologies | 3 | 1 | - | 4 | 30 | 70 | 100 |
| 5 | 20IT7X01<br>20IT7X02 | 02 MOOCS courses @ 2 credits 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 | - | - | - |

| I SEMESTER | L | T | P | C |
|---|---|---|---|---|
| | 3 | - | - | 3 |
| **20MA1T01: LINEAR ALGEBRA** | | | | |

**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. Apply the functions of several variables which is useful in optimization (K3)
3. Acquire important tools of calculus in higher dimensions and will become familiar with double integral(K3)
4. Solve the multiple integrals and are apply for special functions.(K3)

**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

**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.

**Unit III: Quadratic forms**

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

**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.

**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.

**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.

| I SEMESTER | L | T | P | C |
|---|---|---|---|---|
| | 3 | - | - | 3 |
| **20BS1T02: ENGINEERING CHEMISTRY** | | | | |

**COURSE OUTCOMES**

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

**CO1:** Summarize the impurities present in raw water, problems associated and how to avoid them (K2)

**CO2:** List out the advantages of Polymers in daily life (K2)

**CO3:** Illustrate the theory of construction of battery and fuel cells and theories of corrosion and prevention methods. (K2)

**CO4:** Compare conventional and non-conventional energy sources and their advantages and disadvantages. (K2)

**CO5:** Interpret the usage of advanced materials in day to day life (K2)

**UNIT I: WATER TECHNOLOGY**

**Part-A**

Hard water- Types of hardness- Units of Hard Water-Disadvantages of hard water-Determination of hardness by EDTA complexometric 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.

**UNIT-II: POLYMERS AND COMPOSITE MATERIALS**

**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.

## UNIT III: ELECTRO CHEMICAL CELLS AND CORROSION

**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.

## UNIT IV: CONVENTIONAL AND NONCONVENTIONAL ENERGY RESOURCES

**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.

## UNIT V: CHEMISTRY OF MATERIALS

**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.

**Text Books:**

**T1**. A Text Book of Engineering Chemistry -N. Y. S. Murthy, V. Anuradha & K. RamanaRao, 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, DhanpatRai Publishing Company (Latest Edition)

**R2.**Text Book of Engineering Chemistry - ShashiChawla, DhanpatRai & Co. (P) Limited ((Latest Edition))

**R3.**Chemistry –PrasantaRath, Subhendu Chakroborthy, Cengage publications (2018)

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| **20HS1T01: ENGLISH** | | | | |

**COURSE OUTCOMES:**

**At the end of the Course, students will be able to:**

1. Identify the parts of speech, root words and apply relative writing formats to prepare notes (K3)
2. Precise the ideas coherently in day to day life. (K2)
3. Identify the importance of correct usage of grammar (K3)
4. Illustrate the ideas effectively on various topics (K2)
5. Develop the reports and essays by using appropriate sentences (K3)

## A. PROGRAMMECONTENT

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

## B. ELABORATIONOF THEPROGRAMMECONTENT

### 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 keywords and phrases and specific information, application of one's previous knowledge of to understand the ideas dealt with in the text being list end 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 in1 (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 the min 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 pit falls 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**<br>**1.1** Video Lesson<br>1.2.1 Word formation<br>1.2.2. Root words<br>1.2.3. Prefixes and Suffixes<br>1.2.4. Synonyms and Antonyms<br>**1.3 Parts of Speech**<br>**1.4 Note- making, Note-taking** |
| **UNIT –II** | **Basic Writing Skills**<br>**2.1** Video Lesson<br>2.2.1 Basic sentence structure<br>2.2.2. Clauses and Phrases<br>2.2.3 Punctuations<br>2.2.4 Creating coherence<br>2.2.5 Organizing principles of paragraph documents<br>2.2.6 Techniques for writing precisely<br>**2.3 Tenses**<br>**2.4 Letter Writing** |
| **UNIT-III** | **Identifying Common Errors in Writing**<br>**3.1** Video Lesson<br>3.2.1 Sub +verb agreement<br>3.2.2 Noun pronoun agreement<br>3.2.3 Articles<br>3.2.4 Preposition<br>3.2.5 Redundancies<br>3.2.6 Clichés<br>**3.3.1 Active - Passive Voice**<br>**3.3.2 Reported Speech**<br>**3.4 Resume Writing** |
| **UNIT-IV** | **Nature and Style of sensible Writing**<br>**4.1** Video Lesson<br>4.2.1 Describing<br>4.2.2 Classifying<br>4.2.3 Writing Introduction and conclusion<br>**4.3.1Conditional Sentences**<br>**4.3.2Degrees of Comparison**<br>**4.4 Email writing** |
| **UNIT-V** | **Writing Practice**<br>**5.1** Video Lesson<br>5.2.1 Comprehension<br>5.2.2 Precise writing<br>5.2.3 Essay Writing<br>**5.3Simple Compound and Complex Sentences**<br>**5.4 Report Writing** |

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| **20CS1T01: PROBLEM SOLVING USING C PROGRAMMING** | | | | |

**COURSE OUTCOMES**

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

**CO1:** Develop an algorithm/flowchart to find a solution for computational problem **(K3)**

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

**CO3:** Develop a C program using arrays to divide a given computational problem into a number of modules **(K3)**

**CO4:** Apply 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)**

**UNIT-I**

**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**

**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**

**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**

**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**

**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

**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/**

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| **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. Classify 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.

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| **20HS1L01: ENGLISH PROFICIENCY LAB** | | | | |

**COURSE OUTCOMES**

**At the end of the course, students will be able to:**

1. Acquire the sounds of words for correct pronunciation. (K2)
2. Identify and learn accent of words for mastering language proficiency. (K3)
3. Distinguish the word pronunciation relating to accent and accuracy of English language. (K4)
4. Apply the words for ensuring the ability for correct pronunciation. (K3)
5. Summarize the influence of mother tongue on target language. (K2)

**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

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| **20CS1L01: C PROGRAMMING LAB** | | | | |

**Course Outcomes:**

1. Develop basic programs in C and design flowcharts in Raptor. (K3)
2. Apply Conditional and Iterative statements to solve the real time scenarios in C. (K3)
3. Implement the concept of Arrays and Modularity and Strings. (K3)
4. Apply the Dynamic Memory Allocation functions using pointers. (K3)
5. Develop programs using structures and Files. (K3)

**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 array 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.**

**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,3rdEdition,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

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| **20IT1L01: IT WORKSHOP** | | | | |

**Course Outcomes:**

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

1. Acquire complete knowledge of computer hardware. (K2)
2. Install basic computer engineering software. (K2)
3. Document a task through MS office. (K2)
4. Apply the usage of Google Tools and Email handling. (K3)
5. Make use of network troubleshooting. (K3)

**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.

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| **20MA2T02: DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS** | | | | |

**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)

**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.

**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.

**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.

**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.

**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.

**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.

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| **20BS2T01: ENGINEERING PHYSICS** | | | | |

**COURSE OUTCOMES**

**After completion of course student able to:**

1. Acquire the knowledge of basic crystal systems and determination of crystal structures. (K2)
2. Summarize the Magnetic and Dielectric Materials properties. (K2)
3. Illustrate the concept of Magnetic Induction and Super Conducting properties. (K2)
4. Interpret Pure & Doped Semiconductor materials for better utility. (K2)
5. Acquire the knowledge on Optical fibers and Optical properties of materials and their applications (K2)

## 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.

### 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.

### 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.

### 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.

**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.

**TEXT BOOK:**

1. A text book of "Engineering Physics" by M. N. Avadhanulu, P.G. Kshirasagar & TVS Arun Murthy, SChand publications, 11thAddition 2019.

**REFERENCE BOOKS:**

1. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Education, 2018.
2. Engineering Physics by Palanisamy (Scitech Publishers)
3. Engineering Physics by D. Thirupathi Naidu and M. Veeranjaneyulu

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**20CS2T03: OBJECT ORIENTED PROGRAMMINGS WITH PYTHON**

**Course Outcomes:**

**CO1:** Acquire the core programming basics and program design with functions using Python programming language. (K2)
**CO2:** Interpret the high-performance programs designed to strengthen the practical expertise. (K2)
**CO3:** Develop applications for real time problems by applying python data structure concepts. (K3)
**CO4:** Apply the concepts of packages, handling, multithreading and socket programming. (K3)
**CO5:** Analyze the importance of object-oriented programming over structured programming. (K4)

**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

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| **20IT2T01: IT ESSENTIALS** | | | | |

**COURSEOUTCOMES:**

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

1. Acquire the basic concepts of operating systems. (K2)
2. Outline the various software engineering tools. (K2)
3. Acquire the basics of Internet. (K2)
4. Acquire the basic concepts of web basics. (K2)
5. Outline the various computer graphics concepts. (K2)

**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**

**WebBasics:**Introductiontoweb,webbrowsers,webservers,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, Modeling- modeling individual objects, modeling entire scenes. Dealing with global lighting - Ray tracing, Radiosity. Rendering and Animation.

**TEXTBOOKS**

1. J.GlennBrookshear,"ComputerScience:AnOverview",Addision-Wesley,TwelfthEdition,2014.
2. PradeepKSimha,"ComputerFundamentals-Concepts,Systems&Applications",8th edition,BPB.

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| **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. (K4)

CO2 : Acquire the basic concepts of single-phase system for simple AC circuit. (K2)

CO3 : Compare the construction, working and operating characteristics of AC & DC machines. (K2)

CO4 : Interpret the construction details, operation and characteristics of various semiconductor devices, digital and logic operations. (K2)

**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, The venin'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 wave and 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 McGrawHill.
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.

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| 20CS2L03: OBJECT ORIENTED PROGRAMMING LAB WITH PYTHON | | | | |

**COURSE OUTCOMES:**

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

**CO1:** Apply core programming basics and program design with functions using Python programming language. (K3)
**CO2:** Interpret the high-performance programs designed to strengthen the practical expertise. (K2)
**CO3:** Develop applications for real time problems by applying python data structure concepts. (K3)
**CO4:** Apply the concepts of packages, handling, multithreading and socket programming. (K3)
**CO5:** Identify the importance of object-oriented programming over structured programming. (K3)

**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 collides 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**

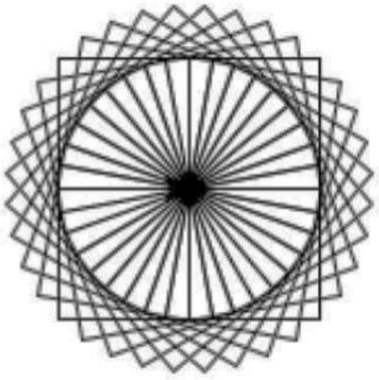
a) Class variables and instance variable and illustration of the self-variable

i) Robot ii) ATM Machine

**Exercise - 14 GUI, Graphics**

a) Write a GUI for an Expression Calculator using tk

b) Write a program to implement the following figures using turtle.



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| **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. (K2)

CO2 : Analyze the performance characteristics and to determine efficiency of DC machines (K4)

CO3 : Identify the characteristics of AC machines. (K3)

CO4 : Apply the knowledge on PN junction diode, transistor and Rectifiers. (K3)

**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.

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| **20BS2L01: ENGINEERING PHYSICS LAB** | | | | |

**COURSE OUTCOMES**

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

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

CO2: Apply the knowledge to verify some of the properties of physical optics. (K3)

CO3: Develop skills to plot various characteristic curves and to calculate the physical properties of given materials. (K3)

CO4: Estimate some the properties of semiconducting materials. (K3)

**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-Ndiode.
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

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| **20HS2L02: ENGLISH COMMUNICATIONS LAB** | | | | |

**COURSE OUTCOMES:**

At the end of the course, students will be able to:

1. Identify the difference between impromptu and extempore.(K3)
2. Express hypothetical situations in different ways.(K2)
3. Outline the etiquettes of telephonic conversation and interviews.(K2)
4. Identify the need of the presentation skills to participate in various oral activities.(K3)
5. Apply preparatory techniques for Job interviews.(K3)

**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.

**PREREQUISITES**

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:**

1. "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

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| **20IT3T01 : DISCRETE MATHEMATICS** | | | | |

Course Objectives:

1. Familiarize closed form solution of linear recurrence relations by various methods.
2. To introduce basics of set theory and its applications
3. Bring awareness of basic concepts of graphs and its applications.
4. To teach the topics on Trees, spanning trees, minimal spanning trees and justification of Kruskal's algorithm.

Course Outcomes:

Upon successful completion of this course the student should be able to

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

**UNIT I:** 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 II:** 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 III:** Set theory and Relations, Relations and ordering, Relations, Properties of binary Relations on 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 IV:** Graph theory Basic Concepts, Representation of Graph, Sub graphs, Multi graphs, Euler Paths, Euler circuits, Hamiltonian Graphs and Graph Isomorphism and its related Problems, Chromatic Number. (All Theorems without proofs)

**UNIT V:** Trees Spanning Trees, minimal Spanning Trees, BFS, DFS, Kruskal's Algorithm, Prim's Algorithm, Binary trees, Planar Graphs. (All Theorems without proofs)

Learning Outcomes:

**Textbooks:**

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. NarsinghDeo, Graph Theory with Applications to Engineering and Computer Science, Prentice Hall of India, 2006.

| III SEMESTER | L | T | P | C |
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| **20BM3T01:MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS** | | | | |

**Course Objectives:**

1. To acquire knowledge of economics to facilitate the process of economic decision making
2. To analyze production function and its laws of variable proportions and cost concepts
3. To differentiate and distinguish price and output decisions in different market structures
4. To compare and contrast the differences between private and public sector in their functioning
5. To develop the skills and to analyze financial statements

**Course Outcomes:**

1. Summarize the importance of Managerial Economics and its utility in decision making (K2)
2. Identify the meaning and usefulness of the production function and cost function in analyzing the firms production activity (K3&K4)
3. Comprehend the market structure, different types of markets and pricing policies (K4)
4. Identify the different forms of business organization and analyze their merits and demerits (K3)
5. Evaluate the Investment proposal through techniques of capital budgeting and financial performance of the company through financial statements (K5)

**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.

| III SEMESTER | L | T | P | C |
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| **20IT3T02: COMPUTER ORGANIZATION** | | | | |

**COURSE OBJECTIVES**

1. To discuss the basic knowledge of computer system including the analysis and design of components of the system.
2. To understand the register transfer language, micro operations and design of basic components of the system.
3. To explain different types of addressing modes and memory organization.
4. To learn the concepts of parallel processing, pipelining and vector processing.

**COURSE OUTCOMES**

After completion of the course students able to

1. Acquire the knowledge on structure of computers and computer arithmetic. (K2)
2. Analyze Micro operations such as Arithmetic micro operations, Shift micro operations and Logic micro operations. (K4)
3. Outline the appropriate addressing modes and instructions for writing programs.(K2)
4. List out the Peripheral devices for efficient operation of system. (K4)
5. Acquire the knowledge on parallel and vector processing. (K2)

**UNIT-I**

**Basic Structure of Computers:**
Basics of computer, Von Neumann Architecture, Generation of Computer, Types of Computer, Functional unit, Basic Operational Concepts and Bus Structures.
**Computer Arithmetic:** Addition and Subtraction, multiplication algorithms, Division Algorithms.

**UNIT-II**

**Register Transfer Language and Micro Operations:** Register Transfer language. Register Transfer Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.

**Basic Computer Organization and Design:** Instruction codes, Computer Registers, Computer Instructions, Timing and control, Instruction Cycle, Memory – Reference, Input – Output and Interrupt Instructions. Design of basic computer, Design of Accumulator logic.

**UNIT-III**

**Central Processing Unit:** General Register Organization, STACK organization. Instruction formats. Addressing modes. DATA Transfer and manipulation, Program control, Reduced Instruction Set Computer.

**Micro Programmed Control:** Control Memory, Address sequencing, micro program example, design of control unit.

**UNIT-IV**

**Input- Output Organization:** Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupts, Direct memory Access.
**The Memory System:** Memory Hierarchy, Main Memory, Auxiliary memory, Associative Memory, Cache Memory and Virtual Memory.

**UNIT-V**

**Parallel Processing and Vector Processing**

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors.

**Text Books:**

1. M. Moris Mano, Computer System Organization, 3rd Edition, Pearson / PHI, 2017.
2. Carl Hamacher, ZvonksVranesic, SafwatZaky, Computer Organization, 5th Edition, McGraw Hill, 2016.
3. John L. Hennessy and David A.Patterson, Computer Organization, A quantitative approach, Fifth Edition, 2017.

**Reference Books:**

1. William Stallings, Computer Organization and Architecture - Ninth Edition, Pearson / PHI, 2012.
2. Andrew S Tanenbaum, Structured Computer Organization - 6th Edition, PHI/ Pearson, 2016.

| III SEMESTER | L | T | P | C |
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| **20CS3T01 : DATA STRUCTURES** | | | | |

**COURSE OBJECTIVES**

1. To impart the basic concepts of data structures and algorithms.
2. To gain knowledge of linear and non-linear data structures.
3. To familiarize with different sorting and searching techniques.
4. To understand basic concepts about stacks, queues, lists, trees and graphs.
5. To understand about writing algorithms and step by step approach in solving problems with the help of fundamental data structures

**COURSE OUTCOMES:**

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

1. Develop the applications using stacks and implement various types of queues. (K3)
2. Analyse and implement operations on linked lists and demonstrate their applications. (K4)
3. Identify the operations on trees. (K3)
4. Illustration of various types of Graphs and Graph Traversals. (K2)
5. Discover the 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. Debasissamanta, Classic Data Structures, PHI, 2nd edition, 2016.
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, Pearson Education Ltd., Second Edition, 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, University Press, 2nd edition, 2018.

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| **20IT3T03 : JAVA PROGRAMMING** | | | | |

**COURSE OBJECTIVES:**

1. Gain knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc
2. Understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc and exception handling mechanisms
3. Understand the principles of inheritance, packages and interfaces.
4. Be aware of the important topics and principles of software development.
5. Have the ability to write a computer program to solve specified problems.
6. Be able to use the Java JDK environment to create, debug and run simple Java programs.

**COURSE OUTCOMES:**

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

1. Identify the concepts of OOPs through Java programming. (K3)
2. Apply the inheritance and packages in Java. (K3)
3. Illustrate the concepts of Exception handling and Multithreading. (K2)
4. Discover the I/O concepts in file operations and HttpClient methods. (K4)
5. Classify the concepts and usage of Collection framework. (K2)

**UNIT-I:**

**Introduction to Java:** History, java features, JDK, JRE, and JVM, program structure, Creating and Executing a Java program, Java tokens, Variables, Arrays, Data types, Operators, Expressions, **Control statements**: Selection , Iterative and Jump Statements, type conversion and casting.

**Classes and objects:** Class declaration, creating objects, methods, **Constructors**: Types of constructors: Default and Parameterized constructors, overloading methods and constructors, garbage collection, access control, static and this keywords, command line arguments, nested classes.

**UNIT-II:**

**Inheritance:** Extending a class, types of inheritance, super keyword, final keyword, overriding methods, abstract methods and classes.

**Interfaces:** Defining an interface, implementing interface, Differences between classes and interfaces, variables in interface and extending interfaces.

**Packages:** Java API packages, creating and importing packages, importance of CLASSPATH.

**UNIT-III:**

**Exception handling:** Exception handling fundamentals, exception hierarchy, usage of try, catch, throw, throws and finally keywords, built-in and user defined exceptions.

**Multithreading:** Introduction, Differences between multi-threading and multitasking, Creating Threads, thread life cycle, thread methods, thread priorities, thread exceptions, thread synchronization, Inter thread communication, Daemon threads.

**UNIT-IV:**

**Input/Output Streams:** Introduction to java I/O, Streams, BufferedStreams, Readers, Reading and Writing data from/to files and HttpClient, Pipelines.

**UNIT-V:**

**Collection Framework:** Lists – ArrayList & LinkedList, Sets – HashSet & TreeSet, Maps – HashMap & TreeMap, Queue, Stack, Iterator – ListIterator, Lambda Expressions.

**Strings:** Strings in java, Creation of a String and String handling methods, StringBuilder, StringBuffer.

**TEXT BOOKS:**

1. Herbert Schildt: "Java The complete reference", 11th Edition, Tata McGraw Hill, 2019.
2. E. Balaguruswamy: "Programming with Java A Primer", 5th Edition, Tata McGraw Hill, 2017.

**REFERENCE BOOKS:**

1. Saurabh Chaudhary and Sachin Malhotra, Programming in Java revised 2nd edition, Oxford, 2018.
2. Dietal, Dietal, Java: How to Program, 8/e, PHI, 2018.
3. Dr. R. Nageswara Rao, Wiley, Core JAVA: An integrated approach, Dream Tech, 2016.

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| 20CS3L01: DATA STRUCTURES LAB | | | | |

**COURSE OUTCOMES:**

At the end of the lab students are able to

1. Construct stack and queue using arrays and linked lists. (K3)
2. Illustrate applications of stack. (K2)
3. Construct the operations on linked lists. (K3)
4. Develop the binary search trees. (K3)
5. Illustrate the different searching and sorting algorithms. (K2)

**LIST OF EXPERIMENTS:**

1. Implement a menu driven program in C for the following operations on stack of integers using arrays.
   i) PUSH()
   ii) POP()
   iii) PEEK()
   iv) Display of stack elements
2. Implement C program to demonstrate how stack can be used to check whether the given string is palindrome or not.
3. Implement a C Program for converting an infix expression to postfix expression.
4. Implement a C Program to evaluate postfix expression.
5. Implement a menu driven program in C for the following operations on queue of integers using arrays.
   i) Insertion
   ii) Deletion
   iii) Queue overflow and underflow conditions
   iv) Display of queue elements
6. Implement a C program for the queue operations by using stacks.
7. Implement a C program for the following
   (i) Create a singly linked list.
   (ii) Insert an element into a singly linked list.
   (iii)Delete an element from a singly linked list.
8. Implement a C program for stack operations using Linked list.
9. Implement a C program for queue operations using linked list.
10. Implement a C program to reverse elements of a single linked list.
11. Implement a C program for the following

(i) Create a circular linked list.

(ii) Insert an element into a circular linked list.

(iii) Delete an element from a circular linked list.

12. Implement a C program for the following

(i) Create a Doubly linked list.

(ii) Insert an element into a doubly linked list.

(iii) Delete an element from a doubly linked list.

13. Implement a C program to create a Binary Search Tree of integers, insert, delete and search integers into (from) Binary search tree.

14. Implement a C program by using recursive functions to traverse a binary search tree in preorder, in-order and post-order.

15. Implement C programs for recursive and iterative functions to perform Linear search for a Key value in the given list.

16. Implement C programs for recursive and iterative functions to perform Binary search for a Key value in the given list.

17. Implement following techniques to sort a given list of integers in ascending order.

(i) Insertion sort

(ii) Bubble sort

(iii) Selection sort

18. Implement a C program that read any string and sort in alphabetical order using Bubble sort.

19. Implement following techniques to sort a given list of integers in ascending order.

(i) Quick sort

(ii) Merge sort

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| **20IT3L01 : COMPUTER ORGANIZATION LAB** | | | | |

**COURSE OUTCOMES:**

At the end of the lab students are able to

1. Simulate the 8085 microprocessor. (K4)
2. Construct the machine language programs to perform different operations. (K3)
3. Develop Arithmetic logic units and different types of memory blocks. (K3)
4. Outline the different number systems, binary addition and subtraction, 2's complement representation and operations with this representation. (K2)

**LIST OF EXPERIMENTS:**

1 a) Write a Machine Language Program to perform Addition of two numbers.

1 b) Write a Machine Language Program to perform Subtraction of two numbers.

2 a) Write a Machine Language Program to perform Addition of n numbers.

2 b) Write a Machine Language Program to generate n numbers.

3 a) Write a Machine Language Program to generate n Even numbers.

3 b) Write a Machine Language Program to generate n Odd numbers.

4 a) Write a Machine Language Program to move data from one block to another block.

4 b) Write a Machine Language Program to mask 4 high-order bits.

5 a) Write a Machine Language Program to read data at location 4400 and unpack data into 07, 0E and store in 4401 & 4402.

5 b) Write a machine language program to subtract an array of elements to get positive result.

6 a) Write a Machine Language Program to Find largest element of an array.

6 b) Write a Machine Language Program to Perform Linear Search operation.

7 a) Write a Machine Language Program to Find smallest element of an array.

7 b) Write a Machine Language Program to Find largest value among two numbers.

8 a) Write a Machine Language Program to Find smallest value among two numbers.

8 b) Write a Machine Language Program to find factorial of given number.

9 a) Write a Machine Language Program to generate Fibonacci Series.

9 b) Write a Machine Language Program to convert a number from Hexadecimal to BCD.

10 a) Write a Machine Language Program to separate Even and Odd numbers.

10 b) Write a Machine Language Program to find 1's Complement and 2's Complement of a number.

11 a) Write a Machine Language Program to perform addition of first n numbers.

11 b) Write a Machine Language Program to perform Division of two 8-bit numbers.

12 a) Write a Machine Language Program to Convert ASCII to Decimal and vice versa.

12 b) Write a Machine Language Program to convert a number from Hexadecimal to Decimal.

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| **20IT3L02 : JAVA PROGRAMMING LAB** | | | | |

**COURSE OBJECTIVES**

1. Understand the concept of OOP as well as the purpose and usage principles of inheritance, polymorphism, encapsulation and method overloading.
2. Able to implement Exception Handling, Multithreading, Applet programming and Event handling in java.

**COURSE OUTCOMES**

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

1. Develop solutions for a range of problems using object-oriented programming. (K3)
2. Construct Java programs that solve simple business problems. (K3)
3. Illustrate the multithreaded applications with synchronization. (K2)
4. Solve problems using java collection framework and I/O classes. (K3)

**LAB EXPERIMENTS**

1. Installation of JDK, setting Class path and Executing simple java programs.
2. Write a program that displays welcome dear user followed by user name. Accept username from the user.
3. Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
4. Write a JAVA program that checks whether a given string is a palindrome or not by using command line arguments.
5. Write a JAVA program to implement array of objects.
6. Write a JAVA program to practice using String class and its methods.
7. Write a JAVA program to implement constructor overloading.
8. Write a JAVA program implement method overloading.
9. Write a JAVA program to implement multilevel inheritance by applying various access controls to its data members and methods.
10. Write a JAVA program to create and Manage bank account using inheritance concept.
11. Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?
12. Write a JAVA program to demonstrate super key word.
13. Write a JAVA program to develop a vehicle class hierarchy in Java to demonstrate the concept of polymorphism.

14. Write a JAVA program to demonstrate user defined packages.
15. Write a JAVA program for abstract class to find areas of different shapes.
16. Write a JAVA program for creation of Java Built-in Exceptions
17. Write a JAVA program for creation of User Defined Exception
18. Write a JAVA program that creates 3 threads by extending Thread class. First thread displays "Good Morning" every 1 sec, the second thread displays "Hello" every 2 seconds and the third displays "Welcome" every 3 seconds. (By implementing Runnable interface).
19. Write a program to read contents from a file using BufferedInputStream.
20. Write a program to read contents from a web page using HttpClient and Buffered Reader and write them to a local file using BufferedWriter.
21. Write a program to read two numbers and one operator from user console and perform the calculation.
22. Write a JAVA program to get sub list from ArrayList.
23. Write a JAVA program to iterate all elements of a list in both directions.
24. Write a JAVA program to add all elements of a list to LinkedList.
25. Write a JAVA program to implement the basic operations on TreeMap.

**Text Books:**

1. Herbert Schildt: "Java The complete reference", 8th Edition, Tata McGraw Hill, 2017.
2. E. Balaguruswamy: "Programming with Java A Primer", 5th Edition, Tata McGraw Hill, 2017.

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| 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

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| **20IT3S01 : DATA ANALYSIS AND VISUALIZATION LAB** | | | | |

**COURSE OUTCOMES:**

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

1. Construct data visualization libraries in Python, including Matplotlib and Seaborn(K3)
2. Develop visualization tools, including area plots, histograms, and bar charts (K3)
3. Illustrate the specialized visualization tools, including pie charts, box plots, scatter plots and bubble plots (K2)
4. Discover the usage of visualization tools, including waffle charts, word clouds and Seaborn and regression plots (K4)
5. Develop maps and visualize geospatial data (K3)

**List of Experiments:**

1. What is a Spreadsheet and explain its operations?
2. What are the 4 types of business analytics and explain it?
3. Explain the following Logical Functions
   i. IF
   ii. Nested IF
   iii. HLOOKUP
4. Explain some Statistical functions with examples?
5. What is Data Visualization and why is It Important?
6. Explain the data visualization using matplotlib in python?
7. Describe some of the basic and specialized Visualization tools?
8. Explain the following advanced Visualization tools
   i. Waffle Charts
   ii. Word Clouds
   iii. Seaborn
9. Explain some techniques to Visualize Geospatial data?
10. Write about Choropleph maps?

**TEXT BOOKS:**

1. Dr. Ossama Embarak, Data Analysis And Visualization Using Python: Analyze Data To Create Visualizations For Bi Systems Apress, 2019.

2. Phuong Vo.T.H, Martin Czygan, Ashish Kumar, Kirthi Raman, Data Analytics and Visualization: Understand, evaluate, and visualize dataPackt Publishing Limited,2017.

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| **20MA4T07: PROBABILITY & STATISTICS** | | | | |

Course Objectives:

1. To familiarize the students with the foundations of probability and statistical methods
2. To impart probability concepts and statistical methods in various applications of Engineering
3. To introduce the correlation and regression and method of least squares

Course Outcomes:

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

1. Illustrate the concepts of probability and their applications (K2)
2. Apply discrete and continuous probability distributions (K3)
3. Identify the components of a classical hypotheses test (K3)
4. Examine Significance tests based on small and large sampling tests (K4)
5. Evaluate correlation methods and principle of least squares, regression lines (K5)

**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 distributions: Binomial, Poisson 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 variances (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.

Text Books:

1. Dr. K. Murugesan & P.Gurusamy, Probability and Statistics Anuradha Publications,2011
2. Dr. B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publications 2012

Reference:

1. Ramana B.V., Higher Engineering Mathematics, Tata Mc Graw Hill New Delhi 11th Reprint2010
2. Miller& Freund, Probability and statistics for engineers by Richard A. Johnson, PHI publications,2011

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| **20IT4T01 :OBJECT ORIENTED SOFTWARE ENGINEERING** | | | | |

**COURSE OUTCOMES:**

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

1. Outline about software development process models (K2)
2. Analyze the planning and scheduling of a software project (K4)
3. Summarize the object oriented analysis (K2)
4. Illustrate the design concepts and principles (K2)
5. Identify the testing methods and comparison of various testing techniques. (K3)

**UNIT- I Introduction**

Introduction to Software Engineering - Software Development process models – Agile Development - Project & Process - Project management - Process & Project metrics - Object Oriented concepts, Principles & Methodologies.

**UNIT- II Planning& Scheduling**

Software Requirements Specification, Software prototyping - Software project planning - Scope - Resources - Software Estimation - Empirical Estimation Models – Planning - Risk Management - Software Project Scheduling - Object Oriented Estimation & Scheduling.

**UNIT-III Analysis**

Analysis Modeling - Data Modeling - Functional Modeling & Information Flow - Behavioral Modeling-Structured Analysis - Object Oriented Analysis - Domain Analysis-Object oriented Analysis process - Object Relationship Model - Object Behavior Model, Design modeling with UML.

**UNIT-IV Design**

Design Concepts & Principles - Design Process - Design Concepts - Modular Design - Design Effective Modularity - Introduction to Software Architecture - Data Design - Transform Mapping - Transaction Mapping - Object Oriented Design - System design process- Object design process – Design Patterns.

**UNIT -V Implementation, Testing & Maintenance**

Top - Down, Bottom-Up, object oriented product Implementation & Integration. Software Testing methods-White Box, Basis Path-Control Structure - Black Box - Unit Testing - Integration testing - Validation & System testing - Testing Tools – Software Maintenance & Reengineering.

**Text Books:**

1. Roger. S. Pressman and Bruce R. Maxim, “Software Engineering – A Practitioner’s Approach”, seventh Edition, McGraw Hill,2015.
2. Ian Sommerville, “Software Engineering”, eighth edition, Pearson Education, New Delhi, 2011.
3. Bill Brykczynski, Richard D. Stutz ,”Software Engineering Project Management”, Wiley India Edition, IEEE computer society, 2007.
4. Craig Larman, Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development (3rd Edition), Pearson Education, 2008.

**References:**

1. Fairley R, “Software Engineering Concepts”, second edition, Tata McGraw Hill, New Delhi,2003.
2. Jalote P, “An Integrated Approach to Software Engineering”, third edition, Narosa Publishers, New Delhi, 2013.
3. Grady Booch, James Rumbaugh, Ivar Jacobson - "the Unified Modeling Language User Guide" - Addison Wesley, 1999.
4. Ali Bahrami, “Object Oriented Systems Development” 1st Edition, The McGraw-Hill Company, 1999.

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| **20CS4T01 : OPERATING SYSTEMS** | | | | |

**COURSE OUTCOMES**

After the completion of the course the students are able to

1. Summarize the Basic concepts about Operating System and its functions. (K2)
2. Outline the Process management, CPU scheduling and Deadlocks. (K2)
3. Analyze Memory management (K4)
4. Classify File systems & Disk Structures. (K2)
5. Apply the Case Study on LINUX, WINDOWS and Android OS. (K3)

**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

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| **20IT4T02 : THEORY OF COMPUTATION** | | | | |

**COURSE OBJECTIVES:**

The student should be made to:

1. To understand the language hierarchy
2. To construct automata for any given pattern and find its equivalent regular expressions
3. To design a context free grammar for any given language
4. To understand Turing machines and their capability
5. To understand undecidable problems and NP class problems

**COURSE OUTCOMES:**

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

1. Construct automata, regular expression for any pattern. (K3)
2. Apply Context free grammar for any construct. (K3)
3. Summarize Turing machines for any language. (K2)
4. Apply computation solutions using Turing machines. (K3)
5. Discover whether a problem is decidable or not. (K4)

**UNIT I:**

**Fundamentals:** Strings, Alphabet, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, deterministic finite automaton and non-deterministic finite automaton, transition diagrams and Language recognizers.

**Finite Automata:** NFA with ε-transitions - Significance, acceptance of languages. Conversions and Equivalence: Equivalence between NFA with and without ε transitions, NFA to DFA conversion, minimization of FSM, equivalence between two FSM's, Finite Automata with output- Moore and Melay machines.

**UNIT II:**

**Regular Languages:** Regular sets, regular expressions, identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Pumping lemma of regular sets, closure properties of regular sets (proofs not required).

**Grammar Formalism:** Regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion, Context free grammar, derivation trees, and sentential forms. Right most and leftmost derivation of strings.

**UNIT III:**

**Context Free Grammars:** Ambiguity in context free grammars. Minimization of Context Free Grammars. Chomsky normal form, Greiback normal form, Pumping Lemma for Context Free Languages. Enumeration of properties of CFL (proofs omitted).

**Push down Automata:** Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, inter conversion. (Proofs not required). Introduction to DCFL and DPDA.

**UNIT IV:**

**Turing Machine:** Turing Machine, definition, model, design of TM, Computable functions, recursively enumerable languages. Church's hypothesis, counter machine, types of Turing machines (proofs not required).

**UNIT V:**

**Computability Theory:** Chomsky hierarchy of languages, linear bounded automata and context sensitive language, LR (0) grammar, decidability of problems, Universal Turing Machine, undecidability of posts Correspondence problem, Turing reducibility, Definition of P and NP problems, NP complete and NP hard problems.

**TEXT BOOKS:**

1. Hopcroft H.E. and Ullman J. D, Introduction to Automata Theory Languages and Computation. Pearson Education, Third edition, 2008.
2. Michael Sipser, Introduction to Theory of Computation 3rd edition, Cengage, 2014.

**REFERENCES BOOKS:**

1. Kamala Krithivasan Rama R, Introduction to Formal languages Automata Theory and Computation 1st edition, Pearson, 2009.
2. Daniel I.A. Cohen, Introduction to Computer Theory, 2nd edition John Wiley.
3. Kavi Mahesh, Theory of Computation: A Problem - Solving Approach, Wiley, 2011.
4. Lewis H.P. & Papadimition C.H. "Elements of Theory of Computation", Pearson /PHI.
5. Mishra and Chandrashekaran, Theory of Computer Science – Automata languages and computation - 2nd edition, PHI, 2006.

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| **20IT4T03 : DATA BASE MANAGEMENT SYSTEMS** | | | | |

**COURSE OBJECTIVES:**

The objectives of the course is

1. To describe a sound introduction to the discipline of database management systems.
2. To give a good formal foundation on Entity- Relationship (E-R) model, the relational model of data and usage of Relational Algebra.
3. To introduce the concepts of basic SQL as a universal Database language.
4. To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization.
5. To provide an overview of transaction management, Database storage and indexing techniques.

**COURSE OUTCOMES**

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

CO1: Illustrate the basic concepts of database management system and design an Entity-Relationship (E-R) model and convert E-R model to relational model. (K2)

CO2: Construct database using Relational algebra and SQL. (K3)

CO3: Apply Normalization techniques to normalize the database. (K3)

CO4: Examine transaction management using different concurrency control protocols and recovery algorithms. (K4)

CO5: Illustrate different file organization and indexing methods. (K2)

**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.

**EXT BOOKS:**

1. Raghurama Krishnan, Johannes Gehrke, Data base Management Systems, McGrawHill Education, 3rd Edition, 2014.
2. A.Silberschatz, H.F. Korth, S.Sudarshan, Database System Concepts, McGraw Hill, 6th edition, 2016.

**Reference Books:**

1. RamezElmasri, 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, Thomson, Database System Design, Implementation and Management, 5/e, 2012.

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| **20IT4L03: OPERATING SYSTEMS LAB IN LINUX** | | | | |

**COURSE OUTCOMES**

At the end of the lab student is able to

1. Acquire basic knowledge in Linux operating System (K3)
2. Illustrate the concepts of CPU Scheduling. (K2)
3. Discover the process management, scheduling and concurrency control mechanisms. (K4)
4. Analyze Page Replacements and deadlocks. (K4)
5. Classify various file systems and its operating systems examples (K2)

**List of Programs:**

1. Execution of various file/directory handling commands in Linux.
2. To study the various commands operated in vi editor in LINUX.
3. To study the various File Access Permission and different types users in LINUX
4. Simulate First Come First Serve CPU scheduling algorithm.
5. Simulate Shortest Job First CPU scheduling algorithm.
6. Simulate Priority CPU scheduling algorithm.
7. Simulate Round Robin CPU scheduling algorithm.
8. Simulate Sequential file allocation strategy.
9. Simulate Linked file allocation strategy.
10. Simulate Indexed file allocation strategy.
11. Simulate First In First Out page replacement algorithm.
12. Simulate Least Recently used page replacement algorithm.
13. Simulate Optimal page replacement algorithm.
14. Write Programs to simulate free space management.
15. Simulate Bankers Algorithm for Dead Lock Avoidance.

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| **20IT4L01: UML LAB** | | | | |

**COURSE OUTCOMES**

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

1) Construct various UML models and diagrams (K3)

2) Develop UML model in object-oriented software. (K3)

3) Analyze and design in solving computer Based problems. (K4)

4) Develop software architecture for a project. (K3)

**LAB EXPERIMENTS**

1) To create a UML diagram of ATM APPLICATION

2) To create a UML diagram of LIBRARY MANAGEMENT SYSTEM

3) To create a UML diagram of ONLINE BOOK SHOP

4) To create a UML diagram of RAILWAY RESERVATION SYSTEM

5) To create a UML diagram of BANKING SYSTEM

6) To create a UML diagram of CREDIT CARD PROCESSING

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| **20IT4L02 : DATA BASE MANAGEMENT SYSTEMS LAB** | | | | |

**COURSE OUTCOMES:**

After the completion of the` course the students are able to

1. Illustrate the basic Structured Query Language (SQL) commands. (K2)
2. Build the Database Integrity Constraints. (K3)
3. Discover SQL Queries on set operators, sub queries, nested queries, aggregate functions, other SQL functions and views. (K4)
4. Develop applications using various features of PL/SQL like Functions, Procedures, Packages, cursors and triggers. (K3)
5. Develop Database system to handle the real world problem. (K3)

**LIST OF EXPERIMENTS:**

1. DDL and DML Commands.
2. Restricting and storing the Data using Key constraints. And displaying Data from Multiple Tables using SELECT command.
3. Queries (along with sub Queries and nested Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSECT.
4. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP by, HAVING Clause.
5. Creation and dropping of Views.
6. Queries using Conversion functions (to char, to number and to date), string functions (Concatenation, lpad , rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr ), date functions (Sysdate, next day, add months, last day, months between, least, greatest, trunc, round, to char, to date).

(i) Creation of simple PL/SQL programs which includes declaration section, executable section and exception handling section.

(ii) Insert data into tables and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.

7. Develop a program that includes the features IF, NESTED IF, CASE and CASE expression.
8. Program development using simple loops, while loops, numeric for loops, nested loops.
9. ERROR Handling, BUILT–IN Exceptions, User defined Exceptions, RAISE- APPLICATION ERROR.
10. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
11. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
12. Program development using creation of package specification, package bodies, private objects, package variables and calling stored packages.
13. Develop programs using Cursors.
14. Develop Programs using Triggers.

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| **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. Subash Kashyap, 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 and Politics Hans
4. J. Raj Indian Government 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

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| **20IT4S01: ANDROID PROGRAMMING LAB** | | | | |

**COURSE OUTCOMES:**

After the completion of the course the students are able to

1. Outline the Android platform, Architecture and features. (K2)
2. Design User Interface and develop activity for Android App. (K4)
3. Apply Internet, Broadcast receivers and Internet services in Android App. (K3)
4. Build Database Application and Content providers. (K3)
5. Develop multimedia, camera and Location based services in Android App. (K3)

**List of Experiments:**

1. Installation of Android Studio.
2. Develop an Android Application using Widgets.
3. Develop an Android Application for Layout Managers and Event Listeners.
4. Develop an Android Application using Activity and Intents.
5. Develop an Android Application using Menus.
6. Develop an Android Application using Android Service.
7. Develop an Android Application using Multimedia.
8. Develop an Android Application using SQLite.
9. Develop an Android Application using Telephony –Call, SMS, and Email.
10. Develop an Android Application using Google Maps.

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| **20CS5T01:Computer Networks** | | | | |

**COURSE OUTCOMES:**

**At the end of the course students are able to**

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

**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, Non-persistent 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, USA.

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| **20IT5T01:Web Technologies** | | | | |

**COURSE OUTCOMES**

After the completion of the course the students are able to

1. Distinguish various static web pages and dynamic web pages using html and java script. (K4)
2. Apply the client side validation using Java Script. (K3)
3. Develop a well formed XML document. (K3)
4. Construct the web servers with servlets. (K3)
5. Summarize java server side programming and connection with database. (K2)

**UNIT-I**

**HTML5:** Introduction, Basic Formatting Tags, Block and inline elements, Lists, Image, Hyperlink, Table, Iframe, Form Elements, Layout Elements and Miscellaneous.

**CSS3**: Introduction, CSS Syntax, Selectors, Add CSS to HTML : External, Internal and Inline, CSS Styling : Backgrounds, Text, Fonts, Links, Lists, Tables, CSS Box Model.

**UNIT-II**

Introducing DHTML, Introducing JavaScript, Client Side benefits of using JavaScript, Embedding JavaScript in an HTML page, Using Variables, Using Operators, Working with Control Flow statements, Working with functions, Handling Events, Using Arrays, Creating objects in JavaScript.

**UNIT-III**

**XML EXTENSIBLE MARKUP LANGUAGE:** XML- Document type Definition,

XML schemas, Document object model, XSLT, DOM and SAX.

**JDBC:** JDBC Architecture, JDBC Drivers, Communicating with Database using JDBC APIs, Creating a Simple Application, Describing Basic JDBC Statement, Creating tables by using JDBC, Working with Prepared Statement.

**UNIT-IV**

**Web Servers and Servlets:** Tomcat web server, Introduction to Servlets: Lifecycle of a Servlet, JSDK, The Servlet API, Reading Servlet parameters, Reading Initialization parameters. Handling HTTP Request & Responses, Using Cookies-Session Tracking, Security Issues.

**Introduction to JSP:** The Problem with Servlet. The Anatomy of a JSP Page, JSP Processing. JSP Application Design with MVC.

**UNIT-V**

**JSP Application Development:** Generating Dynamic Content, Using Scripting Elements, Implicit JSP Objects, Conditional Processing – Displaying Values, Using an Expression to Set an Attribute, Declaring Variables and Methods, Error Handling and Debugging, Sharing Data Between JSP Pages, Requests, and Users, Passing Control and Data Between Pages – Sharing Session and Application Data Memory Usage Considerations. Accessing a Database from a JSP Page.

**TEXT BOOKS:**

1. Kogent Learning solutions Inc sol., Web Technologies – Black Book, Dreamtech press.
2. Herbert Schildt: "Java The complete reference", 11th Edition, Tata McGraw Hill, 2019.
3. Santhosh Kumar K,JDBC, Servlets, and JSP, New Edition, Kogent Learning Solutions Inc, Dreamtech Press
4. Wang, Katila, An Introduction to Web Design + Programming, CENGAGE

**REFERENCE BOOKS:**

1. Uttam K Roy, Web Technologies, Oxford .
2. Kathy sierra, Head first Java, Orielly
3. Marty Hall and Larry Brown, Core Servlets and Java Server Pages Volume 1 CORE TECHNOLOGIES, Pearson
4. Dietel and Nieto, Internet and World Wide Web – How to program PHI/Pearson Education Asia.

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| **20IT5T02:Artificial Intelligence** | | | | |

**COURSE OUTCOMES**

After the completion of the course the students are able to

1. Outline the fundamentals of AI techniques and search techniques. (K2)
2. Identify appropriate search algorithms for any AI problem. (K3)
3. Illustrate a problem using first order and predicate logic. (K2)
4. Summarize the concepts of non-monotonic reasoning. (K2)
5. Acquire the knowledge of various AI applications. (K4)

**UNIT - I Introduction**

Artificial Intelligence definition, AI problems, Problem Spaces, Defining the Problem as a State Space Search, problem characteristics, production Systems. Future of Artificial Intelligence – Characteristics of Intelligent Agents– Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

**UNIT - II Problem solving Methods**

Issues in the design of search programs, Search Strategies- Uninformed (Breadth-First, Depth-First Search), Informed (Heuristic) - Local Search Algorithms and Optimization Problems Generate-And- Test, Hill Climbing, Best-First Search, A* Algorithm, Problem Reduction, AO*Algorithm) - Constraint Satisfaction Problems, Backtracking Search - Game Playing - Optimal Decisions in Games – Minimax Search, Alpha - Beta Pruning - Stochastic Games

**UNIT - III Knowledge Representation**

Representing Simple Facts in Predicate Logic, First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution, Natural Deduction – Knowledge Representation - Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information

**UNIT - IV Uncertain Knowledge and Reasoning**

Introduction to Non-Monotonic Reasoning, acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use, Representing Knowledge in an Uncertain Domain, Probability and Bayes Theorem, The Semantics of Bayesian Networks

**UNIT - V Applications**

AI applications – Language Models – Information Retrieval- Information Extraction – Expert Systems – Natural Language Processing - Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving

**Text Books:**


1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach‖, Prentice Hall, Third Edition, 2009.
2. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011
3. Elaine Rich, Kevin Knight, Shiva Sankar B. Nair, Artificial Intelligence, The McGraw Hill publications, Third Edition, 2017.
4. Bratko, Prolog: Programming for Artificial Intelligence‖, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.


**Reference Books:**


1. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.
2. David Poole and Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge University Press 2010.
3. Dan W Patterson, Introduction to Artificial Intelligence & Expert Systems, PHI, 2010.


**Web Resources:**

1. https://nptel.ac.in/courses/106105077
2. https://nptel.ac.in/courses/106106126
3. https://aima.cs.berkeley.edu
4. https://ai.berkeley,edu/project_overview.html

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| **20IT5E01:Compiler Design** | | | | |

**Course Outcomes:**

At the end of the course students are able to

1. Outline language processors and its phases. (K2)
2. Develop the concepts of scanning of tokens. (K3)
3. Illustrate the syntax analysis by using parsing techniques. (K2)
4. Distinguish memory Management techniques in runtime environment. (K4)
5. Discover optimization techniques for intermediate code forms and code generation. (K4)

**UNIT-I**

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-II**

Syntax Analysis: – Role of a 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-III**

Bottom up Parsing: – Reductions – Handle Pruning - Shift Reduce Parsing - Introduction to 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-IV**

Intermediate code: - DAG - Three address code – Quadruples - Triples - Indirect Triples. Basic Blocks: – DAG representation of Block.

Runtime Environment: - Storage organization - Stack allocation – Static allocation - Heap management- Parameter passing mechanisms.

**UNIT-V**

Code Optimization, Machine independent code optimization - Common sub expression elimination - Constant folding - Copy propagation - Dead code elimination – Strength reduction - Loop optimization. Machine dependent code optimization - Peephole optimization – Instruction scheduling - Inter Procedural.

Code Generation – Instruction selection, Register allocation, Input to the code generator, Target programs, Memory management.

**Text Books:**

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ulman, Compilers: Principles, Techniques and Tools: 2nd Edition, 2nd Edition, Pearson Education.
2. Andrew N. Appel, Modern Compiler Implementation in C, Cambridge University Press.

**References:**

1. John R. Levine, Tony Mason, lex&yacc –Doug Brown, O‟reilly.
2. Dick Grune, Henry E. Bal, Cariel T. H. Jacobs, Modern Compiler Design- Wiley reamtech.
3. Cooper & Linda, Engineering a Compiler- Elsevier.
4. Louden, Compiler Construction, Thomson.
5. V. Raghavan, Principles of compiler design, 2nd edition, TMH, 2011.

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| **20IT5E02: 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. (K3)
2. Outline the concepts of project management & planning. (K2)
3. Test for project plans through managing people, communications and change (K4)
4. Examine the activities necessary to successfully complete and close the Software projects. (K4)
5. Illustrate communication, modeling and construction and deployment practices in software development. (K2)

**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) Walker Royce, Software Project Management, Pearson Education, 2005.
2) Bob Hughes, Software Project Management, 4th edition, Mike Cotterell, TMH.

**Reference Books:**

1) Joel Henry, Software Project Management, Pearson Education.
2) Pankaj Jalote, Software Project Management in practice, Pearson Education, 2005.
3) Robert K.Wysocki, Effective Software Project Management, Wiley,2006.

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| **20IT5E03: Digital Image Processing** | | | | |

**COURSE OUTCOMES:**

After the completion of this course, students are able to

1. List out the basic concepts of image processing and image geometry. (K1)
2. Apply various operations on image both in spatial and frequency domains to solve various real time problems by converting them between domains. (K3)
3. Distinguish different types of images, such as black & white, gray scale and color images, and can convert image from one color model to other. (K4)
4. Analyze different features of the images for the purpose of Compression, authentication and safety. (K4)
5. Summarize Morphological Image Processing, Segmentation and Color Image Processing. (K2)

**UNIT-I**

**BASICS OF DIGITAL IMAGE PROCESSING:**

Origins of digital image processing, uses digital image processing, fundamental steps in digital image processing, components of an image processing system, digital image fundamentals, Elements of visual perception, light and electromagnetic spectrum, imaging sensing and acquisition, image sampling and quantization. Some basic relationships between pixels.

**UNIT-II**

**INTENSITY TRANSFORMATIONS AND SPATIAL FILTERING:**

Background, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters, sharpening spatial filters, Filtering in the frequency domain: Preliminary concepts, the discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform. The Basic of filtering in the frequency domain, image smoothing and sharpening using frequency domain filters.

**UNIT-III**

**IMAGE RESTORATION AND RECONSTRUCTION:**

A model of the image degradation Restoration process, Noise models, restoration in the presence of noise only- Spatial Filtering - Mean filters, order statistic filters and adaptive filters. Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant

Degradations, estimating the degradation function, Inverse filtering, Minimum mean square error (Wiener) filtering, constrained least squares filtering, geometric mean filter, image reconstruction from projections.

**UNIT-IV**

**MULTI-RESOLUTION PROCESSING AND IMAGE COMPRESSION:**

Image pyramids, sub-band coding & Haar transforms multi resolution expressions, wavelet transforms in one dimension. The fast wavelets transform, wavelet transforms in two dimensions, wavelet packets. Image compression: Fundamentals, various compression methods-coding techniques, digital image water marking.

**UNIT-V**

**MORPHOLOGICAL IMAGE PROCESSING, SEGMENTATION AND COLOR IMAGE PROCESSING:**

Preliminaries Erosion and dilation, opening and closing, the Hit-or-miss transformation, some Basic Morphological algorithms, Image segmentation- Fundamentals, point, line, edge detection thresholding, region -based segmentation, color fundamentals, color models, pseudo color image processing, basic of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

**TEXT BOOKS:**

1. R. C. Gonzalez and R. E. Woods, “Digital Image Processing, 3rd edition”, Prentice Hall, 2012.

**REFERENCES:**

1. R. C. Gonzalez, R. E. Woods and Steven L. Eddins, “Digital Image Processing Using MATLAB” 2nd edition, Prentice Hall, 2009.

2. Jayaraman, S. Esakkirajan, and T. Veerakumar, “Digital Image Processing”, Tata McGraw-Hill Education, 2011.

**E-REFERENCES:**

1. Digital Image Processing, Tutorialspoint
https://www.tutorialspoint.com/dip/index.htm
2. Digital Image Processing, Javatpoint
https://www.javatpoint.com/digital-image-processing-tutorial

| V SEMESTER – Professional Elective - I | L | T | P | C |
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| **20IT5E04:Virtual Reality** | | | | |

**COURSE OUTCOMES:**

At the end of the course student are able to

1. Outline various principles and concepts of Virtual Reality and its Application. (K2)
2. Apply appropriate method of Geometric Modeling. (K3)
3. Analyze various VR Hardware and Software. (K4)
4. Summarize the concepts of Augmented Reality. (K2)
5. Discover the Augmented Reality Contents and its Applications. (K4)

**UNIT – I:**

**INTRODUCTION TO VIRTUAL REALITY**

Virtual Reality & Virtual Environment: Introduction – Computer graphics – Real time computer graphics – Flight Simulation – Virtual environments –requirement – Benefits of Virtual Reality - Historical development of VR : 3D Computer Graphics - Human Factors – Vision - Vision and Display Technology – Hearing – Tactile - Equilibrium.

**UNIT – II:**

**GEOMETRIC MODELING**

Geometric Modeling : Introduction – From 2D to 3D – 3D space curves – 3D boundary representation – Other modeling strategies – Geometrical Transformations: Introduction – Frames of reference – Modeling transformations – Instances – Picking – Flying – Scaling the VE – Collision detection – A Generic VR system : Introduction – The virtual environment – The Computer environment – VR Technology – Model of interaction – VR System.

**UNIT – III:**

**VR HARDWARE, SOFTWARE AND APPLICATIONS**

Introduction-Computers-Tracking-Input Devices-Output Devices-Glasses-Displays-Audio-VR-Software Features-Web-based VR-Division's dVISE, Blueberry 3D-Boston Dynamics-Multigen-Introduction-Industrial-Training Simulators-Entertainment-VR Centers.

**UNIT – IV:**

**INTRODUCTION TO AUGMENTED REALITY**

Introduction to Augmented Reality-Definition and Scope-A Brief History of AR-Examples-Related Fields-Augmented Reality Concepts-How does AR Work-Concepts Related AR-Ingredients of an AR-AR Hardware and Software-Major Hardware Components for AR Systems- Major Software Components for AR Systems.

**UNIT – V:**

**AR CONTENT, INTERACTION AND ITS APLLICATIONS**

**AR Content**-Introduction-What is Content-Creating Visual Content-Creating Audio Content-Creating Content for Other Senses-Representation and Perceptual Issues-**AR Interaction**-Introduction-What is Interaction-Mobile AR-**AR Applications**-Introduction-Application Areas-Collaborative AR-Applying AR to a Problem-Evaluating AR Applications-Example AR Applications-The Future of Augmented Reality.

**TEXT BOOKS:**

1. John Vince, Virtual Reality Systems, Pearson Education Asia, 2016.
2. John Vince, Introduction to Virtual Reality, Springer London, 2016.
3. Dieter Schmalsteig, Tobias Hollerer, Augmented Reality, Principles and Practice, Pearson Education, 2016.
4. Alan B. Craig, Elsevier -Morgan Kaufmann Understanding Augmented Reality Concepts and Applications, Publications, 2013.

**REFERENCE BOOKS:**

1. Adams, "Visualizations of Virtual Reality", Tata McGraw Hill, 2000.
2. Grigore C. Burdea, Philippe Coiffet , Virtual Reality Technology , Wiley- Interscience, First Edition,1994.
3. Alan B Craig, William R Sherman and Jeffrey D Will, "Developing Virtual Reality Applications: Foundations of Effective Design", Morgan Kaufmann, 2009.
4. https://nptel.ac.in/courses/106105195/13
5. https://www.mooc-list.com/course/making-your-first-virtual-reality-game-coursera

| V SEMESTER (OPEN ELECTIVE –I) | L | T | P | C |
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| **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<br>**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<br>**Oceans:** Introduction - Ocean Thermal Electric Conversion (OTEC) – methods - prospects of OTEC in India.<br>**Waves:** Introduction - Energy and Power from the waves - Wave Energy conversion devices.<br>**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.<br>**Hydrogen Energy:** Introduction - Methods of Hydrogen production - Storage and Applications<br>**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 |
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| **20ME5O01 - WASTE TO ENERGY CONVERSION** | | | | |

**COURSE OBJECTIVES**

- To enable students to understand of the concept of waste to energy.
- To link technical and management principles for production of energy from waste.
- To learn about the best available technologies for waste to energy.
- 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**

Waste to 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, Barkha Vaish, 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 |
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| **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 |
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| **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 |
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| **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 |
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| **20BM5O03 - DIGITAL MARKETING** | | | | |

**COURSE OUTCOMES**

After the completion of the course the students are able to

1. Describe the importance of Digital marketing and its utility in business promotion. (K2)
2. Generalize the meaning and usefulness of Content marketing in analyzing the firm's promotional activity. (K3)
3. Comprehend the methodologies, tools and technologies involved in digital marketing. (K4)
4. Identify different forms of e-mail marketing and mobile marketing and analyze their effectiveness in digital marketing strategy. (K3)
5. Evaluate the importance of conversion and working with social media marketing. (K5**)**

**UNIT I- Introduction to Digital Marketing:** Concept – scope- importance of digital marketing - Traditional marketing versus digital marketing – Types of digital 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 |
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| **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, Organization, 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 |
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| **20IT5J01 - LINUX ADMINISTRATION** | | | | |

**Course Outcomes:**

At the end of the course, the students will be able to:

1. Illustrate various Linux commands that are used to manipulate system operations at admin level. (K2)
2. Construct Shell Programming using Linux commands. (K3)
3. Develop applications to manipulate internal kernel level Linux File System. (K3)
4. Summarize the concepts of user, group and storage management. (K2)
5. Construct SSH client and server. (K3)

**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, Pearson Education.

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 |
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| **20CS5J01 - FULL STACK WITH JAVA** | | | | |

**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:** 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 |
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| **20IT5L01:Network Programming Lab** | | | | |

**Course Outcomes:**

1. Apply the basics of Physical layer in real time applications. (K3)
2. Interpret data link layer concepts for design issues. (K2)
3. Experiment with Network layer routing protocols and IP addressing. (K3)
4. Develop the functions of Application layer and Presentation layer paradigms and Protocols. (K3)

**Experiments:**

1. Implement the data link layer framing methods such as character stuffing and bit stuffing.
2. Implement on a data set of characters the three CRC polynomials -CRC 12, CRC 16 and CRC CCIP.
3. To write a C program to develop a DNS client server to resolve the given hostname.
4. Write a program to implementation client server application in UDP.
5. Take an example subnet graph with weights indicating delay between nodes.
   Now obtain Routing table art each node using distance vector routing algorithm.
6. Programs using raw sockets (like packet capturing and filtering)
7. Programs using TCP Sockets (like echo server & client)
8. Write a C program to perform sliding window protocols
9. To simulate the Open Shortest Path First routing protocol based on the cost assigned to the path.
10. Implement Dijkstra's algorithm to compute the shortest path in a graph
11. Simulate the implementing Routing protocols using border gateway protocol (BGP)
12. Design TCP client server application to reverse the given input sentence

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| **20IT5L02:Web Technologies Lab** | | | | |

**COURSE OUT COMES**

After the completion of the course the students are able to

1. Distinguish static web pages and dynamic web pages using HTML, XML and JavaScript. (K4)
2. Construct and review on database connectivity. (K3)
3. Develop web applications using Servlets & JSP using oracle database connectivity. (K3)
4. Build and implement the web application projects. (K3)

**LIST OF PROGRAMS:**

1. Create a simple webpage using HTML
2. Use frames to Include Images and Videos.
3. Add a Cascading Style sheet for designing the web page
4. Design a dynamic web page with validation using JavaScript.
5. Design an HTML having a text box and four buttons viz Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate javascript function should be called to display
   a. Factorial of that number
   b. Fibonacci series up to that number
   c. Prime numbers up to that number
   d. Is it palindrome or not
6. Write java script programs to demonstrate
   a. Math Object with at least five methods.
   b. String Object with at least five methods.
   c. Array Object with at least five methods.
   d. Date Object with at least five methods.
7. Write JavaScript programs on Event Handling
   a. Validation of registration form.
   b. Open a Window from the current window
   c. Change color of background at each click of button or refresh of a page
   d. Display calendar for the month and year selected from combo box
   e. On Mouse over event
8. a) Design an XML document to store information about a student in Swarnandhra Engineering college. The information must include Student ID, Name, Name of the College, Brach, Year of Joining, and e-mail id. Make up sample data for 3 students.
   b) Create a CSS style sheet and use it to display the document.
   c) Create an XSLT style sheet for one student element of the above document and use it to create a display of that element.

9. Write a java program to connect to a database server using JDBC and insert 10 students information of user choice in to student table
10. Write a java program to display all records in the student table
11. Develop a simple Servlet to display Welcome to Servlet
12. Develop a Servlet to validate username and password with the data stored in Servlet configuration file. Display authorized user if she/he is authorized else display unauthorized user
13. Write JSP Program to store student information sent from registration page into database table.
14. Develop a program to validate username and password that are stored in Database table using JSP
15. Write appropriate JSP pages to insert, update and delete data in student table in a single application with proper linking of JSP pages and session management
16. Mini Project: Build web application (with Home page, Insert, View, Delete, Update, Search) based on the choice of student/faculty.

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| **20BM5M01 :: ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE** | | | | |

**SYLLABUS**

1. Basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.
2. Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature.
3. Introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system.
4. Basics of Indian Traditional knowledge modern scientific perspective.
5. Basic Structure of Indian Knowledge System
6. Modern Science and Indian Knowledge System
7. Yoga and Holistic Health care
8. Case Studies.

**Text Books**

1. GN Jha (Eng. Trans.) Ed. R N Jha, Yoga-darshanam with Vyasa Bhashya, Vidyanidhi Prakasham, Delhi,2016.
2. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi, 2016.
3. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014.

**Reference Books**

1. Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
2. V N Jha ( Eng. Trans,), Tarkasangraha of Annam Bhatta, Inernational Chinmay Foundation, Velliarnad,Amaku,am
3. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkatta.
4. P R Sharma ( English translation), Shodashang Hridayam.

**E-Resources**

1. https://www.youtube.com/watch?v=sSgj_GZOwU8

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| **20HS5S01 :: Skill Course-3 (ADVANCED COMMUNICATION SKILLS LAB)** | | | | |

At the end of the course students will be able to prepare themselves for their career which may require them to listen and speak in English both for their professional and interpersonal communication in the globalized context.

**Course objectives**

- Analyzing a topic of discussion and relating to it.
- Planning and executing an assignment creatively.
- Presenting ideas coherently within a stipulated time.
- Communicating ideas effectively in prescribed oral activities.
- Applying relevant writing formats for resume and presentations.
- Facing interviews with confidence.

**Course outcomes**

At the end of the course students will be able to

- Summarize ideas and organize information relevantly and coherently. (K2)
- Prove in group discussions and face interviews with confidence. (K5)
- Build resume with covering letter.(K3)
- Plan oral presentations and public speaking. (K3)
- Take part in social and professional communication. (K4)

**SYLLABUS**

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. MadhaviApte - A Course in English Communication – Prentice - Hall of India- 2007.
3. Dr. ShaliniVerma - Body Language – Your Success Mantra- S. Chand- 2006.
4. Sunita Mishra &C.Murali Krishna- Communication Skills for Engineers - Pearson Education - 2007.

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| 20IT6T01:MACHINE LEARNING | | | | |

**COURSE OUTCOMES**

After the completion of the course the students are able to

1. Illustrate the fundamentals of machine learning concepts. (K2)
2. Develop and apply regression and classification algorithms. (K3)
3. Build a model for decision tree learning. (K3)
4. Discover the Bayesian approach for machine learning. (K4)
5. Apply unsupervised learning models for handling unknown pattern. (K3)

**Unit-1 Introduction**

Well-Posed learning problems, Basic concepts, Types of Machine Learning-Supervised, unsupervised and reinforcement. Goals and applications of machine learning, Aspects of developing a learning system: training data, concept representation, function approximation. Concept learning Introduction, Version Spaces and the Candidate Elimination Algorithm.

**Unit-2 Supervised Learning**

Regression: Linear regression, polynomial regression, metrics for accessing regression, Overfitting-Underfitting problems, The bias / Variance tradeoff.

Classification: KNN, SVM-Optimal Separation-Kernels-Kernel Optimization, Linear Discriminant Analysis, metrics for accessing classification

**Unit-3 Decision Tree Learning**

Decision tree representation, appropriate problems for decision tree learning, Univariate Trees (Classification and Regression), Multivariate Trees, Basic Decision Tree Learning algorithms, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning, Random Forest

**Unit-4 Bayesian Learning**

Bayes theorem and concept learning, Bayes optimal classifier, Gibbs algorithms, Naive Bayes Classifier, Bayesian belief networks, The EM algorithm, Gaussian Mixture Model, MLE and Bayesian Estimate

**Unit-5 Unsupervised Learning:**

Curse of Dimensionality, Dimensionality Reduction Techniques, Principal component analysis, Singular Value Decomposition. Introduction to clustering, Hierarchical: AGNES, DIANA, Partitional: K-means clustering, K-Mode Clustering, Hierarchical, Spectral, subspace clustering, Association rule mining.

**Text Books:**

1) Peter Flach, Machine Learning-The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press, 2017

2) T.M. Mitchell, "Machine Learning", McGraw-Hill, 1997.

3) Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, "Machine Learning", Pearson, 2019.

**Reference Books:**

1) Ethern Alpaydin, "Introduction to Machine Learning", MIT Press, 2004.

2) Stephen Marsland, "Machine Learning -An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

3) Andreas C. Müller and Sarah Guido "Introduction to Machine Learning with Python: A Guide for Data Scientists", Oreilly.

**e-Resources:**

1) Andrew Ng, "Machine Learning Yearning" https://www.deeplearning.ai/machine-learning-yearning/

2) Shai Shalev-Shwartz, Shai Ben-David, "Understanding Machine Learning: From Theory to Algorithms", Cambridge University Press https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/index.html

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| **20IT6T02:INTERNET OF THINGS** | | | | |

**Course outcomes:**

After this completion of this course, the student should be able to

1. Outline the concepts of IoT and apply IoT to different applications. (K2)
2. Utilization of Devices, Gateways and Data Management in IoT. (K3)
3. Analyze and evaluate protocols used in IoT. (K4)
4. Identify how IoT differs from traditional data collection systems. (K3)
5. Illustrate the role of big data, cloud computing and data analytics in a typical IoT system. (K2)

**UNIT - I**

**The Internet of Things:** An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples of IoTs, Design Principles For Connected Devices Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

**UNIT - II**

Business Models for Business Processes in the Internet of Things, IoT/M2M systems layers and designs standardizations, Modified OSI Stack for the IoT/M2M Systems ,ETSI M2Mdomains and High-level capabilities, Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability.

**UNIT - III**

Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

**UNIT - IV**

Data Acquiring, Organizing and Analytics in IoT/M2M, Applications /Services /Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

**UNIT - V**

Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2MApplications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively(Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology, Sensing the World.

**Text Books:**

1. Rajkamal, Internet of Things: Architecture, Design Principles and Applications, McGraw Hill Higher Education.
2. A.Bahgya and V.Madisetti, Internet of Things, Univesity Press, 2015

**References:**

1. Adrian McEwen and Hakim Cassimally, Designing the Internet of Things, Wiley
2. CunoPfister, Getting Started with the Internet of Things Oreilly

| VI SEMESTER | L | T | P | C |
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| **20IT6T03: CLOUD COMPUTING** | | | | |

**Course Outcomes:**

**Upon completion of the course, it is expected that student will be able to:**

1. Illustrate the main concepts, key technologies, strengths and limitations of cloud computing. (K2)
2. Discover the enabling technologies that help in the development of cloud. (K4)
3. Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models. (K3)
4. Summarize the core issues of cloud computing such as resource management and security. (K2)
5. Identify the appropriate technologies, algorithms and approaches for implementation and use of cloud. (K3)

**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 Virtualization, 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. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, Morgan KaufmannPublishers.
2. Rittinghouse, John W. and James F. Ransome, Cloud Computing: Implementation, Management and Security, CRCPress.

**References:**

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing, Tata McgrawHill.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing - A Practical Approach, Tata McGrawHill.
3. George Reese, Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), O'Reilly.

| VI SEMESTER – PROFESSIONAL ELECTIVE - II | L | T | P | C |
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| **20IT6E01:DESIGN AND ANALYSIS OF ALGORITHMS** | | | | |

**Course Outcomes**

After the completion of the course the students are able to

1. Analyze the asymptotic runtime complexity of algorithms for real world problems developed using different algorithmic methods. (K4)
2. Identify the optimal solutions by using advanced design and analysis of algorithm techniques like Divide & conquer and greedy method. (K3)
3. Illustrate the fundamentals of Dynamic Programming methods along with its applications. (K2)
4. Apply the search space and optimization problem techniques like backtracking and branch and bound method to solve problems optimally where advanced algorithm design techniques fail to find solution. (K3)
5. Distinguish the problems and its complexity as polynomial and NP problems and can formulate some real world problems to abstract mathematical problems. (K4)

**UNIT-I**

**Introduction:** Algorithm, Pseudo code for expressing algorithms, performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, Probabilistic Analysis. **Disjoint Sets** - disjoint set operations, union and find algorithms, spanning trees, connected components and bi-connected components.

**UNIT-II**

**Divide and conquer:** General method, applications-Binary search, Quick sort, Merge sort, Stassen's matrix multiplication.

**Greedy method:** General method, applications, Job sequencing with deadlines, 0/1 knapsack problem, Minimum cost spanning trees and Single source shortest path problem.

**UNIT – III**

**Dynamic Programming:** General method, applications-Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem and Reliability design.

**UNIT-IV**

**Backtracking:** General method, Applications- n-queen problem, sum of subsets problem, graph coloring and Hamiltonian cycles.

**Branch and Bound:** General method, applications - Travelling sales person problem,0/1 knapsack problem-LC Branch and Bound solution, FIFO Branch and Bound solution.

**UNIT-V**

**NP- Hard and NP- complete problems:** 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, SatrajSahni and Rajasekharam, Fundamentals of Computer Algorithms, Universities Press.
2. Steven S. Skiena, The Algorithm Design Manual, 2nd edition, Springer.
3. T.H.Cormen, C.E.Leiserson, R.L.Rivest and C.Stein, Introduction to Algorithms, second edition, PHI Pvt. Ltd.

**Reference Books:**

1. AnanyLevitin, Introduction to the Design and Analysis of Algorithms, PEA
2. Parag Himanshu Dave, Himansu B Alachandra Dave, Design and Analysis of Algorithms, Pearson Education.
3. R.C.T. Lee, S.S.Tseng, R.C.Chang and T.Tsai, Introduction to Design and Analysis of Algorithms A strategic approach, McGraw Hill.
4. Aho, Ullman and Hopcroft, Design and Analysis of algorithms, Pearson education.

| VI SEMESTER – PROFESSIONAL ELECTIVE - II | L | T | P | C |
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| **20IT6E02:AGILE TECHNOLOGY** | | | | |

**Course Outcomes**

After the completion of the course the students are able to

1. Interpret the basics of Scrum framework. (K2)
2. List out the principles of Agile methodology. (K1)
3. Analyze life time period of a sprint. (K4)
4. Identify the roles, responsibilities and principles of a ScurmMaster. (K3)
5. Categorize the scrum team structures and scrum planning principles. (K4)

**UNIT- 1**

**Introduction**: What Is Scrum? Scrum Origins, Why Scrum? Genomica Results, Complex Domain, Complicated Domain, Simple Domain, Chaotic Domain, Disorder, Interrupt-Driven Work

**Core Concepts:** Scrum Framework, Scrum Roles, Product Owner, ScrumMaster, Development Team, Scrum Activities and Artifacts, Product Backlog

**UNIT-2**

**Agile Principles:** Variability and Uncertainty: Embrace Helpful Variability, Employ Iterative and Incremental Development, Leverage Variability through Inspection, Adaptation, and Transparency, Reduce All Forms of Uncertainty Simultaneously, Prediction and Adaptation, Keep Options Open, Validated Learning, Validate Important Assumptions Fast, Leverage Multiple Concurrent Learning Loops, Organize Workflow for Fast Feedback

**UNIT-3**

**Sprints:** Timeboxed, Establishes a WIP Limit, Forces Prioritization, Demonstrates Progress, Avoids Unnecessary Perfectionism, Motivates Closure, Improves Predictability, Short Duration, Ease of Planning, Fast Feedback, Improved Return on Investment, Bounded Error, Rejuvenated Excitemen, Frequent Checkpoints, Consistent Duration, No Goal-Altering Changes

**UNIT-4**

**ScrumMaster:** Principal Responsibilities, Coach, Servant Leader, Process Authority, Interference Shield, Impediment Remover, Change Agent, Characteristics/Skills, Knowledgeable, Questioning, Patient, Collaborative, Protective, Transparent, Fulfilling the Role, Who Should Be a ScrumMaster? Is ScrumMaster a Full-Time Job? ScrumMaster Combined with Other Roles

**UNIT-5**

**Scrum Team Structures:** Overview, Feature Teams versus Component Teams, Multiple-Team Coordination, Scrum of Scrums, Release Train, Scrum Planning Principles: Correctly Manage the Planning Inventory, Favor Smaller and More Frequent Releases, Plan to Learn Fast and Pivot When Necessary.

**Text Books:**

1. Kenneth S.Rubin, Essential SCRUM (A Practical guide to the most popular Agile Process), July 2012
2. Pichler Roman, Agile Product Management with Scrum, 2008

**References:**

1. Sammons Andrew, Introducing Agile Project Management With Scrum,

| VI SEMESTER – PROFESSIONAL ELECTIVE - II | L | T | P | C |
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| **20IT6E03:EMBEDDED SYSTEMS** | | | | |

**COURSE OUTCOMES:**

After completion of the course, students are able to

1. Interpret the fundamentals of Embedded Systems. (K2)
2. Distinguish various components used in Embedded systems. (K4)
3. Develop the Embedded Firmware. (K3)
4. Summarize the concepts of PIC, AVR controllers and Processors. (K2)
5. Build a case study on Embedded Systems. (K3)

**UNIT-I:** Introduction to Embedded Systems Definition of Embedded System, Embedded Systems Vs. General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

**UNIT-II:** Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

**UNIT-III:** Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

**UNIT-IV:** Overview of PIC, AVR controllers and ARM processors: Introduction to PIC family of Microcontroller. Introduction to AVR family of Microcontroller. Introduction to ARM family Processors.

**UNIT-V:** Design Case studies: Digital clock, Battery operated smartcard reader, Automated meter reading system, Digital camera.

**TEXT BOOKS:**

1. Shibu K.V, "Introduction to Embedded Systems", McGraw Hill, 2014 (Unit I-V)

**REFERENCE BOOKS:**

1. Raj Kamal, "Embedded Systems", TMH.2003
2. David E Simon, "An Embedded Software Primer", Pearson Education, 2015.

**E-REFERENCES:**

https://archive.org/details/K.ShibuIntroductionToEmbeddedSystemsTmh2009/page/n5/mode/2up?view=theater

| VI SEMESTER – PROFESSIONAL ELECTIVE - II | L | T | P | C |
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| **20IT6E04 :ROBOTICS** | | | | |

**Course outcomes:**

After this completion of this course, the student should be able to

1. Identify the basic components of robots. (K3)
2. Distinguish various types of robots and robot grippers. (K4)
3. Illustrate forward and inverse kinematics of robot manipulators. (K2)
4. Analyze forces in links and joints of a robot and design intelligent robots using sensors. (K4)
5. Develop a robot to perform tasks in industrial applications. (K3)

**UNIT - I**

Robotics-Introduction-classification with respect to geometrical configuration (Anatomy),Controlled system & chain type: Serial manipulator & Parallel Manipulator. Components of Industrial robotics-precession of movement-resolution, accuracy & repeatability-Dynamic characteristics- speed of motion, load carrying capacity & speed of response-Sensors-Internal sensors: Position sensors,& Velocity sensors, External sensors: Proximity sensors, Tactile Sensors, & Force or Torque sensors.

**UNIT - II**

Grippers - Mechanical Gripper-Grasping force-Engelberger-g-factors-mechanisms for actuation, Magnetic gripper, vaccume cup gripper-considerations in gripper selection & design. Industrial robots specifications, Selection based on the Application.

**UNIT - III**

Kinematics-Manipulators Kinematics, Rotation Matrix, Homogenous Transformation Matrix, D-H transformation matrix, D-H method of assignment of frames. Direct and Inverse Kinematics for industrial robots. Differential Kinematics for planar serial robots

**UNIT - IV**

Trajectory planning: Joint space scheme- Cubic polynomial fit-Obstacle avoidance in operation space-cubic polynomial fit with via point, bleding scheme. Introduction to Cartesian space scheme.

Control- Interaction control, Rigid Body mechanics, Control architecture- position, path velocity, and force control systems, computed torque control, adaptive control, and Servo system for robot control.

**UNIT - V**

Programming of Robots and Vision System-Lead through programming methods- Teach pendent overview of various textual programming languages like VAL etc. Machine (robot) vision:

**Text Books:**

1. Groover M P, Industrial Robotics Mc Graw Hill
2. John J. Craig, Introduction to Robotics, Pearson

**References:**

1. Jazar, Theory of Applied Robotics, Springer.
2. Ghosal, Robotics,Oxford

| VI SEMESTER : OPEN ELECTIVE - II | L | T | P | C |
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| 20CE6O01:: ENVIRONMENTAL POLLUTION AND CONTROL | | | | |

**Course Outcomes:**

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)

**SYLLUBUS**

**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 landfilling.

**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**

1. https://nptel.ac.in/courses/123105001

| VI SEMESTER : OPEN ELECTIVE - II | L | T | P | C |
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| 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 programs. (K2)

**SYLLABUS**

**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 terrorism -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 |
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| 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 | Analyze 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 |
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| 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 |
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| 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 FORAM**
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/

| VI SEMESTER : OPEN ELECTIVE - II | L | T | P | C |
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| 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.

| VI SEMESTER : OPEN ELECTIVE - II | L | T | P | C |
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| **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, layered 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 and 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.

**TEXTBOOK:**

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

**REFERENCEBOOKS:**

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

| VI SEMESTER : OPEN ELECTIVE - II | L | T | P | C |
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| 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.

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| 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. Waltschafer, 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.

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| 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

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| 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

**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]

**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 – two phase 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

.**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.

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| **20IT6O01 :: INTRODUCTION TO CLOUD COMPUTING** | | | | |

**Course Outcomes:**

**Upon completion of the course, it is expected that student will be able to:**

1. Illustrate the main concepts, key technologies, strengths and limitations of cloud computing. (K2)
2. Discover the enabling technologies that help in the development of cloud. (K4)
3. Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models. (K3)
4. Summarize the core issues of cloud computing such as resource management and security. (K2)
5. Identify the appropriate technologies, algorithms and approaches for implementation and use of cloud. (K3)

**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 Virtualization, 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 McGrawHill.

3. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), George Reese, O'Reilly.

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| **20IT6O02 :: E-COMMERCE** | | | | |

**COURSE OUTCOMES**

After the completion of the course the students are able to

1. Identify the fundamentals E-commerce framework. (K3)
2. Outline the basics of Consumer Oriented Electronic models. (K2)
3. Distinguish different electronic payment systems and their issues. (K4)
4. Illustrate Inter-organizational and intra-organizational electronic commerce. (K2)
5. Summarize the consumer search, resource discovery and key multimedia concepts. (K2)

**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 | | | | |

**Course outcomes:**

**After completing this course, students should be able to**

1. Outline the AWS cloud and identify the Global Infrastructure components of AWS. (K2)
2. Examine when to use Amazon EC2, AWS Lambda and AWS Elastic Beanstalk. (K4)
3. Classify Storage Services and when to use AWS Database services. (K4)
4. Illustrate Networking and Content Delivery Services. (K2)
5. Summarize the Cloud economics and security. (K2)

**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/

| VISEMESTER:JOB ORIENTED ELECTIVE - II | L | T | P | C |
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| 20CS6J02 :: SOFTWARE TESTING TOOLS | | | | |

**COURSE OUTCOMES:**
**At the end of the course students are able to**

1. Develop Manual testing techniques and software test levels (K3)
2. Construct Java Program for Selenium and Test frame works (K3)
3. Construct Apache JMeter and apply JMeter Test Plan (K3)
4. Build the Running Multiple Scripts with JMeter and Different Types of JMeter Test Plans (K3)
5. Analyze JIRA and Test Management In JIRA (Using Zephyr Plug-in) (K4)

**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** | | | | |

**Course Outcomes:**

At the end of the course students will be able to

1. Outline the basic concepts of Web Page and Markup Languages. (K2)
2. Develop web Applications using Scripting languages and Frameworks. (K3)
3. Construct and Run the Applications using PHP. (K3)
4. Examine First Controller Working with and Displaying in AngularJS and Nested Forms with ng-form. (K4)
5. Illustrate working with the Files in React JS and Constructing Elements with Data. (K3)

**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 |
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| | 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 (K4)

CO2 Experiment with crypto currency trading and crypto exchanges (K3)

CO3 Analyze the bitcoin usage and applications (K4)

CO4 Develop private blockchain environment and develop a smart contract on Ethereum (K3)

CO5 Build the hyper ledger architecture and the consensus mechanism applied in the hyperledger (K3)

**Unit-I**

**CRYPTOCURRENCY AND BLOCKCHAIN- INTRODUCTION:**

Blockchain- An Introduction, Distinction between databases and blockchain, Distributed ledger. Blockchain ecosystem - Consensus Algorithms & Types, Block chain structure, Distributed networks- Distributed Applications (DApps) – Web 3.0 - DApps Ecosystems. Working - Permissioned and permission-less Blockchain – Cross Chain Technologies. – IOT & Block chain - 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 Crypto currencies - Digital Signatures – Crypto currency Hash Codes -Need for Crypto Currencies – Crypto Markets – Explore Crypto Currency Ecosystems - ICOs – Crypto Tokens - Atomic Swaps – Crypto Currency Exchanges – Centralized 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 |
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| 20CS6L01:MACHINE LEARNING LAB | | | | |

**Course Outcomes**

After the completion of the course the students are able to

1. Apply Data summarization and visualization. (K3)
2. Develop and implement the Linear Regression Analysis (K3)
3. Develop and implement the Logistic Regression Analysis. (K3)
4. Apply the Classification using Support Vector Machine. (K3)

All the programs should be carried out using tools like Weka/Python/R-Programming/Orange.

**List of Experiments**

1. Installation and running of Scipy.
2. Data loading
3. Data summarization
4. Data visualization
5. Data Predictions
6. Case Study on Linear Regression Analysis
7. Case Study on Logistic Regression Analysis
8. Case Study on Data Classification using Support Vector Machine

| VI SEMESTER | L | T | P | C |
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| **20IT6L02 :INTERNET OF THINGS LAB** | | | | |

**COURSE OUTCOMES:** Students will be able to

1. Analyze temperature and humidity using various sensors (K4)
2. Apply IR sensor/push button to on/off LED (K3)
3. Build a Bluetooth module with Arduino and Use the same (K3)
4. Construct Actuating elements with Arduino and control the same (K3)

1. Familiarization with Arduino and perform necessary software installation.
2. To interface LED/Buzzer with Arduino and write a program to turn ON LED for 1 sec after every 2 seconds.
3. To interface Push button/Digital sensor (IR/LDR) with Arduino and write a program to turn ON LED when push button is pressed or at sensor detection.
4. To interface DHT11 sensor with Arduino and write a program to print temperature and humidity readings.
5. To interface motor using relay with Arduino and write a program to turn ON motor when push button is pressed.
6. To interface OLED with Arduino and write a program to print temperature and humidity readings on it.
7. To interface Bluetooth with Arduino and write a program to send sensor data to smart phone using Bluetooth.
8. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when '1'/'0' is received from smart phone using Bluetooth.
9. To interface Servo motor with Arduino and write a program to control the same
10. To interface Stepper motor with Arduino and write a program to control the same using potentiometer
11. To interface thermistor with Arduino for temperature measurement
12. To measure temperature using thermocouple by interfacing it with Arduino
13. Write a program to create TCP server on Arduino/Raspberry Pi and respond with humidity data to TCP client when requested.
14. Write a program to create UDP server on Arduino/Raspberry Pi and respond with humidity data to UDP client when requested.

| VI SEMESTER | L | T | P | C |
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| **20IT6L03 : CLOUD COMPUTING LAB** | | | | |

**Course Outcomes**

After the completion of the course the students are able to

1. Identify various virtualization tools such as Virtual Box, VMware workstation. (K3)
2. Design and deploy a web application in a PaaS environment. (K6)
3. Build a cloud environment to implement new schedulers. (K3)
4. Outline the use of generic cloud environment that can be used as a private cloud. (K2)
5. Illustrate the large data sets in a parallel environment (K2)

**List of Experiments**

1. Install Virtual box/VMware Workstation with different flavors of Linux or windows OS on top of windows.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
8. Install Hadoop single node cluster and run simple applications like wordcount.

| VI SEMESTER | L | T | P | C |
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| **20IT6S01: Skill Course-4 :: ARTIFICIAL INTELLIGENCE LAB** | | | | |

**Course Outcomes**

After the completion of the course the students are able to

1. Outline the concept of Artificial intelligence. (K2)
2. Apply various search algorithms of artificial intelligence. (K3)
3. Examine the knowledge representation and reasoning techniques. (K4)
4. Apply different types of techniques to solve the traditional computational problems. (K3)

**List of Experiments**

1. Write a program in prolog to implement simple facts and Queries
2. Write a program in prolog to implement simple arithmetic
3. Write a program in prolog to solve Monkey banana problem
4. Write a program in prolog to solve Tower of Hanoi
5. Write a program in prolog to solve 8 Puzzle problems
6. Write a program in prolog to solve Traveling salesman problem
7. Write a python program to implement simple Chatbot?
8. Write a python program to implement Breadth First Search Traversal?
9. Write a python program to implement Depth First Search Traversal?
10. Write a python program to implement Water Jug Problem?
11. Write a program to implement Tic-Tac-Toe game using python.
12. Write a program to implement Missionaries and Cannibals problem using python.

| VI SEMESTER | L | T | P | C |
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| **20BM6M01:PROFESSIONAL ETHICS AND INTELLECTUAL PROPERTY RIGHTS** | | | | |

**COURSE OUTCOMES:**

**Students are able to**

1. Identify the professional roles played by an engineer and illustrate the process of Social experimentation (K3)
2. Determine Engineer's responsibilities and rights towards the society (K5)
3. Analyze various aspects of Intellectual Property Rights and recognize the process of protecting the copyrights (K4)
4. Outline the registration process of Patents and trademarks and also demonstrate the concept of trade secrets and cybercrimes (K2)

**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– RiskBenefit 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 Mark maintenance – 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". Cengage learning , New Delhi, BS Publications (Press)

3. PrabhuddhaGanguli,‘ Intellectual Property Rights” Tata Mc-Graw – Hill, New Delhi

| VII SEMESTER -PROFESSIONAL ELECTIVE - III | L | T | P | C |
|---|---|---|---|---|
| | 3 | - | - | 3 |
| **20IT7E01 : BIO-INFORMATICS** | | | | |

**COURSE OUTCOMES**

After the completion of the course the students are able to

1. Outline the fundamentals of XML, DTD for Bioinformatics. (K2)
2. Apply the concepts for file handling mechanisms. (K3)
3. Summarize the database management system for Bioinformatics. (K2)
4. Analyze the different Sequence Alignment Algorithms. (K3)
5. Examine the Phylogenetic analysis for Bioinformatics. (K4)

**UNIT - I**

The Central Dogma & XML (Bio XML) for Bioinformatics: Watson’s definition, information flow, from data to knowledge, Convergence, the organization of DNA, the organization of Proteins, Introduction, Differences between HTML and XML, fundamentals of XML, fundamentals of XML namespaces. Introduction to DTDs, Document type Declarations, Declaring elements, declaring attributes, working with entities XML Schemas, Essential Concepts, working with simple types, working with complex types, Basic namespaces issues.

**UNIT - II**

Perl (Bioperl) for Bioinformatics: Representing sequence data, program to store a DNA sequence, concatenating DNA fragments, Transcription, Calculating the reverse complement in Perl, Proteins, files, reading proteins in files, Arrays, Flow control, finding motifs, counting Nucleotides, exploding strings into arrays, operating on strings, writing to files, subroutines and bugs.

**UNIT - III**

Databases: Flat file, Relational, object oriented databases, object Relational and Hypertext, Data life cycle, Database Technology, Database Architecture, Database Management Systems and Interfaces.

**UNIT - IV**

Sequence Alignment Algorithms: Biological motivations of sequence analysis, the models for sequence analysis and their biological motivation, global alignment, local alignment, End free-space alignment and gap penalty, Sequence Analysis tools and techniques.

**UNIT - V**

Phylogenetic Analysis: Introduction, methods of Phylogenetic analysis, distance methods, the neighbor-Joining (NJ) method, The Fitch/ Margoliash method, character-based methods, Other methods, Tree

evaluation and problems in phylogenetic analysis, Clustering, Protein structure visualization and Protein structure prediction.

**Text Books:**

1. S.C.Rastogi, N. Mendiratta, "Bioinformatics Methods and Applications", CBS publications.
2. James D. Tisdall, "Beginning Perl for Bioinformatics" O'Reilly media, 1st Edition.

**Reference Books:**

1. D.R. Westhead, J.H. Parish, "Bioinformatics" Viva books private limited, New Delhi
2. Bryan Bergeron, M.D, "Bioinformatics Computing" Pearson Education.

| VII SEMESTER – PROFESSIONAL ELECTIVE - III | L | T | P | C |
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| | 3 | - | - | 3 |
| **20IT7E02 : DEVOPS** | | | | |

**Course Outcomes**

After the completion of the course the students are able to

1. Outline the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT service agility (K2)
2. Develop DevOps & DevSecOps methodologies and their key concepts (K3)
3. Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models (K2)
4. Build the complete private infrastructure using version control systems and CI/CD tools (K3)
5. Discover DevOps maturity model. (K4)

**UNIT-I**

**Phases of Software Development Life Cycle:**

Phases of Software Development life cycle, Values and principles of agile software development.

**UNIT-II**

**Fundamentals of DevOps**

Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system.

**UNIT-III**

**DevOps adoption in projects:** Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes.

**UNIT-IV**

**CI/CD:** Introduction to Continuous Integration, Continuous Delivery and Deployment, Benefits of CI/CD, Metrics to track CICD practices.

**UNIT-V**

**DevOps Maturity Model**: Key factors of DevOps maturity model, stages of Devops maturity model, DevOps maturity Assessment.

**Text Books**

1. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois , Jez Humb,1st Edition, O'Reilly publications, 2016.

2. What is Devops? Infrastructure as code, 1st Edition, Mike Loukides ,O'Reilly publications, 2012.

**Reference Books**

1. Building a DevOps Culture, 1st Edition, Mandi Walls, O'Reilly publications, 2013.

2. The DevOps 2.0 Toolkit: Automating the Continuous Deployment Pipeline With Containerized Microservices, 1st Edition, Viktor Farcic, CreateSpace Independent Publishing Platform publications, 2016

3. Continuous Delivery: Reliable Software Releases Through Build, Test, and Deployment Automation, 1st Edition, Jez Humble and David Farley, 2010.

4. Achieving DevOps: A Novel About Delivering the Best of Agile, DevOps, and microservices, 1st Edition, Dave Harrison, Knox Lively, Apress publications, 2019

| VII SEMESTER – PROFESSIONAL ELECTIVE - III | L | T | P | C |
|---|---|---|---|---|
| | 3 | - | - | 3 |
| **20IT7E03 : DEEP LEARNING** | | | | |

**Course outcomes:**

After this completion of this course, the student should be able to

1. List out the basic concepts of fundamental learning techniques and layers. (K1)
2. Analyze the Neural Network training, various random models. (K4)
3. Classify different types of deep learning network models. (K4)
4. Distinguish the Probabilistic Neural Networks and Sequence model neural networks. (K4)
5. Illustrate tools on Deep Learning techniques. (K2)

**UNIT I:**

Introduction: Various paradigms of learning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques.

Feed forward neural network: Artificial Neural Network, activation function, multi-layer neural network.

**UNIT II:**

Training Neural Network: Risk minimization, loss function, back propagation, regularization, model selection, and optimization.

Conditional Random Fields: Linear chain, partition function, Markov network, Belief propagation, Training CRFs, Hidden Markov Model, Entropy.

**UNIT III:**

Deep Learning: Deep Feed Forward network, regularizations, training deep models, dropouts, Convolution Neural Network, Recurrent Neural Network, and Deep Belief Network.

**UNIT IV:**

Probabilistic Neural Network: Hopfield Net, Boltzmann machine, RBMs, Sigmoid net, Auto encoders.

Sequence Modeling: LSTM, Gated RNNs & Deep Generative Models

**UNIT V:**

Applications: Object recognition, sparse coding, computer vision, natural language processing.

Introduction to Deep Learning Tools: Caffe, Theano, Torch.

**Text Books:**

1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016..
2. Bishop, C., M., Pattern Recognition and Machine Learning, Springer, 2006.

**References:**

1. Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009.
2. Matrix Computations, Golub, G.,H., and Van Loan,C.,F, JHU Press,2013.
3. Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.

| VII SEMESTER – PROFESSIONAL ELECTIVE - III | L | T | P | C |
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| | 3 | - | - | 3 |
| **20CS7E01 : CRYPTOGRAPHY & NETWORK SECURITY** | | | | |

**Course Outcomes**:

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

1. List out the different security threats and counter measures and foundation course of cryptography mathematics. (K1)
2. Classify the basic principles of symmetric key algorithms and operations of some symmetric key algorithms and asymmetric key cryptography (K2)
3. Illustrate the basic principles of Public key algorithms and Working operations ofsome Asymmetric key algorithms such as RSA, ECC and some more (K2)
4. Design applications of hash algorithms, digital signatures and key management techniques (K6)
5. Determine the knowledge of Application layer, Transport layer and Networklayer security Protocols such as PGP, S/MIME, SSL, TSL, and IPsec. (K5)

**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 Modern Symmetric 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, Applications of 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, CengageLearning, 2018

| VII SEMESTER – PROFESSIONAL ELECTIVE - IV | L | T | P | C |
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| | 3 | - | - | 3 |
| **20IT7E04 : DISTRIBUTED SYSTEMS** | | | | |

**COURSE OUTCOMES**

After the completion of the course the students are able to

1. Outline the concept of distributed systems and various distributed models. (K2)
2. Develop the knowledge on inter-process communication mechanisms used in distributed systems and Compare RPC and RMI. (K3)
3. Examine Global states and replication. (K4)
4. Label distributed file systems and name services. (K1)
5. Examine distributed transactions and concurrency control. (K4)

**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.

| VII SEMESTER – PROFESSIONAL ELECTIVE - III | L | T | P | C |
|---|---|---|---|---|
| | 3 | - | - | 3 |
| **20IT7E05 : BIG DATA ANALYTICS** | | | | |

**COURSE OUTCOMES**

After the completion of the course the students are able to

1. List out the basic concepts of Big Data and Big Data Analytics (K1)
2. Analyze the HDFS architecture (K4)
3. Develop the Map Reduce application (K3)
4. Identify the various Hadoop Ecosystem technologies (K3)
5. Outline the Advanced Analytical methods for classification, clustering and Text Analysis (K2)

**Unit-1 Introduction**

Introduction to Big Data: Types of Digital Data-Characteristics of Data – Evolution of Big Data – Definition of Big Data – Challenges with Big Data – 3Vs of Big Data – Non Definitional traits of Big Data – Business Intelligence vs. Big Data – Data warehouse and Hadoop environment – Coexistence.

Big Data Analytics: Classification of analytics – Data Science – Terminologies in Big Data – CAP Theorem

**Unit-2 Hadoop Distributed File System**

Introduction to Hadoop, frame work, features, advantages, HDFS concepts, HDFS architecture, Command Line Interface, hdfs commands, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives,

**Unit-3 Map Reduce**

Understanding Hadoop API for MapReduce Framework, features, Techniques to Optimize MapReduce Jobs; Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression, I/O formats, Uses of MapReduce, Ingestion layer in big data stack

**Unit-4 Hadoop Ecosystem**

Serialization: AVRO, Co-ordination: Zookeeper. Databases: HBase Concepts, Clients, Example, HBase Versus RDBMS, Hive-architecture, data types, file formats, HQL. Scripting language: Pig-features, anatomy, pig on Hadoop, pig latin over view, data types, running pig, execution modes of pig, Streaming: Flink, Storm

**Unit-5 Advanced Analytics**

Clustering: k-means, k-mode algorithm, Association Rules: Apriori Algorithm, Evaluation of Candidate Rules, Applications of Association Rules, Classification: Decision Trees, Naïve Bayes. Time Series Analysis: Overview of Time Series Analysis, ARIMA Model.

Text Analysis: Regular expressions, Collecting Raw Text, Representing Text (bag of words), Term Frequency—Inverse Document Frequency (TFIDF)

**Text Books:**

1. Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", Wiley Publication, 2015.
2. Tom White, "Hadoop: The Definitive Guide", O'Reilly, 4th Edition, 2015.
3. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data by EMC Education Services- Wiley

**Reference Books:**

1. Hadoop in Practice by Alex Holmes, MANNING Publ.
2. Hadoop Map Reduce Cookbook, Srinath Perera, Thilina Gunarathne.
3. Big Data Analytics with R and Hadoop-Vignesh Prajapati.

Software Links:

**E-resources:**

1. Hadoop:http://hadoop.apache.org/
2. Hive: https://cwiki.apache.org/confluence/display/Hive/Home
3. Piglatin: http://pig.apache.org/docs/r0.7.0/tutorial.html

| VII SEMESTER – PROFESSIONAL ELECTIVE - IV | L | T | P | C |
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| **20CS7E05 : QUANTUM COMPUTING** | | | | |

**COURSE OUTCOMES**

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

1. Identify the quantum computing techniques (K3)
2. Identify the mathematics using on quantum computing (K3)
3. Develop quantum logic gate circuits (K3)
4. Analyze quantum algorithm (K4)
5. Examine the programs using various toolkits (K4)

**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", Cambridge UniversityPress.
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

| VII SEMESTER – PROFESSIONAL ELECTIVE - IV | L | T | P | C |
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| **20AM7E03 : NOSQL DATABASES** | | | | |

**Course Objective:**

The student will be able to

- Define, compare and use the four types of NoSQL Databases (Document-oriented, Key-Value Pairs, Column – oriented and Graph).
- Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases.
- Explain the detailed architecture, define objects, load data, query data and performance tune Document-oriented NoSQL databases.

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

1. List out the Aggregate Data Models (K1)
2. Compare Master-Slave Replication, Peer-to-Peer Replication (K4)
3. Interpret the Structure of Data, Scaling, Suitable Use Cases (K2)
4. Illustrate Complex Transactions Spanning Different Operations (K2)
5. Identify Routing, Dispatch and Location-Based Services (K3)

**UNIT-I:** Why NoSQL, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, A (Mostly) Standard Model, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Aggregate Data Models; Aggregates, Example of Relations and Aggregates, Consequences of Aggregate Orientation, Key-Value and Document Data Models, Column-Family Stores, Summarizing Aggregate-Oriented Databases. More Details on Data Models; Relationships, Graph Databases, Schema less Databases, Materialized Views, Modeling for Data Access.

**UNIT-II: Distribution Models:** Single Server, Shading, Master-Slave Replication, Peer-to-Peer Replication, Combining Shading and Replication. Consistency, Update Consistency, Read Consistency, Relaxing Consistency, The CAP Theorem, Relaxing Durability, Quorums. Version Stamps, Business and System Transactions, Version Stamps on Multiple Nodes.

**UNIT-III:** What Is a Key- Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preference, Shopping Cart Data, When Not to Use, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets.

**UNIT-IV:** Document Databases, What Is a Document Database, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, Ecommerce Applications, When Not to Use, Complex Transactions Spanning different Operations, Queries against Varying Aggregate Structure.

**UNIT-V:** Graph Databases, What Is a Graph Database, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch and Location-Based Services, Recommendation Engines, When Not to Use.

**Text Books:**

1. Sadalage, P.& Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Pearson Addision Wesley, 2012

**Reference Books:**

1. Dan Sullivan,"NoSQL for Mere Mortals", 1st Edition, Pearson Education India, 2015. (ISBN13:978-9332557338)
2. Dan McCreary and AnnKelly, "Making Sense of NoSQL: A guide for Managers and the Rest of us",1st Edition, Manning Publication/DreamtechPress,2013.(ISBN-13:978-9351192022)
3. Kristina Chodorow, "Mongodb: The Definitive Guide-Powerful and Scalable Data Storage", 2nd Edition, O'Reilly Publications, 2013. (ISBN-13:978-9351102694)

| VII SEMESTER – PROFESSIONAL ELECTIVE - V | L | T | P | C |
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| **20IT7E06 : COMPUTER VISION** | | | | |

**Course Outcomes**

After the completion of the course the students are able to

1. List out the fundamental image processing techniques required for computer vision. (K1)
2. Evaluate the shape analysis and Implement boundary tracking techniques. (K5)
3. Apply Hough Transform for line, circle and ellipse detections. (K3)
4. Illustrate 3D vision techniques and Implement motion related techniques. (K2)
5. Develop applications using computer vision techniques. (K3)

**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.

| VII SEMESTER – PROFESSIONAL ELECTIVE - V | L | T | P | C |
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| 20IT7E07 :ADVANCED COMPUTER NETWORKS | | | | |

**Course Outcomes**

After the completion of the course the students are able to

1. Identify the basic computer network technology and the different types of routing algorithms.(K3)
2. Compare IPV4 & IPV6 address, address space and types of addressing (K5)
3. Distinguish transport layer protocols TCP, UDP & SCTP and also process to process delivery. (K4)
4. Summarize the DNS, Architecture of World Wide Web, E-mail and different multimedia streaming protocols. (K2)
5. Distinguish functioning and services of Wireless Sensor and Wireless Mesh networks (K4)

**UNIT-I**

**Network Layer:** Network layer design issues: store and forward packet switching, services provided to transport layer, implementation of connectionless service, implementation of connection oriented service, comparison of virtual circuit and datagram subnets.

**Routing algorithm:** Shortest path routing algorithm, flooding, distance vector routing, link state routing, hierarchical routing, broadcast routing, multicast routing, routing for mobile hosts, routing in adhoc networks.

**UNIT-II**

**IPV4 Address:** Address space, notations, classful addressing, classless addressing, network address translation (NAT).

**IPV6 address:** structure address space **Internetworking:** need for network layer internet as a datagram, internet as a connection less network.

IPV4 datagram, fragmentation, checksum, options. IPV6 advantages, packet format, extension headers, translation from IPV4 to IPV6.

**UNIT-III**

**Process to Process delivery:** client/server paradigm, multiplexing and demultiplexing, connectionless versus connection oriented services, reliable versus unreliable.

**UDP:** Well-known ports for UDP, user datagram, checksum, UDP operation, and uses of UDP.

**TCP:** TCP services, TCP features, segment, A TCP connection, flow control, error control, congestion control.

**SCTP:** SCTP services, SCTP features, packet format, SCTP Association, flow control, error control.

**UNIT-IV**

**Domain Name System:** the name space, resource records, name servers.

**E-mail:** architecture and services, the user agent, message formats, message transfer, final delivery.

**WWW:** architecture overview, static web documents, dynamic web documents, hypertext transfer protocol, performance elements, the wireless web.

**Multimedia:** introduction of digital audio, audio compression, streaming audio, internet radio, voice over IP, introduction to video, video compression, voice on demand, the MBone-the multicast backbone.

**UNIT-V**

**Wireless Sensors networks:** WSN functioning, operation system support in sensor devices, WSN characteristics, sensor network operation, sensor architecture, cluster management.

**Wireless Mesh networks:** WMN design, issues in WMNs.

**Computational Grids:** grid features, issue in grid construction technology.

**P2P networks:** characteristics and addressing, components of SIP, SIP session establishment, SIP security, HTMLS.

**Text Books:**

1. Data Communications and Networking, 4th Edition, Behrouz A Fourzan, TMH.
2. Computer Networks, 4th Edition, Andrew S Tannenbaum, Perarson.
3. Comuter Networks, Mayank Dave, Cengage.

**Reference Books:**

1. Computer networks: A systems approach, 5th Edition, Larry L Peterson and Bruce S Davie, Elsevier.

| VII SEMESTER – PROFESSIONAL ELECTIVE - V | L | T | P | C |
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| | 3 | - | - | 3 |
| **20IT7E08: CYBER SECURITY** | | | | |

**COURSE OUTCOMES**

**After the completion of the course the students are able to**

1. Outline the basic knowledge on Cybercrime. (K2)
2. Analyze the concepts of Cyber offenses. (K4)
3. Build the Cybercrime Mobile and Wireless Devices. (K3)
4. Develop the Tools and Methods Used in Cybercrime. (K3)
5. Apply the Cybercrimes and Cyber security scenarios. (K3)

**UNIT- I: Introduction to Cybercrime:**

Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security ,Who are Cybercriminals? , Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens.

**UNIT -II: Cyber offenses:**

How Criminals Plan Them –Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector Cloud Computing.

**UNIT -III: Cybercrime Mobile and Wireless Devices:**

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

**UNIT -IV: Tools and Methods Used in Cybercrime:**

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Phishing and Identity Theft: Introduction, Phishing, Identity Theft (IDTheft)

**UNIT -V: Cybercrimes and Cyber security:**

Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Information Security Planning and Governance, Information Security Policy Standards, Practices, The information Security Blueprint, Security education, Training and awareness program, Continuing Strategies.

**TEXT BOOKS:**

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole, Sunit Belapure, Wiley.
2. Principles of Information Security, Micheal E.Whitman and Herbert J.Mattord, Cengage Learning.

**REFERENCES:**

1. Information Security, Mark Rhodes, Ousley, MGH.

| VII SEMESTER – PROFESSIONAL ELECTIVE - V | L | T | P | C |
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| **20CS7E08: EDGE COMPUTING** | | | | |

**Course Outcomes:**

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

1. List out the various edge computing hardware architectures and edge platforms. (K1)
2. Compare IoT Vs Machine-to-Machine Vs SCADA. (K4)
3. Develop RaspberryPi, Program (K3)
4. Summarize MQTT architecture details, state transitions, packet structure, datatypes, communication formats. (K2)
5. Apply edge computing with RaspberryPi. (K3)

**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 andedge architecture, Role of an architect, Understanding Implementations with examples-Example use 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, MQTT packet structure, MQTT data types, MQTT communication formats, MQTT 3.1.1working 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,3rd Edition, by Simon Monk, Publisher: O'Reilly Media, 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

## OPEN ELECTIVE-III (R20)

| VII SEMESTER : OPEN ELECTIVE - III | L | T | P | C |
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| 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 |
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| 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.

**SYLLABUS:**

**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 |
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| **20EE7O01 :: ENERGY AUDITING, CONSERVATION AND MANAGEMENT** | | | | |

COURSE OUTCOMES:

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

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| 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.<br>**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.<br>**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 |
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| **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 |
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| | 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, Organizational Behavior & Management, 7th edition, Tata McGraw Hill, 2008.
3. L.M.Prasad, Organizational Behavior, 5th Edition, Sulthan Chand & Sons.,2014

| VII SEMESTER : OPEN ELECTIVE - III | L | T | P | C |
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| **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/

| VII SEMESTER : OPEN ELECTIVE - III | L | T | P | C |
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| 20CS7O01 :: FULL-STACK DEVELOPMENT | | | | |

**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. Construct dynamic web pages using DHTML and java script that is easy to navigate and use. (K3)
3. Develop web pages using AngularJS. (K3)
4. Build web applications using Servlet and JSP. (K3)
5. Analyze the various operations on Mongo Database. (K4)

**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 – JOB ORIENTED ELECTIVE - III | L | T | P | C |
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| **20IT7J01 : Mobile Application Development** | | | | |

**Course Outcomes:**

Upon completion of the course students should be able to:

1. Analyze and configure Android application development tools. (K4)
2. Develop user Interfaces for the Android platform. (K3)
3. Illustrate state information across important operating system events. (K2)
4. Apply Java programming concepts to Android application development. (K3)
5. Analyze the advanced topic in mobile application development. (K4)

**UNIT I**

Introduction to mobile devices: Introduction to Mobile Computing, Introduction to Android Development Environment, Mobile devices vs. desktop devices, ARM and Intel architectures, Screen resolution, Touch interfaces, Application deployment, App Store, Google Play, Windows Store. Development environments: XCode, Eclipse, VS2012, PhoneGAP, etc.; Native vs. web applications. Factors in Developing Mobile Applications: Mobile Software Engineering, Frameworks and Tools, Generic UI Development, Android User.

**UNIT II**

Android User Interface: Measurements – Device and pixel density independent measuring units User Interface (UI) Components – Editable and non-editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities.

**UNIT III**

Back Ground Running Process, Networking and Telephony Services: Services: Introduction to services – local service, remote service and binding the service, the communication between service and activity, Intent Service. MultiThreading: Handlers, AsyncTask. Android network programming: HTTP URL Connection, Connecting to REST-based and SOAP based Web services. Broad cast receivers: Local Broadcast Manager, Dynamic broadcast receiver, System Broadcast. Pending Intent, Notifications.

**UNIT IV**

Android: Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

**UNIT V**

Advanced Topics: Power Management: Wake locks and assertions, Low-level OS support, writing power-smart applications. Augmented Reality via GPS and other sensors: GPS, Accelerometer, Camera. Mobile device security in depth: Mobile malware, Device protections, iOS "Jailbreaking", Android "rooting" and Windows' "defenestration"; Security and Hacking: Active Transactions, More on Security, Hacking Android.

**Text Books:**

1) Bill Phillips, Chris Stewart, Brian Hardy, and Kristin Marsicano, Android Programming: The Big Nerd
2) Ranch Guide, Big Nerd Ranch LLC, 2nd edition, 2015.
3) Valentino Lee, Heather Schneider, and Robbie Schell, Mobile Applications: Architecture, Design and Development, Prentice Hall, 2004.
4) Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) , 2012
5) Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013
6) Dawn Griffiths, David Griffiths,"Head First: Android Development" ,OReilly2015,ISBN: 9781449362188
7) http://developer.android.com/develop/index.html
8) Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012

**Reference Books:**

1) Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013
2) Tomasz Nurkiewicz and Ben Christensen, Reactive Programming with RxJava, O'Reilly Media, 2016.
3) Brian Fling, Mobile Design and Development, O'Reilly Media, Inc., 2009.
4) Maximiliano Firtman, Programming the Mobile Web, O'Reilly Media, Inc., 2nd ed., 2013.
5) Cristian Crumlish and Erin Malone, Designing Social Interfaces, 2nd ed., O'Reilly Media, Inc., 2014.
6) Suzanne Ginsburg, Designing the iPhone User Experience: A User-Centered Approach to Sketching and Prototyping iPhone Apps, Addison-Wesley Professional, 2010.

| VII SEMESTER – JOB ORIENTED ELECTIVE - III | L | T | P | C |
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| **20IT7J02 : Natural Language Processing** | | | | |

**COURSE OUTCOMES**

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

1. Rephrase given text with basic Language features (K2)
2. Build an innovative application using NLP components (K3)
3. Apply a rule based system to tackle morphology/syntax of a language (K3)
4. Develop a tag set to be used for statistical processing for real-time applications (K3)
5. Compare and contrast the use of different statistical approaches for different types of NLP applications. (K2)

**UNIT-1**

**Introduction**- Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance

**UNIT-II**

**WORD LEVEL ANALYSIS**: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

**UNIT-III**

**SYNTACTIC ANALYSIS:** Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures.

**UNIT-IV**

**SEMANTICS AND PRAGMATICS** Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

**UNIT-V**

**DISCOURSE ANALYSIS AND LEXICAL RESOURCES:** Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

**TEXT BOOKS:**

1. Daniel Jurafsky, James H. Martin―Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with Python‖, First Edition, O_Reilly Media, 2009.

**REFERENCES**

1. Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
2. Richard M Reese, ―Natural Language Processing with Java‖, O_Reilly Media, 2015.
3. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
4. Tanveer Siddiqui, U.S. Tiwary, ―Natural Language Processing and Information Retrieval‖, Oxford University Press, 2008.

## OPEN ELECTIVE-IV (R20)

| VII SEMESTER : OPEN ELECTIVE - IV | L | T | P | C |
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| **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.

**SYLLUBUS:**

**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 |
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| **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.<br>**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 |
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| **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: “Organizational 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 |
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| 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, Multiscale 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 |
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| 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, environmental 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/

| VII SEMESTER : OPEN ELECTIVE - IV | L | T | P | C |
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| 20CS7O02 :: SOFTWARE TESTING TECHNIQUES | | | | |

**COURSE OBJECTIVES:**

- To study the fundamental concepts of software testing which includes objectives, process, criteria, strategies, and methods.
- To discuss various software testing types and levels of testing like black and white box testing along with levels unit test, integration, regression, and system testing.
- It also helps to learn the types of bugs, testing levels with which the student can very well identify a bug and correct as when it happens.
- It provides knowledge on transaction flow testing and data flow testing techniques so that the flow of the program is tested as well.
- To learn the domain testing, path testing and logic based testing to explore the testing process easier.

**OUTCOMES**

1. List out the basic concepts of software testing and its essentials. (K2)
2. Identify the various bugs and correcting them after knowing the consequences of the bug. (K3)
3. Develop program's control flow as a structural model is the corner stone of testing. (K3)
4. Apply functional testing using control flow and transaction flow graphs. (K3)
5. Summarize the concepts of Graph Matrices and Application (K2)

**UNIT-I**

**Introduction:-**Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs, Flow graphs and Path testing:- Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

**UNIT-II**

**Transaction Flow Testing:-**transaction flows, transaction flow testing techniques.

**Dataflow testing:-** Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.

**UNIT-III**

**Domain Testing:-**domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

**UNIT-IV:**

**Paths, Path products and Regular expressions:-** path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.

**Logic Based Testing:-**overview, decision tables, path expressions, kv charts, specifications.

**UNIT-V:**

**State, State Graphs and Transition testing:-** state graphs, good & bad state graphs, state testing, Testability tips.

**Graph Matrices and Application:-**Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools

**TEXT BOOKS**

1. Software Testing techniques – Boris Beizer, Dreamtech, second edition.
2. Software Testing Tools – Dr.K.V.K.K.Prasad, Dreamtech.

**REFERENCES BOOKS:**

1. The craft of software testing – Brian Marick, Pearson Education.
2. Software Testing Techniques – SPD(Oreille)
3. Software Testing in the Real World – Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing – Meyers, John Wiley.

| VII SEMESTER : OPEN ELECTIVE - IV | L | T | P | C |
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| 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(K3).
2. Apply the concepts of project management & planning(K3)
3. Analyze the project plans through managing people, communications and change(K4)
4. Evaluate the activities necessary to successfully complete and close the Software projects(K5)
5. Illustrate communication, modeling, and construction & deployment practices in software development(K2)

**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.

| VII SEMESTER : OPEN ELECTIVE - IV | L | T | P | C |
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| **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.

**SYLLUBUS:**

**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 – JOB ORIENTED ELECTIVE - IV | L | T | P | C |
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| **20IT7J03 : Amazon Web Services(AWS)** | | | | |

**COURSE OUTCOMES**

After the completion of the course the students are able to

1. Identify the core AWS services. (K3)
2. Analyze the key AWS security concepts. (K4)
3. Apply the strategies for migrating from on-premises to AWS. (K3)
4. Summarize the storage concepts of AWS. (K2)
5. Develop building serverless applications with AWS. (K3).

**UNIT - I**

**Introduction:** Introduction to Cloud Computing, Cloud Environment Architecture, Cloud Computing Models, AWS Services, Infrastructure, Compute Services, Networking and Storage on AWS, Databases on AWS, Monitoring and Scaling.

**UNIT - II**

**AWS Fundamentals:** Addressing Security Risk, Least privilege and Shared Responsibility Model, network isolation and endpoint security, Detective controls such as Amazon CloudTrail as well as AWS Security Hub, Amazon Guard Duty and AWS Config, encryption of data at rest, in motion, store data within and between various AWS services, Amazon EC2 and AWS Lambda, AWS Well-Architected Framework.

**UNIT - III**

**Cloud Migration:** Migrating to the Cloud, Definition of Migration, Migration Preparation and Business Planning, Portfolio Discovery and Planning, Design, Migration and Application Validation, Operate, Cloud Adoption Framework - Hybrid Environments, Scaling Considerations, High Availability, Considerations with Migrating DB vs. Applications, AWS Server Migration Services, VM Import and VM on AWS (Server Migration Service), Introduce AWS Migration Hub, AWS Application Discovery Service, Amazon EFS, Amazon EBS, & Amazon S3.

**UNIT - IV**

**Storage:** AWS Snowball & AWS Snowmobile, AWS Storage Gateway Now with AWS Data Sync, Storage - AWS DMS Overview, Storage - AWS DMS Core Features, Storage Schema Conversion, Storage - Amazon Aurora (Serverless), AWS Direct Connect & Amazon Route 53, Automation - AWS API Centricity, AWS System Manager & AWS Cloud Formation, Overview and TSO Logic, Migration Tools - Cloud Endure.

**UNIT - V**

**Building Server less Applications:** Amazon Lex, Amazon Lex Walkthrough , Introduction to Amazon Cloud Front, AWS Identity Access Management (IAM), Introduction to Server less Computing with AWS Lambda.

**Text Books:**

1. Amazon web services in action, written by Andreas witting and Michael witting.
2. Mastering AWS Development, written by Uchit Vyas.

**Reference Books:**

1. Implementing cloud design patterns for AWS, written by Marcus Young.
2. AWS administration – the definitive guide, written by Yohan Wadia.

| VII SEMESTER – JOB ORIENTED ELECTIVE - IV | L | T | P | C |
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| **20IT7J04 : R Programming** | | | | |

**COURSE OUTCOMES**

After the completion of the course the students are able to

1. Apply the basic fundamental concepts to solve the real world problem using R programming language. (K3)
2. Design and implement the solution using scalar, vectors, matrices and statistical problems in R program. (K6)
3. Distinguish and implement the program using data frames. (K4)
4. Examine various factors, tables and to solve statistical problems. (K4)
5. Analyze Minimize and maximize functions, simulation and visualization using R. (K4)

**UNIT - I**

**Introduction:** Overview of R, R data types and objects, reading and writing data, sub setting R Objects, Essentials of the R Language, Installing R, Running R, Packages in R, Calculations, Complex numbers in R, Rounding, Arithmetic, Modulo and integer quotients, Variable names and assignment, Operators, Integers, Factors, Logical operations.

**UNIT - II**

**Control Structures And Vectors:** Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, and Classes.

**Vectors:** Generating sequences, Vectors and subscripts, Extracting elements of a vector using subscripts, Working with logical subscripts, Scalars, Vectors, Arrays, and Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations

**UNIT - III**

**Lists:** Creating Lists, General List Operations, List Indexing Adding and Deleting List Elements, Getting the Size of a List, Extended Example: Text Concordance Accessing List Components and Values Applying Functions to Lists, Data Frames, Creating Data Frames, Accessing Data Frames, Other Matrix-Like Operations.

**UNIT - IV**

**Factors And Tables**: Factors and Levels, Common Functions Used with Factors, Working with Tables, Matrix/Array-Like Operations on Tables , Extracting a Sub table, Finding the Largest Cells in a Table, Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions.

**UNIT - V**

**Object-Oriented Programming:** S Classes, S Generic Functions, Writing S Classes, Using Inheritance, S Classes, Writing S Classes, Implementing a Generic Function on an S Class, visualization, Simulation, code profiling, Statistical Analysis with R, data manipulation.

**TEXT BOOKS:**

1. Roger D. Peng, "R Programming for Data Science", 2012.
2. Norman Matloff, "The Art of R Programming- A Tour of Statistical Software Design", 2011.

**REFERENCES:**

1. Garrett Grolemund, Hadley Wickham, "Hands-On Programming with R: Write Your Own Functions and Simulations", 1st Edition, 2014.
2. Venables, W.N. and Ripley, "S programming", Springer, 2000.

**WEB REFERENCES:**

1. https://swayam.gov.in/nd1_noc19_ma33/preview
2. https://data-flair.training/blogs/object-oriented-programming-in-r/
3. http://www.r-tutor.com/elementary-statistics
4. https://www.tutorialspoint.com/r/

**ONLINE RESOURCES:**

1. https://www.r-tutor.com/elemntary-statstics
2. https://www.edx.org/learn/r-programming
3. https://www.javatpoint.com/r-tutorial

| B. TECH VII SEMESTER | L | T | P | C |
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| 20HS7T01-UNIVERSAL HUMAN VALUES-II –UNDERSTANDING HARMONY | | | | |

**COURSE OUTCOMES:**

Students are able to

**1:** Outline need, basic guidelines, content and process of value education; explore the meaning of happiness and prosperity (K2)

**2:** Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.(K4)

**3:** Analyze the value of harmonious relationship based on trust and respect in life and profession(K4)

**4:** Examine the role of a human being in ensuring harmony in society and nature.(K4)

**5**: Apply the understanding of ethical conduct to formulate the strategy for ethical life and profession.(K3)

**Syllabus**

**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 BOOK:**

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 | L | T | P | C |
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| **20IT7S01 : Skill Course-5 :: R-Programming Lab** | | | | |

**Course Outcomes**

After the completion of the course the students are able to

1. Build R Programming Environment.(K3)
2. Outline the use of R – Data types. (K2)
3. List out and use of R – Data Structures. (K4)
4. Develop programming logic using R – Packages. (K3)
5. Analyze data sets using R – programming capabilities (K4)

**List of Experiments**

1. Download and install R-Programming environment and install basic packages using install. packages() command in R
2. Learn all the basics of R-Programming (Data types, Variables, Operators etc,)
3. Write a program to find list of even numbers from 1 to n using R-Loops.
4. Create a function to print squares of numbers in sequence.
5. Write a program to join columns and rows in a data frame using cbind() and rbind() in R.
6. Implement different String Manipulation functions in R.
7. Implement different data structures in R (Vectors, Lists, Data Frames)
8. Write a program to read a csv file and analyze the data in the file in R.
9. Create pie chart and bar chart using R.
10. Create a data set and do statistical analysis on the data using R.

| IV SEMESTER (Minor Course) | L | T | P | C |
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**20IT4N01 : DATA STRUCTURES**

**COURSE OBJECTIVES**

1. To impart the basic concepts of data structures and algorithms.
2. To gain knowledge of linear and non-linear data structures.
3. To familiarize with different sorting and searching techniques.
4. To understand basic concepts about stacks, queues, lists, trees and graphs.
5. To understand about writing algorithms and step by step approach in solving problems with the help of fundamental data structures

**COURSE OUTCOMES:**

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

1. Design applications using stacks and implement various types of queues. (K6)
2. Analyze and implement operations on linked lists and demonstrate their applications. (K4)
3. Summarize the operations on trees. (K2)
4. Outline the various types of Graphs and Graph Traversals. (K2)
5. Illustrate various searching and sorting techniques. (K2)

**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. Debasis samanta, Classic Data Structures, PHI, 2nd edition, 2016.
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, Pearson Education Ltd., Second Edition, 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, University Press, 2nd edition, 2018.

| V SEMESTER (Minor Course) | L | T | P | C |
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| **20IT5N01 : SOFTWARE ENGINEERING** | | | | |

**COURSE OBJECTIVES:**

The student should be made to:

1. Understand the phases in a software project
2. Understand fundamental concepts of requirements engineering and Analysis Modeling.
3. Understand the major considerations for enterprise integration and deployment.
4. Learn various testing and implementation techniques
5. Understand the activities involved in project management

**COURSE OUTCOMES:**

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

1. Identify formulate and solve software engineering problems (K3)
2. Analyze and specify software requirements with various stakeholders of a software development project and different software development process models. (K4)
3. Apply systematic procedure for software design and deployment. (K3)
4. Compare and contrast the various testing methods (K4)
5. Identify the key activities in managing a software project. (K3)

**UNIT I**

**INTRODUCTION AND SOFTWARE PROCESS:** Evolving Role of Software, Software Characteristics, Changing Nature of Software, Software Myths, Software Engineering- A layered Technology, a Process Framework, Capability Maturity Model Integration(CMMI), Process Assessment, Process Models – Waterfall Model, Incremental Process Models, Evolutionary Process Models, The Unifies Process.

**UNIT II**

**REQUIREMENTS ANALYSIS AND SPECIFICATION:** Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management-Classical analysis: Structured system Analysis, Petri Nets- Data Dictionary.

**UNIT III**

**SOFTWARE DESIGN:** Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design – Architectural styles, Architectural Design, Architectural Mapping using Data Flow-User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components.

**UNIT IV**

**TESTING AND IMPLEMENTATION:** Software testing fundamentals-Internal and external views of Testing-white box testing- basis path testing-control structure testing-black box testing- Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing And Debugging – Software Implementation Techniques: Coding practices-Refactoring.

**UNIT V**

**PROJECT MANAGEMENT:** Estimation – FP Based, LOC Based, Make/Buy Decision, COCOMO II – Planning – Project Plan, Planning Process, RFP Risk Management – Identification, Projection, RMMM – Scheduling and Tracking –Relationship between people and effort, Task Set & Network, Scheduling, EVA – Process and Project Metrics.

**TEXT BOOK:**

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

**REFEENCE 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 McGraw Hill, New Delhi, 2012.
4. https://nptel.ac.in/courses/106101061

| VI SEMESTER (Minor Course) | L | T | P | C |
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**20IT6N01 : INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**

**Course Objectives:**

1. To provide a strong foundation of fundamental concepts in Artificial Intelligence.
2. To provide a basic exposition to the goals and methods of Artificial Intelligence.
3. To provide fundamentals of machine learning

**Course Outcomes:**

Upon successful completion of the course, the student will be able to:

1. Illustrate the history and foundations of Artificial Intelligence (K2)
2. Apply the basic principles of AI in problem solving (K3)
3. Summarize the appropriate representation of Knowledge (K2)
4. Examine the Perspectives and Issues in Machine Learning (K4)
5. Identify issues in Decision Tree Learning (K3)

**UNIT I**

**Introduction:** What Is AI?, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

**UNIT II**

**Problem Solving:** Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Local Search Algorithms and Optimization Problems, Searching with Nondeterministic Actions.

**UNIT III**

**Knowledge Representation:** Knowledge-Based Agents, Logic, Propositional Logic: A Very Simple Logic, Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, The Internet Shopping World.

**UNIT IV**

**Introduction to Machine Learning:** Well-Posed Learning Problem, Designing a Learning system, Perspectives and Issues in Machine Learning.

**Concept Learning and The General-to-Specific Ordering:** Introduction, A Concept Learning Task, Concept Learning as Search, FIND-S: Finding a Maximally Specific Hypothesis, Version Spaces and the Candidate Elimination Algorithm, Remarks on Version spaces and Candidate-Elimination, Inductive Bias

**UNIT V**

**Decision Tree Learning:** Introduction, Decision Tree Representation, Appropriate Problems for Decision Tree Learning, The Basic Decision Tree Learning Algorithm, Hypothesis Space Search in Decision Tree Learning, Inductive Bias in Decision Tree Learning, Issues in Decision Tree Learning.

**Text Books:**

1) Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach" , 3rd Edition, Pearson
2) Tom M. Mitchell, *Machine Learning,* McGraw Hill Edition, 2013

**Reference Books:**

1) Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011
2) Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill
3) David Poole and Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge University Press 2010.
4) Trivedi, M.C., "A Classical Approach to Artifical Intelligence", Khanna Publishing House, Delhi.
5) Christopher Bishop, Pattern Recognition and Machine Learning (PRML), Springer, 2007.
6) ShaiShalev-Shwartz and Shai Ben-David, Understanding Machine Learning: From Theory to Algorithms (UML), Cambridge University Press, 2014.

**Web Resources:**

1) https://nptel.ac.in/courses/106105077
2) https://nptel.ac.in/courses/106106126
3) https://aima.cs.berkeley.edu
4) https://ai.berkeley,edu/project_overview.html
5) http://www.zuj.edu.jo/download/machine-learning-tom-mitchell-pdf/
6) http://www.ntu.edu.sg/home/egbhuang/pdf/ieee-is-elm.pdf
7) https://swayam.gov.in/nd1_noc20_cs73/preview

| VII SEMESTER (Minor Course) | L | T | P | C |
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| 20IT7N01 : WEB TECHNOLOGIES | | | | |

**COURSE OUTCOMES**

After the completion of the course the students are able to

1. Distinguish various static web pages and dynamic web pages using html and java script. (K4)
2. Apply the client side validation using Java Script. (K3)
3. Develop a well formed XML document. (K3)
4. Construct the web servers with servlets. (K3)
5. Build a java server side programming and connection with database. (K2)

**UNIT-I**

**HTML5:** Introduction, Basic Formatting Tags, Block and inline elements, Lists, Image, Hyperlink, Table, Iframe, Form Elements, Layout Elements and Miscellaneous.

**CSS3**: Introduction, CSS Syntax, Selectors, Add CSS to HTML: External, Internal and Inline, CSS Styling: Backgrounds, Text, Fonts, Links, Lists, Tables, CSS Box Model.

**UNIT-II**

Introducing DHTML, Introducing JavaScript, Client Side benefits of using JavaScript, Embedding JavaScript in an HTML page, Using Variables, Using Operators, Working with Control Flow statements, Working with functions, Handling Events, Using Arrays, Creating objects in JavaScript.

**UNIT-III**

**XML EXTENSIBLE MARKUP LANGUAGE:** XML- Document type Definition,

XML schemas, Document object model, XSLT, DOM and SAX.

**JDBC:** JDBC Architecture, JDBC Drivers, Communicating with Database using JDBC APIs, Creating a Simple Application, Describing Basic JDBC Statement, Creating tables by using JDBC, Working with Prepared Statement.

**UNIT-IV**

**Web Servers and Servlets:** Tomcat web server, Introduction to Servlets: Lifecycle of a Servlet, JSDK, The Servlet API, Reading Servlet parameters, Reading Initialization parameters. Handling HTTP Request & Responses, Using Cookies-Session Tracking, Security Issues.

**Introduction to JSP:** The Problem with Servlet. The Anatomy of a JSP Page, JSP Processing. JSP Application Design with MVC.

**UNIT-V**

**JSP Application Development:** Generating Dynamic Content, Using Scripting Elements, Implicit JSP Objects, Conditional Processing – Displaying Values, Using an Expression to Set an Attribute, Declaring Variables and Methods, Error Handling and Debugging, Sharing Data Between JSP Pages, Requests, and Users, Passing Control and Data Between Pages – Sharing Session and Application Data Memory Usage Considerations. Accessing a Database from a JSP Page.

**TEXT BOOKS:**

1. Kogent Learning solutions Inc sol., Web Technologies – Black Book, Dreamtech press.
2. Herbert Schildt: "Java The complete reference", 11th Edition, Tata McGraw Hill, 2019.
3. Santhosh Kumar K,JDBC, Servlets, and JSP, New Edition, Kogent Learning Solutions Inc, Dreamtech Press
4. Wang, Katila, An Introduction to Web Design + Programming, CENGAGE

**REFERENCE BOOKS:**

1. Uttam K Roy, Web Technologies, Oxford.
2. Kathy sierra, Head first Java, Orielly
3. Marty Hall and Larry Brown, Core Servlets and Java Server Pages Volume 1 CORE TECHNOLOGIES, Pearson
4. Dietel and Nieto, Internet and World Wide Web – How to program PHI/Pearson Education Asia.