



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA  
VIZIANAGARAM-535 003, A.P  
(Established by Andhra Pradesh Act No.22 of 2021)

---

## **Academic Regulations (R23) for B. Tech (Regular-Full time)**

(Effective for the students admitted into I year from the Academic  
Year **2023-24** onwards)

&

## **Academic Regulations (R23) for B.Tech.(Lateral Entry Scheme)**

(Effective for the students admitted into II year through Lateral  
Entry Scheme from the Academic Year 2024 - 25 onwards)

## Academic Regulations (R23) for B. Tech (Regular-Full time)

(Effective for the students admitted into I year from  
the Academic Year 2023-24 onwards)

### 1. Award of the Degree

- (a) Award of the B.Tech. Degree / B.Tech. Degree with a Minor if he/she fulfils the following:
- (i) Pursues a course of study for not less than four academic years and not more than eight academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Eight years).
  - (ii) Registers for 160 credits and secures all 160 credits.
- (b) **Award of B.Tech. degree with Honors** if he/she fulfils the following:
- (i) Student secures additional 15 credits fulfilling all the requisites of a B.Tech. program i.e., 160 credits.
  - (ii) Registering for Honors is optional.
  - (iii) Honors is to be completed simultaneously with B.Tech. programme.

2. Students, who fail to fulfil all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech. course and their admission stands cancelled. This clause shall be read along with clause 1 a) i).

### 3. Admissions

Admission to the B. Tech Program shall be made subject to the eligibility, qualifications and specialization prescribed by the A.P. State Government/University from time to time. Admissions shall be made either based on the merit rank obtained by the student in the common entrance examination conducted by the A.P. Government/University or any other order of merit approved by the A.P. Government/University, subject to reservations as prescribed by the Government/University from time to time.

### 4. Program related terms

**Credit:** A unit by which the course work is measured. It determines the number of hours of instruction required per week. One credit is equivalent to one hour of teaching (Lecture/Tutorial) or two hours of practical work/field work per week.

#### Credit Definition:

|                                 |            |
|---------------------------------|------------|
| 1 Hr. Lecture (L) per week      | 1 credit   |
| 1 Hr. Tutorial (T) per week     | 1 credit   |
| 1 Hr. Practical (P) per week    | 0.5 credit |
| 2 Hrs. Practical (Lab) per week | 1 credit   |

- a) **Academic Year:** Two consecutive (one odd + one even) semesters constitute one academic year.
- b) **Choice Based Credit System (CBCS):** The CBCS provides a choice for students to select from the prescribed courses.

### 5. Semester/Credits:

- i) A semester comprises 90 working days and an academic year is divided into two semesters.
- ii) The summer term is for eight weeks during summer vacation. Internship/ apprenticeship / work-based vocational education and training can be carried out during the summer term, especially by students who wish to exit after two semesters or four semesters of study.
- iii) Regular courses may also be completed well in advance through MOOCs satisfying prerequisites.

### 6. Structure of the Undergraduate Programme

All courses offered for the undergraduate program (B. Tech.) are broadly classified as follows:

| S.No. | Category                                                                                   | Breakup of Credits (Total 160) | Percentage of total credits | AICTE Recommendation (%) |
|-------|--------------------------------------------------------------------------------------------|--------------------------------|-----------------------------|--------------------------|
| 1.    | Humanities and Social Science including Management (HM)                                    | 13                             | 8 %                         | 8 – 9%                   |
| 2.    | Basic Sciences (BS)                                                                        | 20                             | 13 %                        | 12 - 16%                 |
| 3.    | Engineering Sciences (ES)                                                                  | 23.5                           | 14%                         | 10 – 18%                 |
| 4.    | Professional Core (PC)                                                                     | 54.5                           | 34 %                        | 30 – 36%                 |
| 5.    | Electives – Professional (PE) & Open (OE); Domain Specific Skill Enhancement Courses (SEC) | 33                             | 21 %                        | 19 - 23%                 |
| 6.    | Internships & Project work (PR)                                                            | 16                             | 10 %                        | 8 – 11%                  |
| 7.    | Mandatory Courses (MC)                                                                     | Non-credit                     | Non-credit                  | -                        |

### 7. Course Classification:

All subjects/ courses offered for the undergraduate programme in Engineering & Technology (B.Tech. degree programmes) are broadly classified as follows:

| S.No. | Broad Course Classification | Course Category                                 | Description                                                                                                                                        |
|-------|-----------------------------|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.    | Foundation Courses          | Foundation courses                              | Includes Mathematics, Physics and Chemistry; fundamental engineering courses; humanities, social sciences and management courses                   |
| 2.    | Core Courses                | Professional Core Courses (PC)                  | Includes subjects related to the parent discipline/department/branch of Engineering                                                                |
| 3.    | Elective Courses            | Professional Elective Courses (PE)              | Includes elective subjects related to the parent discipline/department/ branch of Engineering                                                      |
|       |                             | Open Elective Courses (OE)                      | Elective subjects which include interdisciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering |
|       |                             | Domain specific skill enhancement courses (SEC) | interdisciplinary/job-oriented/domain courses which are relevant to the industry                                                                   |
| 4.    | Project & Internships       | Project                                         | B.Tech. Project or Major Project                                                                                                                   |
|       |                             | Internships                                     | Summer Internships – Community based and Industry Internships; Industry oriented Full Semester Internship                                          |
| 5.    | Audit Courses               | Mandatory non-credit courses                    | Covering subjects of developing desired attitude among the learners                                                                                |

## 8. Programme Pattern

- i. Total duration of the of B. Tech (Regular) Programme is four academic years.
- ii. Each academic year of study is divided into two semesters.
- iii. Minimum number of instruction days in each semester is 90 days.
- iv. There shall be mandatory student induction program for freshers, with a three-week duration before the commencement of first semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations etc., are included as per the guidelines issued by AICTE.
- v. Health/wellness/yoga/sports and NSS /NSS /Scouts & Guides / Community service activities are made mandatory as credit courses for all the undergraduate students.
- vi. Courses like Environmental Sciences, Indian Constitution, Technical Paper Writing & IPR are offered as non-credit mandatory courses for all the undergraduate students.
- vii. Design Thinking for Innovation & Tinkering Labs are made mandatory as credit courses for all the undergraduate students.
- viii. Increased flexibility for students through an increase in the elective component of the curriculum, with 05 Professional Elective courses and 04 Open Elective courses.

- ix. Professional Elective Courses, include the elective courses relevant to the chosen specialization/branch. Proper choice of professional elective courses can lead to students specializing in emerging areas within the chosen field of study.
- x. A total of 04 Open Electives are offered in the curriculum. A student can complete the requirement for B.Tech. Degree with a Minor within the 160 credits by opting for the courses offered through various verticals/tracks under Open Electives.
- xi. While choosing the electives, students shall ensure that they do not opt for the courses with syllabus contents similar to courses already pursued.
- xii. A pool of interdisciplinary/job-oriented/domain skill courses which are relevant to the industry are integrated into the curriculum of all disciplines. There shall be 05 skill-oriented courses offered during III to VII semesters. Among the five skill courses, four courses shall focus on the basic and advanced skills related to the domain/interdisciplinary courses and the other shall be a soft skills course.
- xiii. Students shall undergo mandatory summer internships, for a minimum of eight weeks duration at the end of second and third year of the programme. The internship at the end of second year shall be community oriented and industry internship at the end of third year.
- xiv. There shall also be mandatory full internship in the final semester of the programme along with the project work.
- xv. Undergraduate degree with Honors is introduced by the University for the students having good academic record.
- xvi. Each college shall take measures to implement Virtual Labs (<https://www.vlab.co.in>) which provide remote access to labs in various disciplines of Engineering and will help student in learning basic and advanced concept through remote experimentation. Student shall be made to work on virtual lab experiments during the regular labs.
- xvii. Each college shall assign a faculty advisor/mentor after admission to a group of students from same department to provide guidance in courses registration/career growth/placements/opportunities for higher studies/GATE/other competitive exams etc.
- xviii. Preferably 25% of course work for the theory courses in every semester shall be conducted in the blended mode of learning.

## 9. Evaluation Process

The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory and 100 marks for practical subject. Summer Internships shall be evaluated for 50 marks, Full Internship & Project work in final semester shall be evaluated for 200 marks, mandatory courses with no credits shall be evaluated for 30 mid semester marks.

A student has to secure not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the mid semester and end examination marks taken together for the theory, practical, design, drawing subject or project etc. In case of a mandatory course, he/she should secure 40% of the total marks.

## Theory Courses

| Assessment Method              | Marks      |
|--------------------------------|------------|
| Continuous Internal Assessment | 30         |
| Semester End Examination       | 70         |
| <b>Total</b>                   | <b>100</b> |

- i) For theory subject, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination.
- ii) For practical subject, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End- Examination.
- iii) If any course contains two different branch subjects, the syllabus shall be written in two parts with 3 units each (Part-A and Part-B) and external examination question paper shall be set with two parts each for 35 marks.
- iv) If any subject is having both theory and practical components, they will be evaluated separately as theory subject and practical subject. However, they will be given same subject code with an extension of 'T' for theory subject and 'P' for practical subject.

### a) Continuous Internal Evaluation

- i) For theory subjects, during the semester, there shall be two midterm examinations. Each midterm examination shall be evaluated for 30 marks of which 10 marks for objective paper (20 minutes duration), 15 marks for subjective paper (90 minutes duration) and 5 marks for assignment.
- ii) Objective paper shall contain for 05 short answer questions with 2 marks each or maximum of 20 bits for 10 marks. Subjective paper shall contain 3 either or type questions (totally six questions from 1 to 6) of which student has to answer one from each either-or type of questions. Each question carries 10 marks. The marks obtained in the subjective paper are condensed to 15 marks.

### Note:

- The objective paper shall be prepared in line with the quality of competitive examinations questions.
  - The subjective paper shall contain 3 either or type questions of equal weightage of 10 marks. Any fraction shall be rounded off to the next higher mark.
  - The objective paper shall be conducted by the respective institution on the day of subjective paper test.
  - Assignments shall be in the form of problems, mini projects, design problems, slip tests, quizzes etc., depending on the course content. It should be continuous assessment throughout the semester and the average marks shall be considered.
- iii) If the student is absent for the mid semester examination, no re-exam shall be conducted and mid semester marks for that examination shall be considered as zero.
  - iv) First midterm examination shall be conducted for I, II units of syllabus with one either or type question from each unit and third either or type question from both the

units. The second midterm examination shall be conducted for III, IV and V units with one either or type question from each unit.

- v) Final mid semester marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage given to the better mid exam and 20% to the other.

**For Example:**

Marks obtained in first mid: 25

Marks obtained in second mid: 20

Final mid semester Marks:  $(25 \times 0.8) + (20 \times 0.2) = 24$

If the student is absent for any one midterm examination, the final mid semester marks shall be arrived at by considering 80% weightage to the marks secured by the student in the appeared examination and zero to the other. For Example:

Marks obtained in first mid: Absent

Marks obtained in second mid: 25

Final mid semester Marks:  $(25 \times 0.8) + (0 \times 0.2) = 20$

**b) End Examination Evaluation:**

End examination of theory subjects shall have the following pattern:

- i) There shall be 6 questions and all questions are compulsory.
- ii) Question I shall contain 10 compulsory short answer questions for a total of 20marks such that each question carries 2 marks.
- iii) There shall be 2 short answer questions from each unit.
  - a) In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.
  - iv) The questions from 2 to 6 shall be set by covering one unit of the syllabus for each question.

End examination of theory subjects consisting of two parts of different subjects, for Example: Basic Electrical & Electronics Engineering shall have the following pattern:

- i) Question paper shall be in two parts viz., Part A and Part B with equal weightage of 35 marks each.
- ii) In each part, question 1 shall contain 5 compulsory short answer questions for a total of 5 marks such that each question carries 1mark.
- iii) In each part, questions from 2 to 4, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.
- iv) The questions from 2 to 4 shall be set by covering one unit of the syllabus for each question.

**Practical Courses**

| Assessment Method              | Marks      |
|--------------------------------|------------|
| Continuous Internal Assessment | 30         |
| Semester End Examination       | 70         |
| <b>Total</b>                   | <b>100</b> |

- b) For practical courses, there shall be a continuous evaluation during the semester for 30 sessional marks and end examination shall be for 70 marks.
- c) Day-to-day work in the laboratory shall be evaluated for 15 marks by the concerned laboratory teacher based on the record/viva and 15 marks for the internal test.
- d) The end examination shall be evaluated for 70 marks, conducted by the concerned laboratory teacher and a senior expert in the subject from the same department.
  - Procedure: 20 marks
  - Experimental work & Results: 30 marks
  - Viva voce: 20 marks.

In a practical subject consisting of two parts (Eg: Basic Electrical & Electronics Engineering Lab), the end examination shall be conducted for 70 marks as a single laboratory in 3 hours. Mid semester examination shall be evaluated as above for 30 marks in each part and final mid semester marks shall be arrived by considering the average of marks obtained in two parts.

- e) For the subject having design and/or drawing, such as Engineering Drawing, the distribution of marks shall be 30 for mid semester evaluation and 70 for end examination.

| Assessment Method              | Marks      |
|--------------------------------|------------|
| Continuous Internal Assessment | 30         |
| Semester End Examination       | 70         |
| <b>Total</b>                   | <b>100</b> |

Day-to-day work shall be evaluated for 15 marks by the concerned subject teacher based on the reports/submissions prepared in the class. And there shall be two midterm examinations in a semester for duration of 2 hours each for 15 marks with weightage of 80% to better mid marks and 20% for the other. The subjective paper shall contain 3 either or type questions of equal weightage of 5 marks. There shall be no objective paper in mid semester examination. The sum of day-to-day evaluation and the mid semester marks will be the final sessional marks for the subject.

The end examination pattern for Engineering Graphics, shall consists of 5 questions, either/or type, of 14 marks each. There shall be no objective type questions in the end examination. However, the end examination pattern for other subjects related to design/drawing , multiple branches, etc is mentioned along with the syllabus.

- f) There shall be no external examination for mandatory courses with zero credits. However, attendance shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 40% or more in the internal examinations. In case, the student fails, a re-

examination shall be conducted for failed candidates for 30 marks satisfying the conditions mentioned in item 1 & 2 of the regulations.

- g) The laboratory records and mid semester test papers shall be preserved for a minimum of 3 years in the respective institutions as per the University norms and shall be produced to the Committees of the University as and when the same are asked for.

#### **10. Skill oriented Courses**

- i) There shall be five skill-oriented courses offered during III to VII semesters.
- ii) Out of the five skill courses two shall be skill-oriented courses from the same domain. Of the remaining three skill courses, one shall be a soft skill course and the remaining two shall be skill-advanced courses from the same domain/Interdisciplinary/Job oriented.
- iii) The course shall carry 100 marks and shall be evaluated through continuous assessments during the semester for 30 sessional marks and end examination shall be for 70 marks. Day-to-day work in the class / laboratory shall be evaluated for 30 marks by the concerned teacher based on the regularity/assignments/viva/mid semester test. The end examination similar to practical examination pattern shall be conducted by the concerned teacher and an expert in the subject nominated by the principal.
- iv) The Head of the Department shall identify a faculty member as coordinator for the course. A committee consisting of the Head of the Department, coordinator and a senior Faculty member nominated by the Head of the Department shall monitor the evaluation process. The marks/grades shall be assigned to the students by the above committee based on their performance.
- v) 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 or any other accredited bodies. If a student chooses to take a Certificate Course offered by external agencies, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency. A committee shall be formed at the level of the college to evaluate the grades/marks given for a course by external agencies and convert to the equivalent marks/grades.
- vi) The recommended courses offered by external agencies, conversions and appropriate grades/marks are to be approved by the University at the beginning of the semester. The principal of the respective college shall forward such proposals to the University for approval.
- vii) If a student prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate as approved by the University.

#### **11. Massive Open Online Courses (MOOCs):**

A Student has to pursue and complete one course compulsorily through MOOCs approved by the University. A student can pursue courses other than core through MOOCs and it is mandatory to complete one course successfully through MOOCs for awarding the degree. A student is not permitted to register and pursue core courses through MOOCs.

A student shall register for the course (Minimum of either 8 weeks or 12 weeks) offered through MOOCs with the approval of Head of the Department. The Head of the Department shall appoint one mentor to monitor the student's progression. The student needs to earn a certificate by passing the exam. The student shall be awarded the credits assigned in the curriculum only by submission of the certificate. Examination fee, if any, will be borne by the student.

Students who have qualified in the proctored examinations conducted through MOOCs platform can apply for credit transfer as specified and are exempted from appearing internal as well as external examination (for the specified equivalent credit course only) conducted by the university.

Necessary amendments in rules and regulations regarding adoption of MOOC courses would be proposed from time to time.

## **12. Credit Transfer Policy**

Adoption of MOOCs is mandatory, to enable Blended model of teaching-learning as also envisaged in the NEP 2020. As per University Grants Commission (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2016, the University shall allow up to a maximum of 20% of the total courses being offered in a particular programme i.e., maximum of 32 credits through MOOCs platform.

- i) The University shall offer credit mobility for MOOCs and give the equivalent credit weightage to the students for the credits earned through online learning courses.
- ii) Student registration for the MOOCs shall be only through the respective department of the institution, it is mandatory for the student to share necessary information with the department.
- iii) Credit transfer policy will be applicable to the Professional & Open Elective courses only.
- iv) The concerned department shall identify the courses permitted for credit transfer.
- v) The University/institution shall notify at the beginning of semester the list of the online learning courses eligible for credit transfer.
- vi) The institution shall designate a faculty member as a Mentor for each course to guide the students from registration till completion of the credit course.
- vii) The university shall ensure no overlap of MOOC exams with that of the university examination schedule. In case of delay in results, the university will re-issue the marks sheet for such students.
- viii) Student pursuing courses under MOOCs shall acquire the required credits only

after successful completion of the course and submitting a certificate issued by the competent authority along with the percentage of marks and grades.

- ix) The institution shall submit the following to the examination section of the university:
  - a) List of students who have passed MOOC courses in the current semester along with the certificate of completion.
  - b) Undertaking form filled by the students for credit transfer.
- x) The universities shall resolve any issues that may arise in the implementation of this policy from time to time and shall review its credit transfer policy in the light of periodic changes brought by UGC, SWAYAM, NPTEL and state government.

**Note:** Students shall be permitted to register for MOOCs offered through online platforms approved by the University from time to time.

### **13. Academic Bank of Credits (ABC)**

The University has implemented Academic Bank of Credits (ABC) to promote flexibility in curriculum as per NEP 2020 to

- i. provide option of mobility for learners across the universities of their choice
- ii. provide option to gain the credits through MOOCs from approved digital platforms.
- iii. facilitate award of certificate/diploma/degree in line with the accumulated credits in ABC
- iv. execute Multiple Entry and Exit system with credit count, credit transfer and credit acceptance from students' account.

### **14. Mandatory Internships**

**Summer Internships :** Two summer internships either onsite or virtual each with a minimum of 08 weeks duration, done at the end of second and third years, respectively are mandatory. It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Power projects, software MNCs or any industries in the areas of concerned specialization of the Undergraduate program. One of the two summer internships at the end of second year (Community Service Project) shall be society oriented and shall be completed in collaboration with government organizations/NGOs & others. The other internship at the end of third year is Industry Internship and shall be completed in collaboration with Industries. The student shall register for the internship as per course structure after commencement of academic year. The guidelines issued by the APSICHE / University shall be followed for carrying out and evaluation of Community Service Project and Industry Internship.

Evaluation of the summer internships shall be through the departmental committee. 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 comprising of Head of the Department, supervisor of the internship and a senior faculty member of the department. A certificate of successful completion from industry shall be included in the report. The report and the oral presentation shall carry 50% weightage

each. It shall be evaluated for 50 external marks. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the University.

**Full Semester Internship and Project work:** In the final semester, the student should mandatorily register and undergo internship (onsite/virtual) and in parallel he/she should work on a project with well-defined objectives. 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.

The project report shall be evaluated with an external examiner. The total marks for project work 200 marks and distribution shall be 60 marks for internal and 140 marks for external evaluation. The supervisor assesses the student for 30 marks (Report: 15 marks, Seminar: 15 marks). At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff and the same is to be evaluated by the departmental Project Review Committee consisting of supervisor, a senior faculty and HOD for 30 marks. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner appointed by the University and is evaluated for 140 marks.

The college shall facilitate and monitor the student internship programs. 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.

### **15. Guidelines for offering a Minor**

To promote interdisciplinary knowledge among the students, the students admitted into B.Tech. in a major stream/branch are eligible to obtain degree in Minor in another stream.

- i) The Minor program requires the completion of 12 credits in Minor stream chosen.
- ii) Two courses for 06 credits related to a Minor are to be pursued compulsorily for the minor degree, but maybe waived for students who have done similar/equivalent courses. If waived for a student, then the student must take an extra elective course in its place. It is recommended that students should complete the compulsory courses (or equivalents) before registering for the electives.
- iii) Electives (minimum of 2 courses) to complete a total of 12 credits.

**Note:** A total of 04 Open Electives are offered in the curriculum. A student can complete the requirement for Minor by opting for the courses offered through various verticals/tracks under Open Electives.

### **16. Guidelines for offering Honors**

The objective of introducing B.Tech. (Hons.) is to facilitate the students to choose additionally the specialized courses of their choice and build their competence in a

specialized area in the UG level. The programme is a best choice for academically excellent students having good academic record and interest towards higher studies and research.

- i) Honors is introduced in the curriculum of all B. Tech. programs offering a major degree and is applicable to all B. Tech (Regular and Lateral Entry) students admitted in Engineering & Technology.
- ii) A student shall earn additional 15 credits for award of B.Tech.(Honors) degree from same branch/department/discipline registered for major degree. This is in addition to the credits essential for obtaining the Undergraduate degree in Major Discipline (i.e., 160 credits).
- iii) A student is permitted to register for Honors in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to the Honors from V Semester onwards.
- iv) The concerned Principal of the college shall arrange separate class work and timetable of the courses offered under Honors program.
- v) Courses that are used to fulfil the student's primary major may not be double counted towards the Honors. Courses with content substantially equivalent to courses in the student's primary Major may not be counted towards the Honors.
- vi) Students can complete the courses offered under Honors either in the college or in online platforms like SWAYAM with a minimum duration of 12 weeks for a 3-credit course and 8 weeks duration for a 2-credit course satisfying the criteria for credit mobility. If the courses under Honors are offered in conventional mode, then the teaching and evaluation procedure shall be similar to regular B. Tech courses.
- vii) The attendance for the registered courses under Honors and regular courses offered for Major degree in a semester are to be considered separately.
- viii) A student shall maintain an attendance of 75% in all registered courses under Honors to be eligible for attending semester end examinations.
- ix) A student registered for Honors shall pass in all subjects that constitute the requirement for the Honors degree program. No class/division (i.e., second class, first class and distinction, etc.) shall be awarded for Honors degree programme.
- x) If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into open or core electives; they will remain extra. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.
- xi) The Honors will be mentioned in the degree certificate as Bachelor of Technology (Honors) in XYZ. For example, B.Tech. (Honors) in Mechanical Engineering

**Enrolment into Honors:**

- i) Students of a Department/Discipline are eligible to opt for Honors program offered by the same Department/Discipline
- ii) The enrolment of student into Honors is based on the CGPA obtained in the major degree program. CGPA shall be taken up to III semester in case of regular entry students and only III semester in case of lateral entry students. Students having 7 CGPA without any backlog subjects will be permitted to register for Honors.
- iii) If a student is detained due to lack of attendance either in Major or in Honors, registration shall be cancelled.

- iv) Transfer of credits from Honors to regular B. Tech degree and vice-versa shall not be permitted.
- v) Honors is to be completed simultaneously with a Major degree program.

**Registration for Honors:**

- i) The eligible and interested students shall apply through the HOD of his/her parent department. The whole process should be completed within one week before the start of every semester. Selected students shall be permitted to register the courses under Honors.
- ii) The selected students shall submit their willingness to the principal through his/her parent department offering Honors. The parent department shall maintain the record of student pursuing the Honors.
- iii) The students enrolled in the Honors courses will be monitored continuously. An advisor/mentor from parent department shall be assigned to a group of students to monitor the progress.
- iv) There is no fee for registration of subjects for Honors program offered in offline at the respective institutions.

**17. Attendance Requirements:**

- i) A student shall be eligible to appear for the University external examinations if he/she acquires a minimum of 40% attendance in each subject and 75% of attendance in aggregate of all the subjects. b) Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.
- ii) Shortage of Attendance below 65% in aggregate shall in NO CASE be condoned.
- iii) A stipulated fee shall be payable towards condonation of shortage of attendance to the University.
- iv) Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.
- v) A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek readmission for that semester from the date of commencement of class work.
- vi) If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.
- vii) If the learning is carried out in blended mode (both offline & online), then the total attendance of the student shall be calculated considering the offline and online attendance of the student.

**18. For induction programme attendance shall be maintained as per AICTE norms. Promotion Rules:**

The following academic requirements must be satisfied in addition to the attendance requirements mentioned in section 16.

- i) A student shall be promoted from first year to second year if he/she fulfils the minimum attendance requirement as per university norms.

- ii) A student will be promoted from II to III year if he/she fulfils the academic requirement of securing 40% of the credits (any *decimal* fraction should be *rounded off* to *lower* digit) up to in the subjects that have been studied up to III semester.
- iii) A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any *decimal* fraction should be *rounded off* to *lower* digit) in the subjects that have been studied up to V semester.

And in case a student is detained for want of credits for a particular academic year by ii) & iii) above, the student may make up the credits through supplementary examinations and only after securing the required credits he/she shall be permitted to join in the V semester or VII semester respectively as the case may be.

- iv) When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfilment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

### 19. Grading:

As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades and corresponding percentage of marks shall be followed:

After each course is evaluated for 100 marks, the marks obtained in each course will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

#### Structure of Grading of Academic Performance

| Range in which the marks in the subject fall | Grade         | Grade points |
|----------------------------------------------|---------------|--------------|
|                                              |               | Assigned     |
| 90 & above                                   | Superior      | 10           |
| 80 - 89                                      | A (Excellent) | 9            |
| 70 - 79                                      | B (Very Good) | 8            |
| 60 - 69                                      | C (Good)      | 7            |
| 50 - 59                                      | D (Average)   | 6            |
| 40 - 49                                      | E (Pass)      | 5            |
| < 40                                         | F (Fail)      | 0            |
| Absent                                       | Ab (Absent)   | 0            |

- i) A student obtaining Grade 'F' or Grade 'Ab' in a subject shall be considered failed and will be required to reappear for that subject when it is offered the next supplementary examination.
- ii) For non-credit audit courses, "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA/Percentage.

Computation of Semester Grade Point Average (SGPA) and Cumulative GradePoint Average (CGPA):

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

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

where,  $C_i$  is the number of credits of the  $i^{th}$  subject and  $G_i$  is the grade point scored by the student in the  $i^{th}$  course.

The Cumulative Grade Point Average (CGPA) will be computed in the same manner considering all the courses undergone by a student over all the semesters of a program, i.e.,

$$CGPA = \frac{\sum (C_i \times S_i)}{\sum C_i}$$

where “ $S_i$ ” is the SGPA of the  $i^{th}$  semester and  $C_i$  is the total number of credits up to that semester.

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

While computing the SGPA the subjects in which the student is awarded Zero grade points will also be included.

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

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

**Award of Class:**

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he/she shall be placed in one of the following four classes:

| Class Awarded                | CGPA Secured     |
|------------------------------|------------------|
| First Class with Distinction | $\geq 7.5$       |
| First Class                  | $\geq 6.5 < 7.5$ |
| Second Class                 | $\geq 5.5 < 6.5$ |
| Pass Class                   | $\geq 5.0 < 5.5$ |

**CGPA to Percentage conversion Formula –  $(CGPA - 0.5) \times 10$**

## 20. With-holding of Results

If the candidate has any dues not paid to the university or if any case of indiscipline or malpractice is pending against him/her, the result of the candidate shall be withheld in such cases.

## 21. Multiple Entry / Exit Option

### (a) Exit Policy:

The students can choose to exit the four-year programme at the end of first/second/third year.

- i) **UG Certificate in (Field of study/discipline)** - Programme duration: First year (first two semesters) of the undergraduate programme, 40 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6-credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.
- ii) **UG Diploma (in Field of study/discipline)** - Programme duration: First two years (first four semesters) of the undergraduate programme, 80 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6-credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.
- iii) **Bachelor of Science (in Field of study/discipline) i.e., B.Sc. Engineering in (Field of study/discipline)**- Programme duration: First three years (first six semesters) of the undergraduate programme, 120 credits.

### (b) Entry Policy:

Modalities on multiple entry by the student into the B.Tech. programme will be provided in due course of time.

**Note:** The Universities shall resolve any issues that may arise in the implementation of Multiple Entry and Exit policies from time to time and shall review the policies in the light of periodic changes brought by UGC, AICTE and State government.

## 22. Gap Year Concept:

Gap year concept for Student Entrepreneur in Residence is introduced and outstanding students who wish to pursue entrepreneurship / become entrepreneur are allowed to take a break of one year at any time after II year to pursue full-time entrepreneurship programme/to establish startups. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. The principal of the respective college shall forward such proposals submitted by the students to the University. An evaluation committee constituted by the University shall evaluate the proposal submitted by the student and the committee shall decide whether to permit the student(s) to avail the Gap Year or not

### **23. Transitory Regulations**

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfilment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

Candidates who are permitted to avail Gap Year shall be eligible for re-joining into the succeeding year of their B. Tech from the date of commencement of class work, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

### **24. Minimum Instruction Days for a Semester:**

The minimum instruction days including exams for each semester shall be 90 days.

### **25. Medium of Instruction:**

The medium of instruction of the entire B. Tech undergraduate programme in Engineering & Technology (including examinations and project reports) will be in English only.

### **26. Student Transfers:**

Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh and the Universities from time to time.

### **27. General Instructions:**

- i. The academic regulations should be read as a whole for purpose of any interpretation.
- ii. Malpractices rules-nature and punishments are appended.
- iii. Where the words “he”, “him”, “his”, occur in the regulations, they also include “she”, “her”, “hers”, respectively.
- iv. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
- v. The Universities may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the Universities.
- vi. In the case of any doubt or ambiguity in the interpretation of the guidelines given, the decision of the Vice-Chancellor / Head of the institution is final.

\*\*\* \*\*

**ACADEMIC REGULATIONS (R23)**  
**FOR B. TECH. (LATERAL ENTRY**  
**SCHEME)**

*(Effective for the students admitted into II year through Lateral Entry Scheme from the Academic Year 2024-25 onwards)*

**1. Award of the Degree**

- (a) Award of the B.Tech. Degree / B.Tech. Degree with a Minor if he/she fulfils the following:
  - (i) Pursues a course of study for not less than three academic years and not more than six academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Six years).
  - (ii) Registers for 120 credits and secures all 120 credits.
  
- (b) **Award of B.Tech. degree with Honors** if he/she fulfils the following:
  - (i) Student secures additional 15 credits fulfilling all the requisites of a B.Tech. program i.e., 120 credits.
  - (ii) Registering for Honors is optional.
  - (iii) Honors is to be completed simultaneously with B.Tech. programme.

- 2.** Students, who fail to fulfil the requirement for the award of the degree within six consecutive academic years from the year of admission, shall forfeit their seat.

**3. Minimum Academic Requirements**

The following academic requirements have to be satisfied in addition to the requirements mentioned in item no.2

- i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the mid semester evaluation and end examination taken together.
  
- ii. A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any decimal fraction should be rounded off to lower digit) in the subjects that have been studied up to V semester.

And in case if student is already detained for want of credits for particular academic year, the student may make up the credits through supplementary exams of the above exams before the commencement of IV year I semester class work of next year.

**4. Course Pattern**

- i) The entire course of study is three academic years on semester pattern.
- ii) A student eligible to appear for the end examination in a subject but absent at it or has failed in the end examination may appear for that subject at the next supplementary examination offered.
- iii) When a student is detained due to lack of credits/shortage of attendance the student may be re-admitted when the semester is offered after fulfilment of academic regulations, the student shall be in the academic regulations into which he/she is readmitted.

- 5.** All other regulations as applicable for B. Tech. Four-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA  
VIZIANAGARAM-535 003, A.P  
(Established by Andhra Pradesh Act No.22 of 2021)

=====

## **B. Tech (Regular-Full time)**

**B. TECH-CSE, IT, CSE(DS), CSE(AI), CSE(CS), CSE(AI&ML), AI&DS, AI&ML**

(Effective for the students admitted into I year from the Academic  
Year **2023-24** onwards)

**B.TECH. - COURSE STRUCTURE – R23**  
**(Applicable from the academic year 2023-24 onwards)**

**INDUCTION PROGRAMME**

| <b>S.No.</b> | <b>Course Name</b>                                                            | <b>Category</b> | <b>L-T-P-C</b> |
|--------------|-------------------------------------------------------------------------------|-----------------|----------------|
| 1            | Physical Activities -- Sports, Yoga and Meditation, Plantation                | MC              | 0-0-6-0        |
| 2            | Career Counselling                                                            | MC              | 2-0-2-0        |
| 3            | Orientation to all branches -- career options, tools, etc.                    | MC              | 3-0-0-0        |
| 4            | Orientation on admitted Branch -- corresponding labs, tools and platforms     | EC              | 2-0-3-0        |
| 5            | Proficiency Modules & Productivity Tools                                      | ES              | 2-1-2-0        |
| 6            | Assessment on basic aptitude and mathematical skills                          | MC              | 2-0-3-0        |
| 7            | Remedial Training in Foundation Courses                                       | MC              | 2-1-2-0        |
| 8            | Human Values & Professional Ethics                                            | MC              | 3-0-0-0        |
| 9            | Communication Skills -- focus on Listening, Speaking, Reading, Writing skills | BS              | 2-1-2-0        |
| 10           | Concepts of Programming                                                       | ES              | 2-0-2-0        |

| <b>I Year I Semester</b> |                    |                                      |          |          |          |                |
|--------------------------|--------------------|--------------------------------------|----------|----------|----------|----------------|
| <b>S.No</b>              | <b>Course Code</b> | <b>Course Name</b>                   | <b>L</b> | <b>T</b> | <b>P</b> | <b>Credits</b> |
| 1.                       | R23BS01            | Linear Algebra & Calculus            | 3        | 0        | 0        | 3              |
| 2.                       | R23BS03            | Engineering Physics                  | 3        | 0        | 0        | 3              |
| 3.                       | R23HS01            | Communicative English                | 2        | 0        | 0        | 2              |
| 4.                       | R23ES01            | Basic Civil & Mechanical Engineering | 3        | 0        | 0        | 3              |
| 5.                       | R23ES07            | Introduction to Programming          | 3        | 0        | 0        | 3              |
| 6.                       | R23HS01            | Communicative English Lab            | 0        | 0        | 2        | 1              |
| 7.                       | R23BS03            | Engineering Physics Lab              | 0        | 0        | 2        | 1              |
| 8.                       | R23ES02            | Engineering Workshop                 | 0        | 0        | 3        | 1.5            |
| 9.                       | R23ES06            | IT Workshop                          | 0        | 0        | 2        | 1              |
| 10.                      | R23ES07            | Computer Programming Lab             | 0        | 0        | 3        | 1.5            |
| 11.                      | R23MC01            | Health and Wellness, Yoga and Sports | 0        | 0        | 1        | 0.5            |
|                          |                    | <b>Total</b>                         |          |          |          | <b>20.5</b>    |

| <b>I Year II Semester</b> |                    |                                               |          |          |          |                |
|---------------------------|--------------------|-----------------------------------------------|----------|----------|----------|----------------|
| <b>S.No</b>               | <b>Course Code</b> | <b>Course Name</b>                            | <b>L</b> | <b>T</b> | <b>P</b> | <b>Credits</b> |
| 1.                        | R23BS02            | Differential Equations and Vector calculus    | 3        | 0        | 0        | 3              |
| 2.                        | R23BS05            | Chemistry                                     | 3        | 0        | 0        | 3              |
| 3.                        | R23ES03            | Engineering Graphics                          | 1        | 0        | 4        | 3              |
| 4.                        | R23ES04            | Basic Electrical & Electronics Engineering    | 3        | 0        | 0        | 3              |
| 5.                        | R23PC04            | Data Structures                               | 3        | 0        | 0        | 3              |
| 6.                        | R23BS05            | Chemistry Lab                                 | 0        | 0        | 2        | 1              |
| 7.                        | R23ES05            | Electrical & Electronics Engineering workshop | 0        | 0        | 3        | 1.5            |
| 8.                        | R23PC04            | Data Structures Lab                           | 0        | 0        | 3        | 1.5            |
| 9.                        | R23MC02            | NSS/NCC/Scouts & Guides/Community Service     | 0        | 0        | 1        | 0.5            |
|                           |                    | <b>Total</b>                                  |          |          |          | <b>19.5</b>    |

**I Year-I Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**LINEAR ALGEBRA & CALCULUS**  
(Common to All Branches of Engineering)

**Course Objectives:**

To equip the students with standard concepts and tools of mathematics to handle various real-world problems and their applications.

**Course Outcomes:**

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

- develop matrix algebra techniques that is needed by engineers for practical applications.
- to find the eigen values and eigen vectors and solve the problems by using linear transformation
- learn important tools of calculus in higher dimensions.
- familiarize with functions of several variables which is useful in optimization.
- familiarize with double and triple integrals of functions of several variables in two and three dimensions.

**UNIT - I: Matrices**

Rank of a matrix by echelon form, normal form. Cauchy –Binet formulae (without proof). Inverse of Non- singular matrices by Gauss-Jordan method

System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method.

**UNIT- II: Linear Transformation and Orthogonal Transformation:**

Eigen values, Eigen vectors and their properties (without Proof), Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation

**UNIT- III : Calculus**

**Mean Value Theorems:** Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems.

**UNIT- IV : Partial differentiation and Applications (Multi variable calculus)**

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

**UNIT – V : Multiple Integrals (Multi variable Calculus)**

Duble integrals - change of variables (Cartesian and Polar coordinates), Change of order of integration, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

**Text books:**

1. B.S.Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2018.

**Reference Books:**

1. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, 5/e, Alpha Science International Ltd.,2021 (9th reprint).
2. George B. Thomas, Maurice D.Weir and Joel Hass, Thomas Calculus,14/e, Pearson Publishers, 2018.
3. Glyn James, Advanced Modern Engineering Mathematics, 5/e, Pearson publishers, 2018.
4. Michael Greenberg, Advanced Engineering Mathematics, 9<sup>th</sup> edition, Pearson edn
5. H. K Das, Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand,2021

|          |          |          |          |
|----------|----------|----------|----------|
| <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**I Year-I Semester**

**ENGINEERING PHYSICS**  
(Common for all branches of Engineering)

**Course Objectives:**

To bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the optical phenomenon like interference, diffraction etc, enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.

**Course Outcomes:**

- CO1: Analyze the intensity variation of light due to polarization, interference and diffraction.  
 CO2: Familiarize with the basics of crystals and their structures.  
 CO3: Explain fundamentals of quantum mechanics and apply it to one dimensional motion of particles.  
 CO4: Summarize various types of polarization of dielectrics and classify the magnetic materials.  
 CO5: Explain the basic concepts of Quantum Mechanics and the band theory of solids.  
 CO6: Identify the type of semiconductor using Hall effect.

**UNIT I Wave Optics**

Interference: Introduction - Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colours in thin films- Newton's Rings, Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative). Polarization: Introduction -Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

**UNIT II Crystallography and X-ray diffraction**

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.

X-ray diffraction: Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods

**UNIT III Dielectric and Magnetic Materials**

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation

polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - complex dielectric constant – Frequency dependence of polarization – dielectric loss

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

#### **UNIT IV Quantum Mechanics and Free electron Theory**

Quantum Mechanics: Dual nature of matter – Heisenberg’s Uncertainty Principle – Significance and properties of wave function – Schrodinger’s time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution - Density of states - Fermi energy

#### **UNIT V Semiconductors**

Semiconductors: Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein’s equation – Hall effect and its applications.

#### **Textbooks:**

1. A Text book of Engineering Physics, M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy, S. Chand Publications, 11th Edition 2019.
2. Engineering Physics - D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)

#### **Reference Books:**

1. Engineering Physics - B.K. Pandey and S. Chaturvedi, Cengage Learning 2021.
2. Engineering Physics - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
3. Engineering Physics” - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press. 2010
4. Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).

**Web Resources:** <https://www.loc.gov/rr/scitech/selected-internet/physics.html>

I Year-I Semester

| L | T | P | C |
|---|---|---|---|
| 2 | 0 | 0 | 2 |

**COMMUNICATIVE ENGLISH**  
(Common to All Branches of Engineering)

**Course Objectives:**

The main objective of introducing this course, *Communicative English*, is to facilitate using Listening, Reading, Speaking and Writing skills effectively by the students. It should result in their better comprehending abilities, oral presentations, reporting useful information and with enhanced knowledge of grammatical structures and vocabulary. This course helps the students in using speaking and writing (productive) skills more efficiently and to make them industry-ready

**Course Outcomes**

- **By the end of the course the students will have** Learned how to understand the context, topic, and specific information from social or transactional dialogues.
- Remedially learn applying grammatical structures to formulate sentence sand use appropriate words and correct word forms.
- Using discourse markers to speak clearly on a specific topic in formal as well as informal discussions.(not required)
- Improved communicative competence in formal and informal contexts and for social and academic purposes.
- Critically comprehending and appreciatingeading /listening texts and to write summaries based on global comprehension of these texts.
- Writing coherent paragraphs essays, letters/e-mails and resume.

**Instructions:**

1. The reading texts can be given as podcasts to the students so that their listening skills can be enhanced
2. While listening and reading to the text can be given as homework, the class work for the students can be to discuss and critically evaluate the texts based on the context, purpose or writing the text and understanding it from the author's as well as reader's point of view.
3. Reading as habit for both academic and non-academic ( pleasure) purposes has to be inculcated in the students. So training has to be given in intensive and extensive reading strategies.
4. Writing for both academic (assignments, examinations, reports, e-mails/letters etc)
5. The writing tasks given in the class are to be self and peer evaluated by the students before they are finally graded by the faculty.

Note: Please note that the texts given here are just contexts for teaching various language skills and sub skills. The students' ability to use language cannot be confined to comprehending or using the language related to the given texts (textbooks). The given texts can be used only for practice.

6. All the activities to develop language skills have to be integrated and interconnected, within each unit and across the units.

7. Use as many supplementary materials as possible in various modes ( Audio, visual and printed versions) in the classroom so that the students get multimode input and will how to use language skills in the absence of the teacher.

## UNIT I

### Lesson: HUMAN VALUES: A Power of a Plate of Rice by Ifeoma Okoye (Short story)

- Listening:** Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.
- Speaking:** Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.
- Reading:** Skimming to get the main idea of a text; scanning to look for specific pieces of information.
- Writing:** Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.( That has to be part of the bridge course- 2 weeks before the actual academic programme starts)
- Grammar:** Parts of Speech, Basic Sentence Structures-forming questions
- Vocabulary:** Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

## UNITII

### Lesson: NATURE: Night of the Scorpion by Nissim Ezekiel (Indian and contemporary)

- Listening:** Answering a series of questions about main ideas and supporting ideas after listening to audio texts.
- Speaking:** Discussion in pairs/small groups on specific topics followed by short structure talks.
- Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
- Writing:** Structure of a paragraph - Paragraph writing (specific topics)
- Grammar:** Cohesive devices -linkers, use of articles and zero article prepositions.
- Vocabulary:** Homonyms, Homophones, Homographs.

## UNITIII

### Lesson: BIOGRAPHY: Steve Jobs

- Listening:** Listening for global comprehension and summarizing what is listened to.
- Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed
- Reading:** Reading a text in detail by making basic inferences-recognizing and interpreting specific context clues; strategies to use text clues for comprehension.
- Writing:** Summarizing, Note-making, paraphrasing
- Grammar:** Verbs - tenses; subject-verb agreement; Compound words, Collocations
- Vocabulary:** Compound words, Collocations

## UNIT IV

### Lesson: INSPIRATION: The Toys of Peace by Saki

- Listening:** Making predictions while listening to conversations/ transactional dialogues without video; listening with video.
- Speaking:** Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.
- Reading:** Studying the use of graphicalements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.
- Writing:** Letter Writing: Official Letters, Resumes
- Grammar:** Reporting verbs, Direct & Indirect speech, Active & Passive Voice
- Vocabulary:** Words often confused, Jargons

## UNIT V

### Lesson: MOTIVATION: The Power of Intrapersonal Communication (An Essay)

- Listening:** Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.
- Speaking:** Formal oral presentations on topics from academic contexts
- Reading:** Reading comprehension.
- Writing:** Writings structured essays on specific topics.
- Grammar:** Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject-verb agreement)
- Vocabulary:** Technical Jargons

#### Textbooks:

1. Pathfinder: Communicative English for Undergraduate Students, 1<sup>st</sup>Edition, OrientBlackSwan, 2023 (Units 1,2 & 3)
2. Empowering English by Cengage Publications, 2023 (Units 4 & 5)

Suggestion: Instead of giving the syllabus in the form of textbooks it would be better to procure the soft copies of individual texts ( stories or poems or biographies and non-fiction texts)by the university and make them available on the university website for registered students to access and download

#### Reference Books:

1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.

#### Web Resources:

##### GRAMMAR:

1. [www.bbc.co.uk/learningenglish](http://www.bbc.co.uk/learningenglish)
2. <https://dictionary.cambridge.org/grammar/british-grammar/>

3. [www.eslpod.com/index.html](http://www.eslpod.com/index.html)
4. <https://www.learngrammar.net/>
5. <https://english4today.com/english-grammar-online-with-quizzes/>
6. <https://www.talkenglish.com/grammar/grammar.aspx>

#### VOCABULARY

1. <https://www.youtube.com/c/DailyVideoVocabulary/videos>
2. [https://www.youtube.com/channel/UC4cmBAit8i\\_NJZE8qK8sfpA](https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA)

|          |          |          |          |
|----------|----------|----------|----------|
| <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**I Year-I Semester**

**BASIC CIVIL & MECHANICAL ENGINEERING**  
(Common to All branches of Engineering)

**Course Objectives:**

- Get familiarized with the scope and importance of Civil Engineering sub-divisions.
- Introduce the preliminary concepts of surveying.
- Acquire preliminary knowledge on Transportation and its importance in nation's economy.
- Get familiarized with the importance of quality, conveyance and storage of water.
- Introduction to basic civil engineering materials and construction techniques.

**Course Outcomes:** On completion of the course, the student should be able to:

- CO1: Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.
- CO2: Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying.
- CO3: Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation.
- CO4: Understand the importance of Water Storage and Conveyance Structures so that the social responsibilities of water conservation will be appreciated.
- CO5: Understand the basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology.

**UNIT I**

**Basics of Civil Engineering:** Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-technical Engineering- Transportation Engineering - Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of each discipline - Building Construction and Planning- Construction Materials-Cement - Aggregate - Bricks- Cement concrete- Steel. Introduction to Prefabricated construction Techniques.

**UNIT II**

**Surveying:** Objectives of Surveying- Horizontal Measurements- Angular Measurements- Introduction to Bearings Levelling instruments used for levelling -Simple problems on levelling and bearings-Contour mapping.

**UNIT III**

**Transportation Engineering** Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering.

**Water Resources and Environmental Engineering:** Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).

**Textbooks:**

1. Basic Civil Engineering, M.S.Palanisamy, , Tata Mcgraw Hill publications (India) Pvt. Ltd. Fourth Edition.
2. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers. 2022. First Edition.
3. Basic Civil Engineering, Satheesh Gopi, Pearson Publications, 2009, First Edition.

**Reference Books:**

1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016
3. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38<sup>th</sup> Edition.
4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10<sup>th</sup> Edition.
5. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012.

## **PART B: BASIC MECHANICAL ENGINEERING**

**Course Objectives:** The students after completing the course are expected to

- Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.
- Explain different engineering materials and different manufacturing processes.
- Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.

**Course Outcomes:** On completion of the course, the student should be able to

CO1: Understand the different manufacturing processes.

CO2: Explain the basics of thermal engineering and its applications.

CO3: Describe the working of different mechanical power transmission systems and power plants.

CO4: Describe the basics of robotics and its applications.

### **UNIT I**

**Introduction to Mechanical Engineering:** Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

**Engineering Materials** - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

## **UNIT II**

**Manufacturing Processes:** Principles of Casting, Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.

**Thermal Engineering** – working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

## **UNIT III**

**Power plants** – working principle of Steam, Diesel, Hydro, Nuclear power plants.

**Mechanical Power Transmission** - Belt Drives, Chain, Rope drives, Gear Drives and their applications.

**Introduction to Robotics** - Joints & links, configurations, and applications of robotics.

(Note: The subject covers only the basic principles of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject)

### **Textbooks:**

1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd.
2. A Tear book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.

### **Reference Books:**

1. Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I
2. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications
3. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt. Ltd.
4. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications (India) Pvt. Ltd.

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**I Year-I Semester****INTRODUCTION TO PROGRAMMING****(Common to All branches of Engineering)****Course Objectives:****The objectives of this course is to acquire knowledge on the**

- i. To impart adequate knowledge on the need of programming languages and problem-solving techniques and develop programming skills.
- ii. To enable effective usage of Control Structures and Implement different operations on arrays.
- iii. To demonstrate the use of Strings and Functions.
- iv. To impart the knowledge of pointers and understand the principles of dynamic memory allocation.
- v. To understand structures and unions and illustrate the file concepts and its operations.
- vi. To impart the Knowledge Searching and Sorting Techniques

**UNIT-I Introduction to Computer Problem Solving:**

Programs and Algorithms, Computer Problem Solving Requirements, Phases of Problem Solving, Problem. Solving Strategies, Top-Down Approach, Algorithm Designing, Program Verification, Improving Efficiency, Algorithm Analysis and Notations.

**UNIT-II Introduction to C Programming:**

Introduction, Structure of a C Program. Comments, Keywords, Identifiers, Data Types, Variables, Constants, Input/output Statements. Operators, Type Conversion. Control Flow, Relational Expressions: Conditional Branching Statements: if, if-else, if-else—if, switch. Basic Loop Structures: while, do-while loops, for loop, nested loops, The Break and Continue Statements, goto statement.

**UNIT-III Arrays:**

Introduction, Operations on Arrays, Arrays as Function Arguments, Two Dimensional Arrays, Multidimensional Arrays. Pointers: Concept of a Pointer, Declaring and Initializing Pointer Variables, Pointer Expressions and Address Arithmetic, Null Pointers, Generic Pointers, Pointers as Function Arguments, Pointers and Arrays, Pointer to Pointer, Dynamic Memory Allocation, Dangling Pointer, Command Line Arguments.

**UNIT-IV Functions:**

Introduction Function : Declaration, Function Definition, Function Call, Categories of Functions, Passing Parameters to Functions, Scope of Variables, Variable Storage Classes. Recursion. Strings: String Fundamentals, String Processing with and without Library Functions, Pointers and Strings.

**UNIT-V**

Structures, Unions, Bit Fields: Introduction, Nested Structures, Arrays of Structures, Structures

and Functions, Self-Referential Structures, Unions, Enumerated Data Type —Enum variables, Using Typedef keyword, Bit Fields. Data Files: Introduction to Files, Using Files in C, Reading from Text Files, Writing to Text Files, Random File Access.

**Note:** The syllabus is designed with C Language as the fundamental language of implementation.

**Course Outcomes:**

At the end of the Course, Student should be able to:

- i . Illustrate the Fundamental concepts of Computers and basics of computer programming and problem-solving approach
- ii. Understand the Control Structures, branching and looping statements
- iii. Use of Arrays and Pointers in solving complex problems.
- iv. Develop Modular program aspects and Strings fundamentals.
- v. Demonstrate the ideas of User Defined Data types, files. Solve real world problems using the concept of Structures, Unions and File operations.

**Text Books:**

1. A Structured Programming Approach Using C, Forouzan, Gilberg, Cengage.
2. How to solve it by Computer, R. G. Dromey, and Pearson Education.
3. Programming In C A-Practical Approach. Ajay Mittal, Pearson

**References:**

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
2. Computer Programming. Reema Thareja, Oxford University Press
3. The C Programming Language, Dennis Richie And Brian Kernighan, Pearson Education.
4. Programming In C, Ashok Kamthane, Second Edition, Pearson Publication.
5. Let us C ,YaswanthKanetkar, 16th Edition,BPB Publication.
- 6.Computing fundamentals and C Programming, Balagurusamy, E., McGraw-Hill Education, 2008

**Web References:**

1. <http://www.c4learn.com/>
2. <http://www.geeksforgeeks.org/c/>
3. <http://nptel.ac.in/courses/122104019/>
4. <http://www.learn-c.org/>
5. <https://www.tutorialspoint.com/cprogramming/>

**I Year-I Semester**

| <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|----------|----------|----------|----------|
| 0        | 0        | 2        | 1        |

**COMMUNICATIVE ENGLISH LAB**  
**(Common to All Branches of Engineering)**

**Course Objectives:**

The main objective of introducing this course, *Communicative English Laboratory*, is to expose the students to a variety of self-instructional, learner friendly modes of language learning. (That can be for theory paper) is to train the students in oral communication skills in real situations. Students will get trained in the basic communication skills and also make them ready to face job interviews. They will be helped to overcome the mother tongue/local language influence and neutralize their accent which makes their speech more intelligible to all listeners.

**Course Outcomes:**

By the end of the course, the students will be have

- Understand the different aspects of the English language oral communication with emphasis on Listening and Speaking S skills.
- Apply communication skills through various language learning activities.
- Analyze the English speech sounds, stress, rhythm and intonation for better listening and speaking comprehension.
- Evaluate and exhibit professionalism in participating in debates and group discussions with polite turn taking strategies and sound more professional while communicating with others
- Create effective resonate and prepare them to face interviews communicate appropriately in corporate settings.

**List of Topics:**

1. Vowels & Consonants( Not rules but use of them in various syllable structures)
2. Neutralization/Accent Rules(No rules again, required more practice)
3. Communication Skills & JAM
4. Role Play or Conversational Practice
5. ( This can be part of theory course)Resume Writing, Cover letter, SOP
6. Group Discussions-methods & practice
7. Debates- Methods & Practice
8. PPT Presentations/ Poster Presentation
9. Interviews Skills

**Suggested Software:**

- Walden InfoTech
- Young India Films

**Reference Books:**

1. Meenakshi Raman, Sangeeta-Sharma. Technical Communication. Oxford Press.2018.( This can be for theory and not for lab)
2. Samson T : Innovate with English, Foundations
3. Grant Taylor: English Conversation Practice, Tata McGraw-Hill EducationIndia,2016
4. Jayashree, M Let's Hear them Speak: Developing Listening-Speaking skills in English. Sage Publications

5. Hewing's, Martin. Cambridge Academic English (B2). CUP, 2012. ( That is for reading and writing and can be used in theory classes but not in Lab)
6. T.Balasubramanyam, A Textbook of English Phonetics for Indian Students,(3rd Ed) Trinity Press. (This is all theory and can be for MA English students but not for B.Tech students)

**Web Resources:**

**Spoken English:**

1. [www.esl-lab.com](http://www.esl-lab.com)
2. [www.englishmedialab.com](http://www.englishmedialab.com)
3. [www.englishinteractive.net](http://www.englishinteractive.net)
4. <https://www.britishcouncil.in/english/online>
5. <http://www.letstalkpodcast.com/>
6. [https://www.youtube.com/c/mmmEnglish\\_Emma/featured](https://www.youtube.com/c/mmmEnglish_Emma/featured)
7. <https://www.youtube.com/c/ArnelsEverydayEnglish/featured>
8. <https://www.youtube.com/c/engvidAdam/featured>
9. <https://www.youtube.com/c/EnglishClass101/featured>
10. <https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists>
11. [https://www.youtube.com/channel/UCV1h\\_cBE0Drdx19qkTM0WNw](https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw)
12. <https://www.linguahouse.com/en-GB>
13. <https://www.ted.com/watch/ted-ed>

**Voice & Accent:**

1. <https://www.youtube.com/user/letstalkaccent/videos>
2. <https://www.youtube.com/c/EngLanguageClub/featured>
3. [https://www.youtube.com/channel/UC\\_OskgZBoS4dAnVUgJVexc](https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc)
4. [https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp\\_IA](https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA)

I Year-I Semester

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

## ENGINEERING PHYSICS LAB

(Common to All Branches of Engineering)

### Course Objectives:

To study the concepts of optical phenomenon like interference, diffraction etc., recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors and study the parameters and applications of dielectric and magnetic materials by conducting experiments.

**Course Outcomes:** The students will be able to

CO1: Operate optical instruments like travelling microscope and spectrometer. CO2: Estimate the wavelengths of different colours using diffraction grating.

CO3: Plot the intensity of the magnetic field of circular coil carrying current with distance. CO4: Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively.

CO5: Calculate the band gap of a given semiconductor. CO6: Identify the type of semiconductor using Hall effect.

### List of Experiments:

1. Determination of radius of curvature of a given Plano-convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Verification of Brewster's law
4. Determination of dielectric constant using charging and discharging method.
5. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
6. Determination of wavelength of Laser light using diffraction grating.
7. Estimation of Planck's constant using photoelectric effect.
8. Determination of the resistivity of semiconductors by four probe methods.
9. Determination of energy gap of a semiconductor using p-n junction diode.
10. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
11. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
12. Determination of temperature coefficients of a thermistor.
13. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
14. Determination of magnetic susceptibility by Kundt's tube method.
15. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.
16. Sonometer: Verification of laws of stretched string.
17. Determination of young's modulus for the given material of wooden scale by non-uniform bending (or double cantilever) method.

18. Determination of Frequency of electrically maintained tuning fork by Melde's experiment.

**Note:** Any TEN of the listed experiments are to be conducted. Out of which any TWO experiments may be conducted in virtual mode.

**References:**

- A Textbook of Practical Physics - S. Balasubramanian, M.N. Srinivasan, S. ChandPublishers, 2017.

**Web Resources**

- [www.vlab.co.in](http://www.vlab.co.in)  
<https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype>

I Year-I Semester

| L | T | P | C   |
|---|---|---|-----|
| 0 | 0 | 3 | 1.5 |

## ENGINEERING WORKSHOP

(Common to All branches of Engineering)

### Course Objectives:

To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

### Course Outcomes:

CO1: Identify workshop tools and their operational capabilities.

CO2: Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.

CO3: Apply fitting operations in various applications.

CO4: Apply basic electrical engineering knowledge for House Wiring Practice

### SYLLABUS

1. **Demonstration:** Safety practices and precautions to be observed in workshop.
2. **Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints.
  - a) Half – Lap joint
  - b) Mortise and Tenon joint
  - c) Corner Dovetail joint or Bridle joint
3. **Sheet Metal Working:** Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.
  - a) Tapered tray
  - b) Conical funnel
  - c) Elbow pipe
  - d) Brazing
4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.
  - a) V-fit
  - b) Dovetail fit
  - c) Semi-circular fit
  - d) Bicycle tire puncture and change of two-wheeler tyre
5. **Electrical Wiring:** Familiarity with different types of basic electrical circuits and make the following connections.
  - a) Parallel and series
  - b) Two-way switch
  - c) Godown lighting
  - d) Tube light
  - e) Three phase motor
  - f) Soldering of wires
6. **Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.
7. **Welding Shop:** Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.
8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.

**Textbooks:**

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.
2. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.

**Reference Books:**

1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition
2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan, 2021-22.

I Year-I Semester

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

## IT WORKSHOP

(Common to all branches of Engineering)

### Course Objectives:

- To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
- To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS
- To teach basic command line interface commands on Linux.
- To teach the usage of Internet for productivity and self-paced life-long learning
- To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

### Course Outcomes:

CO1: Perform Hardware troubleshooting.

CO2: Understand Hardware components and inter dependencies.

CO3: Safeguard computer systems from viruses/worms.

CO4: Document/ Presentation preparation.

CO5: Perform calculations using spreadsheets.

### PC Hardware & Software Installation

**Task 1:** Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

**Task 2:** Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

**Task 3:** Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

**Task 4:** Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

**Task 5:** Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva

### Internet & World Wide Web

**Task1:** Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is

no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

**Task 2:** Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

**Task 3:** Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

**Task 4:** Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

### **LaTeX and WORD**

**Task 1 – Word Orientation:** The mentor needs to give an overview of La TeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La TeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using La TeXand word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

**Task 2:** Using La TeX and Word to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both La TeX and Word.

**Task 3:** Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

**Task 4:** Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

### **EXCEL**

**Excel Orientation:** The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

**Task 1:** Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

**Task 2:** Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,

### **LOOKUP/VLOOKUP**

**Task 3:** Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

### **POWER POINT**

**Task 1:** Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

**Task 2:** Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

**Task 3:** Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

### **AI TOOLS – Chat GPT**

**Task 1:** Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.

- Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

**Task 2:** Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas

- Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

**Task 3:** Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.

- Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

### **Reference Books:**

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2013, 3rd edition
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2<sup>nd</sup> edition
4. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
5. LaTeX Companion, Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme. – CISCO Press, Pearson Education, 3<sup>rd</sup> edition
7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3<sup>rd</sup> edition

I Year-I Semester

| L | T | P | C   |
|---|---|---|-----|
| 0 | 0 | 3 | 1.5 |

## COMPUTER PROGRAMMING LAB (Common to All branches of Engineering)

### Course Objectives:

The course aims to give students hands – on experience and train them on the concepts of the C- programming language.

### Course Outcomes:

CO1: Read, understand, and trace the execution of programs written in C language.

CO2: Select the right control structure for solving the problem.

CO3: Develop C programs which utilize memory efficiently using programming constructs like pointers.

CO4: Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.

## UNIT I

### WEEK 1

**Objective:** Getting familiar with the programming environment on the computer and writing the first program.

#### Suggested Experiments/Activities:

**Tutorial 1:** Problem-solving using Computers.

**Lab1:** Familiarization with programming environment

- i) Basic Linux environment and its editors like Vi, Vim & Emacs etc.
- ii) Exposure to Turbo C, gcc
- iii) Writing simple programs using printf(), scanf()

### WEEK 2

**Objective:** Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.

#### Suggested Experiments /Activities:

**Tutorial 2:** Problem-solving using Algorithms and Flow charts.

**Lab 1:** Converting algorithms/flow charts into C Source code.

Developing the algorithms/flowcharts for the following sample programs

- i) Sum and average of 3 numbers
- ii) Conversion of Fahrenheit to Celsius and vice versa
- iii) Simple interest calculation

### WEEK 3

**Objective:** Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

#### **Suggested Experiments/Activities:**

**Tutorial 3:** Variable types and type conversions:

**Lab 3:** Simple computational problems using arithmetic expressions.

- i) Finding the square root of a given number
- ii) Finding compound interest
- iii) Area of a triangle using heron's formulae
- iv) Distance travelled by an object

## UNIT II

### WEEK 4

**Objective:** Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.

#### **Suggested Experiments/Activities:**

**Tutorial4:** Operators and the precedence and as associativity:

**Lab4:** Simple computational problems using the operator' precedence and associativity

- i) Evaluate the following expressions.
  - a.  $A+B*C+(D*E) + F*G$
  - b.  $A/B*C-B+A*D/3$
  - c.  $A+++B---A$
  - d.  $J= (i++) + (++i)$
- ii) Find the maximum of three numbers using conditional operator
- iii) Take marks of 5 subjects in integers, and find the total, average in float

### WEEK 5

**Objective:** Explore the full scope of different variants of “if construct” namely if-else, null-else, if-else if\*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for “if construct”.

#### **Suggested Experiments/Activities:**

**Tutorial 5:** Branching and logical expressions:

**Lab 5:** Problems involving if-then-else structures.

- i) Write a C program to find the max and min of four numbers using if-else.
- ii) Write a C program to generate electricity bill.
- iii) Find the roots of the quadratic equation.
- iv) Write a C program to simulate a calculator using switch case.
- v) Write a C program to find the given year is a leap year or not.

### WEEK 6

**Objective:** Explore the full scope of iterative constructs namely while loop, do-while loop and

for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

**Suggested Experiments/Activities:**

**Tutorial 6:** Loops, while and for loops

**Lab 6:** Iterative problems e.g., the sum of series

- i) Find the factorial of given number using any loop.
- ii) Find the given number is a prime or not.
- iii) Compute sine and cos series
- iv) Checking a number palindrome
- v) Construct a pyramid of numbers.

**UNIT III**

**WEEK 7:**

**Objective:** Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

**Suggested Experiments/Activities:**

**Tutorial 7:** 1 D Arrays: searching.

**Lab 7:** 1D Array manipulation, linear search

- i) Find the min and max of a 1-D integer array.
- ii) Perform linear search on 1D array.
- iii) The reverse of a 1D integer array
- iv) Find 2's complement of the given binary number.
- v) Eliminate duplicate elements in an array.

**WEEK 8:**

**Objective:** Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

**Suggested Experiments/Activities:**

**Tutorial 8:** 2 D arrays, sorting and Strings.

**Lab 8:** Matrix problems, String operations, Bubble sort

- i) Addition of two matrices
- ii) Multiplication two matrices
- iii) Sort array elements using bubble sort
- iv) Concatenate two strings without built-in functions
- v) Reverse a string using built-in and without built-in string functions

**UNIT IV**

**WEEK 9:**

**Objective:** Explore pointers to manage a dynamic array of integers, including memory allocation value initialization, resizing changing and reordering the contents of an array

and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C

**Suggested Experiments/Activities:**

**Tutorial 9:** Pointers, structures and dynamic memory allocation

**Lab 9:** Pointers and structures, memory dereference.

- i) Write a C program to find the sum of a 1D array using malloc()
- ii) Write a C program to find the total, average of n students using structures
- iii) Enter n students data using calloc() and display failed students list
- iv) Read student name and marks from the command line and display the student details along with the total.
- v) Write a C program to implement realloc()

**WEEK 10:**

**Objective:** Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures

**Suggested Experiments/Activities:**

**Tutorial 10:** Bitfields, Self-Referential Structures, Linked lists

**Lab10 :** Bitfields, linked lists

Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields

- i) Create and display a singly linked list using self-referential structure.
- ii) Demonstrate the differences between structures and unions using a C program.
- iii) Write a C program to shift/rotate using bitfields.
- iv) Write a C program to copy one structure variable to another structure of the same type.

**UNIT V**

**WEEK 11:**

**Objective:** Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration

**Suggested Experiments/Activities:**

**Tutorial 11:** Functions, call by value, scope and extent,

**Lab 11:** Simple functions using call by value, solving differential equations using Eulers theorem.

- i) Write a C function to calculate NCR value.
- ii) Write a C function to find the length of a string.
- iii) Write a C function to transpose of a matrix.
- iv) Write a C function to demonstrate numerical integration of differential equations using Euler's method

**WEEK 12:**

**Objective:** Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

**Suggested Experiments/Activities:**

**Tutorial 12:** Recursion, the structure of recursive calls

**Lab 12:** Recursive functions

- i) Write a recursive function to generate Fibonacci series.
- ii) Write a recursive function to find the lcm of two numbers.
- iii) Write a recursive function to find the factorial of a number.
- iv) Write a C Program to implement Ackermann function using recursion.
- v) Write a recursive function to find the sum of series.

**WEEK 13:**

**Objective:** Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers

**Suggested Experiments/Activities:**

**Tutorial 13:** Call by reference, dangling pointers

**Lab 13:** Simple functions using Call by reference, Dangling pointers.

- i) Write a C program to swap two numbers using call by reference.
- ii) Demonstrate Dangling pointer problem using a C program.
- iii) Write a C program to copy one string into another using pointer.
- iv) Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

**WEEK14:**

**Objective:** To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.

**Suggested Experiments/Activities:**

**Tutorial 14:** File handling

**Lab 14:** File operations

- i) Write a C program to write and read text into a file.
- ii) Write a C program to write and read text into a binary file using fread() and fwrite()
- iii) Copy the contents of one file to another file.
- iv) Write a C program to merge two files into the third file using command-line arguments.
- v) Find no. of lines, words and characters in a file
- vi) Write a C program to print last n characters of a given file.

**Textbooks:**

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw Hill

**Reference Books:**

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice-Hall of India
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

I Year-I Semester

|          |          |          |            |
|----------|----------|----------|------------|
| <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b>   |
| <b>0</b> | <b>0</b> | <b>1</b> | <b>0.5</b> |

## **HEALTH AND WELLNESS, YOGA AND SPORTS**

**(Common to All branches of Engineering)**

**Course Objectives:**

The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

**Course Outcomes:** After completion of the course the student will be able to

**CO1:** Understand the importance of yoga and sports for Physical fitness and sound health.

**CO2:** Demonstrate an understanding of health-related fitness components.

**CO3:** Compare and contrast various activities that help enhance their health.

**CO4:** Assess current personal fitness levels.

**CO5:** Develop Positive Personality

**UNIT I**

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

**Activities:**

- i) Organizing health awareness programmes in community
- ii) Preparation of health profile
- iii) Preparation of chart for balance diet for all age groups

**UNIT II**

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

**Activities:**

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

**UNIT III**

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

**Activities:**

- i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.  
Practicing general and specific warm up, aerobics
- ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

**Reference Books:**

1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning, 2022
2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice
3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc.2014

**General Guidelines:**

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

**Evaluation Guidelines:**

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

I Year-II Semester

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

## DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

(Common to All Branches of Engineering)

### Course Objectives:

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

### Course Outcomes:

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

- solve the differential equations related to various engineering fields.
- model engineering problems as higher order differential equations and solve analytically.
- identify solution methods for partial differential equations that model physical processes.
- interpret the physical meaning of different operators such as gradient, curl and divergence.
- estimate the work done against a field, circulation and flux using vector calculus.

### UNIT- I : Differential equations of first order and first degree

Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay- Electrical circuits

### UNIT – II : Linear differential equations of higher order (Constant Coefficients)

Definitions, homogenous and non-homogenous, complimentary function, general particular integral, Wronskian, method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.

### UNIT – III : Partial Differential Equations

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients.

### UNIT - IV : Vector differentiation

Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions - Divergence and Curl, vector identities

### UNIT –V : Vector integration

Line integral- circulation- work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and applications of these theorems.

### Textbooks:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2018.
2. B.S.Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.

**Reference Books:**

1. Dennis G.Zill and Warren S.Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2018.
2. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 14/e, Pearson Publishers, 2018.
4. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 5/e, Alpha Science International Ltd., 2021 (9th reprint).
5. B.V. Ramana, Higher Engineering Mathematics, McGraw Hill Education, 2017

## I Year-II Semester

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**CHEMISTRY**

(Common to EEE, ECE, CSE, IT &amp; allied branches)

**Course Objectives:**

- To familiarize engineering chemistry and its applications
- To train the students on the principles and applications of electrochemistry and polymers
- To introduce instrumental methods, molecular machines and switches.

**Course Outcomes:** At the end of the course, the students will be able to:**CO1:** Compare the materials of construction for battery and electrochemical sensors.**CO2:** Explain the preparation, properties, and applications of thermoplastics & thermosetting & elastomers conducting polymers.**CO3:** Explain the principles of spectrometry, slc in separation of solid and liquid mixtures.**CO4:** Apply the principle of Band diagrams in the application of conductors and semiconductors.**CO5:** Summarize the concepts of Instrumental methods.**UNIT I Structure and Bonding Models:**

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of  $\Psi$  and  $\Psi^2$ , particle in one dimensional box, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O<sub>2</sub> and CO, etc.  $\pi$ -molecular orbitals of butadiene and benzene, calculation of bond order.

**UNIT II Modern Engineering materials**

Semiconductors – Introduction, basic concept, application

Super conductors-Introduction basic concept, applications.

Supercapacitors: Introduction, Basic Concept-Classification – Applications.

Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphines nanoparticles.

**UNIT III Electrochemistry and Applications**

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).

Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.

Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries

including cell reactions; Fuel cells, hydrogen-oxygen fuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

#### **UNIT IV Polymer Chemistry**

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation.

Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres.

Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline, – mechanism of conduction and applications. Bio-Degradable polymers - Poly Glycolic Acid (PGA), Polyl Lactic Acid (PLA).

#### **UNIT V Instrumental Methods and Applications**

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation. Chromatography-Basic Principle, Classification-HPLC: Principle, Instrumentation and Applications.

##### **Textbooks:**

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

##### **Reference Books:**

1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
2. J.D. Lee, Concise Inorganic Chemistry, 5<sup>th</sup> Edition, Wiley Publications, Feb.2008
3. Textbook of Polymer Science, Fred W. Billmeyer Jr, 3rd Edition

I Year-II Semester

|          |          |          |          |
|----------|----------|----------|----------|
| <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>1</b> | <b>0</b> | <b>4</b> | <b>3</b> |

## **ENGINEERING GRAPHICS**

**(Common to All branches of Engineering)**

### **Course Objectives:**

- To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing
- To impart knowledge on the projection of points, lines and plane surfaces
- To improve the visualization skills for better understanding of projection of solids
- To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
- To make the students understand the viewing perception of a solid object in Isometric and Perspective projections.

### **Course Outcomes:**

CO1: Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.

CO2: Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.

CO3: Understand and draw projection of solids in various positions in first quadrant.

CO4: Explain principles behind development of surfaces.

CO5: Prepare isometric and perspective sections of simple solids.

### **UNIT I**

**Introduction:** Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.

**Curves:** construction of ellipse, parabola and hyperbola by general, Cycloids, Involutives, Normal and tangent to Curves.

**Scales:** Plain scales, diagonal scales and vernier scales.

### **UNIT II**

**Orthographic Projections:** Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.

**Projections of Straight Lines:** Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes

**Projections of Planes:** regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

### UNIT III

**Projections of Solids:** Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

### UNIT IV

**Sections of Solids:** Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.

**Development of Surfaces:** Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

### UNIT V

**Conversion of Views:** Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

**Computer graphics:** Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD (*Not for end examination*).

### Textbook:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.

### Reference Books:

1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.
2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc,2009.
3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, Tata McGraw Hill, 2017.

I Year-II Semester

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

## BASIC ELECTRICAL & ELECTRONICS ENGINEERING (Common to All branches of Engineering)

### Course Objectives

To expose to the field of electrical & electronics engineering, laws and principles of electrical/ electronic engineering and to acquire fundamental knowledge in the relevant field.

**Course Outcomes:** After the completion of the course students will be able to

### Course Outcomes:

**CO1:** Remember the fundamental laws, operating principles of motors, generators, MC and MI instruments.

**CO2:** Understand the problem solving concepts associated to AC and DC circuits, construction and operation of AC and DC machines, measuring instruments; different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations.

**CO3:** Apply mathematical tools and fundamental concepts to derive various equations related to machines, circuits and measuring instruments; electricity bill calculations and layout representation of electrical power systems.

**CO4:** Analyze different electrical circuits, performance of machines and measuring instruments.

**CO5:** Evaluate different circuit configurations, Machine performance and Power systems operation.

## PART A: BASIC ELECTRICAL ENGINEERING

### UNIT I DC & AC Circuits

**DC Circuits:** Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

**AC Circuits:** A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

### UNIT II Machines and Measuring Instruments

**Machines:** Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

**Measuring Instruments:** Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge.

### **UNIT III Energy Resources, Electricity Bill & Safety Measures**

**Energy Resources:** Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.

**Electricity bill:** Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of “unit” used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

**Equipment Safety Measures:** Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

#### **Textbooks:**

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

#### **Reference Books:**

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition
2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017
4. Basic Electrical and Electronics Engineering, S. K. Bhattacharya, Person Publications, 2018, Second Edition.

#### **Web Resources:**

1. <https://nptel.ac.in/courses/108105053>
2. <https://nptel.ac.in/courses/108108076>

## **PART B: BASIC ELECTRONICS ENGINEERING**

### **Course Objectives:**

- To teach the fundamentals of semiconductor devices and its applications, principles of digital electronics.

## **UNIT I SEMICONDUCTOR DEVICES**

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.

## **UNIT II BASIC ELECTRONIC CIRCUITS AND INSTRUMENTATION**

Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

## **UNIT III DIGITAL ELECTRONICS**

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits–Half and Full Adders. Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)

### **Textbooks:**

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4<sup>th</sup> Edition, Tata Mc Graw Hill, 2009

### **Reference Books:**

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
2. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

I Year-II Semester

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

## DATA STRUCTURES

(Common to CSE, IT & allied branches)

### Course Objectives:

- Understand the significance of linear data structures in problem-solving and basic time/space complexity analysis.
- Create and manage linked lists to efficiently organize and manipulate data, emphasizing memory efficiency.
- Implement and apply stacks to manage program flow and solve problems involving expression evaluation and backtracking.
- Utilize queues to model real-world scenarios, such as process scheduling and breadth-first search algorithms and understand the versatility of deques and prioritize data management using priority queues.
- Impart basic understanding of non-linear data structures such as trees.
- Explore basic concepts of hashing and apply it to solve problems requiring fast data retrieval and management.

### UNIT I

**Introduction to Linear Data Structures:** Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Overview of time and space complexity analysis for linear data structures. **Searching Techniques:** Linear & Binary Search, **Sorting Techniques:** Bubble sort, Selection sort, Insertion Sort

### UNIT II

**Linked Lists:** Singly linked lists, representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists.

### UNIT III

**Stacks:** Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, backtracking, reversing list etc.

### UNIT IV

**Queues:** Introduction to queues: properties and operations, implementing queues using arrays and linked lists, Applications of queues in breadth-first search, scheduling, etc.  
**Deque:** Introduction to deque (double-ended queues), Operations on deque and their applications.

### UNIT V

**Trees:** Introduction to Trees, Binary Search Tree – Insertion, Deletion & Traversals  
**Hashing:** Brief introduction to hashing and hash functions, Collision resolution techniques: chaining and open addressing, Hash tables: basic implementation and operations, Applications of hashing in unique identifier generation, caching, etc.

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

- Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.
- Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.
- Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.
- Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues, and apply them appropriately to solve data management challenges.
- Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees
- Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.

**Textbooks:**

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008

**Reference Books:**

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
3. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms" by Robert Sedgewick

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**I Year-II Semester****CHEMISTRY LAB**

(Common to EEE, ECE, CSE, IT &amp; allied branches)

**Course Objectives:**

- Verify the fundamental concepts with experiments.

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

CO1: Determine the cell constant and conductance of solutions.

CO2: Prepare advanced polymer Bakelite materials.

CO3: Measure the strength of an acid present in secondary batteries.

CO4: Analyse the IR spectra of some organic compounds.

CO5: Calculate strength of acid in Pb-Acid battery.

**List of Experiments:**

1. Measurement of 10Dq by spectrophotometric method
2. Conductometric titration of strong acid vs. strong base
3. Conductometric titration of weak acid vs. strong base
4. Determination of cell constant and conductance of solutions
5. Potentiometry - determination of redox potentials and emfs
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a Bakelite
8. Verify Lambert-Beer's law
9. Wavelength measurement of sample through UV-Visible Spectroscopy
10. Identification of simple organic compounds by IR
11. Preparation of nanomaterials by precipitation method
12. Estimation of Ferrous Iron by Dichrometry

**Reference:**

- "Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C.Denney, J.D.Barnes and B. Sivasankar

I Year-II Semester

| L | T | P | C   |
|---|---|---|-----|
| 0 | 0 | 3 | 1.5 |

## ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP (Common to All branches of Engineering)

### Course Objectives:

To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.

### Course Outcomes:

**CO1:** Understand the Electrical circuit design concept; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer.

**CO2:** Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments; calculations for the measurement of resistance, power and power factor.

**CO3:** Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and power factor.

**CO4:** Analyse various characteristics of electrical circuits, electrical machines and measuring instruments.

**CO5:** Design suitable circuits and methodologies for the measurement of various electrical parameters; Household and commercial wiring.

### Activities:

1. Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
  - Provide some exercises so that hardware tools and instruments are learned to be used by the students.
2. Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
  - Provide some exercises so that measuring instruments are learned to be used by the students.
3. Components:
  - Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.

- Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments

## **PART A: ELECTRICAL ENGINEERING LAB**

### **List of experiments:**

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Magnetization Characteristics of DC shunt Generator
5. Measurement of Power and Power factor using Single-phase wattmeter
6. Measurement of Earth Resistance using Megger
7. Calculation of Electrical Energy for Domestic Premises

### **Reference Books:**

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

**Note:** Minimum Six Experiments to be performed.

## **PART B: ELECTRONICS ENGINEERING LAB**

### **Course Objectives:**

- To impart knowledge on the principles of digital electronics and fundamentals of electron devices & its applications.

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

CO1: Identify & testing of various electronic components.

CO2: Understand the usage of electronic measuring instruments.

CO3: Plot and discuss the characteristics of various electron devices.

CO4: Explain the operation of a digital circuit.

### **List of Experiments:**

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
3. Implementation of half wave and full wave rectifiers

4. Plot Input & Output characteristics of BJT in CE and CB configurations
5. Frequency response of CE amplifier.
6. Simulation of RC coupled amplifier with the design supplied
7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
8. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

Tools / Equipment Required: DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

**References:**

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4<sup>th</sup> Edition, Tata Mc Graw Hill, 2009
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

Note: Minimum Six Experiments to be performed. All the experiments shall be implemented using both Hardware and Software.

I Year-II Semester

| L | T | P | C   |
|---|---|---|-----|
| 0 | 0 | 3 | 1.5 |

**DATA STRUCTURES LAB**  
(Common to CSE, IT & allied branches of Engineering)

**Course Objectives:**

- Understand the significance of linear data structures in problem-solving and basic time/space complexity analysis.
- Create and manage linked lists to efficiently organize and manipulate data, emphasizing memory efficiency.
- Implement and apply stacks to manage program flow and solve problems involving expression evaluation and backtracking.
- Utilize queues to model real-world scenarios, such as process scheduling and breadth-first search algorithms and understand the versatility of deques and prioritize data management using priority queues.
- Impart basic understanding of non-linear data structures such as trees.
- Explore basic concepts of hashing and apply it to solve problems requiring fast data retrieval and management.

**List of Experiments:****Exercise 1: Array Manipulation**

- i) Write a program to reverse an array.
- ii) C Programs to implement the Searching Techniques – Linear & Binary Search
- iii) C Programs to implement Sorting Techniques – Bubble, Selection and Insertion Sort

**Exercise 2: Linked List Implementation**

- i) Implement a singly linked list and perform insertion and deletion operations.
- ii) Develop a program to reverse a linked list iteratively and recursively.
- iii) Solve problems involving linked list traversal and manipulation.

**Exercise 3: Linked List Applications**

- i) Create a program to detect and remove duplicates from a linked list.
- ii) Implement a linked list to represent polynomials and perform addition.
- iii) Implement a double-ended queue (deque) with essential operations.

**Exercise 4: Double Linked List Implementation**

- i) Implement a doubly linked list and perform various operations to understand its properties and applications.
- ii) Implement a circular linked list and perform insertion, deletion, and traversal.

**Exercise 5: Stack Operations**

- i) Implement a stack using arrays and linked lists.
- ii) Write a program to evaluate a postfix expression using a stack.
- iii) Implement a program to check for balanced parentheses using a stack.

**Exercise 6: Queue Operations**

- i) Implement a queue using arrays and linked lists.

- ii) Develop a program to simulate a simple printer queue system.
- iii) Solve problems involving circular queues.

**Exercise 7: Stack and Queue Applications**

- i) Use a stack to evaluate an infix expression and convert it to postfix.
- ii) Create a program to determine whether a given string is a palindrome or not.
- iii) Implement a stack or queue to perform comparison and check for symmetry

**Exercise 8: Binary Search Tree**

- i) Implementing a BST using Linked List.
- ii) Traversing of BST.

**Exercise 9: Hashing**

- i) Implement a hash table with collision resolution techniques.
- ii) Write a program to implement a simple cache using hashing.

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

- Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.
- Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.
- Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.
- Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between dequeues and priority queues, and apply them appropriately to solve data management challenges.
- Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees
- Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.

**Textbooks:**

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008

**Reference Books:**

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
3. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms by Robert Sedgewick.

## I Year-II Semester

| L | T | P | C   |
|---|---|---|-----|
| 0 | 0 | 1 | 0.5 |

**NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE**  
(Common to All branches of Engineering)

**Course Objectives:**

The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

**Course Outcomes:** After completion of the course the students will be able to

**CO1:** Understand the importance of discipline, character and service motto.

**CO2:** Solve some societal issues by applying acquired knowledge, facts, and techniques.

**CO3:** Explore human relationships by analyzing social problems.

**CO4:** Determine to extend their help for the fellow beings and downtrodden people.

**CO5:** Develop leadership skills and civic responsibilities.

**UNIT I Orientation**

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

**Activities:**

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

**UNIT II Nature & Care****Activities:**

- i) Best out of waste competition.
- ii) Poster and signs making competition to spread environmental awareness.
- iii) Recycling and environmental pollution article writing competition.
- iv) Organising Zero-waste day.
- v) Digital Environmental awareness activity via various social media platforms.
- vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
- vii) Write a summary on any book related to environmental issues.

**UNIT III Community Service****Activities:**

- i) Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities-experts-etc.

- ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
- iii) Conducting consumer Awareness. Explaining various legal provisions etc.
- iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
- v) Any other programmes in collaboration with local charities, NGOs etc.

**Reference Books:**

1. Nirmalya Kumar Sinha & Surajit Majumder, *A Text Book of National Service Scheme Vol;I*, Vidya Kutir Publication, 2021 ( ISBN 978-81-952368-8-6)
2. *Red Book - National Cadet Corps – Standing Instructions Vol I & II*, Directorate General of NCC, Ministry of Defence, New Delhi
3. Davis M. L. and Cornwell D. A., “Introduction to Environmental Engineering”, McGraw Hill, New York 4/e 2008
4. Masters G. M., Joseph K. and Nagendran R. “Introduction to Environmental Engineering and Science”, Pearson Education, New Delhi. 2/e 2007
5. Ram Ahuja. *Social Problems in India*, Rawat Publications, New Delhi.

**General Guidelines:**

1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students.

**Evaluation Guidelines:**

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

\*\*\* \*\*



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

**Department Of CSE (Cyber Security)**

**COURSE STRUCTURE**

(Applicable from the academic year 2023-24 onwards)

**B.Tech.– II Year I Semester**

| S.No         | Category                 | Title                                                                     | L         | T        | P         | Credits   |
|--------------|--------------------------|---------------------------------------------------------------------------|-----------|----------|-----------|-----------|
| 1            | BS                       | Discrete Mathematics & Graph Theory                                       | 3         | 0        | 0         | 3         |
| 2            | HSMC                     | Universal Human Values –<br>Understanding Harmony & Human Ethical Conduct | 2         | 1        | 0         | 3         |
| 3            | Engineering Science      | Digital Logic & Computer Organization                                     | 3         | 0        | 0         | 3         |
| 4            | Professional Core        | Advanced Data Structures & Algorithm Analysis                             | 3         | 0        | 0         | 3         |
| 5            | Professional Core        | Object Oriented Programming Through Java                                  | 3         | 0        | 0         | 3         |
| 6            | Professional Core        | Advanced Data Structures and Algorithm Analysis Lab                       | 0         | 0        | 3         | 1.5       |
| 7            | Professional Core        | Object Oriented Programming Through Java Lab                              | 0         | 0        | 3         | 1.5       |
| 8            | Skill Enhancement course | Python programming                                                        | 0         | 1        | 2         | 2         |
| 9            | Audit Course             | Environmental Science                                                     | 2         | 0        | 0         | -         |
| <b>Total</b> |                          |                                                                           | <b>15</b> | <b>2</b> | <b>10</b> | <b>20</b> |

**B.Tech.– II Year II Semester**

| S.No.                                                                                      | Category             | Title                                                                                        | L         | T        | P         | Credits   |
|--------------------------------------------------------------------------------------------|----------------------|----------------------------------------------------------------------------------------------|-----------|----------|-----------|-----------|
| 1                                                                                          | Management Course- I | Managerial Economics and Financial Analysis<br>Business Environment Organizational Behaviour | 2         | 0        | 0         | 2         |
| 2                                                                                          | Basic Science        | Number Theory & Applications                                                                 | 3         | 0        | 0         | 3         |
| 3                                                                                          | Professional Core    | Operating Systems                                                                            | 3         | 0        | 0         | 3         |
| 4                                                                                          | Professional Core    | Database Management Systems                                                                  | 3         | 0        | 0         | 3         |
| 5                                                                                          | Professional Core    | Computer Networks                                                                            | 3         | 0        | 0         | 3         |
| 6                                                                                          | Professional Core    | Computer Networks Lab                                                                        | 0         | 0        | 3         | 1.5       |
| 7                                                                                          | Professional Core    | Database Management Systems Lab                                                              | 0         | 0        | 3         | 1.5       |
| 9                                                                                          | SEC                  | Full Stack Development-1                                                                     | 0         | 1        | 2         | 2         |
| 10                                                                                         | ES                   | Design Thinking & Innovation                                                                 | 1         | 0        | 2         | 2         |
| <b>Total</b>                                                                               |                      |                                                                                              | <b>15</b> | <b>1</b> | <b>12</b> | <b>21</b> |
| Mandatory Community Service Project Internship of 08 weeks duration during summer vacation |                      |                                                                                              |           |          |           |           |



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

## DISCRETE MATHEMATICS & GRAPH THEORY

### Course Objectives:

- To understand mathematical arguments using logical connectives and quantifiers and verify the validity of logical flow of arguments using propositional, predicate logic, and truth tables.
- To understand about elementary of combinatorics, the principle of inclusion and exclusion and the pigeonhole principle.
- To expose the students to Binary relations, posets, Hasse diagram, lattice, and discuss various properties of relations.
- To understand Algebraic structures like groups, semigroups, monoids.
- To introduce generating functions and recurrence relations.

### Course Outcomes:

- Recall the concepts of Mathematical logic and statement & predicate calculus
- Recall the concepts of combinatorics, set theory, posets and lattices
- Recall the concepts of algebraic structures, recurrence relations and generating functions
- Use and interpret the concepts of Mathematical logic and statement & predicate calculus
- Use and interpret the concepts of combinatorics, set theory, posets and lattices
- Use and interpret the concepts of algebraic structures, recurrence relations and generating functions
- Apply the concepts of discrete mathematical structures to computer science and engineering

### Unit-I:

#### Mathematical Logic & Statement Calculus

Statements and Connectives: statements, connectives, compound statements (Formulas), well-formed formulas, truth tables, tautologies, equivalence of formulas, converse, contrapositives & inverse of an implication, duality law, tautological implications, Normal forms: Principal disjunctive and conjunctive normal forms; Statement calculus: Validity of an argument using truth tables and rules of inference, consistency of premises, indirect method of proof.

### Unit-II:

#### Predicates & Predicate Calculus

Predicate calculus: Predicates, statement of functions, variables and quantifiers, predicate formulas, free and bound variables, universe of discourse, valid formulas and equivalences involving quantifiers, rules of inference, theory of inference for predicate calculus

### Unit-III:

#### Combinatorics, Set Theory, Posets and Lattices

Combinatorics: Principles of counting (product and sum rules), Pigeonhole principle and its applications, Principle of Inclusion-Exclusion and its applications.

**Relations:** Binary relation, properties, equivalence relation, partition of a set, equivalence classes  
Partial ordering: Partial order relation, partially ordered set (poset), Hasse diagrams, Lattices.

### Unit-IV:

#### Algebraic Structures

Algebraic Systems (Structures): Binary operation, algebraic structures such as Semi group, Monoid, Group, commutative group with suitable examples, properties satisfied by the algebraic



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

structures and the elements; Special group structures: Sub group and its criteria, order of an element, Cosets ,index of sub group ,properties of cosets, order of a group, Lagrange's theorem

**Unit-V:**

**Recurrence Relations & Generating Functions**

Recurrence Relations: Formation, iterative method of solving recurrence relations, solving homogeneous and non-homogeneous recurrence relations by characteristic roots method;  
Generating Functions: Generating functions of sequences, calculation of coefficients of expansions, solving recurrence relations by generating functions

**Textbooks:**

1. J.P.Tremblay and R.Manohar, Discrete Mathematical Structures with Applications to CSc, TataMcGrawHill,1997
2. S. Santha and EV Prasad, Mathematical Foundations for Computer Science, CENG AGE Publishers

**Reference Books:**

1. Kenneth. H.Rosen,Discrete Mathematics and itsApplications,6/e, Tata McGraw-Hill, 2009.
2. Dr.DSChandrasekharaiah, Mathematical Foundations of Computer Science ,Prism Book Pvt Ltd.
3. Swapan Kumar Sarkar, Mathematical Foundation of Computer Science,9th Edition, SChand Publishers.

\*\*\*\*\*



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

**UNIVERSAL HUMAN VALUES- UNDERSTANDING HARMONY &  
HUMAN ETHICAL CONDUCT**

**Course Objectives:**

- To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

**Course Outcomes:**

- By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
- They would have better critical ability.
- They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
- It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

**Course Topics**

The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1-hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions.

The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

- UNIT I** Introduction to Value Education (6 lectures and 3 tutorials for practice session)
- Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)
- Lecture 2: Understanding Value Education
- Tutorial 1: Practice Session PS1 Sharing about Oneself
- Lecture 3: self-exploration as the Process for Value Education
- Lecture 4: Continuous Happiness and Prosperity – the Basic Human Aspirations
- Tutorial 2: Practice Session PS2 Exploring Human Consciousness
- Lecture 5: Happiness and Prosperity – Current Scenario
- Lecture 6: Method to Fulfill the Basic Human Aspirations
- Tutorial 3: Practice Session PS3 Exploring Natural Acceptance
- UNIT II** Harmony in the Human Being (6 lectures and 3 tutorials for practice session)
- Lecture 7: Understanding Human being as the Co-existence of the self and the body.
- Lecture 8: Distinguishing between the Needs of the self and the body



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.  
Lecture 9: The body as an Instrument of the self  
Lecture 10: Understanding Harmony in the self  
Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self  
Lecture 11: Harmony of the self with the body  
Lecture 12: Programme to ensure self-regulation and Health  
Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

**UNIT III** Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)

Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction  
Lecture 14: 'Trust' – the Foundational Value in Relationship  
Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust  
Lecture 15: 'Respect' – as the Right Evaluation  
Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect  
Lecture 16: Other Feelings, Justice in Human-to-Human Relationship  
Lecture 17: Understanding Harmony in the Society  
Lecture 18: Vision for the Universal Human Order  
Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal

**UNIT IV** Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)

Lecture 19: Understanding Harmony in the Nature  
Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature  
Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature  
Lecture 21: Realizing Existence as Co-existence at All Levels  
Lecture 22: The Holistic Perception of Harmony in Existence  
Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence

**UNIT V** Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)

Lecture 23: Natural Acceptance of Human Values  
Lecture 24: Definitiveness of (Ethical) Human Conduct  
Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct  
Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order  
Lecture 26: Competence in Professional Ethics  
Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education  
Lecture 27: Holistic Technologies, Production Systems and Management Models- Typical Case Studies  
Lecture 28: Strategies for Transition towards Value-based Life and Profession  
Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT I – Introduction to Value Education

PS1 Sharing about Oneself

PS2 Exploring Human Consciousness

PS3 Exploring Natural Acceptance

Practice Sessions for UNIT II – Harmony in the Human Being

PS4 Exploring the difference of Needs of self and body

PS5 Exploring Sources of Imagination in the self



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

PS6 Exploring Harmony of self with the body

Practice Sessions for UNIT III – Harmony in the Family and Society

PS7 Exploring the Feeling of Trust

PS8 Exploring the Feeling of Respect

PS9 Exploring Systems to fulfil Human Goal

Practice Sessions for UNIT IV – Harmony in the Nature (Existence)

PS10 Exploring the Four Orders of Nature

PS11 Exploring Co-existence in Existence

Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics

PS12 Exploring Ethical Human Conduct

PS13 Exploring Humanistic Models in Education

PS14 Exploring Steps of Transition towards Universal Human Order

**Readings:**

**Textbook and Teachers Manual**

- a. The Textbook A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
- b. The Teacher's Manual Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

**Reference Books**

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

**Mode of Conduct:**

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.

Tutorial hours are to be used for practice sessions.

While analysing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

Scenarios may be used to initiate discussion. The student is encouraged to take up” ordinary” situations rather than” extra-ordinary” situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department.

Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.

\*\*\*\*\*



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

## **DIGITAL LOGIC & COMPUTER ORGANIZATION**

### **Course Objectives:**

The main objectives of the course is to

- Provide students with a comprehensive understanding of digital logic design principles and computer organization fundamentals
- Describe memory hierarchy concepts
- Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices

### **Course Outcomes:**

After completion of the course, students will be able to

1. Differentiate between combinational and sequential circuits based on their characteristics and functionalities. (L2)
2. Demonstrate an understanding of computer functional units. (L2)
3. Analyze the design and operation of processors, including instruction execution, pipelining, and control unit mechanisms, to comprehend their role in computer systems. (L3)
4. Describe memory hierarchy concepts, including cache memory, virtual memory, and secondary storage, and evaluate their impact on system performance and scalability. (L3)
5. Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices, including interrupts, DMA, and I/O mapping techniques. (L3)

### **UNIT – I:**

**Data Representation:** Binary Numbers, Fixed Point Representation. Floating Point Representation. Number base conversions, Octal and Hexadecimal Numbers, components, Signed binary numbers, Binary codes

**Digital Logic Circuits-I:** Basic Logic Functions, Logic gates, universal logic gates, Minimization of Logic expressions. K-Map Simplification, Combinational Circuits, Decoders, Multiplexers

### **UNIT – II:**

**Digital Logic Circuits-II:** Sequential Circuits, Flip-Flops, Binary counters, Registers, Shift Registers, Ripple counters

**Basic Structure of Computers:** Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers, Computer Generations, Von-Neumann Architecture

### **UNIT – III:**

**Computer Arithmetic:** Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations

**Processor Organization:** Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control and Multi programmed Control

### **UNIT – IV:**

**The Memory Organization:** Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage

### **UNIT – V:**

**Input/Output Organization:** Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces





**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

## **ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS**

### **Course Objectives:**

The main objectives of the course is to

- provide knowledge on advance data structures frequently used in Computer Science domain
- Develop skills in algorithm design techniques popularly used
- Understand the use of various data structures in the algorithm design

### **Course Outcomes:**

After completion of the course, students will be able to

1. Illustrate the working of the advanced tree data structures and their applications (L2)
2. Understand the Graph data structure, traversals and apply them in various contexts. (L2)
3. Use various data structures in the design of algorithms (L3)
4. Recommend appropriate data structures based on the problem being solved (L5)
5. Analyze algorithms with respect to space and time complexities (L4)

### **UNIT – I:**

Introduction to Algorithm Analysis, Space and Time Complexity analysis, Asymptotic Notations.

AVL Trees – Creation, Insertion, Deletion operations and Applications

B-Trees – Creation, Insertion, Deletion operations and Applications

### **UNIT – II:**

Heap Trees (Priority Queues) – Min and Max Heaps, Operations and Applications

Graphs – Terminology, Representations, Basic Search and Traversals, Connected Components and Biconnected Components, applications

Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen’s matrix multiplication, Convex Hull

### **UNIT – III:**

Greedy Method: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths

Dynamic Programming: General Method, All pairs shortest paths, Single Source Shortest Paths– General Weights (Bellman Ford Algorithm), Optimal Binary Search Trees, 0/1 Knapsack, String Editing, Travelling Salesperson problem

### **UNIT – IV:**

Backtracking: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem

Branch and Bound: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem

### **UNIT – V:**

NP Hard and NP Complete Problems: Basic Concepts, Cook’s theorem

NP Hard Graph Problems: Clique Decision Problem (CDP), Chromatic Number Decision Problem (CNDP), Traveling Salesperson Decision Problem (TSP)

NP Hard Scheduling Problems: Scheduling Identical Processors, Job Shop Scheduling



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

**Textbooks:**

1. Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh, 2<sup>nd</sup> Edition Universities Press
2. Computer Algorithms in C++, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2<sup>nd</sup> Edition University Press

**Reference Books:**

1. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
2. An introduction to Data Structures with applications, Trembley & Sorenson, McGraw Hill
3. The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.
4. Data Structures using C & C++: Langsam, Augenstein & Tanenbaum, Pearson, 1995
5. Algorithms + Data Structures & Programs:, N.Wirth, PHI
6. Fundamentals of Data Structures in C++: Horowitz Sahni & Mehta, Galgottia Pub.
7. Data structures in Java:, Thomas Standish, Pearson Education Asia

**Online Learning Resources:**

1. [https://www.tutorialspoint.com/advanced\\_data\\_structures/index.asp](https://www.tutorialspoint.com/advanced_data_structures/index.asp)
2. <http://peterindia.net/Algorithms.html>
3. [https://www.youtube.com/playlist?list=PLDN4rrl48XKpZkf03iYFl-O29szjTrs\\_O](https://www.youtube.com/playlist?list=PLDN4rrl48XKpZkf03iYFl-O29szjTrs_O)

\*\*\*\*\*





**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

**Interfaces:** Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

#### **UNIT IV:**

**Packages and Java Library:** Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

**Exception Handling:** Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions.

**Java I/O and File:** Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java (Text Book 2)

#### **UNIT V:**

**String Handling in Java:** Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer.

**Multithreaded Programming:** Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread-Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.

**Java Database Connectivity:** Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, ResultSet Interface

**Java FX GUI:** Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (Text Book 3)

#### **Text Books:**

1. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2. Joy with JAVA, Fundamentals of Object Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge, 2023.
3. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4<sup>th</sup> Edition, Pearson.

#### **References Books:**

1. The complete Reference Java, 11<sup>th</sup> edition, Herbert Schildt, TMH
2. Introduction to Java programming, 7<sup>th</sup> Edition, Y Daniel Liang, Pearson



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

**Online Resources:**

1. <https://nptel.ac.in/courses/106/105/106105191/>
2. [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_012880464547618816347\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview)

\*\*\*\*\*



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

## **ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB**

### **Course Objectives:**

The objectives of the course is to

- Acquire practical skills in constructing and managing Data structures
- Apply the popular algorithm design methods in problem-solving scenarios

### **Course Outcomes:**

After completion of the course, students will be able to

1. Design and develop programs to solve real world problems with the popular algorithm design methods. (L5)
2. Demonstrate an understanding of Non-Linear data structures by developing implementing the operations on AVL Trees, B-Trees, Heaps and Graphs. (L2)
3. Critically assess the design choices and implementation strategies of algorithms and data structures in complex applications. (L5)
4. Utilize appropriate data structures and algorithms to optimize solutions for specific computational problems. (L3)
5. Compare the performance of different of algorithm design strategies (L4)

### **Experiments covering the Topics:**

- Operations on AVL trees, B-Trees, Heap Trees
- Graph Traversals
- Sorting techniques
- Finding Biconnected components in a graph
- Shortest path algorithms using greedy Method
- 0/1 Knapsack Problem using Dynamic Programming and Backtracking
- Travelling Salesperson problem using Branch and Bound
- N-Queens Problem using Backtracking
- Job Sequencing using Branch and Bound

### **Sample Programs:**

1. Construct an AVL tree for a given set of elements which are stored in a file. And implement insert and delete operation on the constructed tree. Write contents of tree into a new file using in-order.
2. Construct B-Tree an order of 5 with a set of 100 random elements stored in array. Implement searching, insertion and deletion operations.
3. Construct Min and Max Heap using arrays, delete any element and display the content of the Heap.
4. Implement BFT and DFT for given graph, when graph is represented by
  - a) Adjacency Matrix
  - b) Adjacency Lists
5. Write a program for finding the biconnected components in a given graph.
6. Implement Quick sort and Merge sort and observe the execution time for various input sizes (Average, Worst and Best cases).
7. Compare the performance of Single Source Shortest Paths using Greedy method when the graph is represented by adjacency matrix and adjacency lists.
8. Implement Job Sequencing with deadlines using Greedy strategy.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

9. Write a program to solve 0/1 Knapsack problem Using Dynamic Programming.
10. Implement N-Queens Problem Using Backtracking.
11. Use Backtracking strategy to solve 0/1 Knapsack problem.
12. Implement Travelling Sales Person problem using Branch and Bound approach.

**Reference Books:**

1. Fundamentals of Data Structures in C++, Horowitz Ellis, Sahni Sartaj, Mehta, Dinesh, 2<sup>nd</sup> Edition, Universities Press
2. Computer Algorithms/C++ Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2<sup>nd</sup> Edition, University Press
3. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
4. An introduction to Data Structures with applications, Trembley & Sorenson, McGraw Hill

**Online Learning Resources:**

1. <http://cse01-iiith.vlabs.ac.in/>
2. <http://peterindia.net/Algorithms.html>

\*\*\*\*\*



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

**OBJECT-ORIENTED PROGRAMMING THROUGH JAVA LAB**

**Course Objectives:**

The aim of this course is to

- Practice object-oriented programming in the Java programming language
- implement Classes, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- Illustrate inheritance, Exception handling mechanism, JDBC connectivity
- Construct Threads, Event Handling, implement packages, Java FX GUI

**Experiments covering the Topics:**

- Object Oriented Programming fundamentals- data types, control structures
- Classes, methods, objects, Inheritance, polymorphism,
- Exception handling, Threads, Packages, Interfaces
- Files, I/O streams, JavaFX GUI

**Sample Experiments:**

**Exercise – 1:**

1. Write a JAVA program to display default value of all primitive data type of JAVA
2. Write a java program that display the roots of a quadratic equation  $ax^2+bx=0$ . Calculate the discriminate D and basing on value of D, describe the nature of root.

**Exercise - 2**

1. Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
2. Write a JAVA program to sort for an element in a given list of elements using bubble sort
3. Write a JAVA program using StringBuffer to delete, remove character.

**Exercise - 3**

1. Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.
2. Write a JAVA program implements method overloading.
3. Write a JAVA program to implement constructor.
4. Write a JAVA program to implement constructor overloading.

**Exercise - 4**

1. Write a JAVA program to implement Single Inheritance
2. Write a JAVA program to implement multi level Inheritance
3. Write a JAVA program for abstract class to find areas of different shapes

**Exercise - 5**

1. Write a JAVA program give example for “super” keyword.
2. Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?
3. Write a JAVA program that implements Runtime polymorphism



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

**Exercise - 6**

1. Write a JAVA program that describes exception handling mechanism
2. Write a JAVA program Illustrating Multiple catch clauses
3. Write a JAVA program for creation of Java Built-in Exceptions
4. Write a JAVA program for creation of User Defined Exception

**Exercise - 7**

1. Write a JAVA program that creates threads by extending Thread class. First thread display “Good Morning “every 1 sec, the second thread displays “Hello “every 2 seconds and the third display “Welcome” every 3 seconds, (Repeat the same by implementing Runnable)
2. Write a program illustrating **is Alive** and **join ()**
3. Write a Program illustrating Daemon Threads.
4. Write a JAVA program Producer Consumer Problem

**Exercise – 8**

1. Write a JAVA program that import and use the user defined packages
2. Without writing any code, build a GUI that display text in label and image in an ImageView (use JavaFX)
3. Build a Tip Calculator app using several JavaFX components and learn how to respond to user interactions with the GUI

**Exercise – 9**

1. Write a java program that connects to a database using JDBC
2. Write a java program to connect to a database using JDBC and insert values into it.
3. Write a java program to connect to a database using JDBC and delete values from it

\*\*\*\*\*



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

**PYTHON PROGRAMMING  
(Skill Enhancement Course)**

**Course Objectives:**

The main objectives of the course are to

- Introduce core programming concepts of Python programming language.
- Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
- Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

**Course Outcomes:**

After completion of the course, students will be able to

1. Showcase adept command of Python syntax, deftly utilizing variables, data types, control structures, functions, modules, and exception handling to engineer robust and efficient code solutions. (L4)
2. apply Python programming concepts to solve a variety of computational problems (L3)
3. understand the principles of object-oriented programming (OOP) in Python, including classes, objects, inheritance, polymorphism, and encapsulation, and apply them to design and implement Python programs (L3)
4. become proficient in using commonly used Python libraries and frameworks such as JSON, XML, NumPy, pandas (L2)
5. exhibit competence in implementing and manipulating fundamental data structures such as lists, tuples, sets, dictionaries (L3)

**UNTI-I:**

History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook.

Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.

Control Flow Statements: if statement, if-else statement, if...elif...else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

**Sample Experiments:**

1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples.
  - i) Arithmetic Operators ii) Relational Operators iii) Assignment Operators iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators viii) Identity Operators
5. Write a program to add and multiply complex numbers
6. Write a program to print multiplication table of a given number.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

**UNIT-II:**

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, \*args and \*\*kwargs, Command Line Arguments.

Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

**Sample Experiments:**

7. Write a program to define a function with multiple return values.
8. Write a program to define a function using default arguments.
9. Write a program to find the length of the string without using any library functions.
10. Write a program to check if the substring is present in a given string or not.
11. Write a program to perform the given operations on a list:
  - i. addition
  - ii. insertion
  - iii. slicing
12. Write a program to perform any 5 built-in functions by taking any list.

**UNIT-III:**

Dictionaries: Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.

Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozenset.

**Sample Experiments:**

13. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
14. Write a program to count the number of vowels in a string (No control flow allowed).
15. Write a program to check if a given key exists in a dictionary or not.
16. Write a program to add a new key-value pair to an existing dictionary.
17. Write a program to sum all the items in a given dictionary.

**UNIT-IV:**

Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance, Polymorphism.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

**Sample Experiments:**

18. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.
19. Python program to print each line of a file in reverse order.
20. Python program to compute the number of characters, words and lines in a file.
21. Write a program to create, display, append, insert and reverse the order of the items in the array.
22. Write a program to add, transpose and multiply two matrices.
23. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

**UNIT-V:**

Introduction to Data Science: Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.

**Sample Experiments:**

24. Python program to check whether a JSON string contains complex object or not.
25. Python Program to demonstrate NumPy arrays creation using array () function.
26. Python program to demonstrate use of ndim, shape, size, dtype.
27. Python program to demonstrate basic slicing, integer and Boolean indexing.
28. Python program to find min, max, sum, cumulative sum of array
29. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:
  - a) Apply head () function to the pandas data frame
  - b) Perform various data selection operations on Data Frame
30. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

**Reference Books:**

1. Gowri shankar S, Veena A., Introduction to Python Programming, CRC Press.
2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2<sup>nd</sup> Edition, Pearson, 2024
3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

**Online Learning Resources/Virtual Labs:**

1. <https://www.coursera.org/learn/python-for-applied-data-science-ai>
2. <https://www.coursera.org/learn/python?specialization=python#syllabus>

\*\*\*\*\*



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

**ENVIRONMENTAL SCIENCE**

**Course Objectives:**

- To make the students to get awareness on environment.
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life
- To save earth from the inventions by the engineers.

**UNIT I**

**Multidisciplinary Nature of Environmental Studies:** – Definition, Scope and Importance – Need for Public Awareness.

**Natural Resources :** Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – 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, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

**UNIT II**

**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 the following ecosystem:

- a. Forest ecosystem.
- b. Grassland ecosystem
- c. Desert ecosystem.
- d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**Biodiversity and its Conservation :** Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

**UNIT III**

**Environmental Pollution:** Definition, Cause, effects and control measures of:

- a. Air Pollution.
- b. Water pollution
- c. Soil pollution
- d. Marine pollution
- e. Noise pollution
- f. Thermal pollution
- g. Nuclear hazards

**Solid Waste Management:** Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

**UNIT IV**

**Social Issues and the Environment:** From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment 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.

**UNIT V**

**Human Population and the Environment:** Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

**Field Work:** Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

**Textbooks:**

1. Textbook of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press.
2. Palaniswamy, “Environmental Studies”, Pearson education
3. S.Azeem Unnisa, “Environmental Studies” Academic Publishing Company
4. K.Raghavan Nambiar, “Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus”, Scitech Publications (India), Pvt. Ltd.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

**References:**

1. Deeksha Dave and E.Sai Baba Reddy, “Textbook of Environmental Science”, Cengage Publications.
2. M.Anji Reddy, “Text book of Environmental Sciences and Technology”, BS Publication.
3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, “Environmental Sciences and Engineering”, Prentice Hall of India Private limited
5. G.R.Chatwal, “A Text Book of Environmental Studies” Himalaya Publishing House
6. Gilbert M. Masters and Wendell P. Ela, “Introduction to Environmental Engineering and Science, Prentice Hall of India Private limited.

\*\*\*\*\*



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

**MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**

**Course Objectives:**

- To inculcate the basic knowledge of microeconomics and financial accounting
- To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost
- To Know the Various types of market structure and pricing methods and strategy
- To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
- To provide fundamental skills on accounting and to explain the process of preparing financial statements.

**Course Outcomes:**

- Define the concepts related to Managerial Economics, financial accounting and management(L2)
- Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets (L2)
- Apply the Concept of Production cost and revenues for effective Business decision (L3)
- Analyze how to invest their capital and maximize returns (L4)
- Evaluate the capital budgeting techniques. (L5)
- Develop the accounting statements and evaluate the financial performance of business entity (L5)

**UNIT - I Managerial Economics**

Introduction – Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

**UNIT - II Production and Cost Analysis**

Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least- cost combination– Short run and long run Production Function- Isoquants and Is costs, Cost & Break-Even Analysis - Cost concepts and Cost behaviour- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems).

**UNIT - III Business Organizations and Markets**

Introduction – Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition– Oligopoly-Price-Output Determination - Pricing Methods and Strategies



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

**UNIT - IV Capital Budgeting**

Introduction – Nature, meaning, significance. Types of Working Capital, Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting– Features, Proposals, Methods and Evaluation. Projects – Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)

**UNIT - V Financial Accounting and Analysis**

Introduction – Concepts and Conventions- Double-Entry Bookkeeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Introduction to Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

**Textbooks:**

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

**Reference Books:**

1. Ahuja HI Managerial economics Schand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage.

**Online Learning Resources:**

<https://www.slideshare.net/123ps/managerial-economics-ppt>  
<https://www.slideshare.net/rossanz/production-and-cost-45827016>  
<https://www.slideshare.net/darkyla/business-organizations-19917607>  
<https://www.slideshare.net/balarajbl/market-and-classification-of-market>  
<https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396>  
<https://www.slideshare.net/ashu1983/financial-accounting>

\*\*\*\*\*



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

**NUMBER THEORY AND ITS APPLICATIONS**

(Common to CSE(AI), CSE(CYS), CSE (IoT & CYS), CSE(BCT), Cyber Security)

**Course Outcomes:**

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

- Understand concepts related to primality, divisibility, and Greatest common divisors.
- Comfortable with divisibility proofs that use a number of different means, including induction, congruences, and divisibility tests
- Develop the knowledge to apply various applications of Congruences
- Analyze the Finite fields & Primality, factoring in the related applications
- Develop various encryption methods and its applications to computer science.

**UNIT I:**

**Integers, Greatest common divisors and prime Factorization**

The well-ordering property-Divisibility-Representation of integers-Computer operations with integers-Prime Numbers-Greatest common divisors-The Euclidean algorithm -The fundamental theorem of arithmetic-Factorization of integers and the Fermat numbers-Linear Diophantine equations

**UNIT II**

**Congruences**

Introduction to congruences -Linear congruences-The Chinese remainder theorem-Systems of linear congruences

**UNIT III**

**Applications of Congruences**

Divisibility tests-The perpetual calendar-Round-robin tournaments-Computer file storage and hashing functions. Wilson's theorem and Fermat's little theorem- Pseudo primes- Euler's theorem- Euler's  $\phi$  function- The sum and number of divisors- Perfect numbers and Mersenne primes.

**UNIT IV**

**Finite fields & Primality, factoring**

Finite fields- quadratic residues and reciprocity-Pseudo primes-rho method-Fermat factorization and factor bases.

**UNIT V**

**Cryptology**

Basic terminology-complexity theorem-Character ciphers-Block ciphers-Exponentiation ciphers-Public-key cryptography-Discrete logarithm-Knapsack ciphers- RSA algorithm-Some applications to computer science.

**Textbooks:**

1. Kenneth H Rosen, Elementary number theory and its applications, AT & T Information systems & Bell laboratories.
2. Neal Koblitz, A course in Number theory & Cryptography, Springer



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

**Reference Books:**

1. Herbert S. Zuckerman, Hugh L. Montgomery, Ivan Niven, An Introduction To The Theory Of Numbers, wiley publishers
2. Tom M Apostol, Introduction to Analytic number theory- springer
3. VK Krishnan, Elementary number theory, Universities press

**Online Learning Resources:**

1. <https://www.slideshare.net/ItishreeDash3/a-study-on-number-theory-and-its-applications>

\*\*\*\*\*



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

## OPERATING SYSTEMS

### Course Objectives:

The main objectives of the course is to make student

- Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection
- Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
- Illustrate different conditions for deadlock and their possible solutions.

### Course Outcomes:

After completion of the course, students will be able to

1. Describe the basics of the operating systems, mechanisms of OS to handle processes, threads, and their communication. (L1)
2. Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection. (L2)
3. Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system. (L3)
4. Illustrate different conditions for deadlock and their possible solutions. (L2)
5. Analyze the memory management and its allocation policies. (L4)

### UNIT - I

Operating Systems Overview: Introduction, Operating system functions, Operating systems operations, Computing environments, Free and Open-Source Operating Systems

System Structures: Operating System Services, User and Operating-System Interface, system calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Building and Booting an Operating System, Operating system debugging

### UNIT - II

Processes: Process Concept, Process scheduling, Operations on processes, Inter-process communication.

Threads and Concurrency: Multithreading models, Thread libraries, Threading issues.

CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling.

### UNIT – III

Synchronization Tools: The Critical Section Problem, Peterson’s Solution, Mutex Locks, Semaphores, Monitors, Classic problems of Synchronization.

Deadlocks: system Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlock.

### UNIT - IV

Memory-Management Strategies: Introduction, Contiguous memory allocation, Paging, Structure of the Page Table, Swapping.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

Virtual Memory Management: Introduction, Demand paging, Copy-on-write, Page replacement, Allocation of frames, Thrashing

Storage Management: Overview of Mass Storage Structure, HDD Scheduling.

**UNIT - V**

File System: File System Interface: File concept, Access methods, Directory Structure; File system Implementation: File-system structure, File-system Operations, Directory implementation, Allocation method, Free space management; File-System Internals: File-System Mounting, Partitions and Mounting, File Sharing.

Protection: Goals of protection, Principles of protection, Protection Rings, Domain of protection, Access matrix.

**Text Books:**

1. Operating System Concepts, Silberschatz A, Galvin P B, Gagne G, 10<sup>th</sup> Edition, Wiley, 2018.
2. Modern Operating Systems, Tanenbaum A S, 4<sup>th</sup> Edition, Pearson , 2016

**Reference Books:**

1. Operating Systems -Internals and Design Principles, Stallings W, 9<sup>th</sup> edition, Pearson, 2018
2. Operating Systems: A Concept Based Approach, D.M Dhamdhare, 3<sup>rd</sup> Edition, McGraw- Hill, 2013

**Online Learning Resources:**

1. <https://nptel.ac.in/courses/106/106/106106144/>
2. <http://peterindia.net/OperatingSystems.html>

\*\*\*\*\*



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

**DATABASE MANAGEMENT SYSTEMS**

**Course Objectives:**

The main objectives of the course is to

- Introduce database management systems and to give a good formal foundation on the relational model of data and usage of Relational Algebra
- Introduce the concepts of basic SQL as a universal Database language
- Demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- Provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

**Course Outcomes:**

After completion of the course, students will be able to

1. Understand the basic concepts of database management systems (L2)
2. Analyze a given database application scenario to use ER model for conceptual design of the database (L4)
3. Utilize SQL proficiently to address diverse query challenges (L3).
4. Employ normalization methods to enhance database structure (L3)
5. Assess and implement transaction processing, concurrency control and database recovery protocols in databases. (L4)

**UNIT I:**

Introduction: Database system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

**UNIT II:**

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra, Relational Calculus. BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update).

**UNIT III:**

SQL: Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions (Date and Time, Numeric, String conversion) Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updateable and non-updateable), relational set operations.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

**UNIT IV:**

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency Lossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd normal form (BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form (5NF).

**UNIT V:**

Transaction Concept: Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock based, time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.

Introduction to Indexing Techniques: B+ Trees, operations on B+Trees, Hash Based Indexing:

**Text Books:**

- 1) Database Management Systems, 3<sup>rd</sup> edition, Raghurama Krishnan, Johannes Gehrke, TMH (For Chapters 2, 3, 4)
- 2) Database System Concepts, 5<sup>th</sup> edition, Silberschatz, Korth, Sudarsan, TMH (For Chapter 1 and Chapter 5)

**Reference Books:**

- 1) Introduction to Database Systems, 8<sup>th</sup> edition, C J Date, Pearson.
- 2) Database Management System, 6<sup>th</sup> edition, Ramez Elmasri, Shamkant B. Navathe, Pearson
- 3) Database Principles Fundamentals of Design Implementation and Management, 10<sup>th</sup> edition, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning, 2022

**Online Learning Resources:**

- 1) <https://nptel.ac.in/courses/106/105/106105175/>
- 2) [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_01275806667282022456\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01275806667282022456_shared/overview)

\*\*\*\*\*



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

## **COMPUTER NETWORKS**

### **Course Objectives:**

The main objectives of the course is to

- To understand the different types of networks
- To discuss the software and hardware components of a network
- To develop an understanding the principles of computer networks.
- To familiarize with OSI model and the functions of layered structure.
- To explain networking protocols, algorithms and design perspectives

### **Course Outcomes:**

After completion of the course, students will be able to

1. Identify the software and hardware components of a Computer network. (L1)
2. Explain the functionality of each layer of a computer network. (L2)
3. Identify and analyze flow control, congestion control, and routing issues. (L4)
4. Analyze and interpret the functionality and effectiveness of the routing protocols. (L4)
5. Choose the appropriate transport protocol based on the application requirements. (L3)

### **UNIT I:**

**Introduction:** Types of Computer Networks, Broadband Access Networks, Mobile and Wireless Access Networks, Content Provider Networks, Transit networks, Enterprise Networks, Network technology from local to global, Personal Area Networks, Local Area Networks, Home Networks, Metropolitan Area Networks, Wide Area Networks, Internetworks, Network Protocols, Design Goals, Protocol Layering, Connections and Reliability, Service Primitives, The Relationship of Services to Protocols ,Reference Models, The OSI Reference Model, The TCP/IP Reference Model, A Critique of the OSI Model and Protocols, A Critique of the TCP/IP Reference Model and Protocols.

### **UNIT II:**

**The Data Link Layer:** Guided Transmission Media, Persistent Storage, Twisted Pairs, Coaxial Cable, Power Lines, Fiber Optics, Data Link Layer Design Issues, Services Provided To The Network Layer, Framing Error Control, Flow Control, Error Detection And Correction, Error-Correcting Codes, Error-Detecting Codes, Elementary Data Link Protocols, Initial Simplifying Assumptions Basic Transmission And Receipt, Simplex Link-Layer Protocols, Improving Efficiency, Bidirectional Transmission, Multiple Frames In Flight, Examples Of Full-Duplex, Sliding Window Protocols, The Channel Allocation Problem, Static Channel Allocation, Assumptions For Dynamic Channel Allocation, Multiple Access Protocols, Aloha, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Limited-Contention Protocols, Wireless LAN Protocols, Ethernet, Classic Ethernet Physical Layer, Classic Ethernet Mac Sublayer Protocol, Ethernet Performance, Switched Ethernet, Fast Ethernet, Gigabit Ethernet, 10-Gigabit Ethernet, 40- And 100-Gigabit Ethernet, Retrospective On Ethernet.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

**UNIT III:**

**The Network Layer:** Network Layer Design Issues, Store-And-Forward Packet Switching, Services Provided To The Transport Layer, Implementation Of Connectionless Service, Implementation Of Connection-Oriented Service, Comparison Of Virtual-Circuit And Datagram Networks, Routing Algorithms In A Single Network, The Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing Within a Network, Broadcast Routing, Multicast Routing, Anycast Routing, Traffic Management at The Network Layer, The Need for Traffic Management: Congestion, Approaches To Traffic Management, Internetworking, Internetworks: An Overview, How Networks differ, Connecting Heterogeneous Networks, Connecting Endpoints Across Heterogeneous Networks, Internetwork Routing: Routing Across Multiple Networks Supporting Different Packet Sizes: Packet Fragmentation, The Network Layer In The Internet, The IP Version 4 Protocol, IP Addresses, IP Version 6, Internet Control Protocols, Label Switching and MPLS, OSPF—An Interior Gateway Routing Protocol, BGP—The Exterior Gateway Routing Protocol, Internet Multicasting.

**UNIT IV:**

**The Transport Layer:** The Transport Service, Services Provided To The Upper Layers, Transport Service Primitives, Berkeley Sockets, An Example Of Socket Programming: An Internet File Server, Elements Of Transport Protocols, Addressing, Connection Establishment, Connection Release, Error Control And Flow Control, Multiplexing, Crash Recovery, Congestion Control, Desirable Bandwidth Allocation, Regulating The Sending Rate, Wireless Issues, The Internet Transport Protocols: UDP, Introduction To UDP, Remote Procedure Call, Real-Time Transport Protocols, The Internet Transport Protocols: TCP, Introduction To TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release.

**UNIT V:**

**The Application Layer:** Electronic Mail, Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery, The World Wide Web, Architectural Overview, Static Web Objects, Dynamic Web Pages and Web Applications, HTTP and HTTPS, Web Privacy, Content Delivery, Content and Internet Traffic, Server Farms and Web Proxies, Content Delivery Networks, Peer-To-Peer Networks, Evolution of The Internet.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

**Text Books:**

Andrew Tanenbaum, Feamster Wetherall, Computer Networks, 6<sup>th</sup> Edition, Global Edition.

**Reference Books:**

1. Behrouz A. Forouzan, Data Communications and Networking, 5<sup>th</sup> Edition, McGraw Hill Publication, 2017.
2. James F. Kurose, Keith W. Ross, “Computer Networking: A Top-Down Approach”, 6<sup>th</sup> edition, Pearson, 2019.
3. Youlu Zheng, Shakil Akthar, “Networks for Computer Scientists and Engineers”, Oxford Publishers, 2016.

**Online Learning Resources:**

<https://nptel.ac.in/courses/106105183/25>

<http://www.nptelvideos.in/2012/11/computer-networks.html>

<https://nptel.ac.in/courses/106105183/3>

\*\*\*\*\*



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

**COMPUTER NETWORKS LAB**

**Course Objectives:**

- To understand the different types of networks
- To discuss the software and hardware components of a network
- To enlighten the working of networking commands supported by operating system
- To impart knowledge of Network simulator 2/3
- To familiarize the use of networking functionality supported by JAVA
- To familiarize with computer networking tools.

**Course Outcomes:**

1. Understand working of wired and wireless networks. (L2)
2. Develop scripts for Simulating Wired and wireless Networks. (L3)
3. Analyze the data traffic using tools. (L4)
4. Develop JAVA programs for client-server communication. (L3)
5. Utilize networking commands proficiently to diagnose and troubleshoot the network issues (L5)

**List of Activities/Experiments:**

1. Study different types of Network cables (Copper and Fiber) and prepare cables (Straight and Cross) to connect Two or more systems. Use crimping tool to connect jacks. Use LAN tester to connect the cables. - Install and configure Network Devices: HUB, Switch and Routers. Consider both manageable and non-manageable switches. Do the logical configuration of the system. Set the bandwidth of different ports. - Install and Configure Wired and Wireless NIC and transfer files between systems in Wired LAN and Wireless LAN. Consider both adhoc and infrastructure mode of operation.
2. Work with the commands Ping, Tracert, Ipconfig, pathping, telnet, ftp, getmac, ARP, Hostname, Nbtstat, netdiag, and Nslookup
3. Find all the IP addresses on your network. Unicast, Multicast, and Broadcast on your network.
4. Use Packet tracer software to build network topology and configure using Distance vector routing protocol.
5. Use Packet tracer software to build network topology and configure using Link State routing protocol.
6. Using JAVA RMI Write a program to implement Basic Calculator.
7. Implement a Chatting application using JAVA TCP and UDP sockets.
8. Hello command is used to know whether the machine at the other end is working or not. Echo command is used to measure the round-trip time to the neighbor. Implement Hello and Echo commands using JAVA.
9. Using Wireshark perform the following operations:
  - Inspect HTTP Traffic
  - Inspect HTTP Traffic from a Given IP Address,
  - Inspect HTTP Traffic to a Given IP Address,
  - Reject Packets to Given IP Address,
  - Monitor Apache and MySQL Network Traffic.
10. Install Network Simulator 2/3. Create a wired network using dumbbell topology.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

Attach agents, generate both FTP and CBR traffic, and transmit the traffic. Vary the data rates and evaluate the performance using metrics throughput, delay, jitter and packet loss.

11. Create a static wireless network. Attach agents, generate both FTP and CBR traffic, and transmit the traffic. Vary the data rates and evaluate the performance using metric throughput, delay, jitter and packet loss.
12. Create a mobile wireless network. Attach agents, generate both FTP and CBR traffic, and transmit the traffic. Vary the data rates and evaluate the performance using metric throughput, delay, jitter and packet loss.

**Reference Books:**

1. ShivendraS.Panwar, Shiwen Mao, Jeong-dong Ryoo, and Yihan Li, “TCP/IP Essentials:A Lab-Based Approach”, Cambridge University Press, 2004.
2. Cisco Networking Academy, “CCNA1 and CCNA2 Companion Guide”, Cisco Networking Academy Program, 3rd edition, 2003.
3. Elloitte Rusty Harold, “Java Network Programming”, 3rd edition, O’REILLY, 2011.

**Online Learning Resources:**

<https://www.netacad.com/courses/packet-tracer> - Cisco Packet Tracer.

Ns Manual, Available at: <https://www.isi.edu/nsnam/ns/ns-documentation.html>, 2011.

[https://www.wireshark.org/docs/wsug\\_html\\_chunked/](https://www.wireshark.org/docs/wsug_html_chunked/) -Wireshark.

<https://nptel.ac.in/courses/106105183/25>

<http://www.nptelvideos.in/2012/11/computer-networks.html>

<https://nptel.ac.in/courses/106105183/3>

[http://vlabs.iitb.ac.in/vlabs-dev/labs\\_local/computer-networks/labs/explist.php](http://vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/explist.php)

\*\*\*\*\*



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

**DATABASE MANAGEMENT SYSTEMS LAB**

**Course Objectives:**

This Course will enable students to

- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers

**Course Outcomes:**

After completion of the course, students will be able to

1. Utilizing Data Definition Language (DDL), Data Manipulation Language (DML), and Data Control Language (DCL) commands effectively within a database environment (L3)
2. Constructing and execute queries to manipulate and retrieve data from databases. (L3)
3. Develop application programs using PL/SQL. (L3)
4. Analyze requirements and design custom Procedures, Functions, Cursors, and Triggers, leveraging their capabilities to automate tasks and optimize database functionality (L4)
5. Establish database connectivity through JDBC (Java Database Connectivity) (L3)

**Experiments covering the topics:**

- DDL, DML, DCL commands
- Queries, nested queries, built-in functions,
- PL/SQL programming- control structures
- Procedures, Functions, Cursors, Triggers,
- Database connectivity- ODBC/JDBC

**Sample Experiments:**

1. Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example: - Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to char, to number and to date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

and instr), date functions (Sysdate, next\_day, add months, last day, months between, least, greatest, trunc, round, to\_char, to date)

5.
  - i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
  - ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12. Create a table and perform the search operation on table using indexing and non-indexing techniques.
13. Write a Java program that connects to a database using JDBC
14. Write a Java program to connect to a database using JDBC and insert values into it
15. Write a Java program to connect to a database using JDBC and delete values from it

**Reference Books:**

1. Oracle: The Complete Reference by Oracle Press
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
3. Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007
4. RamezElmasri, Shamkant, B. Navathe, "Database Systems", Pearson Education, 6th Edition, 2013.
5. Database Principles Fundamentals of Design Implementation and Management, 10<sup>th</sup> edition, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning, 2022

**Online Learning Resources:**

<http://www.scoopworld.in>

<http://vlabs.iitb.ac.in/vlabs-dev/labs/dblab/index.php>

\*\*\*\*\*



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA - VIZIANAGARAM

VIZIANAGARAM – 535 003 Andhra Pradesh (India)

(Established by Andhra Pradesh Act No.22 of 2021)

### FULL STACK DEVELOPMENT – 1 (Skill Enhancement Course)

#### Course Objectives:

The main objectives of the course are to

- Make use of HTML elements and their attributes for designing static web pages
- Build a web page by applying appropriate CSS styles to HTML elements
- Experiment with JavaScript to develop dynamic web pages and validate forms

#### Course Outcomes:

1. Design Websites. (L6)
2. Apply Styling to web pages. (L3)
3. Make Web pages interactive. (L3)
4. Design Forms for applications. (L6)
5. Choose Control Structure based on the logic to be implemented. (L4)

#### Experiments covering the Topics:

- Lists, Links and Images
- HTML Tables, Forms and Frames
- HTML 5 and Cascading Style Sheets, Types of CSS
- Selector forms
- CSS with Color, Background, Font, Text and CSS Box Model
- Applying JavaScript - internal and external, I/O, Type Conversion
- JavaScript Conditional Statements and Loops, Pre-defined and User-defined Objects
- JavaScript Functions and Events
- Node.js

#### Sample Experiments:

##### 1. Lists, Links and Images

- a. Write a HTML program, to explain the working of lists.  
Note: It should have an ordered list, unordered list, nested lists and ordered list in an unordered list and definition lists.
- b. Write a HTML program, to explain the working of hyperlinks using `<a>` tag and href, target Attributes.
- c. Create a HTML document that has your image and your friend's image with a specific height and width. Also when clicked on the images it should navigate to their respective profiles.
- d. Write a HTML program, in such a way that, rather than placing large images on a page, the preferred technique is to use thumbnails by setting the height and width parameters to something like to 100\*100 pixels. Each thumbnail image is also a link to a full sized version of the image. Create an image gallery using this technique.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

**2. HTML Tables, Forms and Frames**

- a. Write a HTML program, to explain the working of tables. (use tags: <table>, <tr>, <th>, <td> and attributes: border, rowspan,colspan)
- b. Write a HTML program, to explain the working of tables by preparing a timetable. (Note: Use <caption> tag to set the caption to the table & also use cell spacing, cell padding, border, rowspan, colspan etc.).
- c. Write a HTML program, to explain the working of forms by designing Registration form. (Note: Include text field, password field, number field, date of birth field, checkboxes, radio buttons, list boxes using <select>&<option> tags, <text area> and two buttons ie: submit and reset. Use tables to provide a better view).
- d. Write a HTML program, to explain the working of frames, such that page is to be divided into 3 parts on either direction. (Note: first frame → image, second frame → paragraph, third frame → hyperlink. And also make sure of using “no frame” attribute such that frames to be fixed).

**3. HTML 5 and Cascading Style Sheets, Types of CSS**

- a. Write a HTML program, that makes use of <article>, <aside>, <figure>, <figcaption>, <footer>, <header>, <main>, <nav>, <section>, <div>, <span> tags.
- b. Write a HTML program, to embed audio and video into HTML web page.
- c. Write a program to apply different types (or levels of styles or style specification formats) - inline, internal, external styles to HTML elements. (identify selector, property and value).

**4. Selector forms**

- a. Write a program to apply different types of selector forms
  - i. Simple selector (element, id, class, group, universal)
  - ii. Combinator selector (descendant, child, adjacent sibling, general sibling)
  - iii. Pseudo-class selector
  - iv. Pseudo-element selector
  - v. Attribute selector

**5. CSS with Color, Background, Font, Text and CSS Box Model**

- a. Write a program to demonstrate the various ways you can reference a color in CSS.
- b. Write a CSS rule that places a background image halfway down the page, tilting it horizontally. The image should remain in place when the user scrolls up or down.
- c. Write a program using the following terms related to CSS font and text:
  - i. font-size      ii. font-weight      iii. font-style
  - iv. text-decoration      v. text-transformation      vi. text-alignment
- d. Write a program, to explain the importance of CSS Box model using
  - i. Content      ii. Border      iii. Margin      iv. padding

**6. Applying JavaScript - internal and external, I/O, Type Conversion**

- a. Write a program to embed internal and external JavaScript in a web page.
- b. Write a program to explain the different ways for displaying output.
- c. Write a program to explain the different ways for taking input.
- d. Create a webpage which uses prompt dialogue box to ask a voter for his name and age. Display the information in table format along with either the voter can vote or not



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA - VIZIANAGARAM

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

### 7. JavaScript Pre-defined and User-defined Objects

- a. Write a program using document object properties and methods.
- b. Write a program using window object properties and methods.
- c. Write a program using array object properties and methods.
- d. Write a program using math object properties and methods.
- e. Write a program using string object properties and methods.
- f. Write a program using regex object properties and methods.
- g. Write a program using date object properties and methods.
- h. Write a program to explain user-defined object by using properties, methods, accessors, constructors and display.

### 8. JavaScript Conditional Statements and Loops

- a. Write a program which asks the user to enter three integers, obtains the numbers from the user and outputs HTML text that displays the larger number followed by the words “LARGER NUMBER” in an information message dialog. If the numbers are equal, output HTML text as “EQUAL NUMBERS”.
- b. Write a program to display week days using switch case.
- c. Write a program to print 1 to 10 numbers using for, while and do-while loops.
- d. Write a program to print data in object using for-in, for-each and for-of loops
- e. Develop a program to determine whether a given number is an ‘ARMSTRONG NUMBER’ or not. [Eg: 153 is an Armstrong number, since sum of the cube of the digits is equal to the number i.e.,  $1^3 + 5^3 + 3^3 = 153$ ]
- f. Write a program to display the denomination of the amount deposited in the bank in terms of 100’s, 50’s, 20’s, 10’s, 5’s, 2’s & 1’s. (Eg: If deposited amount is Rs.163, the output should be 1-100’s, 1-50’s, 1- 10’s, 1-2’s & 1-1’s)

### 9. Java script Functions and Events

- a. Design a appropriate function should be called to display
  - i. Factorial of that number
  - ii. Fibonacci series up to that number
  - iii. Prime numbers up to that number
  - iv. Is it palindrome or not
- b. Design a HTML having a text box and four buttons named Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate function should be called to display
  - i. Factorial of that number
  - ii. Fibonacci series up to that number
  - iii. Prime numbers up to that number
  - iv. Is it palindrome or not
- c. Write a program to validate the following fields in a registration page
  - i. Name (start with alphabet and followed by alphanumeric and the length should not be less than 6 characters)
  - ii. Mobile (only numbers and length 10 digits)
  - iii. E-mail (should contain format like [xxxxxxx@xxxxxx.xxx](mailto:xxxxxxx@xxxxxx.xxx))



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

**Text Books:**

1. John Dean, Web Programming with HTML5, CSS and JavaScript, Jones & Bartlett Learning, 2019.

**Reference Books:**

1. Programming the World Wide Web, 7<sup>th</sup> Edition, Robert W Sebesta, Pearson, 2013.
2. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasam Subramanian, 2<sup>nd</sup> edition, APress, O'Reilly.

**Online Learning Resources:**

<https://www.w3schools.com/html>

<https://www.w3schools.com/css>

<https://www.w3schools.com/js/>

<https://www.w3schools.com/nodejs>

<https://www.w3schools.com/typescript>

\*\*\*\*\*



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA - VIZIANAGARAM

VIZIANAGARAM – 535 003 Andhra Pradesh (India)

(Established by Andhra Pradesh Act No.22 of 2021)

### DESIGN THINKING & INNOVATION

#### Course Objectives:

The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.

#### Course Outcomes:

- Define the concepts related to design thinking. (L1, L2)
- Explain the fundamentals of Design Thinking and innovation (L1, L2)
- Apply the design thinking techniques for solving problems in various sectors. (L3)
- Analyse to work in a multidisciplinary environment (L4)
- Evaluate the value of creativity (L5)
- Formulate specific problem statements of real time issues (L3, L6)

#### UNIT I

##### Introduction to Design Thinking

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

#### UNIT II

##### Design Thinking Process

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, customer, journey map, brainstorming, product development

**Activity:** Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

#### UNIT III

##### Innovation

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations- Creativity to Innovation- Teams for innovation- Measuring the impact and value of creativity.

**Activity:** Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003 Andhra Pradesh (India)**

(Established by Andhra Pradesh Act No.22 of 2021)

**UNIT IV**

**Product Design**

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications- Innovation towards product design- Case studies

**Activity:** Importance of modelling, how to set specifications, Explaining their own product design.

**UNIT V**

**Design Thinking in Business Processes**

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs- Design thinking for Startups- Defining and testing Business Models and Business Cases- Developing & testing prototypes.

**Activity:** How to market our own product, About maintenance, Reliability and plan for startup.

**Textbooks:**

1. Tim Brown, Change by design, Harper Bollins (2009)
2. Idris Mootee, Design Thinking for Strategic Innovation, 2013, John Wiley & Sons.

**Reference Books:**

1. David Lee, Design Thinking in the Classroom, Ulysses press
2. Shrutin N Shetty, Design the Future, Norton Press
3. William Lidwell, Universal Principles of Design- Kritinaholden, Jill Butter.
4. Chesbrough. H, The Era of Open Innovation – 2013

**Online Learning Resources:**

- <https://nptel.ac.in/courses/110/106/110106124/>
- <https://nptel.ac.in/courses/109/104/109104109/>
- [https://swayam.gov.in/ndl\\_noc19\\_mg60/preview](https://swayam.gov.in/ndl_noc19_mg60/preview)

\*\*\*\*\*

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA VIZIANAGARAM**



**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)**

**CSE (Cyber Security)**

**B.Tech. – III Year I Semester**

| S.No. | Category                                   | Title                                                                                                                                                                                       | L  | T | P  | Credits |
|-------|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|---|----|---------|
| 1     | Professional Core                          | Cloud Computing                                                                                                                                                                             | 3  | 0 | 0  | 3       |
| 2     | Professional Core                          | Introduction to Cyber Security                                                                                                                                                              | 3  | 0 | 0  | 3       |
| 3     | Professional Core                          | Automata Theory & Compiler Design                                                                                                                                                           | 3  | 0 | 0  | 3       |
| 3     | Professional Elective-I                    | 1. Software Engineering<br>2. Wireless Sensor Networks<br>3. Microprocessors & Microcontrollers<br>4. Artificial Intelligence<br>5. 12-week MOOC Swayam/NPTEL course recommended by the BoS | 3  | 0 | 0  | 3       |
| 4     | Open Elective- I                           | <b>Open elective offered by other department</b>                                                                                                                                            | 3  | 0 | 0  | 3       |
| 6     | Professional Core                          | Cloud Computing Lab                                                                                                                                                                         | 0  | 0 | 3  | 1.5     |
| 7     | Professional Core                          | Cyber Security Lab                                                                                                                                                                          | 0  | 0 | 3  | 1.5     |
| 8     | Skill Enhancement course                   | Sale Force                                                                                                                                                                                  | 0  | 1 | 2  | 2       |
| 9     | Engineering Science                        | Tinkering Lab                                                                                                                                                                               | 0  | 0 | 2  | 1       |
| 10    | Evaluation of Community Service Internship |                                                                                                                                                                                             | -  | - | -  | 2       |
| Total |                                            |                                                                                                                                                                                             | 14 | 1 | 10 | 23      |

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA VIZIANAGARAM**



**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)**

**CSE (Cyber Security)**

**B.Tech.– III Year II Semester**

| S.No.                                                                     | Category                  | Title                                                                                                                                                                                                  | L         | T        | P         | Credits   |
|---------------------------------------------------------------------------|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------|-----------|-----------|
| 1                                                                         | Professional Core         | Cyber Crimes & Digital Forensics                                                                                                                                                                       | 3         | 0        | 0         | 3         |
| 2                                                                         | Professional Core         | Cryptography & Network Security                                                                                                                                                                        | 3         | 0        | 0         | 3         |
| 3                                                                         | Professional Core         | Machine Learning                                                                                                                                                                                       | 3         | 0        | 0         | 3         |
| 4                                                                         | Professional Elective-II  | 1. Software Testing Methodologies<br>2. DevOps<br>3. Internet of Things<br>4. Applied Cryptography<br>5. 12-week MOOC Swayam/NPTEL course recommended by the BoS                                       | 3         | 0        | 0         | 3         |
| 5                                                                         | Professional Elective-III | 1. Software Project Management<br>2. Mobile Adhoc Networks<br>3. Natural Language Processing<br>4. Security Assessment and Risk Analysis<br>5. 12-week MOOC Swayam/NPTEL course recommended by the BoS | 3         | 0        | 0         | 3         |
| 6                                                                         | Open Elective – II        | <b>Open elective offered by other department</b>                                                                                                                                                       | 3         | 0        | 0         | 3         |
| 7                                                                         | Professional Core         | Cryptography & Network Security Lab                                                                                                                                                                    | 0         | 0        | 3         | 1.5       |
| 8                                                                         | Professional Core         | Cyber Crimes & Digital Forensics Lab                                                                                                                                                                   | 0         | 0        | 3         | 1.5       |
| 9                                                                         | Skill Enhancement course  | Soft skills                                                                                                                                                                                            | 0         | 1        | 2         | 2         |
| 10                                                                        | Audit Course-2            | Technical Paper Writing & IPR                                                                                                                                                                          | 2         | 0        | 0         | -         |
| <b>Total</b>                                                              |                           |                                                                                                                                                                                                        | <b>19</b> | <b>1</b> | <b>06</b> | <b>23</b> |
| Mandatory Industry Internship of 08 weeks duration during summer vacation |                           |                                                                                                                                                                                                        |           |          |           |           |

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA VIZIANAGARAM**



**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)**

**CSE (Cyber Security)**

**CSE (Cyber Security)**

**B.Tech. – IV Year I Semester**

| S.No.        | Category                 | Title                                                                                                                                                                                                                     | L         | T        | P         | Credits   |
|--------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------|-----------|-----------|
| 1            | Professional Core        | Block chain Technology                                                                                                                                                                                                    | 3         | 0        | 0         | 3         |
| 2            | Management Course- II    | Human Resource Management                                                                                                                                                                                                 | 2         | 0        | 0         | 2         |
| 3            | Professional Elective-IV | 1. Software Architecture & Design Patterns<br>2. Network Management Systems and Operations<br>3. Deep Learning<br>4. Malware Analysis & Reverse Engineering<br>5. 12 week MOOC Swayam/NPTEL course recommended by the BoS | 3         | 0        | 0         | 3         |
| 4            | Professional Elective-V  | 1. Computer Graphics<br>2. Intrusion Detection and Prevention System<br>3. Metaverse<br>4. Cyber Laws and Security Policies<br>5. 12 week MOOC Swayam/NPTEL course recommended by the BoS                                 | 3         | 0        | 0         | 3         |
| 5            | Open Elective-III        | <b>Open elective offered by other department</b>                                                                                                                                                                          | 3         | 0        | 0         | 3         |
| 6            | Open Elective-IV         | <b>Open elective offered by other department</b>                                                                                                                                                                          |           |          |           | 3         |
| 7            | Skill Enhancement Course | Ethical Hacking                                                                                                                                                                                                           | 0         | 1        | 2         | 2         |
| 8            | Audit Course-3           | Gender Sensitization                                                                                                                                                                                                      | 2         | 0        | 0         | -         |
| 9            | Internship               | Evaluation of Industry Internship                                                                                                                                                                                         | -         | -        | -         | 2         |
| <b>Total</b> |                          |                                                                                                                                                                                                                           | <b>19</b> | <b>1</b> | <b>06</b> | <b>21</b> |

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA VIZIANAGARAM**

VIZIANAGARAM – 535 003, Andhra Pradesh, India

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)**

**CSE (Cyber Security)**

CSE (Cyber Security)

**B.Tech.– IV Year II Semester**

| S.No. | Category                  | Title                                   | L | T | P  | Credits |
|-------|---------------------------|-----------------------------------------|---|---|----|---------|
| 1     | Internship & Project Work | Full semester Internship & Project Work | 0 | 0 | 24 | 12      |

**OPEN ELECTIVES OFFERED BY CSE (CYBER SECURITY) TO OTHER BRANCHES:**

|                                                                                                                                         |                                                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>OPEN ELECTIVE -I</b><br>1. Introduction to Artificial Intelligence<br>2. Ethical hacking<br>3. Exploratory Data Analysis with Python | <b>OPEN ELECTIVE -II</b><br>1. Fundamentals of Data Base Management System<br>2. Data encryption and network security<br>3. AI Chabot |
| <b>OPEN ELECTIVE -III</b><br>1. Introduction to Cyber Security<br>2. Digital forensics<br>3. Social Media Analytics                     | <b>OPEN ELECTIVE -IV</b><br>1. Internet of Things<br>2. Data Wrangling and Pre-processing<br>3. Fundamentals of Cloud Computing       |



|                     |                 |   |   |   |   |
|---------------------|-----------------|---|---|---|---|
| III Year I Semester | CLOUD COMPUTING | L | T | P | C |
|                     |                 | 3 | 0 | 0 | 3 |

**Course Objectives:**

- To provide students with the fundamentals and essentials of Cloud Computing.
- To provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.
- To enable students exploring some important cloud computing driven commercial systems and applications.
- To expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research.

**UNIT I:**

**Introduction:** Network centric computing, Network centric content, peer-to –peer systems, cloud computing delivery models and services, Ethical issues, Vulnerabilities, Major challenges for cloud computing

Parallel and Distributed Systems: introduction, architecture, distributed systems, communication protocols, logical clocks, message delivery rules, concurrency, and model concurrency with Petri Nets.

**UNIT II:**

**Cloud Infrastructure:** At Amazon, The Google Perspective, Microsoft Windows Azure, Open Source Software Platforms, Cloud storage diversity, Inter cloud, energy use and ecological impact, responsibility sharing, user experience, Software licensing Cloud Computing : Applications and Paradigms: Challenges for cloud, existing cloud applications and new opportunities, architectural styles, workflows, The Zookeeper, The Map Reduce Program model, HPC on cloud, biological research

**UNIT III:**

**Cloud Resource virtualization:** Virtualization, layering and virtualization, virtual machine monitors, virtual machines, virtualization- full and para, performance and security isolation, hardware support for virtualization, Case Study: Xen, vBlades

Cloud Resource Management and Scheduling: Policies and Mechanisms,

Applications of control theory to task scheduling, Stability of a two-level resource allocation architecture, feed back control based on dynamic thresholds, coordination, resource bundling, scheduling algorithms, fair queuing, start time fair queuing, cloud scheduling subject to deadlines, Scheduling Map Reduce applications, Resource management and dynamic application scaling

**UNIT IV:**

**Storage Systems:** Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system., Apache Hadoop, Big Table, Megastore ( text book 1), Amazon Simple Storage Service(S3) (Text book 2)

Cloud Security: Cloud security risks, security – atop concern for cloud users, privacy and privacy impact assessment, trust, OS security, Virtual machine security, Security risks

**UNIT V:**

**Cloud Application Development:** Amazon Web Services : EC2 – instances, connecting clients, security rules, launching, usage of S3 in Java, Installing Simple Notification Service on Ubuntu 10.04, Installing



**CSE (Cyber Security)**

Hadoop on Eclipse, Cloud based simulation of a Distributed trust algorithm, Cloud service for adaptive data streaming ( Text Book 1)

Google: Google App Engine, Google Web Toolkit (Text Book 2)

Microsoft: Azure Services Platform, Windows live, Exchange Online, Share Point Services, Microsoft Dynamics CRM (Text Book 2)

**Course Outcomes:**

After successful completion of this course, student will be able to

- Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
- Apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost.
- Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing.
- Analyze various cloud programming models and apply them to solve problems on the cloud.

**TEXT BOOKS:**

1. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier
2. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH



|                     |                                |   |   |   |   |
|---------------------|--------------------------------|---|---|---|---|
| III Year I Semester | INTRODUCTION TO CYBER SECURITY | L | T | P | C |
|                     |                                | 3 | 0 | 0 | 3 |

**Course Objectives:**

- To learn threats and risks within context of the cyber security architecture.
- Student should learn and Identify security tools and hardening techniques.
- To learn types of incidents including categories, responses and timelines for response.

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

- Apply cyber security architecture principles.
- Demonstrate the risk management processes and practices.
- Appraise cyber security incidents to apply appropriate response
- Distinguish system and application security threats and vulnerabilities.
- Identify security tools and hardening techniques

**UNIT-I:**

**Introduction to Cyber Security**-Cyber security objectives, roles, differences between information security and cyber security, Cyber security principles-confidentiality, integrity, availability, authentication and non repudiation

**UNIT-II:**

**Information Security within Lifecycle Management**-Lifecycle management landscape, Security architecture processes, Security architecture tools, Intermediate lifecycle management concepts, **Risks & Vulnerabilities**-Basics of risk management, Operational threat environments, Classes of attacks

**UNIT-III:**

**Incident Response**-Incident categories, Incident response, Incident recovery, **Operational security protection**-Digital and data assets, ports and protocols, Protection technologies, Identity and access Management, configuration management

**UNIT-IV:**

**Threat Detection and Evaluation Monitoring**-Vulnerability management, Security logs and alerts, Monitoring tools and appliances, **Analysis**-Network traffic analysis, packet capture and analysis

**UNIT-V:**

**Introduction to backdoor System and security**-Introduction to metasploit, backdoor, demilitarized zone (DMZ), Digital signature, Brief study on Harding of operating system.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA VIZIANAGARAM**



**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)**

**CSE (Cyber Security)**

**Text Books:**

1. NASSCOM: Security Analyst Student Hand Book, Dec 2015
2. Information Security Management Principles, Updated Edition, [David Alexander](#), [Amanda Finch](#), [David Sutton](#), BCS publishers, June 2013

**Reference Books:**

1. Cyber Security Fundamentals-Cyber Security, Network Security and Data Governance Security, 2<sup>nd</sup> Edition, ISACA Publishers, 2019



|                            |                                              |          |          |          |          |
|----------------------------|----------------------------------------------|----------|----------|----------|----------|
| <b>III Year I Semester</b> | <b>Automata Theory &amp; Compiler Design</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                            |                                              | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**Course Objectives:**

- Automata and compiler Design mainly deals with the languages which are formal and regular and also deals with grammar present in the machine.
- An compiler is a program that accepts a program in source language and converts into a machine understandable format.
- The push down automata is the major one it's a five tuple set containing states, alphabets, transition function and accept states.

**UNIT - I:**

**Formal Language and Regular Expressions:** Languages, Definition Languages regular expressions, Finite Automata – DFA, NFA. Conversion of regular expression to NFA, NFA to DFA. Applications of Finite Automata to lexical analysis, lex tools.

**Context Free grammars and parsing :** Context free grammars, derivation, parse trees, ambiguity LL(K) grammars and LL(1) parsing

**UNIT - II:**

Bottom up parsing handle pruning LR Grammar Parsing, LALR parsing, parsing ambiguous grammars, YACC programming specification.

**Semantics:** Syntax directed translation, S-attributed and L-attributed grammars, Intermediate code – abstract syntax tree, translation of simple statements and control flow statements.

**UNIT - III:**

**Context Sensitive features** – Chomsky hierarchy of languages and recognizers. Type checking, type conversions, equivalence of type expressions, overloading of functions and operations.

**UNIT - IV:**

**Run time storage :** Storage organization, storage allocation strategies scope access to now local names, parameters, language facilities for dynamics storage allocation.

**Code optimization :** Principal sources of optimization, optimization of basic blocks, peephole optimization, flow graphs, Data flow analysis of flow graphs.

**UNIT - V:**

**Code generation:** Machine dependent code generation, object code forms, generic code generation algorithm, Register allocation and assignment. Using DAG representation of Block.

**TEXT BOOKS:**

1. Introduction to Theory of computation.Sipser, 2nd Edition, Thomson.
2. Compilers Principles, Techniques and Tools Aho, Ullman, Ravisethi, Pearson Education.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA VIZIANAGARAM**



**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)**

**CSE (Cyber Security)**

**REFERENCES:**

1. Modern Compiler Construction in C , Andrew W.Appel Cambridge University Press.
2. Compiler Construction, LOUDEN, Thomson.
3. Elements of Compiler Design, A. Meduna, Auerbach Publications, Taylor and Francis Group.
4. Principles of Compiler Design, V. Raghavan, TMH.
5. Engineering a Compiler, K. D. Cooper, L. Torczon, ELSEVIER.

**Course Outcomes:**

- Graduate should be able to understand the concept of abstract machines and their power to recognize the languages.
- Attains the knowledge of language classes & grammars relationship among them with the help of chomsky hierarchy.
- Ability to understand the design of a compiler given features of the languages.

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA VIZIANAGARAM



VIZIANAGARAM – 535 003, Andhra Pradesh, India

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)**

**CSE (Cyber Security)**

|                     |                                                 |   |   |   |   |
|---------------------|-------------------------------------------------|---|---|---|---|
| III Year I Semester | Software Engineering<br>Professional Elective-I | L | T | P | C |
|                     |                                                 | 3 | 0 | 0 | 3 |

## Course Objectives:

The objectives of this course is to acquire knowledge on the

- i. To understand the software life cycle models.
- ii. To understand the software requirements and SRS document.
- iii. To understand the importance of modeling and modelling languages.
- iv. To design and develop correct and robust software products.

## UNIT – I:

**Software and Software Engineering:** The Nature of Software, The Unique Nature of Web Apps, Software Engineering, Software Process, Software Engineering Practice, Software Myths.

**Process Models:** A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Terminology, Product and Process.

## UNIT - II:

**Requirements Analysis And Specification:** Requirements Gathering and Analysis, Software Requirement Specification (SRS), Formal System Specification.

**Software Design:** Overview of the Design Process, How to Characterize of a Design, Cohesion and Coupling, Layered Arrangement of Modules, Approaches to Software Design

## UNIT – III:

**Function-Oriented Software Design:** Overview of SA/SD Methodology, Structured Analysis, Developing the DFD Model of a System, Structured Design, Detailed Design, Design Review, over view of Object Oriented design.

**User Interface Design:** Characteristics of Good User Interface, Basic Concepts, Types of User Interfaces, Fundamentals of Component-based GUI Development, A User Interface Design Methodology.

## UNIT - IV:

**Coding And Testing:** Coding, Code Review, Software Documentation, Testing, Unit Testing, Black-Box Testing, White-Box Testing, Debugging, Program Analysis Tool, Integration Testing, Testing Object-Oriented Programs, System Testing, Some General Issues Associated with Testing

## UNIT - V:

**Software Reliability And Quality Management:** Software Reliability, Statistical Testing, Software Quality, Software Quality Management System, ISO 9000, SEI Capability Maturity Model.

**Software Maintenance:** Software maintenance, Maintenance Process Models, Maintenance Cost, Software Configuration Management.

**Software Reuse:** what can be reused? Why almost No Reuse So Far? Basic Issues in Reuse Approach, Reuse at Organization Level

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA VIZIANAGARAM**



**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)**

**CSE (Cyber Security)**

**Course Outcomes:**

- i. Define and develop a software project from requirement gathering to implementation.
- ii. Obtain knowledge about principles and practices of software engineering.
- iii. Focus on the fundamentals of modelling a software project.
- iv. Obtain basic knowledge of coding
- v. Obtain knowledge about estimation maintenance and reuse of software systems.

**Text Books:**

1. Software engineering A practitioner's Approach, Roger S. Pressman, Seventh Edition McGrawHillInternationalEdition.
2. Fundamentals of Software Engineering, Rajib Mall, Third Edition, PHI.
3. Software Engineering, Ian Sommerville, Ninth edition, Pearsoneducation

**References:**

1. Software Engineering : A Primer, Waman S Jawadekar, Tata McGraw-Hill,2008
2. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India,2010.
3. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
4. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer International edition,2006.

**Web References:**

<https://nptel.ac.in/courses/10>



|                     |                                                     |   |   |   |   |
|---------------------|-----------------------------------------------------|---|---|---|---|
| III Year I Semester | Wireless Sensor Networks<br>Professional Elective-I | L | T | P | C |
|                     |                                                     | 3 | 0 | 0 | 3 |

### Course Objectives

1. Define WSN and Dynamic modulation scaling.
2. Explore working of the MAC protocols
3. Demonstrate Routing and Data gathering protocols
4. Illustrate working of Embedded OS.
5. Explore a wide range of WSN applications in different sectors

### Unit-I – CHARACTERISTICS OF WSN (8 Hours)

Characteristic requirements for WSN – Challenges for WSNs – WSN vs Adhoc Networks – Sensor node architecture – Commercially available sensor nodes – Imote, IRIS, Mica Mote, EYES nodes, BTnodes, TelosB, Sunspot -Physical layer and transceiver design considerations in WSNs, Energy usage profile, Choice of modulation scheme, Dynamic modulation scaling, Antenna considerations.

### Unit – II: MEDIUM ACCESS CONTROL PROTOCOLS (10 Hours)

Fundamentals of MAC protocols – Low duty cycle protocols and wakeup concepts – Contention based protocols – Schedule-based protocols – SMAC – BMAC – Traffic adaptive medium access protocol (TRAMA) – The IEEE 802.15.4 MAC protocol.

### Unit – III: ROUTING AND DATA GATHERING PROTOCOLS (10 Hours)

Routing Challenges and Design Issues in Wireless Sensor Networks, Flooding and gossiping – Data centric Routing – SPIN – Directed Diffusion – Energy aware routing – Gradient-based routing – Rumor Routing – COUGAR – ACQUIRE – Hierarchical Routing – LEACH, PEGASIS – Location Based Routing – GF, GAF, GEAR, GPSR – Real Time routing Protocols – TEEN, APTEEN, SPEED, RAP – Data aggregation - data aggregation operations – Aggregate Queries in Sensor Networks – Aggregation Techniques – TAG, Tiny DB.

### Unit – IV: EMBEDDED OPERATING SYSTEMS (10 Hours)

Operating Systems for Wireless Sensor Networks – Introduction – Operating System Design Issues – Examples of Operating Systems – TinyOS – Mate – MagnetOS – MANTIS – OSPM – EYES OS – SenOS – EMERALDS – PicOS – Introduction to Tiny OS – NesC – Interfaces and Modules – Configurations and Wiring – Generic Components – Programming in Tiny OS using NesC, Emulator TOSSIM.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA VIZIANAGARAM**



**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)**

**CSE (Cyber Security)**

**Unit – V: APPLICATIONS OF WSN (10 Hours)**

WSN Applications – Home Control – Building Automation – Industrial Automation – Medical Applications – Reconfigurable Sensor Networks – Highway Monitoring – Military Applications – Civil and Environmental Engineering Applications – Wildfire Instrumentation – Habitat Monitoring – Nanoscopic Sensor Applications – Case Study: IEEE 802.15.4 LR-WPANs Standard – Target detection and tracking – Contour/edge detection – Field sampling

**Course Outcomes:**

1. Understand the basics, characteristics and challenges of Wireless Sensor Network
2. Apply the knowledge to identify appropriate physical and MAC layer protocol
3. Apply the knowledge to identify the suitable routing algorithm based on the network and user requirement
4. Analysis of OS used in Wireless Sensor Networks and build basic modules

Analyze specific WSN application using a case study approach

**Text Books:**

1. Wireless Sensor Networks Technology, Protocols, and Applications, KazemS ohraby, Daniel Minoli and TaiebZnati, John Wiley & Sons, 2007
2. Protocols and Architectures for Wireless Sensor Network, Holger Karl and Andreas Willig John Wiley & Sons, Ltd ,2005

**References Books:**

Title of the Reference book, Author Name, publisher Name, year of publication, Edition

1. A survey of routing protocols in wireless sensor networks , K. Akkaya and M. Younis, Elsevier
2. Ad Hoc Network Journal, Vol. 3, no. 3, pp. 325--349
3. TinyOS Programming, Philip Levis
4. Wireless Sensor Network Designs, Anna Ha ´c , John Wiley & Sons Ltd



|                     |                                                             |   |   |   |   |
|---------------------|-------------------------------------------------------------|---|---|---|---|
| III Year I Semester | Microprocessor & Microcontroller<br>Professional Elective-I | L | T | P | C |
|                     |                                                             | 3 | 0 | 0 | 3 |

### COURSE OBJECTIVES:

1. To understand the organization and architecture of Microprocessor
2. To understand addressing modes to access memory
3. To understand 8051 micro controller architecture
4. To understand the programming principles for 8086 and 8051
5. To understand how to develop cyber physical systems

### UNIT-1

Introduction to Microprocessor Architecture Introduction and evolution of Microprocessors – Architecture of 8086 – Memory Organization of 8086 – Register Organization of 8086 – Instruction sets of 8086 – Addressing modes – Assembler directives – Introduction to 80286, 80386, 80486 and Pentium (brief description about architectural advancements only).

### UNIT-2

**Minimum and Maximum Mode Operations** General bus operation of 8086 – Minimum and Maximum mode operations of 8086 – 8086 Control signal interfacing – Read and write cycle timing diagrams.

**Microprocessors I/O interfacing – I** 8255 PPI– Architecture of 8255–Modes of operation– Interfacing I/O devices to 8086 using 8255–Interfacing A to D converters– Interfacing D to A converters– Stepper motor interfacing– Static memory interfacing with 8086.

### UNIT-3

**Microprocessors I/O interfacing – II** Architecture and interfacing of 8251 USART – Architecture and interfacing of 8254 Timer/counter – Architecture and interfacing of DMA controller (8257) – Architecture 8259 Programmable Interrupt Controller (8259) – Command words and operating modes of 8259 – Interfacing of 8259 – Architecture of Keyboard/display controller (8279) – Modes of operation – Command words of 8279 – Interfacing of 8279.

### UNIT-4

**8051 Microcontroller:** Overview of 8051 Microcontroller – Architecture– Memory Organization – Register set – I/O ports and Interrupts – Timers and Counters – Serial Communication – Interfacing of peripherals Instruction set.

### UNIT-5

**PIC Architecture** Block diagram of basic PIC 18 micro controller – registers I/O ports – Programming in C for PIC: Data types, I/O programming, logical operations, data conversion.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA VIZIANAGARAM**



**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)**

**CSE (Cyber Security)**

**TEXT BOOKS:**

1. Ray and Burchandi, “Advanced Microprocessors and Interfacing”, Tata McGraw–Hill.
2. Kenneth J Ayala, “The 8051 Microcontroller Architecture, Programming and Applications”, Thomson Publishers, 2nd Edition.
3. PIC Microcontroller and Embedded Systems using Assembly and C for PIC 18, – Muhammad Ali Mazidi, RolindD.Mckinay , Danny causey -Pearson Publisher 21st Impression.

**REFERENCE BOOKS:**

1. Embedded Systems Fundamentals with Arm Cortex-M based Microcontrollers: A Practical Approach in English, by Dr. Alexander G. Dean, Published by Arm Education Media,2017.
2. Cortex -M3 Technical ReferenceManual.

**COURSE OUTCOMES:**

At the end of this course the student will be able to:

1. understand the Microprocessor capability in general and explore the evaluation of microprocessors.
2. understand the addressing modes of Microprocessors
3. understand the Microcontroller capability
4. program Microprocessors and Microcontrollers.
5. interface Microprocessors and Microcontrollers with other electronic devices



|                     |                                                    |   |   |   |   |
|---------------------|----------------------------------------------------|---|---|---|---|
| III Year I Semester | Artificial Intelligence<br>Professional Elective-I | L | T | P | C |
|                     |                                                    | 3 | 0 | 0 | 3 |

**Course Objectives:** The student will be able to

- Know the methodology of Problem solving
- Implement basic AI algorithms
- Design and carry out an empirical evolution of different algorithms on a problem formalization

**UNIT I:**

**Introduction to artificial intelligence:** Introduction ,history, intelligent systems, foundations of AI, applications, tic-tac-tie game playing, development of AI languages, current trends in AI.

**UNIT II:**

**Problem solving: state-space search and control strategies:** Introduction, general problem solving, characteristics of problem

**Search Strategies:** exhaustive searches, heuristic search techniques, iterative-deepening A\*, constraint satisfaction

**UNIT III:**

**Logic concepts:** Introduction, propositional calculus, propositional logic, natural deduction system, axiomatic system, semantic tableau system in propositional logic, predicate logic

**UNIT IV:**

**Knowledge representation:** Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR

**Advanced knowledge representation techniques:** Introduction, conceptual dependency theory, script structure.

**UNIT V:**

**Expert system and applications:** Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems blackboard systems truth maintenance systems, application of expert systems, list of shells and tools.

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

- Understand the fundamental concepts in Artificial Intelligence
- Analyze the applications of search strategies and problem reductions
- Apply the mathematical logic concepts.
- Develop the Knowledge representations in Artificial Intelligence.

Explain the Fuzzy logic systems

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA VIZIANAGARAM**



**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)**

**CSE (Cyber Security)**

**Text Books:**

1. Artificial Intelligence, Saroj Kaushik, CENGAGE Learning,
2. Artificial intelligence, A modern Approach, 2<sup>nd</sup> ed, Stuart Russel, Peter Norvig, PEA
3. Artificial Intelligence, Rich, Kevin Knight, Shiv Shankar B Nair, 3<sup>rd</sup> ed, TMH
4. Introduction to Artificial Intelligence, Patterson, PHI

**Reference Books:**

1. Artificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5<sup>th</sup> ed, PEA
2. Introduction to Artificial Intelligence, Ertel, Wolf Gang, Springer
3. Artificial Intelligence, A new Synthesis, Nils J Nilsson, Elsevier



|                     |                                           |   |   |   |   |
|---------------------|-------------------------------------------|---|---|---|---|
| III Year I Semester | Open elective offered by other department | L | T | P | C |
|                     |                                           | 3 | 0 | 0 | 3 |

|                     |                     |   |   |   |     |
|---------------------|---------------------|---|---|---|-----|
| III Year I Semester | Cloud Computing Lab | L | T | P | C   |
|                     |                     | 0 | 0 | 3 | 1.5 |

**Course Objectives:**

- This course provides an insight into cloud computing
- Topics covered include- distributed system models, different cloud service models, service oriented architectures, cloud programming and software environments, resource management.

**Course Outcomes:**

- Understand various service types, delivery models and technologies of a cloud computing environment.
- Understand the ways in which the cloud can be programmed and deployed.
- Understand cloud service providers like Cloudsim, Globus Toolkit etc.
- Examine various programming paradigms suitable to solve real world and scientific problems using cloud services.

**List of Experiments:**

1. Install Virtualbox/VMware Workstation with different flavors of Linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Create an Amazon EC2 instance and set up a web-server on the instance and associate an IP address with the instance.
4. Install Google App Engine. Create a hello world app and other simple web applications using python/java.
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 word count.
9. Create a database instance in the cloud using Amazon RDS.
10. Create a database instance in the cloud using Google Cloud SQL

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA VIZIANAGARAM**



**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)**

**CSE (Cyber Security)**

**TEXT BOOK:**

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

**REFERENCE BOOKS:**

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
3. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010



|                     |                    |   |   |   |     |
|---------------------|--------------------|---|---|---|-----|
| III Year I Semester | Cyber Security Lab | L | T | P | C   |
|                     |                    | 0 | 0 | 3 | 1.5 |

**Course Objectives:**

- Understanding Cybersecurity Principles and Techniques
- Application of Security Tools and Methods

**Lab Experiments**

1. Implement and test simple symmetric encryption algorithms like AES and DES.
2. Implement RSA encryption to demonstrate the concept of public and private keys.
3. Set up and configure a basic firewall using tools like iptables on Linux.
4. Demonstrate DNS spoofing and DNS cache poisoning attacks.
5. Set up a proxy server and demonstrate how attackers can use proxies to hide their tracks.
6. Demonstrate basic antifoensics techniques like
  - i. Deleting logs
  - ii. Using steganography tools.
7. Perform SQL injection on a test website and then implement measures to prevent it.
8. Create a simple application vulnerable to buffer overflow and demonstrate how to exploit it.
9. Implement an XSS attack on a test web application and demonstrate ways to mitigate such attacks.
10. Analyze a simple computer virus in a controlled environment and discuss detection and prevention strategies.
11. Investigate the functioning of a rootkit and demonstrate techniques to detect it.
12. Set up a basic IDS like Snort and test its effectiveness in detecting different types of attacks.

**Course Outcomes:**

1. Practical Skills in Cybersecurity Tools and Techniques
2. Analytical and Problem-Solving Abilities

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA VIZIANAGARAM**



**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)**

**CSE (Cyber Security)**

**TEXT BOOK:**

1. James Graham, Richard Howard, Ryan Olson, “Cyber Security Essentials”, CRC Press, Taylor & Francis Group, 2011.

**REFERENCE BOOKS:**

1. Mayank Bhusan, Rajkumar Singh Rathore, Aatif Jamshed, “Fundamental Of Cyber Security (Principles, Theory and Practices) BPB Publications 2018



**CSE (Cyber Security)**

|                     |                                           |          |          |          |          |
|---------------------|-------------------------------------------|----------|----------|----------|----------|
| III Year I Semester | Sales Force<br>(Skill Enhancement course) | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                     |                                           | 0        | 1        | 2        | 2        |

**Course Objectives:**

- Sales force training equips you with an in-depth understanding of the top Customer Relationship Management (CRM) platform worldwide.
- This training introduces learners to the dynamics of managing customer relationships effectively and leveraging Sales force's tools to drive business growth.

**Course Outcomes:**

1. Understand the functionality of CRM.
2. Analyze the Custom App Functionality and to develop the real world Apps using Lightning web components.
3. Apply AI insights to business processes for strategic decision-making.
4. Build and Configure Prompts Using Prompt Builder
5. Creation of APEX Test cases to debug real world apps.

**Module I:** Introduction to CRM, Sales force Values, Trailhead and Trailblazer Community, Trailhead Playground Management, Sales force Platform Basics, Picklist Administration , Duplicate Management

**Module II:**, Data Modelling, Formulas and Validations, Data management, Data Security ,Event Monitoring, Shield Platform Encryption, Lightning App Builder, Lightning Web Components Basics, API Basics.

**Module III:**, LLMs, Data Fundamentals For AI, Data +AI+CRM, Prompt Fundamentals, Prompt Builder Basics, Autonomous Agents, Agent force Builder

**Module IV :** Customize Agent force, Hands on Prompt Builder, Deploying Agents

**Module V:** Apex Basics & Databases, Apex Triggers, Apex Testing, Asynchronous Apex, Apex Integration Services.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA VIZIANAGARAM**



**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)**

**CSE (Cyber Security)**

**Textbooks:**

1. Learning Sales force Development with APEX, Paul Bateson, 2nd Edition, August 2022.
2. Practical Guide To Sales force Communities, Philip Weinmeister, Apress, 1st Edition, June 2018.

**References:**

1. <https://trailhead.salesforce.com>
2. <https://trailblazercommunitygroups.com>



|                     |                       |   |   |   |   |
|---------------------|-----------------------|---|---|---|---|
| III Year I Semester | Tinkering Lab         | L | T | P | C |
|                     | (Engineering Science) | 0 | 1 | 2 | 2 |

### Course Objective

1. A small unique idea can be become big changer when it gets the suitable platform and transformed into a product or re-define existing products with better enhancement.
2. This lab provides a platform to seed, fertilize and encourage the spirit of curiosity and innovation among young minds. It is a work place where students can give shape to their ideas.

### Course Outcome:

In the tinkering lab, students able to

- Apply prior knowledge to develop and conceptualize scientific methods and engineering techniques.
- Analyze real-world problems through self-directed exploration and iterative experimentation.
- Design and develop technical experiments or prototypes with available financial and mentoring support.
- *Evaluate and refine self-initiated projects by learning from failures, feedback, and performance metrics.*
- Create innovative, application-oriented solutions by integrating technical skills, creativity, and exploratory learning.

### List of Sample Projects:

- Face Recognition Door lock System
- Hand gesture recognition
- Text to speech
- Smart City
- Private chat room
- Android app controlled roboticarm
- Smart Traffic System
- Vehicle Accident Alam System
- Smart dustbin
- Surveillance BOT
- Automatic Water Gardening System
- e-Mirror
- Smart Parking System
- Service Bot
- Drone Surveillance
- Wallpaintingrobot



- Home automation
- Automated wheelchair
- AnyInnovativeIdea–RealTime application

**Expectations from the Lab:**

- Workshop on empathy, ideation, and identifying real-world problems.
- Understanding the basic logics with interaction as teams.
- Working Hand-on using present tools available
- Students form teams, plan their mini project and starts working with the help of the mentor
- Students do Hands-on building, troubleshooting, testing
- Finalize, document, and prepare for demonstration



|                      |                                  |   |   |   |   |
|----------------------|----------------------------------|---|---|---|---|
| III Year II Semester | Cyber Crimes & Digital Forensics | L | T | P | C |
|                      |                                  | 3 | 0 | 0 | 3 |

:

**COURSE OBJECTIVES:**

1. To provide an understanding of cybercrime types, motives, and trends in the digital world.
2. To study the various digital crime investigation methods and forensic procedures.
3. To impart knowledge of different cyber laws and legal frameworks for prosecuting cybercriminals.
4. To understand the tools and technologies used for digital forensics investigations.
5. To equip students with practical knowledge in evidence acquisition, preservation, analysis, and reporting.

**SYLLABUS**

**UNIT-I:**

**Introduction to Cyber Crimes:** Definition and origins of cybercrime, classification of cybercrimes – hacking, phishing, spoofing, cyberstalking, cyberbullying, cyber terrorism, online frauds. Reasons for cybercrimes – social, psychological, and economic factors. Challenges in combating cybercrimes. Role of cybercriminals, organized cybercrime groups, and insider threats. Real-life cybercrime case studies.

**UNIT-II:**

**Cybercrime and Legal Perspectives:** Overview of Indian IT Act 2000 and amendments, international cyber laws and treaties. Legal issues in cyberspace – jurisdiction, identity theft, privacy, and data protection. Cyber law enforcement agencies and their roles. Investigation procedures and legal frameworks. Case laws relating to cybercrimes in India and globally.

**UNIT-III:**

**Introduction to Digital Forensics:** Meaning and scope of digital forensics, objectives and stages of digital investigation. Types of digital evidence – volatile and non-volatile. Basics of evidence acquisition, chain of custody, and preservation. Digital crime scene management. Ethics in digital forensics. Forensic readiness and incident response.

**UNIT-IV:**

**Digital Forensic Tools and Techniques:** Overview of forensic tools such as EnCase, FTK, Autopsy, Kali Linux, and Sleuth Kit. File system analysis (FAT, NTFS), email and browser forensics, mobile device forensics. Network forensics and packet analysis using Wireshark. Password cracking techniques and tools. Steganography and its detection.

**UNIT-V:**

**Cyber Forensics Investigation Process:** Planning and preparation for investigation, collection and validation of evidence, examination and analysis. Documentation and reporting standards. Writing forensic reports. Expert testimony and court presentation of evidence. Recent trends in digital forensics – AI in forensics, cloud forensics, IoT forensics, and anti-forensics.

**COURSE OUTCOMES:**

1. Understand and classify various types of cybercrimes and their causes.
2. Apply knowledge of national and international cyber laws in real-world contexts.
3. Demonstrate proficiency in digital forensic tools for evidence acquisition and analysis.
4. Analyze digital crime scenes and develop forensic reports based on standard procedures.
5. Identify emerging challenges and technologies in the field of digital forensics.



**TEXTBOOKS:**

1. **Nelson, B., Phillips, A., & Steuart, C.** – *Guide to Computer Forensics and Investigations*, Cengage Learning, 6th Edition.
2. **Marjie T. Britz** – *Computer Forensics and Cyber Crime: An Introduction*, Pearson Education, 2nd Edition.
3. **K.K. Ravi** – *Cyber Laws and Information Technology*, Khanna Publishers, 2017.

**REFERENCE BOOKS:**

1. **John R. Vacca** – *Computer Forensics: Computer Crime Scene Investigation*, Charles River Media, 2005.
2. **Chirag Shah** – *Digital Forensics: Threatscape and Best Practices*, Springer, 2019.
3. **William Stallings** – *Computer Security: Principles and Practice*, Pearson Education, 4th Edition.



|                      |                                 |   |   |   |   |
|----------------------|---------------------------------|---|---|---|---|
| III Year II Semester | Cryptography & Network Security | L | T | P | C |
|                      |                                 | 3 | 0 | 0 | 3 |

**Course**

In this course, the following principles and practice of cryptography and network security are covered:

- Classical systems, symmetric block ciphers (DES, AES, other contemporary symmetric ciphers)
- Public-key cryptosystems (RSA, El Gamal, and ECC)
- Algorithms for factoring and discrete logarithms
- Cryptographic protocols, hash functions, authentication, key management, key exchange, signature schemes
- The fundamental aspects of Email and web security, viruses, firewalls, cyber laws, and other topics are discussed.

**UNIT-I: Introduction and Mathematical Background**

Security Goals, Attacks, Services and Mechanisms, Model for Network Security, Cryptography and Cryptanalysis, Symmetric vs. Asymmetric Ciphers, Substitution vs. Transposition Ciphers, Stream vs. Block ciphers.

**Number Theory:** Primes, Coprimes, Primality Test, GCD (Euclid’s algorithm), Groups and Fields, Discrete Logarithmic Problem.

**Modular Arithmetic:** Basics, Congruence, Fermat’s Little Theorem, Euler’s Theorem, Computing Inverse, Chinese Remainder Theorem.

**UNIT-II: Symmetric Ciphers**

Classic Ciphers, Confusion and Diffusion, Feistel Structure, DES, Modes of operation, Triple DES, IDEA, Blowfish, AES.

**UNIT-III: Public Key Cryptography**

RSA (algorithm, performance, and attacks), Diffie-Hellman Key Exchange, El Gamal (encryption and signatures), Elliptic Curve Cryptography (Elliptic Curves, encryption, key exchange, and signatures).

**UNIT-IV: Key Management and Authentication**

Cryptographic Hash, Message Authentication Codes, Digital Signatures, X.509 certificates, PKI, One Way Authentication, Mutual Authentication, Centralised Authentication, Kerberos.

**UNIT-V: Network Security and Malware**

IPsec (Transport vs. Tunnel, AH, ESP, Security Associations, IKE), SSL, Firewalls and Intrusion Detection Systems, DoS and DDoS, Buffer Overflow, Format String Vulnerabilities,

**The IT Act 2000:** Aim and Objectives, Scope, Offences and Punishments.

**Course Outcomes:**

- To be familiar with information security awareness and a clear understanding of its importance.
- To master fundamentals of secret-key and public-key cryptographic systems.
- To master protocols that provide security and authentication services.
- To be familiar with network security threats and countermeasures.
- To be familiar with different types of cybercrimes and cyber laws.



**Textbooks:**

1. *Cryptography and Network Security: Principles and Practice*, Sixth Edition, William Stallings, Pearson, 7th edition.
2. *Cryptography and Network Security*, Third Edition, Behrouz A. Forouzan, Debdeep Mukhopadhyay, McGraw Hill.
3. *Cryptography, Network Security and Cyber Laws*, Bernard L. Menezes, Ravinder Kumar, Cengage.

**Reference Books:**

1. *Introduction to Computer Networks & Cyber Security*, Chwan Hwa Wu, J. David Irwin, CRC Press.
2. *Everyday Cryptography: Fundamental Principles & Applications*, Keith Martin, Oxford.



|                      |                  |   |   |   |   |
|----------------------|------------------|---|---|---|---|
| III Year II Semester | Machine Learning | L | T | P | C |
|                      |                  | 3 | 0 | 0 | 3 |

**Course Objectives:**

The objectives of the course is to

- Define machine learning and its different types (supervised and unsupervised) and understand their applications.
- Apply supervised learning algorithms including decision trees and k-nearest neighbours (k-NN).
- Implement unsupervised learning techniques, such as K-means clustering.

**UNIT-I: Introduction to Machine Learning:** Evolution of Machine Learning, Paradigms for ML, Learning by Rote, Learning by Induction, Reinforcement Learning, Types of Data, Matching, Stages in Machine Learning, Data Acquisition, Feature Engineering, Data Representation, Model Selection, Model Learning, Model Evaluation, Model Prediction, Search and Learning, Data Sets.

**UNIT-II: Nearest Neighbor-Based Models:** Introduction to Proximity Measures, Distance Measures, Non-Metric Similarity Functions, Proximity Between Binary Patterns, Different Classification Algorithms Based on the Distance Measures ,K-Nearest Neighbor Classifier, Radius Distance Nearest Neighbor Algorithm, KNN Regression, Performance of Classifiers, Performance of Regression Algorithms.

**UNIT-III: Models Based on Decision Trees:** Decision Trees for Classification, Impurity Measures, Properties, Regression Based on Decision Trees, Bias–Variance Trade-off, Random Forests for Classification and Regression.

**The Bayes Classifier:** Introduction to the Bayes Classifier, Bayes’ Rule and Inference, The Bayes Classifier and its Optimality, Multi-Class Classification | Class Conditional Independence and Naive Bayes Classifier (NBC)

**UNIT-IV: Linear Discriminants for Machine Learning:** Introduction to Linear Discriminants, Linear Discriminants for Classification, Perceptron Classifier, Perceptron Learning Algorithm, Support Vector Machines, Linearly Non-Separable Case, Non-linear SVM, Kernel Trick, Logistic Regression, Linear Regression, Multi-Layer Perceptrons (MLPs), Backpropagation for Training an MLP.

**UNIT-V: Clustering :** Introduction to Clustering, Partitioning of Data, Matrix Factorization | Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering, K-Means Clustering, Soft Partitioning, Soft Clustering, Fuzzy C-Means Clustering, Rough Clustering, Rough K-Means Clustering Algorithm, Expectation Maximization-Based Clustering, Spectral Clustering.

**Text Books:**

- 1.“Machine Learning Theory and Practice”, M N Murthy, V S Ananthanarayana, Universities Press (India), 2024

**Reference Books:**

- 1.“Machine Learning”, Tom M. Mitchell, McGraw-Hill Publication, 2017
- 2.“Machine Learning in Action”, Peter Harrington, DreamTech
- 3.“Introduction to Data Mining”, Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 7th Edition, 2019.



|                      |                                |   |   |   |   |
|----------------------|--------------------------------|---|---|---|---|
| III Year II Semester | Software Testing Methodologies | L | T | P | C |
|                      | Professional Elective-II       | 3 | 0 | 0 | 3 |

**Course Objectives:**

- To understand the purpose of Testing.
- To Study about Logic Based Testing.
- To learn how to Test a Project, Starting from Planning, Design Test Cases with Data, perform Testing operations, manage defects and generate test reports.
- To Understand the Software Testing automation process.
- To gain the techniques of using testing tools

**Course Outcomes:**

- Understand the concepts of Software Testing.
- Apply testing techniques to design the test cases for checking the functionality of software.
- Apply testing techniques to design the test cases for checking the structural aspects of software.
- Apply validation techniques across the software life cycle.
- Apply knowledge to design the test cases effectively and using the modern tools.

**Unit I:**

**Software Testing:** Introduction, Evolution, Myths & Facts, Goals, Psychology, Definition, Model for testing, Effective Vs Exhaustive Software Testing. Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle, relating test life cycle to development life cycle Software Testing Methodology

**Verification and Validation:** Verification & Validation Activities, Verification of Requirements, High level and low level designs, How to verify code, Validation

**Unit II:**

**Static Testing:** inspections, Structured Walkthroughs, Technical reviews

**Dynamic Testing I:** Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing, Error guessing

**Unit III:**

**Dynamic Testing II:** White-Box Testing: need, Logic coverage criteria, Basis path testing, Loop testing, data flow testing, mutation testing

**Graph matrices and Applications:** Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm

**Unit IV:**

**Validation activities:** Unit testing, Integration Testing,. Function testing, system testing, acceptance testing.

**Regression Testing:** Objectives, Types, Techniques.

**Unit V:**

**Efficient Test Suite Management:** Test case design Why does a test suite grow, Minimizing the test suite and its benefits, test suite prioritization techniques, Understanding severity vs priority.

**Automation and Testing Tools:** need for automation, categorization of testing tools, selection of testing tools, Cost incurred, Guidelines for automated testing.JIRA,Zephyr.

**Text Books:**

- Software Testing, Principles and Practices, Naresh Chauhan, Oxford, 2nd Edition, 2016.
- Software testing techniques - Baris Beizer, International Thomson computer press, second edition, 2002.
- Foundations of Software testing, Aditya P Mathur, 2<sup>nd</sup> edition , 2013.



**Reference books:**

- Software Testing- Yogesh Singh, CAMBRIDGE
- Software Testing, Principles, techniques and Tools, M G Limaye, TMH
- Effective Methods for Software testing, Willian E Perry, 3ed, Wiley
- Hands-On Test Management with Jira. Afsana Atar, Packt Publishing



|                      |                          |   |   |   |   |
|----------------------|--------------------------|---|---|---|---|
| III Year II Semester | DevOps                   | L | T | P | C |
|                      | Professional Elective-II | 3 | 0 | 0 | 3 |

**Course Objectives:**

- Understand the principles and practices of DevOps.
- Understand the tools and techniques used in automation, CI/CD, configuration management, and containerization.
- Develop, test, and deploy software efficiently using DevOps practices.
- Foster collaboration between software development and operations.
- Understand monitoring & security in DevOps

**Course Outcomes:**

- Understand the process of principles and practices of DevOps
- Analyze the techniques used in automation, CI/CD, configuration management, and containerization
- Develop, test, and deploy software efficiently using DevOps practices
- Apply the association rule mining to real time applications
- Apply the clustering algorithms to various data sets.

**Unit 1: Introduction to DevOps**

**Introduction to** Software Development life cycle and agile software development, DevOps Definition and Benefits and its Goals, differentiate between Traditional vs .DevOps IT Infrastructure, Cloud Platforms (AWS, GCP, Azure, IBM), DevOps Principles (CI, CD, CT, CM), DevOps Tools (Git, Jenkins, Docker, Kubernetes, Ansible, Terraform), DevOps Lifecycle (Development → Monitoring), Version Control (SVN, Git, GitHub, GitLab)

**Unit 2: Continuous Integration & Delivery (CI/CD)**

Introduction to CI/CD Concepts (Build, Test, Deploy Automation), CI/CD Tools (Jenkins, GitLab CI, CircleCI)

**Unit 3: Containerization & Orchestration**

**Introduction to Containers:** Difference between Containers and Virtual Machines, Benefits □ □ **Docker Basics:** Docker Images, Containers, Docker file, **Container Orchestration with Kubernetes:** Basic Components (Pods, Services, Deployments), Kubernetes Architecture, Scaling Applications, Kubernetes on Cloud (GKE, EKS, AKS)

**Unit 4: Configuration Management & IaC**

**Introduction to Configuration Management:** Why Configuration Management is Important. Tools: Ansible, Puppet, Chef,

**Infrastructure as Code:** Definition, Benefits, Tools like Terraform and Cloud Formation

**Unit 5: Monitoring & Security in DevOps**

**Introduction to DevOps Monitoring:** Importance and Overview, **Monitoring Tools:** Nagios, Prometheus, Grafana, **Log Management:** Centralized logging with ELK (Elastic search, Logstash, Kibana), **Security Tools:** Using tools like Sonar Qube for code analysis.



**Text Books:**

1. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations Paperback – October 6, 2016, 1st Edition.
2. Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation (Addison-Wesley Signature Series (Fowler)) 1st Edition by Jez Humble (Author), David Farley (Author), 1st Edition, 2010.
3. Docker Deep Dive Paperback – July 12, 2017 by Nigel Poulton (Author), 1st Edition.
4. Terraform: Up & Running, 2nd Edition by Yevgeniy Brikman Released September 2019 Publisher(s): O'Reilly Media, Inc.
5. The entire Pro Git book, written by Scott Chacon and Ben Straub and published by Apress, first edition, 2014.
6. What is Devops? Infrastructure as code, 1st Edition, Mike Loukides ,O'Reilly publications, 2012.

**Reference Books:**

1. Software Engineering: A Practitioner's Approach" – *Roger S. Pressman*
2. Building a DevOps Culture, 1st Edition, Mandi Walls, O'Reilly publications, 2013.
3. The DevOps 2.0 Toolkit: Automating the Continuous Deployment Pipeline With Containerized Micro services, 1st Edition, Viktor Farcic, CreateSpace Independent Publishing Platform publications, 2016
4. Continuous Delivery: Reliable Software Releases Through Build, Test, and Deployment Automation, 1st Edition, Jez Humble and David Farley, 2010.
5. Achieving DevOps: A Novel About Delivering the Best of Agile, DevOps

**Web References:**

1. [https://www.tutorialspoint.com/sdlc/sdlc\\_overview.htm](https://www.tutorialspoint.com/sdlc/sdlc_overview.htm)
2. <https://www.agilealliance.org/agile101/>
3. <https://scrumguides.org/>
4. <https://aws.amazon.com/devops/what-is-devops/>
5. [What is DevOps? - DevOps Models Explained - Amazon Web Services \(AWS\)](#)
6. [SDLC Overview](#)
7. [DevOps Roadmap: Learn to become a DevOps Engineer or SRE](#)
8. [Complete DevOps Roadmap 2025 - Master these 4 Levels!](#)
9. [Kunal Kushwaha - YouTube](#)
10. <https://www.sonarsource.com/products/sonarqube/>



|                      |                          |   |   |   |   |
|----------------------|--------------------------|---|---|---|---|
| III Year II Semester | Internet of Things       | L | T | P | C |
|                      | Professional Elective-II | 3 | 0 | 0 | 3 |

**Course Objectives:**

The main objectives of this course are

- Vision and Introduction to Internet of Things (IoT).
- Understand IoT Market perspective.
- Data and Knowledge Management and use of Devices in IoT Technology.
- Understand State of the Art – IoT Architecture.
- Understand Real World IoT Design Constraints, Industrial Automation and Commercial.

**Course Outcomes (COs):**

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

- Explain in a concise manner how the general Internet as well as Internet of Things work.
- Understand constraints and opportunities of wireless and mobile networks for Internet of Things.
- Use basic sensing and measurement and tools to determine the real-time performance of network of devices.
- Develop prototype models for various applications using IoT technology.

**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 M2M domains 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/M2M Applications/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.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)**

**CSE (Cyber Security)**

**Text Books:**

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

**Reference Books:**

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



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)**

**CSE (Cyber Security)**

|                             |                                 |          |          |          |          |
|-----------------------------|---------------------------------|----------|----------|----------|----------|
| <b>III Year II Semester</b> | <b>Applied Cryptography</b>     | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                             | <b>Professional Elective-II</b> | 3        | 0        | 0        | 3        |

**COURSE OBJECTIVES:**

1. To introduce students to the fundamental principles and concepts of cryptography.
2. To provide knowledge of various symmetric and asymmetric cryptographic algorithms.
3. To study key management, digital signatures, and cryptographic protocols.
4. To explore modern cryptographic applications such as SSL/TLS, blockchain, and secure email.
5. To develop the ability to design secure systems using applied cryptographic techniques.

**SYLLABUS**

**UNIT – I:**

Introduction to Cryptography and Security Principles: Overview of cryptography, security goals – confidentiality, integrity, availability, authenticity, and non-repudiation. Historical ciphers – Caesar cipher, monoalphabetic and polyalphabetic substitution. Cryptanalysis basics. Shannon's principles – confusion and diffusion. Introduction to modern cryptography and threat models.

**UNIT – II:**

Symmetric Key Cryptography: Block ciphers and stream ciphers. DES – structure, working, modes of operation. AES – architecture, key expansion, and rounds. Modern block cipher modes – ECB, CBC, CFB, OFB, CTR. RC4 and stream cipher principles. Attacks on symmetric ciphers – brute-force, differential, and linear cryptanalysis.

**UNIT – III:**

Asymmetric Key Cryptography: Principles of public key cryptography. RSA algorithm – key generation, encryption, decryption, and attacks. ElGamal cryptosystem, Diffie-Hellman key exchange. Elliptic Curve Cryptography (ECC) – basic idea and comparison with RSA. Applications of asymmetric encryption.

**UNIT – IV:**

Authentication and Digital Signatures: Message authentication codes (MAC), HMAC, hash functions – MD5, SHA-1, SHA-2. Digital signatures – RSA-based and ElGamal-based. Public Key Infrastructure (PKI), digital certificates, certificate authorities. Kerberos authentication protocol. Key distribution and key agreement.

**UNIT – V:**

Applied Cryptography in Practice: Cryptographic protocols – SSL/TLS, IPsec, PGP, S/MIME. Cryptography in Blockchain – hash puzzles, proof-of-work, digital wallets. Secure email, secure storage, and secure communication protocols. Side-channel attacks and countermeasures. Legal and ethical issues in cryptography.

**COURSE OUTCOMES:**



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)**

**CSE (Cyber Security)**

1. Understand core concepts of classical and modern cryptographic systems.
2. Analyze and apply symmetric and asymmetric cryptographic algorithms.
3. Use cryptographic primitives such as hash functions and digital signatures in security protocols.
4. Design secure communication systems incorporating cryptographic protocols.
5. Evaluate real-world applications and limitations of cryptographic techniques.

**TEXTBOOKS:**

1. **William Stallings** – *Cryptography and Network Security: Principles and Practice*, Pearson Education, 7th Edition.
2. **Bruce Schneier** – *Applied Cryptography: Protocols, Algorithms, and Source Code in C*, Wiley India, 2nd Edition.
3. **Behrouz A. Forouzan** – *Cryptography and Network Security*, McGraw Hill Education, 2nd Edition.

**REFERENCE BOOKS:**

1. **Douglas R. Stinson** – *Cryptography: Theory and Practice*, CRC Press, 3rd Edition.
2. **Wade Trappe and Lawrence C. Washington** – *Introduction to Cryptography with Coding Theory*, Pearson, 2nd Edition.
3. **Kaufman, Perlman & Speciner** – *Network Security: Private Communication in a Public World*, Pearson, 2nd Edition



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)**

**CSE (Cyber Security)**

|                             |                                    |          |          |          |          |
|-----------------------------|------------------------------------|----------|----------|----------|----------|
| <b>III Year II Semester</b> | <b>Software Project Management</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                             | <b>Professional Elective-II</b>    | 3        | 0        | 0        | 3        |

**Course Objectives:**

- To understand the basic concepts and effectively planning the software projects.
- To implement the project plans through managing people, communications and change
- To conduct activities necessary to successfully complete and close the Software projects
- To develop software projects based on current technologies.
- To develop awareness regarding the theoretical and methodological issues related to software project management.

**Course Outcomes:**

- Identify the theoretical and methodological issues involved in modern software project management
- Identify project goals, constraints, deliverables, performance criteria, control needs, and resource requirements in consultation with stakeholders
- Estimate project cost and perform cost-benefit evaluation among projects
- Document and evaluate outcomes of risk management plans
- Select and use project management frameworks for hiring the staff.

**Unit I:**

Project, Management, Software Project Management activities, Challenges in software projects, Stakeholders, Objectives & goals

Project Planning: Step-wise planning, Project Scope, Project Products & deliverables, Project activities, Effort estimation, Infrastructure

**Unit II:**

Lifecycle models, Choosing Technology, Prototyping Iterative & incremental Process Framework: Lifecycle phases, Process Artifacts, Process workflows

**Unit III:**

Estimation techniques, Function Point analysis, SLOC, COCOMO, Use case-based estimation

Activity Identification Approaches, Network planning models, Critical path analysis

**Unit IV:**

Risk categories, Identification, Assessment, Planning and management, PERT technique, Monte Carlo approach

Creating a framework for monitoring & control, Progress monitoring, Cost monitoring, Earned value Analysis, Software Quality Assurance, Quality Metrics.

**Unit V:**

Change Management, Impact analysis of change on budget and schedule, Managing people – Organizational behaviour – Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model – Stress – Health and Safety – Ethical and Professional concerns – Working in teams – Decision making – Organizational structures – Dispersed and Virtual teams – Communications genres – Communication plans – Leadership.

**Text Books:**



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)**

**CSE (Cyber Security)**

- Software Project Management, Bob Hughes & Mike Cotterell, TATA Mcgraw-Hill, 5th Edition, 2009
- Software Project Management, Walker Royce: Pearson Education, 1st Edition, 2005.

**Reference books:**

- Software Project Management in practice, Pankaj Jalote, Pearson, 1st Edition, January 2002.
- Software Project Management, Joel Henry, Pearson Education, 1st Edition, 2004.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)**

**CSE (Cyber Security)**

|                             |                                  |          |          |          |          |
|-----------------------------|----------------------------------|----------|----------|----------|----------|
| <b>III Year II Semester</b> | <b>Mobile Adhoc Networks</b>     | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                             | <b>Professional Elective-III</b> | 3        | 0        | 0        | 3        |

**Course Objectives:**

- To understand the concepts of AdHoc Wireless Networks
- To understand the Data Transmission in MANETS
- To understand the MAC protocols for ad- hoc networks
- To understand and analyze the various routing protocols and model link cost
- Understanding security in Adhoc Networks

**Course Outcomes:**

1. Evaluate the principles and characteristics of mobile adhoc networks(MANETs) and what distinguishes them from infrastructure-based networks
2. Discuss the challenges in designing MAC, routing, and transport protocols for wireless ad-hoc sensor networks
3. Understand the MAC Protocols for AdHoc Wireless Networks
4. Illustrate the various Routing Protocols And Transport Layer In Ad Hoc Wireless Networks
5. Demonstrate the issues and challenges in security provisioning and also familiar with the mechanisms for implementing security and trust mechanisms in MANETs and WSNs

**UNIT-I**

**INTRODUCTION:**

Introduction to ad-hoc networks – definition, characteristics features, applications. Characteristics of wireless channel, ad-hoc mobility models: indoor and outdoor models.

**UNIT-II**

**MEDIUM ACCESS PROTOCOLS:**

MAC Protocols: Design issues, goals and classification. Contention based protocols – with Reservation, scheduling algorithms, protocols using directional antennas. IEEE standards:802.11a,802.11b, 802.11g, 802.15. HIPERLAN.

**UNIT-III**

**NETWORK PROTOCOLS:**

Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, energy aware routing algorithm, hierarchical routing, QoS aware routing.

**UNIT-IV**

**END – END DELIVERY AND SECURITY:**

Transport Layer: Issues in designing – Transport layer classification, adhoc transport protocols.

Security issues in adhoc networks: issues and challenges, network security attacks, secure routing protocols.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)**

**CSE (Cyber Security)**

**UNIT-V**

**CROSS LAYER DESIGN:**

Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques, cross layer cautionary perspective. Integration of adhoc with Mobile IP networks.

**TextBooks**

- C. Siva Ram Murthy and B. S. Manoj, Ad hoc Wireless Networks Architecture and Protocols, 2nd edition, Pearson Edition, 2007.
- Charles E. Perkins, Ad hoc Networking, Addison – Wesley, first edition, 2001.

**References**

- Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, Mobile ad-hoc networking, Wiley-IEEE press, 2004.
- Mohammad Ilyas, The handbook of ad-hoc wireless networks, CRC press, 2002.
- T. Camp, J. Boleng, and V. Davies “ A Survey of Mobility Models for Ad-hoc Network”
- Research, “Wireless Commun, and Mobile Comp.. Special Issue on Mobile Ad-hoc Networking Research, Trends and Applications, Vol. 2, no. 5, 2002, pp. 483 – 502.
- A survey of integrating IP mobility protocols and Mobile Ad-hoc networks, Fekri M. bduljalil and Shrikant K. Bodhe, IEEE communication Survey and tutorials, no: 1



|                      |                                                          |   |   |   |   |
|----------------------|----------------------------------------------------------|---|---|---|---|
| III Year II Semester | Natural Language Processing<br>Professional Elective-III | L | T | P | C |
|                      |                                                          | 3 | 0 | 0 | 3 |

**Course Objectives:**

- To introduce the fundamental concepts and challenges of Natural Language Processing (NLP), including text normalization, statistical models, and neural embedding.
- To explore sequence labelling and tagging methods such as Hidden Markov Models (HMM), Conditional Random Fields (CRF), and RNN-based techniques, along with formal grammars and syntactic structures.
- To familiarize students with various parsing techniques and semantic representation frameworks, including statistical parsing, dependency grammars, and Word Sense Disambiguation.
- To expose learners to practical NLP applications such as Information Extraction, Sentiment Analysis, Semantic Role Labelling, and Machine Translation.
- To provide hands-on experience in building and evaluating NLP systems for Question Answering, Dialog Systems, and Speech Recognition using deep learning and AI-driven approaches.

**UNIT I:**

**Introduction:**

Introduction to NLP (Overview, applications, challenges), Regular Expressions & Text Normalization (Tokenization, case folding, stemming, lemmatization), Edit Distance (Levenshtein distance, applications in NLP), N-gram Language Models (Smoothing, perplexity, applications), Ambiguity, Naive Bayes, and Sentiment Classification (Ambiguity in language, Naive Bayes for text classification, sentiment analysis), Vector Semantics (Word embeddings, cosine similarity), Neural Networks and Neural Language Models (Feed forward networks, Word2Vec, Glove), RNN, LSTM, GRU (Recurrent architectures, handling long-term dependencies), Part-of-Speech Tagging (Definition, applications, tagsets (Penn Treebank)).

**UNIT II:**

HMM and Maximum Entropy Models (Probabilistic sequence models, applications), CRF (Conditional Random Fields) (Overview, usage in sequence labeling), Sequence Processing with Recurrent Networks (Applications of RNNs, LSTMs in tagging and entity recognition), Formal Grammars of English (CFGs, derivations, basic structures), Treebanks as Grammars (Penn Treebank, constituency structures).

**UNIT III:**

Syntactic Parsing (Top-down, bottom-up parsing), Statistical Parsing and PCFG (Probabilistic CFGs, statistical approaches), Dependency Parsing (Dependency grammars, transition-based and graph-based parsing), The Representation of Sentence Meaning (Logical forms, semantic representation, challenges), Word Sense Disambiguation (WSD) (Supervised and unsupervised methods, Lesk algorithm).

**UNIT IV:**

Information Extraction (Named entity recognition, relation extraction), Semantic Role Labeling (Predicate-argument structure, Frame Net), Lexicons for Sentiment and Discourse Coherence (Sentiment lexicons, discourse parsing), Machine Translation (Statistical, rule-based, neural machine translation).



**(Applicable from the academic year 2024-25 and onwards)**  
**CSE (Cyber Security)**

**UNIT V:**

Question Answering (QA systems, applications in NLP), Dialog Systems and Chat bots (Architecture, types, conversational AI), Speech Recognition and Synthesis (ASR systems, TTS systems, deep learning techniques).

**Course Outcomes:** Upon completion of the course, the student will be able to

- Apply fundamental Natural Language Processing (NLP) techniques such as tokenization, stemming, lemmatization, language modeling, word embeddings, and neural language models to analyze and process text.
- Analyze sequence labeling techniques using probabilistic models like HMM, CRF, and RNN-based approaches, and interpret formal grammar structures and treebanks.
- Implement syntactic parsing techniques including top-down, bottom-up, statistical, and dependency parsing, and apply semantic representation.
- Design NLP applications in information extraction, semantic role labeling, sentiment analysis, and machine translation.
- Design advanced NLP systems such as question answering, dialogue systems, and speech processing tools.
- 

**Textbooks**

1. Jurafsky D., Martin J. H., Speech and Language Processing, Prentice Hall, 3rd Edition, 2024.
2. Manning C., Schütze H., Foundations of Statistical Natural Language Processing, MIT Press, 1st Edition, 1999.
3. Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2nd Edition, 2014.
4. 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 Indurkha 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.

**Links:**

- [https://onlinecourses.nptel.ac.in/noc23\\_cs45/preview](https://onlinecourses.nptel.ac.in/noc23_cs45/preview)
- <https://www.coursera.org/specializations/natural-language-processing>



|                      |                                                                    |   |   |   |   |
|----------------------|--------------------------------------------------------------------|---|---|---|---|
| III Year II Semester | Security Assessment and Risk Analysis<br>Professional Elective-III | L | T | P | C |
|                      |                                                                    | 3 | 0 | 0 | 3 |

### COURSE OBJECTIVES:

1. To introduce the fundamental concepts of information security assessment and risk management.
2. To provide knowledge of security controls, vulnerabilities, threats, and risk evaluation techniques.
3. To equip students with the skills to perform threat modeling and risk analysis for IT systems.
4. To understand frameworks, standards, and best practices for security assessments.
5. To develop competence in applying methodologies for assessing and mitigating information security risks.

### SYLLABUS

#### UNIT – I:

##### **Introduction to Security Assessment and Risk Management:**

Overview of information security principles, risk, threat, vulnerability, and exposure. Types of risks – operational, strategic, legal, and reputational. Risk management process – identification, analysis, evaluation, treatment, monitoring, and communication. Role of risk in security planning. Importance of security assessments in organizations.

#### UNIT – II:

##### **Threat Modelling and Vulnerability Assessment:**

Introduction to threat modeling methodologies – STRIDE, DREAD, PASTA, OCTAVE. Steps in threat modeling – identifying assets, threat agents, attack vectors. Vulnerability assessment – manual and automated techniques. Common Vulnerabilities and Exposures (CVE), Common Vulnerability Scoring System (CVSS). Tools for vulnerability scanning – Nessus, OpenVAS, Nikto.

#### UNIT – III:

##### **Risk Assessment Methodologies:**

Qualitative and quantitative risk assessments. Asset valuation and impact analysis. Risk matrix and heat maps. Annualized Loss Expectancy (ALE), Single Loss Expectancy (SLE), and Exposure Factor (EF). ISO/IEC 27005 risk management framework. NIST SP 800-30 guide to risk assessment. Comparative study of risk assessment methodologies.

#### UNIT – IV:

**Security Control Selection and Evaluation:** Categories of security controls – preventive, detective, corrective. Control selection based on risk treatment. Defence -in-depth strategy. Evaluation of security controls using NIST SP 800-53, ISO/IEC 27001 controls. Control testing and effectiveness review. Residual risk evaluation and mitigation strategies.

#### UNIT – V:

##### **Security Audits and Risk Mitigation Planning:**

Overview of information security audits – planning, execution, reporting. Internal vs. external audits. Audit tools and techniques. Risk response strategies – avoidance, transference, mitigation, acceptance. Creating a risk register. Business continuity planning (BCP) and disaster recovery planning (DRP) as risk management tools. Case studies in enterprise risk handling.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA VIZIANAGARAM**



**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)  
CSE (Cyber Security)**

**COURSE OUTCOMES:**

1. Understand the key concepts of security risk and its impact on information systems.
2. Identify and analyse threats and vulnerabilities using standard methodologies and tools.
3. Conduct comprehensive risk assessments and prioritize security controls.
4. Apply international standards and frameworks for security assessment and risk analysis.
5. Prepare effective mitigation plans and contribute to enterprise risk management processes.

**TEXTBOOKS:**

1. **Douglas J. Landoll** – *Information Security Risk Assessment Toolkit: Practical Assessments through Data Collection and Data Analysis*, Syngress, 2010.
2. **Thomas R. Peltier** – *Information Security Risk Analysis*, CRC Press, 3rd Edition.
3. **Debra S. Herrmann** – *Complete Guide to Security and Privacy Metrics*, Auerbach Publications, 2007.

**REFERENCE BOOKS:**

1. **NIST Special Publication 800-30** – *Guide for Conducting Risk Assessments*, National Institute of Standards and Technology.
2. **ISO/IEC 27005:2018** – *Information Security Risk Management*, International Organization for Standardization.
3. **E. Cole, T. Krutz, J. Conley** – *Network Security Bible*, Wiley India, 2nd Edition.



|                             |                                                                         |          |          |          |          |
|-----------------------------|-------------------------------------------------------------------------|----------|----------|----------|----------|
| <b>III Year II Semester</b> | <b>Open elective offered by other department<br/>Open Elective – II</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                             |                                                                         | 3        | 0        | 0        | 3        |

|                             |                                                |          |          |          |          |
|-----------------------------|------------------------------------------------|----------|----------|----------|----------|
| <b>III Year II Semester</b> | <b>Cryptography &amp; Network Security Lab</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                             |                                                | 3        | 0        | 0        | 3        |

**Course Objectives:**

1. To provide practical exposure to classical and modern encryption techniques.
2. To enable students to implement symmetric and asymmetric cryptographic algorithms.
3. To familiarize students with cryptanalysis and hashing functions.
4. To impart hands-on experience in secure communication using various protocols.
5. To develop skill in the use of tools for network security analysis and simulation.

**Lab List:**

1. Implement the Caesar Cipher and Monoalphabetic Cipher encryption/decryption algorithms.
2. Write a program for Playfair Cipher and Vigenère Cipher.
3. Develop a Java/Python program for DES algorithm.
4. Implement AES (128, 192, 256-bit) encryption and decryption.
5. Simulate RSA Algorithm for secure communication.
6. Implement MD5 and SHA-1 Hashing Algorithms.
7. Demonstrate Digital Signature creation and verification using RSA.
8. Perform secure file transfer using GPG (GNU Privacy Guard) or OpenSSL.
9. Use Wireshark to analyze and inspect SSL/TLS packets.
10. Configure basic Firewall rules using iptables or Windows Defender Firewall.

**Course Outcomes:**

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

1. Implement classical encryption techniques like Caesar cipher and mono alphabetic cipher.
2. Design and simulate modern cryptographic algorithms like AES, DES, RSA, etc.
3. Use hashing algorithms for data integrity and authentication.
4. Develop secure communication programs using socket programming and cryptographic libraries.
5. Utilize network security tools for detecting and analyzing threats.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA VIZIANAGARAM**



**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)**  
**CSE (Cyber Security)**

**Text Books:**

1. William Stallings, "**Cryptography and Network Security: Principles and Practice**", 7th Edition, Pearson Education.
2. Behrouz A. Forouzan, "**Cryptography and Network Security**", McGraw Hill Education, 2nd Edition.
3. Atul Kahate, "**Cryptography and Network Security**", Tata McGraw-Hill, 3rd Edition.

**Reference Books:**

1. Charlie Kaufman, Radia Perlman and Mike Speciner, "**Network Security: Private Communication in a Public World**", Pearson Education, 2nd Edition.
2. Bruce Schneier, "**Applied Cryptography**", Wiley India, 2nd Edition.
3. Eric Rescorla, "**SSL and TLS: Designing and Building Secure Systems**", Addison-Wesley.



**(Applicable from the academic year 2024-25 and onwards)**  
**CSE (Cyber Security)**

|                      |                                      |          |          |          |          |
|----------------------|--------------------------------------|----------|----------|----------|----------|
| III Year II Semester | Cyber Crimes & Digital Forensics Lab | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                      |                                      | 3        | 0        | 0        | 3        |

**Course Objectives:**

1. To provide students with a comprehensive overview of collecting, investigating, preserving, and presenting evidence of cybercrime left in digital storage devices, emails, browsers, mobile devices using different Forensics tools.
2. To Understand file system basics and where hidden files may lie on the disk, as well as how to extract the data and preserve it for analysis.
3. Understand some of the tools of e-discovery.
4. To understand the network analysis, Registry analysis and analyze attacks using different forensics tools.

**Course Outcomes:**

1. Learn the importance of a systematic procedure for investigation of data found on digital storage media that might provide evidence of wrong-doing.
2. To Learn the file system storage mechanisms and retrieve files in hidden format.
3. Learn the use of computer forensics tools used in data analysis.
4. Learn how to find data that may be clear or hidden on a computer disk, find out the open ports for the attackers through network analysis, Registry analysis.

**List of Experiments**

1. Perform email analysis using the tools like Exchange EDB viewer, MBOX viewer and View user mailboxes and public folders, Filter the mailbox data based on various criteria, Search for particular items in user mailboxes and public folders
2. Perform Browser history analysis and get the downloaded content, history, saved logins, searches, websites visited etc using Foxton Forensics tool, Dumpzilla.
3. Perform mobile analysis in the form of retrieving call logs, SMS log, all contacts list using the forensics tool like SAFT
4. Perform Registry analysis and get boot time logging using process monitor tool
5. Perform Disk imaging and cloning the using the X-way Forensics tools
6. Perform Data Analysis i.e History about open file and folder, and view folder actions using Last view activity tool
7. Perform Network analysis using the Network Miner tool.
8. Perform information for incident response using the crowd Response tool
9. Perform File type detection using Autopsy tool
10. Perform Memory capture and analysis using the Live RAM capture or any forensic tool

**TEXT BOOKS:**

1. Real Digital Forensics for Handheld Devices, E. P. Dorothy, Auerback Publications, 2013.
2. The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics, J. Sammons, Syngress Publishing, 2012.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA VIZIANAGARAM**



**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)**  
**CSE (Cyber Security)**

**REFERENCE BOOKS:**

1. Handbook of Digital Forensics and Investigation, E. Casey, Academic Press, 2010.
2. Malware Forensics Field Guide for Windows Systems: Digital Forensics Field Guides, C. H. Malin, E. Casey and J. M. Aquilina, Syngress, 2012.
3. The Best Damn Cybercrime and Digital Forensics Book Period, J. Wiles and A.Reyes, Syngress, 2007.



|                      |                            |   |   |   |   |
|----------------------|----------------------------|---|---|---|---|
| III Year II Semester | Soft skills                | L | T | P | C |
|                      | (Skill Enhancement course) | 3 | 0 | 0 | 3 |

### Course Objectives

- Encourage use of a wide range of grammatical structures and vocabulary in speech and writing
- Demonstrate good writing skills for effective paraphrasing, argumentative essays, and formal correspondence
- Provide training and opportunities to develop fluency in English through participation informal group discussions and presentations using audio-visual aids
- Knowing the best practices at the workplace to perform well in the interview. ➤ Encouraging smart self-learning, communication skills that focus on employability.

### Course Outcomes

- understand the grammatical forms of English and the use of these forms in specific communicative and career context
- use a wide range of reading comprehension strategies appropriate to texts, to retrieve information
- strengthen their ability to write paragraphs, essays, emails and summaries ➤ improve their speaking ability in English both in terms of fluency and comprehensibility by participating in Group discussion and oral assignments
- prepare their own resume and answer interview related questions unhesitatingly with acceptable soft skills

**Unit 1 Preparing for Written Assessment [6 Hours] Grammar: Articles:** Know how to use different types of Articles, use articles appropriately in context Identify errors in the use of articles, **Prepositions:** Learn to use prepositions in context, Identifying errors in the use of prepositions, Look at the different functions of Prepositions, **Tenses:** understand the different form of tense used in sentences, know the various purposes of using different Tense forms, Use appropriate tense forms of verbs in context, Identify the errors in the use of tense forms, **Concord:** Know how to identify Subject-Verb-Agreement in sentences, Use SVA appropriately in Context, identify the errors in the use of SVA, **Voices:** Know when to use Active or Passive Voice, Convert Active sentences to Passive ones, Relative Clause:

Know what relative pronouns are, know when to use relative clauses, know the functions of Relative Clauses.

**Soft Skills: Leadership:** Introduction to Leadership, Leadership Power, Leadership Styles, Leadership in Administration. **Interpersonal Relations:** Introduction to Interpersonal Relations, Analysis of different ego states, Analysis of Transactions, Analysis of Strokes, Analysis of Life position

### Learning Outcomes

At the end of the module, the learners will be able to

- Comprehend the factors that influence use of grammar and vocabulary in speech and writing(L3)
- Produce a range of valid grammatical sentences in the real world situations and



professional environment.(L3)

- develop employability skills through Leadership skills and interpersonal skills (L3)

## Unit 2 Reading Comprehension

**Purposes & Strategies of Reading:** know the general purpose of Reading, assess your skills of reading, develop reading Strategies **Skimming for details:** Skim through a variety of passages, understand how skimming will orient you to the text, **Identifying main Ideas:** Identify the main ideas in the give text, Look for supporting statements in a passage, understand how the writer supports main ideas with details **Scanning for information:** Scan passages for factual information, understand how scanning can help find certain answers quickly, know how to look for factual answers, **drawing inferences:** Understand how to draw inferences, infer meanings while reading passages, **vocabulary:** Learn strategies to understand difficult words used in the passage, Apply strategies of reading to understand a variety of passages, **practise tests**

**Soft Skills:Communication:** Introduction to Communication, Flow of Communication, Listening, Barriers of Communication, How to overcome barriers of communication. **Stress Management:** Introduction to Stress, Causes of Stress, Impact Stress, Managing Stress

## Learning Outcomes

At the end of the module, the learners will be able to

- assess the reading skill by developing reading strategies (L3)
- Understand the skimming & scanning techniques orients to identify the theme, purpose and statements.(L2)
- develop employability skills through communication skills and stress management(L3)

## Unit 3 Writing paragraphs & Essays [6 Hours]

**Features of Good Writing:** understand what makes a piece of writing good, Analyse & discuss some samples of good & bad writing, **Gathering Ideas:** Discuss various techniques for gathering ideas before you start writing, practice some of the techniques that can be used in the Prewriting stage, **Purposes of Writing:** understand the importance of purpose of writing, explore various purpose of writing, choose content & language based on the purpose **Writing for Specific audience:** Study ways of tailoring content to suit a target audience, analyse text to deduce the target audience, discuss how language is used to suit the target audience **organizing ideas:** understand the importance of organising ideas in a text, Learn the different ways of organising ideas, practice organising ideas while writing **Writing an introduction:** Know the importance of a good introduction, understand the different ways in which writers catch the attention of readers, **Developing supporting ideas:** Learn how to develop your ideas in a paragraph, discuss a variety of supporting ideas, **Writing a conclusion:** Learn the different parts of a conclusion, Practice writing an effective conclusion **Using linkers:** Learn the different types of Linkers or cohesive devices, Discuss why it is important to use connectors in writing, **Choosing the right words:** Discuss why writers make a careful choice of language, Learn how to select language to make the intended impact, **Writing film & book reviews:** Learn the different categories of books & films, Know the elements which go into analysing books & films, Write your own film & book reviews **Common errors in writing, editing & proofreading.:** Practice correcting errors in basic sentence structure, Learn to proof-read & edit your draft before writing the final version



## **CSE (Cyber Security)**

**Soft Skills:Group Dynamics and Team Building:** Importance of groups in organization,Interactions in group, Group Decision Taking, Team Building, Interaction with the Team, How to build a good team?

### **Learning Outcomes**

At the end of the module, the learners will be able to

- produce logically coherent argumentative essays (L3)
- understand the use of passive voice in academic writing (L2)
- use appropriate vocabulary to express ideas and opinions (L2)
- develop employability skills through group dynamics and team building (L3)

### **Unit 4 Preparing for oral Assignment [6 Hours]**

**Group Discussion:**Group Discussions as a tool for selection, skills for GD,Leadership & Problem-Solving Skills, Types of GD, Group Dynamics, Roles & Functions: Beginning, Presenting, Elaborating, Roles & Functions: Clarifying, Synthesising & Challenging, Roles & Functions: Agreeing, Disagreeing & Summarizing., Etiquette: Body Language & Time Management, GD Activities

**Soft Skills: Conflict Management:**Introduction to Conflict, Causes of Conflict, Managing Conflict **Time Management:** Time as a Resource, Identify Important Time Wasters, Individual Time Management Styles, Techniques for better Time Management.

### **Learning Outcomes**

At the end of the module, the learners will be able to

- participate in group discussions using appropriate conventions and language strategies and develop advanced listening skills for in-depth understanding of academic text(L3) ➤ collaborate with a partner to make discussions (L2)
- develop employability skills through conflict management and time management(L3)

### **Unit 5 Interview Skills [6 Hours]**

**Purpose of interviews:**Know what recruiters looking for during Interviews,Become familiar with the process of career search, understand your skills,interests,achievements and attitude better **Preparing a Resume:**Understand what a job application is,know the details to be included in a CV,Know how to lay out details of a CV & prepare CV on your own **Writing a Cover Letter:**Study the information which is included in a cover letter.Learn how to organise information in a cover letter **Before and at the interview:**Learn how to prepare for an interview,learn how to behave during the interview, discuss what the interviewer might assess you on **Answering FAQs about yourself & your families:**Learn how to answer questions about yourself & family, Learn how to identify & talk about your strengths and Weaknesses **Answering FAQs about Likes & Dislikes:**Learn to choose interests which will be relevant to your Interview.learn to speak about your likes & Dislikes **Answering FAQs about Justifying your candidature:**Know what you need to say to answer a question about yourself, Be able to answer questions about your suitability for a job **Answering FAQs about Priorities,Attitudes & Biases:**Understand what your priorities will be in a job & learn to talk about them,learn to correct understanding of your attitude, biases & prejudice, if any, towards others,know positive qualities that are valued at work **Answering FAQs about Professional goals:** Become aware of the things you need to keep in mind while choosing a job,Set goals for your professional growth &



**(Applicable from the academic year 2024-25 and onwards)**

**CSE (Cyber Security)**

plan how to achieve them **Public Speaking: Planning, Practice & Delivery:** Plan one minute speeches on simple topics, understand how to capture the audience's attention, be able to create strong closing statements.

**Soft Skills:Motivation:** Introduction to Motivation, Relevance and types of Motivation, Motivating subordinates, Analysis of Motivation

**Learning Outcomes**

At the end of the module, the learners will be able to

- prepare a CV with a cover letter to seek internship/ job (L2)
- understand the structure of Interviews and familiar with frequently asked questions while interview and how to respond to it (L3)
- develop employability skills through motivation and analysis of motivation (L3)

The learners will demonstrate their knowledge and abilities through completion of the following required assessments while or at the end of this course. —1 Quiz, 1 GD, 2 Activities on Interview Readiness and Softskills, 1 Personal Interview

**Quiz: (10M)**

Quiz is conducted on Grammar, Vocabulary and Reading Comprehension. The Quiz consists of 50 questions and will be scaled down to 10 Marks. Duration of the quiz is 1hr 30 Min only and it is Computer Based Test (CBT)

**Resume:(10 M)**

Each student is required to submit 3 independently written Resumes during the course. Specific requirements for each one are accessed on the following Link:

[https://docs.google.com/document/d/1W15961dOEnIxlnMm9BKyo8L9Wia7nPbEfg\\_R-9DT\\_mRg/edit?usp=sharing](https://docs.google.com/document/d/1W15961dOEnIxlnMm9BKyo8L9Wia7nPbEfg_R-9DT_mRg/edit?usp=sharing)

**GD:(10 M)**

1. Each student has to perform 5 Group Discussions during the course on a peer evaluation basis which fetches them 5Marks.
2. The Final Assessment through one formal GD by the Internal Examiner is for 5 marks.

**The GD will be assessed on the following criteria :**

- Content (3M)
- Body Language(2M)
- Group dynamics & Leadership Skills (3M)
- Communication Skills (2M)



**(Applicable from the academic year 2024-25 and onwards)  
CSE (Cyber Security)**

**Soft Skills:(10M)**

Student will be Assessed on

- Presentation of his/her Readiness of Interview (Grooming) with Prepared Resume (5M)
- Aptitude based question/Case study/Behavior based Question (5M)

**Activities on Interview Readiness:(10M)**

The external Examiner assesses on Interview readiness

**1) Tell something about Yourself (5M)**

Assessment Parameters:

- a) Initiation
- b) Confidence level
- c) Body Language
- d) Attention Grabbing

**2) JAM/Face to Face Interview (5M):** Student will be given a topic on-Spot for JAM and will be assessed by the External examiner on the candidate's

- Flow of Speech (2M)
- Accuracy and Language (2M)
- Confidence (1M)



|                      |                               |   |   |   |   |
|----------------------|-------------------------------|---|---|---|---|
| III Year II Semester | Technical Paper Writing & IPR | L | T | P | C |
|                      | Audit Course-2                | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES:**

1. To enable students to understand the process of writing quality technical papers and research articles.
2. To familiarize students with effective strategies for literature survey, organization, and scientific writing.
3. To introduce the basics of Intellectual Property Rights (IPR), including patents, copyrights, and trademarks.
4. To provide insights into patent filing procedures, laws, and the role of IPR in academia and industry.
5. To encourage ethical writing practices and awareness of plagiarism, authorship, and publication ethics.

**UNIT I:**

**Introduction to Technical Writing:**

Characteristics of technical writing – clarity, precision, formality, and structure. Types of technical documents – journal papers, conference papers, technical reports, theses. Components of a research paper – title, abstract, keywords, introduction, literature review, methodology, results, discussion, conclusion, and references. Importance of audience and purpose. Common errors in writing.

**UNIT II:**

**Research Process and Writing Tools:**

Understanding the research process – problem formulation, hypothesis, research design, and data interpretation. Conducting effective literature review using databases (IEEE Xplore, Scopus, Google Scholar). Citation and referencing styles – IEEE, APA, MLA. Use of tools such as LaTeX, Grammarly, Mendeley, and Zotero. Best practices in editing and proofreading.

**UNIT III:**

**Publication Ethics and Plagiarism:**

Ethics in research and authorship. Understanding plagiarism and how to avoid it. Tools for plagiarism detection. Roles of authors, co-authors, reviewers, and editors. Ethics in peer review. Predatory journals and conferences. Guidelines from COPE (Committee on Publication Ethics).

**UNIT IV:**

**Introduction to Intellectual Property Rights (IPR):**

Overview of IPR – need, scope, and types: patents, copyrights, trademarks, and trade secrets. Concept of novelty, utility, and non-obviousness in patents. Indian and international IPR frameworks (WIPO, TRIPS). Role of IPR in academia, startups, and innovation ecosystems.

**UNIT V:**

**Patent Filing and Case Studies:** Patent search and patentability criteria. Process of patent application – drafting, filing, prosecution, and grant. Role of patent attorneys and patent offices. Infringement and litigation. Case studies of IPR in technology and research. Role of IP in commercialization and technology transfer.

**COURSE OUTCOMES:**

1. Understand the components and structure of technical research papers.
2. Develop skills in literature review, referencing, and use of writing tools.
3. Apply ethical principles in academic writing and avoid plagiarism.
4. Gain knowledge of various types of intellectual property and related legal aspects.
5. Understand patent filing procedures and their importance in innovation and entrepreneurship.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA VIZIANAGARAM**



**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)**

**CSE (Cyber Security)**

**TEXT BOOKS:**

1. Ritu Arora (2020). Technical Writing and Professional Communication. McGraw-Hill Education.
2. Neeraj Pandey & Khushdeep Dharni (2014). Intellectual Property Rights. PHI Learning.
3. Gopalkrishnan, N. S. & Agitha, T. G. (2009). Principles of Intellectual Property. Eastern Book Company.

**REFERENCE BOOKS:**

1. WIPO (2016). Understanding Intellectual Property: A Guide for Beginners. World Intellectual Property Organization.
2. Day, R. A., & Gastel, B. (2012). How to Write and Publish a Scientific Paper. Cambridge University Press.
3. Deborah Bouchoux (2012). Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets. Cengage Learning.



|                    |                       |   |   |   |   |
|--------------------|-----------------------|---|---|---|---|
| IV Year I Semester | Blockchain Technology | L | T | P | C |
|                    |                       | 3 | 0 | 0 | 3 |

### Course Objectives

- To provide conceptual understanding of the function of Block chainsaw method of securing distributed ledgers.
- To understand the structure of a Block chain and why/when it is better than a simple distributed database
- To make students understand the technology call under pinning of Blockchain operations as distributed data structures and decision-making systems.
- To understand “smart” contract and its legal implications.

### Course Outcomes

The student will be able to:

- Illustrate the fundamentals of Blockchain.
- Summarize decentralization and the role of Blockchain in it.
- Analyse Bit coin Crypto currency and underlying Blockchain network.
- Understand Ethereum currency and platform, and develop applications using Solidity.
- Analyse the challenges and future opportunities in Blockchain technology.

### UNIT I:

**Introduction:** History and basics, Types of Blockchain, Consensus, CAP Theorem. **Cryptographic Hash Functions:** Properties of hash functions, Secure Hash Algorithm, Merkle trees, Patricia trees.

### UNIT II:

**Decentralization:** Decentralization using Blockchain, Methods of decentralization, decentralization framework, Blockchain and full ecosystem decentralization, Smart contracts, Decentralized Organizations, Platforms for decentralization.

### UNIT III:

**Bitcoin:** Introduction to Bitcoin, Digital keys and addresses, Transactions, Blockchain, The Bitcoin network, Bitcoin payments, Bitcoin Clients and APIs, Alternatives to Proof of Work, Bitcoin limitations.

### UNIT IV:

**Ethereum:** Smart Contracts, Introduction to Ethereum, The Ethereum network, Components of the Ethereum ecosystem, Blocks and Blockchain, Fee schedule, Ethereum Development Environment, Solidity.



**(Applicable from the academic year 2024-25 and onwards)**  
**CSE (Cyber Security)**

**UNIT V:**

**Hyper ledger:** Introduction, Hyper ledger Projects, Protocol, Architecture, Hyper ledger Fabric, Saw tooth Lake, Corda.

**Challenges and Opportunities:** Scalability, Privacy, Blockchain for IoT, Emerging trends

**Text Books**

1. Mastering Block chain, Imran Bashir, Second Edition, Packet Publishing, 2<sup>nd</sup> edition, March 2018.
2. Mastering Bitcoin: Unlocking Digital Crypto currencies, Andreas Antonopoulos, O'Reilly

**Reference Books:**

1. BlockchainTechnology: Crypto currency and Applications, S.Shukla, M.Dhawan, S. Sharma, S. Venkatesan, Oxford University Press.
2. Blockchain Blueprint for a New Economy, Melanie Swan, O'Reilly.
3. Mastering Bitcoin: Programming the Open Blockchain, Antonopoulos, And reasM. O'Reilly.

**Links:**

- <https://www.coursera.org/learn/introduction-blockchain-technologies>
- [https://onlinecourses.nptel.ac.in/noc22\\_cs44/preview](https://onlinecourses.nptel.ac.in/noc22_cs44/preview)



|                           |                                  |          |          |          |          |
|---------------------------|----------------------------------|----------|----------|----------|----------|
| <b>IV Year I Semester</b> | <b>Human Resource Management</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                           |                                  | 2        | 0        | 0        | 2        |

**Course Objectives:**

1. To impart knowledge of the fundamental concepts and functions of human resource management in organizations.
2. To familiarize students with the recruitment and selection processes and the importance of training and development.
3. To understand the significance of performance management, compensation strategies, and employee motivation.
4. To explore industrial relations, grievance handling, and labor legislation.
5. To analyze the role of HR in contemporary issues such as globalization, diversity, and technological advancement.

**UNIT – I:**

Human Resource Management – Definition, Nature, Scope and Objectives – Functions and Importance of HRM – Role of HR Manager – HR Policies – Evolution of HRM – Challenges of HRM in the 21st Century – Strategic Human Resource Management – HRM vs Personnel Management.

**UNIT – II:**

Human Resource Planning – Process and Importance – Job Analysis and Design – Recruitment: Sources and Process – Selection: Steps and Methods – Placement and Induction – Trends in Talent Acquisition – Outsourcing and Employer Branding – Use of Technology in Recruitment.

**UNIT – III:**

Training and Development – Objectives and Importance – Types of Training – Training Methods – Training Needs Assessment – Evaluation of Training Programs – Career Planning and Development – Promotion, Transfer, and Separation – Succession Planning – Mentoring and Coaching.

**UNIT – IV:**

Performance Management – Concept, Objectives, and Process – Performance Appraisal Methods – Limitations and Errors – Compensation Management – Components of Compensation – Incentives and Benefits – Employee Motivation – Theories of Motivation – Job Satisfaction and Employee Engagement.

**UNIT – V:**

Industrial Relations – Concept, Importance, and Parties – Trade Unions – Collective Bargaining – Grievance Handling Procedure – Employee Discipline – Labor Legislation in India – Factories Act, Industrial Disputes Act, and Workmen Compensation Act – Recent Trends in HRM – E-HRM, HR Analytics, Global HRM, Diversity and Inclusion.

**Course Outcomes:**

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

1. Demonstrate understanding of human resource management concepts and their application in the corporate world.
2. Explain and apply the processes of recruitment, selection, training, and employee development.





|                    |                                                                     |   |   |   |   |
|--------------------|---------------------------------------------------------------------|---|---|---|---|
| IV Year I Semester | Software Architecture & Design Patterns<br>Professional Elective-IV | L | T | P | C |
|                    |                                                                     | 3 | 0 | 0 | 3 |

**Course Objectives:**

1. To understand the fundamental concepts and principles of software architecture and its role in software development.
2. To analyze various architectural styles and their appropriate use cases in software systems.
3. To introduce the concepts of design patterns and demonstrate their relevance in object-oriented design.
4. To develop the ability to apply design patterns to build reusable and maintainable software systems.
5. To examine case studies that show the implementation of patterns and architectures in real-world applications.

**Course Outcomes:**

After completing this course, students will be able to:

1. Comprehend the foundational principles and importance of software architecture in large-scale systems.
2. Identify and evaluate various architectural styles and patterns and their practical applications.
3. Apply appropriate design patterns to solve specific software design problems.
4. Improve system maintainability and reusability by incorporating well-known design patterns.
5. Integrate architectural and design pattern knowledge in the development of scalable and robust software systems.

**SYLLABUS**

**UNIT – I:**

Introduction to Software Architecture – Software Architecture versus Software Design – Importance of Software Architecture – Architectural Structures and Views – Architectural Patterns and Styles – Quality Attributes – Designing the Architecture – Architectural Description Languages – Documenting Software Architecture – Stakeholders and Concerns.

**UNIT – II:**

Architectural Styles – Data-Centered Architecture – Data Flow Architecture – Call and Return Architecture – Layered Architecture – Pipe and Filter Architecture – Client-Server Architecture – Event-Driven Architecture – Component-Based Architecture – Case Studies Demonstrating Different Styles – Selecting Architecture Styles Based on Requirements.

**UNIT – III:**

Introduction to Design Patterns – Definition and Characteristics – Elements of Design Patterns – Classification of Patterns: Creational, Structural, and Behavioral – Pattern Catalogs – Using Patterns in Software Design – Pattern Discovery – Pattern Relationships and Pattern Languages – Benefits and Limitations of Using Patterns.

**UNIT – IV:**

Creational and Structural Patterns – Singleton, Factory Method, Abstract Factory, Builder, Prototype – Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy – Application of These Patterns in Designing Object-Oriented Systems – Case Studies and UML Representations.

**UNIT – V:**

Behavioral Patterns – Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Strategy, Template Method, Visitor – Anti-Patterns – Refactoring to Patterns – Integrating Multiple Patterns – Applying Patterns in Framework Design – Real-World Pattern Implementations and Case Studies.



**Text Books:**

1. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, “**Design Patterns: Elements of Reusable Object-Oriented Software**”, Addison-Wesley, 1st Edition.
2. Len Bass, Paul Clements, Rick Kazman, “**Software Architecture in Practice**”, Pearson Education, 3rd Edition.
3. Frank Buschmann, Regine Meunier, Hans Rohnert, “**Pattern-Oriented Software Architecture**”, Wiley, Volume 1.

**Reference Books:**

1. Craig Larman, “**Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development**”, Pearson Education, 3rd Edition.
2. Martin Fowler, “**Patterns of Enterprise Application Architecture**”, Addison-Wesley, 1st Edition.
3. Mary Shaw and David Garlan, “**Software Architecture: Perspectives on an Emerging Discipline**”, Prentice Hall, 1st Edition.



|                    |                                                                       |   |   |   |   |
|--------------------|-----------------------------------------------------------------------|---|---|---|---|
| IV Year I Semester | Network Management Systems and Operations<br>Professional Elective-IV | L | T | P | C |
|                    |                                                                       | 3 | 0 | 0 | 3 |

**Course Objectives:**

1. To provide an understanding of the concepts, architecture, and operations involved in managing data and communication networks.
2. To study the protocols and models used in network management systems including SNMP and TMN.
3. To familiarize students with fault, configuration, accounting, performance, and security (FCAPS) management.
4. To introduce various tools and software used in network monitoring and troubleshooting.
5. To develop skills in planning, operating, and maintaining enterprise network infrastructure.

**UNIT – I:**

Overview of Network Management – Objectives and Functions – Evolution of Network Management Technologies – Challenges in Modern Network Operations – Basic Terminology – Network Models: ISO/OSI and TCP/IP – Management Models – Network Management Standards – Need for Automated Management Systems – Functional Areas of Network Management.

**UNIT – II:**

Simple Network Management Protocol (SNMP) – SNMP Architecture and Components – Management Information Base (MIB) – Structure of Management Information (SMI) – SNMP Operations and Messages – SNMPv1, SNMPv2, SNMPv3 – Security in SNMP – Role of Agents and Managers – Configuring SNMP on Routers and Switches – Practical SNMP Monitoring.

**UNIT – III:**

Telecommunication Management Network (TMN) – TMN Architecture and Interfaces – Logical Layered Architecture – Information Models and Interface Requirements – Network Element Management – FCAPS Model: Fault Management, Configuration Management, Accounting Management, Performance Management, and Security Management – Implementation Examples.

**UNIT – IV:**

Network Monitoring Tools and Techniques – Packet Sniffing and Analysis – Use of Tools like Wireshark, Nagios, PRTG, SolarWinds – Log Management and Traffic Analysis – Alerts and Thresholds – Syslog and SNMP Trap Management – Event Correlation – Reporting and Dashboards – Case Studies on Enterprise Network Monitoring.

**UNIT – V:**

Network Operations and Maintenance – Operational Procedures and Standards – Network Provisioning and Service Level Agreements (SLAs) – Network Optimization Techniques – Incident and Problem Management – Backup and Recovery – Change and Configuration Management – Network Troubleshooting Techniques – Emerging Trends: SDN and Cloud-based Network Management.

**Course Outcomes:**

Upon completion of this course, students will be able to:

1. Understand and describe the functional areas of network management systems.
2. Apply network management protocols such as SNMP to manage devices and monitor network performance.
3. Analyze and interpret data from network monitoring tools to diagnose and resolve issues.
4. Design and implement network management solutions for real-world enterprise networks.



Evaluate the performance and security of a network through various metrics and tools

**Text Books:**

1. Mani Subramanian, “**Network Management: Principles and Practice**”, Pearson Education, 2nd Edition.
2. Uyles Black, “**Network Management: Standards and Protocols**”, McGraw Hill, 1st Edition.
3. William Stallings, “**SNMP, SNMPv2, SNMPv3, and RMON 1 and 2**”, Pearson Education, 3rd Edition.

**Reference Books:**

1. Alexander Clemm, “**Network Management Fundamentals**”, Cisco Press, 1st Edition.
2. J. Richard Burke, “**Network Management: Concepts and Practice, A Hands-On Approach**”, Prentice Hall, 1st Edition.
3. Salahuddin and Manoharan, “**Network Management: Algorithms and Techniques**”, CRC Press, 1st Edition.



|                    |                          |   |   |   |   |
|--------------------|--------------------------|---|---|---|---|
| IV Year I Semester | Deep Learning            | L | T | P | C |
|                    | Professional Elective-IV | 3 | 0 | 0 | 3 |

**Course Objectives:**

The objective of the course is to make students learn the frameworks of deep learning and their application

**Course Outcomes:**

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

- Apply the fundamentals of linear algebra to deep learning algorithms
- Understand the fundamental building blocks of deep learning
- Apply the concepts of Convolution Neural Networks to computer vision applications
- Apply the concepts of Recurrent Neural Networks to Natural Language Process
- Apply the regularization techniques to improve the model performance

**UNIT-I:**

**Mathematical foundations of Deep Learning**

Scalars, Vectors, Matrices and Tensors, Multiplying Matrices and Vectors, Identity and Inverse Matrices, Linear dependence and span, Norms, Special kinds of matrices and vectors, Trace operations, Eigen value decomposition

**UNIT-II:**

**Fundamentals of Deep Learning**

Introduction to Biological Neurons, Artificial Neural Networks, McCulloch Pitts Neuron, Learning processes, Perceptron convergence theorem, XOR problem, Multilayer perceptron, Back Propagation (BP) Learning, Activation functions: Sigmoid, Linear, Tanh, ReLU, Leaky ReLU, SoftMax, loss functions; Optimizers: Gradient Descent (GD), Batch Optimization, Momentum Based GD, Stochastic GD, AdaGrad, RMSProp, Adam

**UNIT-III:**

**Convolution Neural Networks**

CNN-Architectural Overview, Motivation, Layers, Filters, Parameter sharing, Regularization, Convolution and Pooling as infinitely strong prior, Variants of Convolution Operation, Efficient Convolution Computation Methods, Popular CNN Architectures (ResNet, Alexnet, VGGNet, Inception)

**UNIT-IV:**

**Recurrent Neural Networks**

Architecture of traditional RNN, Types and applications of RNN, Variants of RNNs (LSTM, Bi-LSTM, GRU), Back propagation through time (BPTT), Vanishing and Exploding Gradients, NLP Applications.

**UNIT-V:**

**Regularization and Auto encoders**

Regularization for Deep Learning: Bias Variance Tradeoffs, L1 and L2, Dropout, Batch Normalization, Data Augmentation, Early Stopping.

**Auto encoders:** Architecture, Implementation, Denoising Auto encoders, Sparse Auto encoders, Use cases





|                    |                                                                    |   |   |   |   |
|--------------------|--------------------------------------------------------------------|---|---|---|---|
| IV Year I Semester | Malware Analysis & Reverse Engineering<br>Professional Elective-IV | L | T | P | C |
|                    |                                                                    | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES:**

- To learn fundamentals of malware analysis which includes analysis of JIT compilers for malware detection in legitimate code.
- To explore the techniques for detecting, analyzing, reverse engineering and eradicating malware.
- Employ network and system-monitoring tools to examine how malware interacts with the file system, registry, network, and other processes in a Windows environment.
- Assess the threat associated with malicious documents.
- Build an isolated, controlled laboratory environment for analyzing the code and behaviour of malicious program.

**SYLLABUS:**

**UNIT-I:**

Fundamentals of Malware Analysis (MA), Reverse Engineering Malware (REM) Methodology, Brief Overview of Malware analysis lab setup and configuration, Introduction to key MA tools and techniques, Behavioural Analysis vs. Code Analysis, Resources for Reverse-Engineering Malware (REM) Understanding Malware Threats, Malware indicators, Malware Classification, Examining Clam AV Signatures, Creating Custom Clam AV Databases.

**UNIT-II:**

Malware Forensics Using TSK for Network and Host Discoveries, Using Microsoft Offline API to Registry Discoveries, Identifying Packers using PEiD, Registry Forensics with RegRipper Plu-gins, Bypassing Poison Ivy’s Locked Files, Bypassing Conficker’s File System ACL Restrictions, Detecting Rogue PKI Certificates.

**UNIT-III:**

Malware and Kernel Debugging Opening and Attaching to Processes, Configuration of JITDebugger for Shellcode Analysis, Controlling Program Execution, Setting and Catching Breakpoints, Debugging with Python Scripts and Py Commands, DLL Export Enumeration, Execution, and Debugging, Debugging a VMware Workstation Guest (on Windows), Debugging a Parallels Guest (on Mac OS X).

**UNIT-IV:**

Memory Forensics and Volatility Memory Dumping with MoonSols Windows Memory Toolkit, Accessing VM Memory Files Overview of Volatility, Investigating Processes in Memory Dumps, Code Injection and Extraction, Detecting and Capturing Suspicious Loaded DLLs, Finding Artifacts in Process Memory, Identifying Injected Code with Malfind and YARA.

**UNIT-V:**

Researching and Mapping Source Domains/IPs Using WHOIS to Research Domains, DNS Hostname Resolution, Querying Passive DNS, Checking DNS Records, Reverse IP Search New Course Form, Creating Static Maps, Creating Interactive Maps.



**COURSE OUTCOMES:**

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

- 1 : Demonstrate the concept of malware and reverse engineering. [K2]
- 2 : Apply various tools and techniques of malware analysis to examine malicious software. [K3]
- 3 : Analyze and evaluate various techniques for used in malware analysis & reverse engineering to identify vulnerabilities. [K4]
- 4 : Utilize the python language for development & analysis of anti-malwares. [K4]
- 5 : Setup an environment for malware analysis & recognize common malware characteristics. [K1]

**TEXT BOOKS:**

1. Sikorski, M., & Honig, A. (2012). Practical malware analysis: the hands-on guide to dissecting malicious software. No starch press.
2. Eilam, E. (2005). Reversing, Secrets of Reverse Engineering Wiley Publishing.
3. Malin, C. H. (2013). Linux Malware Incident Response: A Practitioner's Guide to Forensic Collection and Examination of Volatile Data: An Excerpt from Malware Forensic Field Guide for Linux Systems. Elsevier.

**REFERENCE BOOKS:**

1. Shashidhar, N., & Cooper, P. (2016, April). Teaching malware analysis: The design philosophy of a model curriculum. In 2016 4th International Symposium on Digital Forensic and Security (ISDFS) (pp. 119-125). IEEE.
2. Singh, A. (Ed.). (2009). Identifying malicious code through reverse engineering (Vol. 44). Springer Science & Business Media.



|                    |                                              |   |   |   |   |
|--------------------|----------------------------------------------|---|---|---|---|
| IV Year I Semester | Computer Graphics<br>Professional Elective-V | L | T | P | C |
|                    |                                              | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES:**

1. To introduce the fundamental principles and techniques of computer graphics.
2. To develop understanding of graphical systems, display devices, and coordinate systems.
3. To teach various 2D and 3D geometric transformations and viewing pipelines.
4. To impart knowledge of algorithms for line drawing, clipping, and rendering.
5. To explore advanced topics such as shading, illumination, and animation.

**SYLLABUS**

**UNIT – I:**

**Introduction to Computer Graphics:**

Overview and applications of computer graphics. Graphics systems – raster scan and random scan displays. Color models – RGB, CMY, HSV. Coordinate systems and graphics standards (GKS, PHIGS). Introduction to OpenGL. Line generation algorithms – DDA and Bresenham’s algorithm. Circle generation using midpoint method. Polygon representation and filling algorithms – scan-line, boundary-fill, and flood-fill.

**UNIT – II:**

**2D Geometric Transformations:**

Basic transformations – translation, rotation, scaling. Homogeneous coordinates and matrix representation. Composite transformations. Reflection and shearing. 2D viewing pipeline – window-to-viewport transformation. Clipping algorithms – Cohen-Sutherland line clipping, Liang-Barsky, and Sutherland-Hodgman polygon clipping.

**UNIT – III:**

**3D Graphics and Transformations:**

3D coordinate systems and transformations – translation, rotation, scaling. Composite 3D transformations. Parallel and perspective projections. Introduction to 3D viewing and viewing transformations. 3D object representations – polygon surfaces, curved surfaces, quadric surfaces, spline representations.

**UNIT – IV:**

**Visible Surface Detection and Illumination:**

Hidden surface removal methods – Z-buffer, Painter’s algorithm, back-face culling. Shading models – flat, Gouraud, and Phong shading. Illumination models – ambient, diffuse, and specular reflection. Introduction to ray tracing and radiosity methods. Light sources and material properties.

**UNIT – V:**

**Introduction to Animation and Advanced Topics:**

Basics of computer animation – keyframe, morphing, motion capture. Animation techniques – traditional vs. computer-based. Design of simple animation sequences. Introduction to virtual reality, augmented reality, and visualization. Overview of graphics hardware, GPU, and rendering pipeline.



**COURSE OUTCOMES:**

1. Understand the basic principles and applications of computer graphics.
2. Implement 2D and 3D transformations and viewing pipelines.
3. Apply various algorithms for drawing, clipping, and object representation.
4. Demonstrate knowledge of surface visibility and illumination techniques.
5. Develop simple animations and understand advanced rendering concepts.

**TEXTBOOKS:**

1. **Hearn, D., & Baker, M. P.** – *Computer Graphics with OpenGL*, Pearson Education, 4th Edition.
2. **Zehm, F. S., & Wright, Jr., P. S.** – *Fundamentals of Computer Graphics*, CRC Press, 4th Edition.
3. **Rogers, D. F.** – *Procedural Elements for Computer Graphics*, McGraw Hill Education, 2nd Edition.

**REFERENCE BOOKS:**

1. **Foley, J. D., van Dam, A., Feiner, S. K., & Hughes, J. F.** – *Computer Graphics: Principles and Practice*, Pearson Education, 3rd Edition.
2. **Donald Hearn & Pauline Baker** – *Computer Graphics: C Version*, Pearson Education, 2nd Edition.
3. **Peter Shirley** – *Fundamentals of Computer Graphics*, A K Peters, 3rd Edition.



|                    |                                           |   |   |   |   |
|--------------------|-------------------------------------------|---|---|---|---|
| IV Year I Semester | Intrusion Detection and Prevention System | L | T | P | C |
|                    | Professional Elective-V                   | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES:**

1. To understand the concepts of intrusion detection and prevention systems and their significance in cyber security.
2. To examine the types of intrusions and various detection techniques used in network and host-based environments.
3. To provide knowledge of architecture, design, and deployment of IDS/IPS solutions.
4. To familiarize students with tools and techniques for implementing and managing IDPS.
5. To enable students to analyze attack patterns and apply effective countermeasures using IDPS.

**SYLLABUS**

**UNIT – I:**

**Introduction to Intrusion Detection and Prevention Systems:**

Definition, need, and importance of IDS and IPS. Categories of intrusions – host-based, network-based, wireless, and application-level intrusions. IDS vs. IPS vs. firewalls. Evolution and history of intrusion detection. Goals and challenges in building effective IDPS. Overview of attack lifecycle and intrusion signatures.

**UNIT – II:**

Types and Techniques of Intrusion Detection: Host-based IDS (HIDS) and Network-based IDS (NIDS) – architecture and working. Signature-based, anomaly-based, and specification-based detection methods. Statistical approaches, rule-based systems, and machine learning approaches. Advantages and limitations of different detection techniques. False positives and false negatives – tuning and optimization.

**UNIT – III:**

**IDPS Architecture and Components:**

Core components – sensors, analyzers, user interfaces, databases. Centralized and distributed IDS architectures. Passive vs. active detection. Deployment considerations – inline vs. out-of-band. Placement strategies for network sensors. Data collection techniques – log files, traffic sniffing, and system calls.

**UNIT – IV:**

**Tools and Techniques for IDPS:**

Overview of open-source tools – Snort, Suricata, OSSEC, Bro/Zeek. Writing and testing rules in Snort. Case studies on attack detection using IDPS tools. Integration of IDPS with SIEM (Security Information and Event Management) systems. Correlation of alerts and incident analysis. Performance evaluation of IDPS.



**UNIT – V:**

**Countermeasures and Response:**

Intrusion response strategies – automated vs. manual responses. Prevention techniques – blocking, throttling, resetting connections. Honeypots and honeynets – deception techniques. Logging, alerting, and reporting mechanisms. Legal and ethical issues in intrusion detection. Trends in intrusion detection – AI/ML-based IDS, cloud-based IDS, and behavioral analytics.

**COURSE OUTCOMES:**

1. Understand the importance and working principles of intrusion detection and prevention systems.
2. Differentiate between detection techniques and apply them in various network environments.
3. Design and deploy IDS/IPS architectures for enterprise-level security.
4. Utilize open-source tools to detect, analyze, and respond to cyber intrusions.
5. Implement practical strategies for intrusion response and understand emerging IDPS trends.

**TEXTBOOKS:**

1. **Rebecca Gurley Bace** – *Intrusion Detection*, Macmillan Technical Publishing, 2000.
2. **Carl Endorf, Eugene Schultz, and Jim Mellander** – *Intrusion Detection & Prevention*, McGraw Hill, 2003.
3. **Rafeeq Ur Rehman** – *Intrusion Detection with Snort: Advanced IDS Techniques Using Snort, Apache, MySQL, PHP, and ACID*, Prentice Hall, 2003.

**REFERENCE BOOKS:**

1. **Michael Collins** – *Network Security Through Data Analysis: From Data to Action*, O'Reilly Media, 2nd Edition.
2. **Stephen Northcutt and Judy Novak** – *Network Intrusion Detection*, New Riders Publishing, 3rd Edition.
3. **Richard Bejtlich** – *The Practice of Network Security Monitoring*, No Starch Press, 2013.



|                    |                                      |   |   |   |   |
|--------------------|--------------------------------------|---|---|---|---|
| IV Year I Semester | Metaverse<br>Professional Elective-V | L | T | P | C |
|                    |                                      | 3 | 0 | 0 | 3 |

### Course Objectives

1. Introduce the foundational concepts and evolution of the Metaverse.
2. Explore the technologies enabling immersive virtual environments.
3. Understand the integration of blockchain and NFTs within the Metaverse.
4. Examine the societal, ethical, and legal implications of virtual worlds.
5. Analyze real-world applications and future trends of the Metaverse.

### Course Outcomes

1. Define and articulate the components and architecture of the Metaverse.
2. Develop basic virtual environments using relevant tools and platforms.
3. Integrate blockchain concepts and NFTs into Metaverse applications.
4. Critically assess the ethical and legal challenges in virtual spaces.
5. Evaluate the potential and limitations of Metaverse applications across various industries.

### Unit I: Introduction to the Metaverse

Definition and historical evolution, Key characteristics and components, Technological enablers: VR, AR, XR, Metaverse vs. traditional internet

### Unit II: Building Blocks of the Metaverse

3D modelling and virtual environment creation, Avatars and digital identities, Spatial computing and interaction design, Tools and platforms: Unity, Unreal Engine, WebXR

### Unit III: Blockchain and NFTs in the Metaverse

Introduction to blockchain technology, Role of cryptocurrencies, Non-Fungible Tokens (NFTs) and digital ownership, Smart contracts and decentralized applications

### Unit IV: Societal and Ethical Considerations

Data privacy and security in virtual environments, Digital divide and accessibility issues, Legal frameworks and intellectual property rights Psychological and social impacts

### Unit V: Applications and Future Trends

Metaverse in gaming, education, healthcare, and commerce, Enterprise use cases and virtual workplaces, Emerging trends: AI integration, virtual economies, Challenges and opportunities ahead.

### Textbooks

1. Matthew Ball, *The Metaverse: And How it Will Revolutionize Everything*, Liveright, 2022.
2. Tony Parisi, *The Metaverse: How It Will Revolutionize Everything*, Wiley, 2021.
3. Jeremy Bailenson, *Experience on Demand: What Virtual Reality Is, How It Works, and What It Can Do*, W.W. Norton & Company, 2018.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA VIZIANAGARAM**



**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**B.Tech (R23-COURSE STRUCTURE & SYLLABUS)**

**(Applicable from the academic year 2024-25 and onwards)**  
**CSE (Cyber Security)**

**Reference Books**

1. Casey Newton, *The Interface: The Future of Digital Experience*, 2021.
2. Katherine Cross, *Virtual Ethics: Navigating the Metaverse*, 2022.
3. Jon Radoff, *Building the Metaverse: The Future of Immersive Digital Experiences*, 2021.



|                    |                                                             |   |   |   |   |
|--------------------|-------------------------------------------------------------|---|---|---|---|
| IV Year I Semester | Cyber Laws and Security Policies<br>Professional Elective-V | L | T | P | C |
|                    |                                                             | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES:**

1. To impart a comprehensive understanding of cyber laws and legal frameworks related to cybersecurity.
2. To explore national and international cybercrime laws and digital evidence handling.
3. To familiarize students with IT Act, intellectual property rights, and privacy issues in cyberspace.
4. To develop knowledge of security policies, standards, and compliance requirements.
5. To enable students to draft, implement, and audit effective organizational security policies.

**SYLLABUS**

**UNIT – I:**

**Introduction to Cyber Law and Cybercrime:**

Overview of cyberspace and cyber law. Definition and classification of cybercrimes – hacking, cyberstalking, phishing, identity theft, cyber terrorism. Causes and prevention of cybercrimes. Legal challenges in cyberspace. Need for cyber regulations and frameworks. Overview of computer ethics and cyber jurisprudence.

**UNIT – II:**

**Indian Cyber Law – IT Act 2000 and Amendments:**

Objectives and features of the Information Technology Act, 2000. Definitions under the Act – electronic records, digital signatures, cyber offences. Offences and penalties under IT Act. Adjudication process and appellate tribunal. Amendments in IT Act 2008 – cybercrime regulation, data protection provisions, and legal recognition of digital evidence.

**UNIT – III:**

**Legal Aspects of E-Commerce and Intellectual Property Rights:**

Legal recognition of electronic contracts and digital signatures. Cyber contracts and their enforceability. Consumer protection in e-commerce. Intellectual property issues – copyright, trademark, and patent in the digital environment. Software piracy, digital rights management, and licensing. Jurisdictional issues in online transactions.

**UNIT – IV:**

**Cyber Security Policies and Governance:**

Introduction to security policies – definition, purpose, and scope. Key elements of security policy – access control, data classification, incident response. Policy creation and enforcement. Security standards and frameworks – ISO/IEC 27001, NIST, COBIT. Compliance requirements – HIPAA, PCI-DSS, GDPR. Risk-based policy formulation and best practices.

**UNIT – V:**

**Cyber Forensics and Legal Investigation:**

Introduction to cyber forensics. Role of digital evidence in legal proceedings. Legal procedures for evidence collection, preservation, and analysis. Chain of custody and admissibility in court. Case studies on cybercrime investigation and legal proceedings. Roles of CERT-IN and law enforcement agencies in cybercrime management.



**COURSE OUTCOMES:**

1. Understand the scope and significance of cyber laws in the context of cybersecurity.
2. Analyze cybercrimes and the legal provisions applicable under the IT Act and other laws.
3. Apply intellectual property and legal concepts to digital content and e-commerce.
4. Formulate and evaluate cybersecurity policies based on international standards and regulations.
5. Demonstrate knowledge of legal procedures and forensic practices in cybercrime investigation.

**TEXTBOOKS:**

1. **K. Kumar** – *Cyber Laws: Intellectual Property & E-Commerce, Internet & E-Business*, LexisNexis, 5th Edition.
2. **Pavan Duggal** – *Cyber Law: The Indian Perspective*, Saakshar Law Publications, Latest Edition.
3. **Nandan Kamath** – *Law Relating to Computers, Internet and E-Commerce*, Universal Law Publishing Co., 2nd Edition.

**REFERENCE BOOKS:**

1. **Jonathan Rosenoer** – *CyberLaw: The Law of the Internet*, Springer, 1st Edition.
2. **Mark F. Grady & Francesco Parisi** – *The Law and Economics of Cybersecurity*, Cambridge University Press.
3. **Chris Reed & Rebecca Wong** – *Cyber Security and the Law: Regulating the Connected World*, Routledge, 2019.



|                           |                                                                            |          |          |          |          |
|---------------------------|----------------------------------------------------------------------------|----------|----------|----------|----------|
| <b>IV Year I Semester</b> | <b>Open elective offered by other department<br/>Optional Elective-III</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                           |                                                                            | 3        | 0        | 0        | 3        |

|                           |                                                                           |          |          |          |          |
|---------------------------|---------------------------------------------------------------------------|----------|----------|----------|----------|
| <b>IV Year I Semester</b> | <b>Open elective offered by other department<br/>Optional Elective-IV</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                           |                                                                           | 0        | 0        | 0        | 3        |



|                    |                 |   |   |   |   |
|--------------------|-----------------|---|---|---|---|
| IV Year I Semester | Ethical Hacking | L | T | P | C |
|                    |                 | 0 | 1 | 2 | 2 |

**Course Objectives:**

- The aim of the course is to introduce the methodologies and framework of ethical hacking for enhancing the security.
- The course includes-Impacts of Hacking; Types of Hackers; Information Security Models, Information Security Program, Business Perspective, Planning a Controlled Attack
- Framework of Steps (Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Deliverable and Integration)

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

- Explain the concepts related to hacking, ports and protocols, pen testing and virtualization
- Determine the applicable footprinting techniques and scanning methods
- Explain the process of system hacking and Explain the concepts Trojans, backdoors, worms and virus and it's countermeasures
- Demonstrate systematic understanding of the concepts of Sniffing and Social Engineering and it's attacks
- Determine the applicable methods of cryptography, steganography and Vulnerability Assessment

**UNIT I:**

**Introduction to Hacking:** Hacking, Types and phases of hacking, **Introduction to Ports & Protocols:** Ports, Protocols, Primary Network Types, **Virtualization & Introduction to Kali Linux:** Virtualization, Virtualization software, supported platforms, **Introduction to Penetration Testing:** Penetration test, Categories and Types of Penetration tests, Structure of Penetration Test Report.

**UNIT II:**

**Footprinting:** Footprinting, Types, Using ping and ns Lookup commands in Windows command line, **Scanning:** Scanning, Basics of Scanning, Basic Techniques of Scanning, Enumerating DNS using dns enum, Performing flag scan using hping3.

**UNIT III:**

**Hacking into System:** System Hacking, Password Cracking, Default password databases, Manual and Automated Password Cracking, Process of System Hacking, Using Keyloggers, **Trojans & Backdoors:** Trojans, Working of Trojan, Infection Techniques, Attack, Lifecycle and Classification of Virus, Worms, Virus Construction Kit.

**UNIT IV:**

**Sniffing, Packet Analysis & Session Hijacking:** Sniffing, Packet Analysis, Types of Sniffing, Active and Passive Sniffing Techniques, Session Hijacking, **Social Engineering:** Social Engineering, Process, Identity Theft, Human and Computer Based Social Engineering Techniques, Phishing Process, Types of Phishing Attacks, Social Engineering Toolkit (SET)

**UNIT V:**

**Cryptography:** Cryptography, Digital Signature, Hash Functions, **Steganography:** Steganography Process, watermarking, Steganography Methods and Attacks, Steganography tools, **Vulnerability Assessment:** Vulnerability, The Open Web Application Security Project (OWASP), Prevention, Damn Vulnerable Web Application (DVWA), installation and testing of DVWA

**Text Books:**

1. Hacking: Be a Hacker with Ethics, Harsh Bothra, Khanna Publications, 2019
2. Ethical Hacking and Penetration Testing Guide, Rafay Baloch, 2014

**Reference Books:**

1. Kali Linux Wireless Penetration Testing Beginner's Guide, Vivek Ramachandran, Cameron Buchanan, Packt Publishing, 2015
2. SQL Injection Attacks and Defense, 1<sup>st</sup> Edition, Justin Clarke-Salt, Syngress Publication
3. Mastering Modern Web Penetration Testing, Prakhar Prasad, Packt Publishing, October 2016

|                    |                      |   |   |   |   |
|--------------------|----------------------|---|---|---|---|
| IV Year I Semester | Gender Sensitization | L | T | P | C |
|                    |                      | 2 | 0 | 0 | - |

### Course: Objectives

1. To develop students' sensibility with regard to issues of gender in contemporary India.
2. To provide a critical perspective on the socialization of men and women.
3. To introduce students to information about some key biological aspects of genders.
4. To expose the students to debates on the politics and economics of work.
5. To help students reflect critically on gender violence.
6. To expose students to more egalitarian interactions between men and women.

### UNIT - I: UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men

- Preparing for Womanhood. Growing up Male. First lessons in Caste.

### UNIT – II: GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences- Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

### UNIT – III: GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- “My Mother doesn't Work.” “Share the Load.”-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work. - Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

### UNIT – IV: GENDER - BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No! -Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: “*Chupulu*”.

Domestic Violence: Speaking Out Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-“I Fought for my Life....”

## **UNIT – V: GENDER AND CULTURE**

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals  
Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers.  
Rosa Parks- The Brave Heart.

### **COURSE OUTCOMES:**

1. Students will have developed a better understanding of important issues related to gender in contemporary India.
2. Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
3. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
4. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
5. Students will develop a sense of appreciation of women in all walks of life.

|                           |                                          |          |          |          |          |
|---------------------------|------------------------------------------|----------|----------|----------|----------|
| <b>IV Year I Semester</b> | <b>Evaluation of Industry Internship</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                           | <b>Internship</b>                        | -        | -        | -        | 2        |

|                            |                                      |          |          |          |          |
|----------------------------|--------------------------------------|----------|----------|----------|----------|
| <b>IV Year II Semester</b> | <b>Full semester</b>                 | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                            | <b>Internship &amp; Project Work</b> | 0        | 0        | 24       | 12       |