

**ACADEMIC REGULATIONS  
COURSE STRUCTURE  
AND  
DETAILED SYLLABUS  
OF  
B.TECH**

Regular-Full time

**DEPARTMENT OF COMPUTER SCIENCE AND  
ENGINEERING (Internet of Things)**

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



**VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY  
(Autonomous)**

**Approved by AICTE, Permanently Affiliated to JNTUK,**

**NAAC Accredited with 'A' Grade, ISO 9001:2015 Certified**

Nambur (V), Pedakakani (M), Guntur (Dt.), Andhra Pradesh – 522 508

**ACADEMIC REGULATIONS (R23) FOR B. TECH.  
(REGULAR/HONORS/MINOR)**

**Applicable for the students of B. Tech. (Regular) from the Academic Year 2023-24 onwards**

The B. Tech Degree of Jawaharlal Nehru Technological University Kakinada, Kakinada shall be conferred on candidates who are admitted to the programme and who fulfill all the requirements for the award of the Degree.

**VISION**

To impart quality education through exploration and experimentation and generate socially-conscious engineers, embedding ethics and values, for the advancement in science and technology.

**MISSION**

- To educate students with a practical approach to dovetail them to industry-needs.
- To govern the institution with a proactive and professional management with passionate teaching faculty.
- To provide holistic and integrated education and achieve over all development of students by imparting scientific and technical, social and cognitive, managerial and organizational skills.
- To compete with the best and be the most preferred institution of the studios and the scholarly.
- To forge strong relationships and linkage with the industry.

**OBJECTIVES**

- Equip the institute with state-of-the-art infrastructure comparable to the best in the industry.
- Tap the resources of the best minds in the field as faculty and visiting faculty.
- Groom students to become global entrepreneurs and responsible citizens.
- Provide financial assistance to meritorious students.
- Requisition the services of the best HR managers to place our students in reputed industries.
- Provide conducive atmosphere to the faculty for Research & Development and ensure active participation of the students.

**DEPARTMENT VISION**

To excel in educating students in computer science and the internet of things, fostering creativity and ethical values. Our goal is to become recognized for our high-quality education and industry relevance.

**DEPARTMENT MISSION**

- Excellence in Education: Striving for excellence in educating students in computer science and the internet of things, fostering creativity and ethical values.
- Industry Relevance: Ensuring programs are highly relevant to industry needs, preparing students for successful careers in the dynamic field of technology.
- Continuous Improvement: Committed to continuous improvement in educational programs, incorporating feedback and staying updated with advancements in technology and pedagogy.
- Student Success: Empowering students to excel academically, professionally, and personally, equipping them with the knowledge, skills, and values needed to make a positive impact.
- Community Engagement: Engaging with local and global communities, collaborating with industry partners, and stakeholders to address societal challenges and contribute to the advancement of technology for the betterment of society.

**PROGRAM EDUCATIONAL OBJECTIVES (PEOS)**

- PEO-1: Industry Problem-Solving: Graduates will excel in solving real-world problems encountered in various industries using their engineering skills.
- PEO-2: Technology Application: Graduates will actively engage in the development, deployment, and utilization of advanced technologies, contributing to the improvement of engineering systems.
- PEO-3: Ethical Leadership and Social Responsibility: Graduates will demonstrate strong ethical leadership and social responsibility, ensuring their actions positively impact society while adhering to professional values.
- PEO-4: Integrated Engineering and Management Proficiency: The program will equip graduates with comprehensive skills in engineering and management, enabling them to succeed in their professional endeavors.
- PEO-5: Diverse Career Opportunities: Graduates will possess the skills and knowledge necessary to pursue diverse career paths, including teaching, research, and innovation, opening doors to various job opportunities.

**PROGRAM OUTCOMES (POS)**

PO1 : Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 : Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3 : Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4 : Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 : Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6 : The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional engineering practice.

PO7 : Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8 : Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 : Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 : Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11 : Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12 : Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **PROGRAM SPECIFIC OUTCOMES (PSOS)**

**PSO-1: Developing IoT Systems:** Graduates will acquire the skills to design and construct Internet of Things (IoT) setups, integrating engineering fundamentals and specialized knowledge to address complex engineering problems (aligned with PO1 and PO3).

**PSO-2: Ensuring IoT Security and Ethical Conduct:** Graduates will prioritize cybersecurity and ethical considerations in IoT design and implementation, addressing societal, legal, and safety issues to uphold professional ethics and responsibilities (aligned with PO2, PO4, PO6, and PO8).

**PSO-3: Innovating IoT Solutions:** Graduates will innovate solutions for integrating IoT with emerging technologies, utilizing modern tools and techniques to analyze data and design effective IoT systems (aligned with PO4, PO5, and PO12).

## **ACADEMIC REGULATIONS (R23) FOR B. TECH. (REGULAR)**

### **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**

A student will be declared eligible for the award of the B.Tech. 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 fulfill 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 offered during the summer on a fast-track mode to enable students to do additional courses or complete backlogs in coursework.
- iv) The Universities/HEIs can decide on the courses to be offered in the summer term depending on the availability of faculty and the number of students.

### 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 Core 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 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. The total duration of the B. Tech (Regular) Programme is four academic years.
- ii. Each academic year of study is divided into two semesters.
- iii. The minimum number of instruction days in each semester is 90 days.
- iv. There shall be a mandatory student induction program for freshers, with a three-week duration before the commencement of the 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 is 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 the **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. An undergraduate degree with **Honors** is introduced for the students having good academic record.
  - xvi. Each department 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 department 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 **must secure** not less than **35% of marks** in the **end examination** and a **minimum of 40% of marks** in the **sum of the mid semester and end examination marks** taken together for the theory, practical, design, drawing subject or project etc. In the case of a mandatory course, he/she should secure 40% of mid semester marks.

#### THEORY COUSES

| Assessment Method              | Marks |
|--------------------------------|-------|
| Continuous Internal Assessment | 30    |
| Semester End Examination       | 70    |
| Total                          | 100   |

- i) For the theory subject, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination.
- ii) For practical subjects, the distribution shall be 30 marks for the Internal Evaluation and 70 marks for the End Examination.
- iii) If any subject has both theory and practical components, they will be evaluated separately as theory subject and practical subject. However, they will be given the 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 a semester, there shall be two mid-term examinations. The first midterm examination shall be conducted for the first two and half units of syllabus and the second midterm examination shall be conducted for the rest of the syllabus. Each **mid-term examination consists** of (i) one **online objective** examination (ii) one **descriptive** examination (iii) one **assignment** and (iv) one **Subject Seminar**.

The **online examination** (objective) shall be **10 marks** with duration of **20 minutes**, **descriptive examination** shall be for **10 marks** with a duration of **1 hour 30 minutes**, **assignment** test shall be **5 marks**

with duration of **50 minutes** (Open book system with questions of L4 standard on Bloom's scale) and **Subject Seminar 5 marks**.

- ii) The first **online** examination (objective) is set with **20 multiple choice questions for 10 marks** (20 questions x 1/2 marks) from first two and half units (50% of the syllabus).
- iii) The first **descriptive examination** is set with **30 marks** (two questions for 12 marks and one question for 6 marks) with either or choice from first two and half units (50% of the syllabus), the student must answer all questions. The marks obtained in the subjective paper are condensed to 10 marks.
- iv) The first **assignment Test** from first two and half units conducted for **20 Marks** and will be **scaled down to 5 Marks**. The test is an **open book** system, and the duration of the exam is **50 minutes**. Students can bring a maximum of three printed text books related to that subject. (Soft copies of the text books will not be allowed.) The assignments must provide broadened exposure to the course. The questions shall include problem solving approach, problem analysis & design, implementation, case studies etc.
- v) For the first subject **seminar 5 marks**, each student shall be evaluated based on the presentation on any topic of his/her choice in the subject duly approved by the faculty member concerned.  
In the **similar lines**, the **second mid** examinations shall be conducted on the rest of the syllabus. Any fraction in the total of mid marks shall be rounded off to the next higher mark.
- vi) 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:  $(0 \times 0.2) + (25 \times 0.8) = 20$

**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 1** shall contain **10 compulsory short answer questions** (2 short questions from each unit) for a total of **20 marks** such that **each question** carries **2 marks**.
- iii) In each of the questions from **2 to 6**, there shall be **either/or type** questions of **10 marks each**. Students 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.

**Note:** End examination of theory subjects consisting of two parts of different subjects, for Example: Basic Electrical & Electronics Engineering shall have the following pattern: **Question 1** shall contain **10 compulsory short answer questions** (Fist five Questions from first two and half units and last five questions from remaining syllabus). The questions numbers **2, 3, 4(a)** shall be set by covering from first two and half units and questions numbers **4(b), 5, 6** in the remaining syllabus.

### PRACTICAL COURSES

| Assessment Method              | Marks |
|--------------------------------|-------|
| Continuous Internal Assessment | 30    |
| Semester End Examination       | 70    |
| Total                          | 100   |

- a) For practical courses, there shall be a continuous evaluation during the semester for **30 internal marks** and the end examination shall be for **70 marks**.
- b) **Day-to-day** work in the laboratory shall be evaluated for **15 marks** by the concerned laboratory teacher based on the regularity/record/viva and 15 marks for the internal test.
- c) 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**.
- d) For the subject having **design and/or drawing/graphics**, 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    |
| Total                          | 100   |

**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 first mid exam is set with **30 marks** (two questions for 12 marks and one question for 6 marks) with either or choice from first two and half units (50% of the syllabus), the student must answer all questions. The marks obtained in the subjective paper are condensed to 15 marks. The **second mid** examinations shall be conducted on the rest of the syllabus. Any fraction in the total of mid marks shall be rounded off to the next higher mark. Finalized 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. There shall be no objective paper in the mid semester examination. The sum of day-to-day evaluation and the mid semester marks will be the final internal marks for the subject.

**Note:** 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**. **Internal examination** shall be evaluated **30 marks** in **each part**. **Final Internal marks** shall be arrived by considering the **average of marks obtained in two parts**.

The **end examination pattern for design and/or drawing/graphics** shall consist 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.

- e) 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 a minimum of **40%** 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.
- f) The **laboratory records** and **mid semester test papers** shall be **preserved** for a **minimum of 3 years** in the **respective departments** as per the norms and shall be produced to the various committees 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.**

- g) The course shall carry 100 marks and shall be evaluated through continuous assessments during the semester for 30 internal 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.
- iii) 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.
- iv) The student shall be given an option to choose either the skill courses being offered by the department 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 department to evaluate the grades/marks given for a course by external agencies and convert to the equivalent marks/grades.
- v) 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 Head of the department.

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

A Student must pursue and complete **one course compulsorily** through MOOCs approved by the concerned department. 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**. The **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 college**.

**Necessary amendments** to the **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 **college 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 departments** and it is **mandatory** for the student to share **necessary information** with the **department**.
- iii) The **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 **department shall notify** at the **beginning of semester** the **list** of the online learning courses **eligible for credit transfer**.
- vi) The department 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 department shall ensure **no overlap of MOOC exams** with that of the **college examination schedule**. In case of **delay in results**, the college will **re-issue** the **marks sheet** for **such students**.
- viii) Students **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 in 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 institution 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 APSCHE / 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 a **minimum of 40%** of marks for successful completion. In case a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the institution.

**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 a project report on the work carried out during the internship.

The **project report** shall be **evaluated** by an **external examiner**. The total marks for project work are **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 an **internal examiner and external examiner** appointed by the University and is evaluated for **140 marks**.

The department 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 a 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 within the 160 credits 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 additional specialized courses of their choice and build their competence in a specialized area in the UG level. The programme is the best choice for academically excellent students having a 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 an 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 Principal of the department 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 students 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 for 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 students pursuing the Honors.
- iii) The students enrolled in the Honors courses will be monitored continuously. An advisor/mentor from the 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 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) 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.
- iv) 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.
- v) If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.
- vi) 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.
- vii) For induction programme attendance shall be maintained as per AICTE norms.

### **18. Promotion Rules:**

The following academic requirements must be satisfied in addition to the attendance requirements mentioned in section 17.

- 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 a 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                                     | S (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 Grade Point 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  $i^{\text{th}}$  subject and  $G_i$  is the grade point scored by the student in the  $i^{\text{th}}$  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  $i^{\text{th}}$  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:

| <b>Class Awarded</b>          | <b>CGPA to be secured</b>  |
|-------------------------------|--|
| First Class with distinction* | $\geq 7.75$ (Without any supplementary appearance)                               |
| First Class                   | $\geq 7.75$ (With any supplementary appearance)<br>(or) $\geq 6.75$ and $< 7.75$ |
| Second Class                  | $\geq 5.75$ & $< 6.75$   |
| Pass Class                    | $\geq 5$ & $< 5.75$  |
| Fail                          | $< 5$  |

**Note:** \* Students who have written supplementary examinations to fulfil the credit requirement will not be awarded First Class with Distinction. For such students the highest degree that is awarded will be First Class Only.

#### **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 HoD of the respective department shall forward such proposals submitted by the students to the Principal. An evaluation committee constituted by the Principal 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:**

- a. The academic regulations should be read as a whole for purpose of any interpretation.
- b. Malpractices rules-nature and punishments are appended.
- c. Where the words “he”, “him”, “his”, occur in the regulations, they also include “she”, “her”, “hers”, respectively.
- d. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
- e. 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.
- f. 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 getting admitted into II year through Lateral Entry Scheme from the Academic Year **2024-2025** 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**

A student will be declared eligible for the award of the B.Tech. 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 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 applicable for B. Tech. Four-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).

(\* \* \* \*)

**MALPRACTICE RULES**  
**DISCIPLINARY ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS**

| <b>S.No.</b> | <b>Nature of Malpractices/Improper conduct</b>   | <b>Punishment</b>  |
|--------------|--|--|
| 1. (a)       | Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination) | Expulsion from the examination hall and cancellation of the performance in that subject only.  |
| (b)          | Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.  | Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.  |
| 2.           | Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.  | Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University. |

|    |   |  |
|----|---|--|
| 3. | Impersonates any other candidate in connection with the examination.  | The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practical and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him. |
| 4. | Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination. | Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University   |

|    |   |   |
|----|---|---|
|    |   | examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.   |
| 5. | Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.  | Cancellation of the performance in that subject.  |
| 6. | Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination. | In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them. |
| 7. | Leaves the exam hall taking away answer script or intentionally tears   | Expulsion from the examination hall and cancellation of   |

|    |   |  |
|----|---|--|
|    | of the script or any part thereof inside or outside the examination hall.   | performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. |
| 8. | Possess any lethal weapon or firearm in the examination hall.   | Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.   |
| 9. | If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8. | Student of the college expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and   |

|     |   |  |
|-----|---|--|
|     |   | forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.  |
| 10. | Comes in a drunken condition to the examination hall.   | Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. |
| 11. | Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.   | Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester / year examinations.  |
| 12. | If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment. |  |

# Ragging

## Prohibition of ragging in educational institutions Act 26 of 1997

### Salient Features

- ⇒ Ragging within or outside any educational institution is prohibited.
- ⇒ Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student

|  | Imprisonment upto   |   | Fine Upto           |
|--|---|---|---------------------|
| Teasing, Embarrassing and Humiliation  |  6 Months    | + | <b>Rs. 1,000/-</b>  |
| Assaulting or Using Criminal force or Criminal intimidation                          |  1 Year     | + | <b>Rs. 2,000/-</b>  |
| Wrongfully restraining or confining or causing hurt                                  |  2 Years   | + | <b>Rs. 5,000/-</b>  |
| Causing grievous hurt, kidnapping or Abducts or rape or committing unnatural offence |  5 Years   | + | <b>Rs. 10,000/-</b> |
| Causing death or abetting suicide  |  10 Months | + | <b>Rs. 50,000/-</b> |

**In case any emergency call Toll Free No. 1800 425 1288**

**LET US MAKE VVIT A RAGGING FREE CAMPUS**

# Ragging



## **ABSOLUTELY NO TO RAGGING**

1. Ragging is prohibited as per Act 26 of A.P. Legislative Assembly, 1997.
2. Ragging entails heavy fines and/or imprisonment.
3. Ragging invokes suspension and dismissal from the College.
4. Outsiders are prohibited from entering the College and Hostel without permission.
5. Girl students must be in their hostel rooms by 7.00 p.m.
6. All the students must carry their Identity Cards and show them when demanded
7. The Principal and the Wardens may visit the Hostels and inspect the rooms any time.

**In case any emergency call Toll Free No. 1800 425 1288**

**LET US MAKE VVIT A RAGGING FREE CAMPUS**

## COURSE STRUCTURE

### Induction Programme

| S.No. | Course Name   | Category | L-T-P-C |
|-------|---|----------|---------|
| 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 |

### I Year I Semester

| S. No         | Course code | Course Name                                       | L | T | P | Credits     |
|---------------|-------------|---|---|---|---|-------------|
| 1             | 23SH1T03    | Chemistry   | 3 | 0 | 0 | 3           |
| 2             | 23SH1T01    | Linear Algebra and Calculus                       | 3 | 0 | 0 | 3           |
| 3             | 23EE1T01    | Basic Electrical and Electronics Engineering      | 3 | 0 | 0 | 3           |
| 4             | 23CS1T01    | Introduction to Programming                       | 3 | 0 | 0 | 3           |
| 5             | 23ME1T01    | Engineering Graphics                              | 1 | 0 | 4 | 3           |
| 6             | 23CS1P02    | IT Workshop                                       | 0 | 0 | 2 | 1           |
| 7             | 23SH1P03    | Chemistry Lab                                     | 0 | 0 | 2 | 1           |
| 8             | 23EE1P01    | Electrical and Electronics Engineering Workshop   | 0 | 0 | 3 | 1.5         |
| 9             | 23CS1P01    | Computer Programming Lab                          | 0 | 0 | 3 | 1.5         |
| 10            | 23SH1E02    | NSS / NCC / Scouts and Guides / Community Service | 0 | 0 | 1 | 0.5         |
| 11            | 23SH1N01    | Life Skills-I                                     | 2 | 0 | 0 | 0           |
| Total Credits |             |   |   |   |   | <b>20.5</b> |

**I Year II Semester**

| <b>S. No</b>         | <b>Course code</b> | <b>Course Name</b>                         | <b>L</b> | <b>T</b> | <b>P</b> | <b>Credits</b> |
|----------------------|--------------------|--|----------|----------|----------|----------------|
| <b>1</b>             | 23SH2T01           | Differential Equations and Vector Calculus | 3        | 0        | 0        | 3              |
| <b>2</b>             | 23SH2T04           | Engineering Physics                        | 3        | 0        | 0        | 3              |
| <b>3</b>             | 23CE2T01           | Basic Civil and Mechanical Engineering     | 3        | 0        | 0        | 3              |
| <b>4</b>             | 23SH2T05           | Communicative English                      | 2        | 0        | 0        | 2              |
| <b>5</b>             | 23CS2T01           | Data Structures                            | 3        | 0        | 0        | 3              |
| <b>6</b>             | 23SH2P03           | Engineering Physics Lab                    | 0        | 0        | 2        | 1              |
| <b>7</b>             | 23ME2P03           | Engineering Workshop                       | 0        | 0        | 3        | 1.5            |
| <b>8</b>             | 23SH2P04           | Communicative English Lab                  | 0        | 0        | 2        | 1              |
| <b>9</b>             | 23CS2P02           | Data Structures Lab                        | 0        | 0        | 3        | 1.5            |
| <b>10</b>            | 23SH2E02           | Health and wellness, Yoga and sports       | 0        | 0        | 1        | 0.5            |
| <b>11</b>            | 23SH2N01           | Life Skills-II                             | 2        | 0        | 0        | 0              |
| <b>Total Credits</b> |                    |  |          |          |          | <b>19.5</b>    |

**II Year I Semester**

| <b>S. No</b>         | <b>Course code</b> | <b>Course Name</b>   | <b>L</b> | <b>T</b> | <b>P</b> | <b>Credits</b> |
|----------------------|--------------------|--|----------|----------|----------|----------------|
| <b>1</b>             | 23SH3T05           | Discrete Mathematics and Graph Theory                              | 3        | 0        | 0        | 3              |
| <b>2</b>             | 23SH3T07           | Managerial Economic and Financial Analysis                         | 2        | 0        | 0        | 2              |
| <b>3</b>             | 23EC3001           | Digital Logic and Computer Organization                            | 3        | 0        | 0        | 3              |
| <b>4</b>             | 23CS3T01           | Advanced Data Structures and Algorithm Analysis                    | 3        | 0        | 0        | 3              |
| <b>5</b>             | 23CS3T02           | Object Oriented Programming Through Java                           | 3        | 0        | 0        | 3              |
| <b>6</b>             | 23CO3L01           | Advanced Data Structures and Algorithm Analysis Lab                | 0        | 0        | 3        | 1.5            |
| <b>7</b>             | 23CO3L02           | Object Oriented Programming Through Java Lab                       | 0        | 0        | 3        | 1.5            |
| <b>8</b>             | 23CO3S01           | Python Programming   | 0        | 1        | 2        | 2              |
| <b>9</b>             | 23SH3N01           | Environmental Science /<br>Essence of Indian Traditional Knowledge | 2        | 0        | 0        | 0              |
| <b>10</b>            | 23CO3N01           | Life Skills-III  | 2        | 0        | 0        | 0              |
| <b>Total Credits</b> |                    |  |          |          |          | <b>19</b>      |

## II Year II Semester

| S. No         | Course code | Course Name  | L | T | P | Credits |
|---------------|-------------|--|---|---|---|---------|
| 1             | BS&H        | Universal Human Values 2–Understanding Harmony   | 2 | 1 | 0 | 3       |
| 2             | ES          | Probability and Statistics   | 3 | 0 | 0 | 3       |
| 3             | PC          | Operating Systems  | 3 | 0 | 0 | 3       |
| 4             | PC          | Microprocessors and Microcontrollers   | 3 | 0 | 0 | 3       |
| 5             | PC          | Computer Networks  | 3 | 0 | 0 | 3       |
| 6             | PC          | Computer Networks and Operating Systems Lab  | 0 | 0 | 3 | 1.5     |
| 7             | PC          | Microprocessors and Microcontrollers Lab   | 0 | 0 | 3 | 1.5     |
| 8             | SEC         | Full Stack Development-1   | 0 | 1 | 2 | 2       |
| 9             | BS&H        | Design Thinking and Innovation   | 1 | 0 | 2 | 2       |
| 10            | LS          | Life Skills-IV   | 2 | 0 | 0 | 0       |
| Total Credits |             |  |   |   |   | 22      |
|               |             | Mandatory Community Service Project Internship of 08 weeks duration during summer Vacation |   |   |   |         |
|               |             | Honors/Minor courses   | 3 | 0 | 2 | 4       |

## III Year I Semester

| S. No         | Course code | Course Name   | L | T | P | Credits   |
|---------------|-------------|---|---|---|---|-----------|
| 1             | PC          | Internet of Things  | 3 | 0 | 0 | 3         |
| 2             | PC          | Database Management Systems   | 3 | 0 | 0 | 3         |
| 3             | PC          | Embedded Systems  | 3 | 0 | 0 | 3         |
| 4             | PE          | Professional Elective-1<br>1. Software Engineering<br>2. Wireless Sensor Networks<br>3. Artificial Intelligence<br>4. Cryptography & Network Security | 3 | 0 | 0 | 3         |
| 5             | OE          | Open Elective-1   | 3 | 0 | 0 | 3         |
| 6             | PC          | Internet of Things and Embedded Systems Lab   | 0 | 0 | 3 | 1.5       |
| 7             | PC          | Database Management Systems Lab   | 0 | 0 | 3 | 1.5       |
| 8             | SEC         | Full Stack Development - 2  | 0 | 1 | 2 | 2         |
| 9             | ES          | Tinkering Lab   | 0 | 0 | 2 | 1         |
| 10            | CSP         | Evaluation of Community Service Project / Internship  | 0 | 0 | 0 | 2         |
| 11            | LS          | Life Skills-V   | 2 | 0 | 0 | 0         |
| Total Credits |             |   |   |   |   | <b>23</b> |
|               |             | Honors/Minor courses  | 3 | 0 | 2 | 4         |

## III Year II Semester

| S. No         | Course code | Course Name   | L | T | P | Credits   |
|---------------|-------------|---|---|---|---|-----------|
| 1             | PC          | Big Data Analytics for IoT  | 3 | 0 | 0 | 3         |
| 2             | PC          | Cloud Computing   | 3 | 0 | 0 | 3         |
| 3             | PC          | Sensors, Actuators and data acquisition   | 3 | 0 | 0 | 3         |
| 4             | PE          | Professional Elective-2<br>1. DevOps<br>2. IoT Security<br>3. Automata Theory and Compiler Design<br>4. Machine Learning  | 3 | 0 | 0 | 3         |
| 5             | PE          | Professional Elective-3<br>1. Blockchain Technologies<br>2. Natural Language Processing<br>3. Security Assessment and Risk Analysis<br>4. Android Application Development | 3 | 0 | 0 | 3         |
| 6             | OE          | Open Elective-2   | 3 | 0 | 0 | 3         |
| 7             | PC          | Cloud Computing Lab   | 0 | 0 | 3 | 1.5       |
| 8             | PC          | Big Data Analytics Lab  | 0 | 0 | 3 | 1.5       |
| 9             | SEC         | Soft skills or IELTS  | 0 | 1 | 2 | 2         |
| 10            | Audit       | Technical Paper Writing and IPR   | 2 | 0 | 0 | 0         |
| 11            | LS          | Life Skills-VI  | 2 | 0 | 0 | 0         |
| Total Credits |             |   |   |   |   | <b>23</b> |
|               |             | Mandatory Industry Internship of 08 weeks duration during summer vacation   |   |   |   |           |
|               |             | Honors/Minor courses  | 3 | 0 | 2 | 4         |

## IV Year I Semester

| S. No         | Course code | Course Name  | L | T | P | Credits |
|---------------|-------------|--|---|---|---|---------|
| 1             | PC          | IoT Applications Development on Cloud Platform   | 3 | 0 | 0 | 3       |
| 2             | MC          | Software Project Management  | 2 | 0 | 0 | 2       |
| 3             | PE          | Professional Elective-4<br>1. Ad-hoc and Sensor Networks<br>2. Malware Analysis and Reverse Engineering<br>3. Crypto Currency Technologies<br>4. Designing IoT Architectures | 3 | 0 | 0 | 3       |
| 4             | PE          | Professional Elective-5<br>1. Cyber Physical Systems<br>2. Intrusion Detection and Prevention System<br>3. Human Computer Interaction<br>4. AR/VR                            | 3 | 0 | 0 | 3       |
| 5             | OE          | Open Elective-3  | 3 | 0 | 0 | 3       |
| 6             | OE          | Open Elective-4  | 3 | 0 | 0 | 3       |
| 7             | SEC         | Ethical Hacking  | 0 | 1 | 2 | 2       |
| 8             | Audit       | Constitution of India  | 2 | 0 | 0 | -       |
| 9             | Intern      | Evaluation of Industry Internship  | - | - | - | 2       |
| 10            | LS          | Life Skills-VII  | 2 | 0 | 0 | 0       |
| Total Credits |             |  |   |   |   | 21      |
|               |             | Honors/Minor courses   | 3 | 0 | 2 | 4       |

## IV Year II Semester

| S. No         | Course code | Course Name                                | L | T | P  | Credits |
|---------------|-------------|--|---|---|----|---------|
| 1             | PROJ        | Full Semester<br>Internship & Project Work | 0 | 0 | 24 | 12      |
| Total Credits |             |  |   |   |    | 12      |

**Note:** Student need to do at least ONE MOOC Course (of 3 credits out of 160 credits) to meet the mandatory requirement (11th criteria, as per R23 regulations)

**Courses for Honors degree**

| <b>POOL-1</b>  | <b>POOL-2</b>   | <b>POOL-3</b>                 | <b>POOL-4</b>               |
|--|---|-------------------------------|-----------------------------|
| Advanced Python Programming                              | Software Testing Methodologies                                      | Advanced Data Structures      | Natural Language Processing |
| Advanced Operating Systems                               | Cyber Law & Ethics  | Advanced Database Systems     | Sentiment Analysis          |
| RFID and Micro Controllers                               | Energy harvesting technologies and power management for IoT Devices | Database Security and Privacy | Computer Vision             |
| Robotics and Automation in Food Industry                 | Design and Testing of Digital Systems                               | Kernel and Driver Programming | SDN and NFV for IOT         |
| Biomedical Sensors                                       | Ethical Hacking   | Storage Area Networks         | FOG Computing               |
| <b>MOOC-1* (NPTEL/SWAYAM) Duration: 12 Weeks minimum</b> |   |                               |                             |
| <b>MOOC-2* (NPTEL/SWAYAM) Duration: 12 Weeks minimum</b> |   |                               |                             |

\*Course/subject title cannot be repeated

**Note:**

1. A student must acquire 16 credits with minimum one subject from each pool.
2. Compulsory MOOC/NPTEL course for 4 credits (2 course, each 2 credited)

**General Minor degree courses offered by CSO department**

|                                     |           |
|-------------------------------------|-----------|
| 1. Machine Learning                 | 3-0-3-3   |
| 2. Introduction to IoT              | 3-0-0-3   |
| 3. Blockchain technology            | 3-0-3-3   |
| 4. Cloud computing                  | 3-0-0-3   |
| 5. Cyber Security                   | 3-0-0-3   |
| 6. IoT Lab Using Python             | 3-0-3-1.5 |
| 7. Machine learning with python Lab | 3-0-0-1.5 |

**Note:**

- i. A Student can select four subjects from the above eight subjects @ 3-0-2-4 credits per subject.
- ii. Compulsory MOOC/NPTEL courses for 04 credits (02 courses @ 02 credits each)

(\*\*\*)

|                          |                  |          |          |          |          |
|--------------------------|------------------|----------|----------|----------|----------|
| <b>I-Year-I Semester</b> | <b>Chemistry</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| 23SH1T03                 |                  | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**Course objectives:**

- To familiarize engineering chemistry and its applications.
- To understand the significance of Schrodinger wave equation and molecular orbital theory
- To apply advanced materials for engineering applications.
- To train the students on the principles and applications of electrochemistry - batteries and fuel cells.
- To know the significance of polymers and composites (FRP's) in household appliances, aerospace and automotive industries.
- To summarize the instrumental methods and its applications.

**Unit-1: (10 hrs)****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-2: (9 hrs)****Modern Engineering materials:**

Semiconductors – Introduction, Classification, intrinsic and extrinsic Si-semiconductors, applications

Super conductors-Introduction, Types of superconductors, Meissner effect applications.

Supercapacitors: Introduction, Basic Concept-Classification – Applications.

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

**Unit-3: (9 hrs)****Electrochemistry and Applications**

Electrochemical cell, \*Nernst equation, Electrochemical series - significance, 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, working of hydrogen-oxygen fuel cell-. Polymer Electrolyte Membrane Fuel cells (PEMFC).

**Unit-4: (10 hrs)****Polymer Chemistry**

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

Plastics –Thermoplastics and Thermosettings, Preparation, properties, and

applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibers (CFRP& GFRP). 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), Poly Lactic Acid (PLA).

**Unit-5: (10 hrs)**

**Instrumental Methods and Applications.**

Types of electromagnetic spectrum, Absorption of radiation: Beer-Lambert's law, UV-Visible Spectroscopy, types of electronic transitions, \*Applications of UV-Visible Spectroscopy IR spectroscopy: fundamental modes molecular vibrations, functional group region, and finger print region, \*Applications of IR-Spectroscopy, NMR spectroscopy-Basic Principle, Chemical shift, Instrumentation and \*Applications.

**Note:** \*Only general applications – without any problems /spectroscopic problems regarding quantitative and qualitative analysis.

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

|            |  |
|------------|--|
| <b>CO1</b> | Apply the principles of quantum mechanics to solve the problems like particle in a one-dimensional box   |
| <b>CO2</b> | Demonstrate and distinguish the principle of Band diagrams in the application of semiconductors, conductors & superconductors                  |
| <b>CO3</b> | Analyze the materials usage in construction of batteries, fuel cells and electrochemical sensors.  |
| <b>CO4</b> | Synthesize some important polymers, analyze the properties and applications of thermosetting, thermoplastics, elastomers & conducting polymers |
| <b>CO5</b> | Compare and apply the principles of spectroscopy, to elucidate the molecular structure and functional group analysis                           |

**Text books:**

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, 5th Edition, Wiley Publications, Feb.2008
3. Textbook of Polymer Science, Fred W. Billmeyer Jr, 3rd Edition

|                          |                                    |          |          |          |          |
|--------------------------|------------------------------------|----------|----------|----------|----------|
| <b>I-Year-I Semester</b> | <b>Linear Algebra and Calculus</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| 23SH1T01                 |                                    | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**Course objectives:**

- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics
- To develop the confidence and ability among the students to handle various real-world problems and their applications.

**Unit-1: (10 hrs)****Matrices**

Rank of a matrix by Echelon form and 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 - Gauss elimination method, Jacobi and Gauss-Seidel iteration methods.

**Unit-2: (9 hrs)****Eigenvalues, Eigenvectors and Orthogonal transformation**

Eigenvalues, Eigenvectors and their properties - Diagonalization of a matrix - Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem - Quadratic form and nature of a quadratic form - Reduction of quadratic form to canonical form by orthogonal transformation.

**Unit-3: (9 hrs)****Calculus**

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

**Unit-4: (10 hrs)****Partial differentiation and Applications (Multi variable calculus)**

Functions of several variables: Continuity and Differentiability - Partial derivatives - Total derivatives - Chain rule - Taylor's and Maclaurin's series expansion of functions of two variables - Jacobians - Functional dependence - Maxima and minima of functions of two variables - Method of Lagrange's multipliers.

**Unit-5: (10 hrs)****Multiple Integrals (Multi variable calculus)**

Double integrals - Triple integrals - Change of order of integration - Change of variables to polar, cylindrical and spherical co-ordinates - Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

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

|            |  |
|------------|--|
| <b>CO1</b> | Develop and use of matrix algebra techniques that are needed by engineers for practical applications |
|------------|--|

|            |  |
|------------|--|
| <b>CO2</b> | Determine the eigenvalues and eigenvectors of a matrix or a linear transformation and using them to diagonalize a matrix   |
| <b>CO3</b> | Utilize mean value theorems to real life problems  |
| <b>CO4</b> | Familiarize with functions of several variables which is useful in optimization  |
| <b>CO5</b> | Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates |

**Text books:**

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

**Reference books:**

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, Micheael Greenberg, Pearson publishers, 9th edition.
5. Higher Engineering Mathematics, H. K. Das, Er. Rajnish Verma, S. Chand Publications, 2014, Third Edition (Reprint 2021).

|                          |   |          |          |          |          |
|--------------------------|---|----------|----------|----------|----------|
| <b>I-Year-I Semester</b> | <b>Basic Electrical and Electronics<br/>Engineering</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| 23EE1T01                 |   | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**Course objectives:**

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

**Unit-1: (10 hrs)****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-2: (9 hrs)****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. (Elementary Treatment only)

**Unit-3: (9 hrs)****Energy Resources, Electricity Bill, Safety Measures and Semiconductor Devices**

**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. (Simple numerical problem)

**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.

**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. (Elementary Treatment only)

**Unit-4: (10 hrs)****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. (Elementary Treatment only)

**Unit-5: (10 hrs)****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)

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

|            |   |
|------------|---|
| <b>CO1</b> | Remembering the basic electrical elements and different fundamental laws  |
| <b>CO2</b> | Understand the construction and operation of AC and DC machines, measuring instruments  |
| <b>CO3</b> | Understand the different power generation mechanisms, Electricity billing concept, important safety measures related to electrical operations & understand the basic operation of Semiconductor Devices |
| <b>CO4</b> | Understand the operation of different electronics circuits  |
| <b>CO5</b> | Understand the Boolean Algebra theorems, simplify and design logic circuits and elements of sequential logic circuits   |

**Text 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, DhanpatRai& Co, 2013 .
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition.
4. R. L. Boylestad& Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
5. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009

**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. 4. Basic Electrical and Electronics Engineering, S. K. Bhattacharya, Person Publications, 2018, Second Edition.
5. 5. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
6. 6. SantiramKal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
7. 7. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

**e- Resources:**

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

|                          |                                    |          |          |          |          |
|--------------------------|------------------------------------|----------|----------|----------|----------|
| <b>I-Year-I Semester</b> | <b>Introduction to Programming</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| 23CS1T01                 |                                    | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**Course objectives:**

- To introduce students to the fundamentals of computer programming.
- To provide hands-on experience with coding and debugging.
- To foster logical thinking and problem-solving skills using programming.
- To familiarize students with programming concepts such as data types, control structures, functions, and arrays.
- To encourage collaborative learning and teamwork in coding projects.

**Unit-1: (10 hrs)****Introduction to Programming and Problem Solving**

**Introduction:** History of Computers, Basic organization of a computer: ALU, input-output units, memory.

**Problem solving techniques:** Algorithmic approach, characteristics of algorithm, Algorithms, flowcharts (Using Dia Tool).

**Introduction to Programming:** Languages & types, Basics of a Computer Program- basic structure of a C program, C Tokens – Literals, Primitive Data Types, Keywords, operators, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting.

**Unit-2: (9 hrs)****Control Structures**

**Decision making:** Simple sequential programs Conditional Statements (if, if-else, switch),

**Iterative Statements:** Loop - for, while, do-while, unconditional branching - break and continue.

**Unit-3: (9 hrs)****Arrays and Strings**

**Arrays:** indexing, memory model, programs with array of integers, two dimensional arrays

**Strings:** Introduction to Strings

**Unit-4: (10 hrs)****Pointers & User Defined Data types**

**Pointers:** dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, Dynamic memory management.

**User-defined data types:** Structures and Unions

**Unit-5: (10 hrs)****Functions & File Handling**

**Functions:** Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables,

**File Handling:** Basics of File Handling

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

|            |   |
|------------|---|
| <b>CO1</b> | Understand basics of computers, the concept of algorithm and algorithmic thinking |
| <b>CO2</b> | Analyse a problem and develop an algorithm to solve it                            |
| <b>CO3</b> | Implement various algorithms using the C programming language                     |
| <b>CO4</b> | Understand more advanced features of C language                                   |
| <b>CO5</b> | Develop problem-solving skills and the ability to debug and optimize the code     |

**Text books:**

1. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice-Hall, 1988
2. Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education, 1996

**Reference books:**

1. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-Hill Education, 2008.
2. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd edition

|                          |                             |          |          |          |          |
|--------------------------|-----------------------------|----------|----------|----------|----------|
| <b>I-Year-I Semester</b> | <b>Engineering Graphics</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| 23ME1T01                 |                             | <b>1</b> | <b>0</b> | <b>4</b> | <b>3</b> |

**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 and lines
- To improve the visualization skills for better understanding of plane surfaces and 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 Orthographic projection.

**(First angle projection only)**

|  |
|--|
| <p><b>Unit-1: (10 hrs)</b><br/> <b>Introduction:</b> Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.<br/> <b>Curves:</b> construction of ellipse, parabola and hyperbola by general method (<b>Eccentricity method</b>), Cycloids, Involutives, Normal and tangent to Curves</p>  |
| <p><b>Unit-2: (9 hrs)</b><br/> <b>Orthographic Projections:</b> Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.<br/> <b>Projections of Straight Lines:</b> 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.<br/> <b>Projections of Straight Lines Inclined to both the reference planes:</b> Midpoint problems.</p>  |
| <p><b>Unit-3: (9 hrs)</b><br/> <b>Projections of Planes:</b> 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.<br/> <b>Projections of Solids:</b> 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</p> |
| <p><b>Unit-4: (10 hrs)</b><br/> <b>Sections of Solids:</b> Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in <b>simple position only</b>.<br/> <b>Development of Surfaces:</b> Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone</p>   |
| <p><b>Unit-5: (10 hrs)</b></p>   |

**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).**

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

|            |  |
|------------|--|
| <b>CO1</b> | Constructions of various engineering curves  |
| <b>CO2</b> | Apply the principle of orthographic projection to points and lines                                 |
| <b>CO3</b> | Understand and draw the projection of planes and solids inclined to both planes in first quadrant  |
| <b>CO4</b> | Use the knowledge of sectional views and Development of Solid Surfaces in Real time Applications   |
| <b>CO5</b> | Develop isometric drawings of simple objects reading the orthographic projections of those objects |

**Text books:**

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

**Reference books:**

1. Engineering Drawing, K.L. Narayana and P. Kanniah, 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.
4. AutoCAD 2018 Training Guide (English, Paperback, Sagar Linkan)

**e- Resources:**

1. <https://www.autodesk.com.au/campaigns/autocad-tutorials>
2. <https://nptel.ac.in/courses/112104172>

|                          |                    |          |          |          |          |
|--------------------------|--------------------|----------|----------|----------|----------|
| <b>I-Year-I Semester</b> | <b>IT Workshop</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| 23CS1P02                 |                    | <b>0</b> | <b>0</b> | <b>2</b> | <b>1</b> |

**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.

**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 TeX and 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 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 – ChatGPT**

**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?'"

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

|            |   |
|------------|---|
| <b>CO1</b> | Perform Hardware troubleshooting                      |
| <b>CO2</b> | Understand Hardware components and inter dependencies |
| <b>CO3</b> | Safeguard computer systems from viruses/worms         |
| <b>CO4</b> | Document/ Presentation preparation                    |
| <b>CO5</b> | Perform calculations using spreadsheets               |

**Text 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, 2nd 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 Anfinson and Ken Quamme. – CISCO Press, Pearson Education, 3rd edition
7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3rd edition

|                          |                      |          |          |          |          |
|--------------------------|----------------------|----------|----------|----------|----------|
| <b>I-Year-I Semester</b> | <b>Chemistry Lab</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| 23SH1P03                 |                      | <b>0</b> | <b>0</b> | <b>2</b> | <b>1</b> |

**Course objectives:**

- To verify the fundamental concepts with experiments

**List of Experiments:**

1. Determination of Strength of an acid in Pb-Acid battery.
2. Determination of Hardness of a groundwater sample.
3. Conductometric titration of strong acid vs. strong base.
4. Conductometric titration of weak acid vs. strong base.
5. Determination of cell constant and conductance of solutions.
6. Potentiometry - determination of redox potentials and emfs.
7. pH metry/ pH metric titration of strong acid Vs strong base.
8. Preparation of a Bakelite.
9. Determine the strength of given KMnO<sub>4</sub> by colorimetry (Verification of Lambert-Beer's law).
10. Estimation of Ferrous Iron by Dichrometry.
11. Estimation of Iron by Permanganometry.
12. Measurement of 10D<sub>q</sub> by spectrophotometric method.
13. Wavelength measurement of sample through UV- Visible Spectroscopy.
14. Identification of simple organic compounds by IR.
15. Preparation of nanomaterials by precipitation method.
16. Estimation of Vitamin-C present in soft drink.

**Note: A student can choose any 10 experiments from the above list.**

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

|            |   |
|------------|---|
| <b>CO1</b> | Determine the cell constant and conductance of solutions            |
| <b>CO2</b> | Prepare advanced polymer Bakelite materials                         |
| <b>CO3</b> | Measure the strength of an acid present in any given ample/specimen |
| <b>CO4</b> | Estimate the amount of Vitamin-C present in soft drinks             |
| <b>CO5</b> | Verify Beer-Lambert's law   |

**Text books:**

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

|                          |   |          |          |          |            |
|--------------------------|---|----------|----------|----------|------------|
| <b>I-Year-I Semester</b> | <b>Electrical and Electronics Engineering</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b>   |
| 23EE1P01                 |   | <b>0</b> | <b>0</b> | <b>3</b> | <b>1.5</b> |

**Preamble:** Electrical and Electronics Engineering Workshop Lab provides the essential facilities to the students to augment their concepts about the fundamentals of Electrical and Electronics Engineering.

- To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.
- To impart knowledge on the principles of digital electronics and fundamentals of electron devices & its applications.

**Course objectives:**

- To understand the Electrical circuit design concept, operation of Electrical Machines and Transformer, control the speed of three phase induction motors, measurement of resistance, power, and power factor.
- To apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments.
- To analyze the various characteristics of electrical circuits, electrical machines and measuring instruments.
- To understand the usage of electronic measuring instruments.
- To Plot and discuss the characteristics of various electron devices.

**List of Experiments:**

**Any Ten of the following experiments are to be conducted:**

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. Calculation of Electrical Energy for Domestic Premises
7. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
8. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
9. Implementation of half wave and full wave rectifiers
10. Plot Input & Output characteristics of BJT in CE and CB configurations
11. Frequency response of CE amplifier.
12. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.

**List of Additional Experiments:** Any of the two experiments are to be conducted.

1. Measurement of Earth Resistance using Megger.
2. Simulation of RC coupled amplifier with the design supplied

3. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs
4. Measurement of parameters of choke coil.

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

|            |   |
|------------|---|
| <b>CO1</b> | Analyze the Electrical circuit design concept; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer   |
| <b>CO2</b> | 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 |
| <b>CO3</b> | Analyze various characteristics of electrical circuits, electrical machines and measuring instruments   |
| <b>CO4</b> | Understand the usage of electronic measuring instruments  |
| <b>CO5</b> | Plot and discuss the characteristics of various electron devices  |

**Text books:**

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. R. L. Boylestad& Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.

**Reference books:**

1. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, DhanpatRai& Co, 2013.
2. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition.
3. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata McGraw Hill, 2009
4. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

**e-Resources:**

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

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|--------------------------|---------------------------------|----------|----------|----------|------------|
| <b>I-Year-I Semester</b> | <b>Computer Programming Lab</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b>   |
| 23CS1P01                 |                                 | <b>0</b> | <b>0</b> | <b>3</b> | <b>1.5</b> |

**Course objectives:**

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

**List of Experiments:****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

**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

### 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

**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

**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 Euler's 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.

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

|            |   |
|------------|---|
| <b>CO1</b> | Read, understand, and trace the execution of programs written in C language   |
| <b>CO2</b> | Select the right control structure for solving the problem  |
| <b>CO3</b> | Develop C programs which utilize memory efficiently using programming constructs like pointers                            |
| <b>CO4</b> | Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C |

**Text books:**

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

|                          |  |          |          |          |            |
|--------------------------|--|----------|----------|----------|------------|
| <b>I-Year-I Semester</b> | <b>NSS / NCC / Scouts and Guides /<br/>Community Service</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b>   |
| 23SH1E02                 |  | <b>0</b> | <b>0</b> | <b>1</b> | <b>0.5</b> |

**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.

**Unit-1: (10 hrs)****Orientation**

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

**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.

Conducting talent show in singing patriotic songs-paintings- any other contribution.

**Unit-2: (9 hrs)****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-3: (9 hrs)****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.

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

|            |  |
|------------|--|
| <b>CO1</b> | Understand the importance of discipline, character and service motto             |
| <b>CO2</b> | Solve some societal issues by applying acquired knowledge, facts, and techniques |
| <b>CO3</b> | Explore human relationships by analyzing social problems                         |
| <b>CO4</b> | Determine to extend their help for the fellow beings and downtrodden people      |
| <b>CO5</b> | Develop leadership skills and civic responsibilities                             |

**Text books:**

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

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|--------------------------|----------------------|----------|----------|----------|----------|
| <b>I-Year-I Semester</b> | <b>Life Skills-I</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| 23SH1N01                 |                      | <b>2</b> | <b>0</b> | <b>0</b> | <b>0</b> |

**Outline:**

The Life Skills course is divided into three components – Part-A. Quantitative Ability, Part-B. Reasoning Ability and Part-C. Verbal Ability

**Part-A: Quantitative Ability:** Almost all competitive examinations test the candidate for quantitative aptitude, especially recruitment test, public service examinations management courses, where they evaluate the student's thinking prowess and analytical skills. Critical analysis of problems asked in examination reveal that they are designed to correlate multiple topics and the test taker is expected to identify those link points and come out with an out-of-box unique solution. The purpose of the test is to assess arithmetic abilities, logic, analysis, problem solving and decision-making skills.

**Part-B: Reasoning Ability:** Reasoning ability is the ability to draw connections between factors, and the ability to synthesize a message from a body of information. Reasoning ability of the aspirants for jobs or courses is tested by means of a verbal reasoning test non-verbal reasoning. Thus, reasoning is a highly specialized thinking which helps an individual to explore mentally the cause & effect relationship of an event or solution of a problem by adopting some well-organized systematic steps based on previous experience combined with present observation. Most of the recruitment tests consist of questions to assess the reasoning ability of the students.

**Part-C: Verbal Ability:** The dramatic changes in global economies have been matched with the transformation in technology and these have an impact on education as well the workplace. Life skills provide students with important skills such as independent thinking, social skills, situational awareness, and communication skills needed in the campus and future workplaces. They equip the student with the requisite tools for all round development, and the requisite non-academic skills to enrich their lives.

**Part-A: Quantitative Ability****Unit-1: (10 hrs)**

**Module 1:** Linear equation or simple equation and Algebraic equation

**Module 2:** Number System – Prime Factorization, divisibility of a factorial number, number of zeroes, unit digit and remainders, Examples, and practice problems

**Unit-2: (9 hrs)**

**Module 3:** LCM AND HCF – Definitions of LCM and HCF, Methods of finding LCM and HCF using Prime Factorization method and Division Method, Examples, and practice problems.

**Module 4:** Ratio, proportion, and variation – Definition of Ratios and Proportions, Meaning of Ratios and Proportions, Properties of Ratios, Formulas, differences between Ratios and Proportions, Examples, and practice problems.

**Part-B: Reasoning Ability**

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| <b>Unit-3: (9 hrs)</b><br><b>Module 5:</b> Series<br><b>Module 6:</b> Analogy                      |
| <b>Unit-4: (10 hrs)</b><br><b>Module 7:</b> Classification<br><b>Module 8:</b> Coding and Decoding |

**Part-C: Verbal Ability**

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| <b>Unit-5: (10 hrs)</b><br><br><b>Module 9:</b> Functional English; Ad-lib/ impromptu speaking sessions; JAM sessions<br><b>Module 10:</b> Writing paragraphs (describing a process, reporting an incident, explaining an experience); Summarizing TED talks; and Letter Writing |
| <b>Unit-6: (10 hrs)</b><br><br><b>Module 11:</b> Time management; Stress Management; and Emotional intelligence<br><b>Module 12:</b> Interpersonal skills; Team dynamics; and Leadership development   |

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

|            |   |
|------------|---|
| <b>CO1</b> | To convert difficult data into equations and find solution by various methods and means using Algebra |
| <b>CO2</b> | Application of Number system usage in daily life  |
| <b>CO3</b> | Enhance the logical abilities on various series and analogies (number, letter and verbal)             |
| <b>CO4</b> | Implementing logical classification, coding and decoding (number, letter and verbal)                  |
| <b>CO5</b> | Understand importance of effective communication ski, usage of contextual vocabulary                  |
| <b>CO6</b> | Understand the importance of grammar for effective communication                                      |

**Text books:**

1. Quantitative Aptitude for Competitive Examination by Dr R S Agarwal
2. Fast Track Objective Arithmetic Paperback – 2018 by Rajesh Verma
3. Teach Yourself Quantitative Aptitude, by Arun Sharma
4. The Pearson Guide to Quantitative Aptitude for Competitive Examination by Dinesh Khattar
5. Quantitative Aptitude for all Competitive Exam by Abhijit Gupta
6. Quantitative Aptitude Quantum CAT by Sarvesh K. Verma
7. How to Prepare for Data Interpretation by Arun Sharma

8. Logical Reasoning Data Interpretation by Nishit K. Sinha
9. Analytical Reasoning (2018-2019) Session by MK Panday
10. How to Crack Test of Reasoning by Jaikishan and Premkishan [Arihant]
11. Logical Reasoning and Data Interpretation for CAT & other MBA exams by K. Sinha Nishit [Pearson]
12. Reasoning for Competitive Exams by K. Sinha Nishit [Pearson]
13. How to Prepare for Logical Reasoning for CAT by Arun Sharma [McGraw Hill]
14. Shortcuts in Reasoning (Verbal, Non-Verbal, Analytical & Critical) for Competitive Exams by Disha Experts
15. Visual Intelligence for Beginners by Matthew Alcot
16. McCarthy, Michael & Felicity O'Dell. English Vocabulary in Use beginner, Cambridge University Press, 2017.
17. McCarthy, Michael & Felicity O'Dell. English Vocabulary in Use Upper-Intermediate, Cambridge University Press, 2017.
18. McCarthy, Michael & Felicity O'Dell. English Vocabulary in Use Advanced, Cambridge University Press, 2017.
19. Sonmez, John. Soft Skills: The Software Developer's Life, Manning Publications, 2014.
20. Tulgan, Bruce. Bridging the Soft Skills Gap: How to Teach the Missing Basics to Today's Young Talent, Pan Macmillan India, 2016.

|                           |   |          |          |          |          |
|---------------------------|---|----------|----------|----------|----------|
| <b>I-Year-II Semester</b> | <b>Differential Equations and Vector<br/>Calculus</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| 23SH2T01                  |   | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**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 into advanced level by handling various real-world applications

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| <p><b>Unit-1: (10 hrs)</b><br/> <b>Differential equations of first order and first degree</b><br/>         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.</p>  |
| <p><b>Unit-2: (9 hrs)</b><br/> <b>Linear differential equations of higher order (constant coefficients)</b><br/>         Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral - Wronskian, Method of variation of parameters - Simultaneous linear equations - Applications to L-C-R circuit problems and Simple harmonic motion.</p> |
| <p><b>Unit-3: (9 hrs)</b><br/> <b>Partial differential equations</b><br/>         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.</p>                       |
| <p><b>Unit-4: (10 hrs)</b><br/> <b>Vector differentiation</b><br/>         Scalar and vector point functions - Vector operator del - Del applied to scalar point functions - Gradient, Directional derivative - Del applied to vector point functions - Divergence and Curl - Vector identities.</p>   |
| <p><b>Unit-5: (10 hrs)</b><br/> <b>Vector integration</b><br/>         Line integral - Circulation - Work done - Surface integral, flux - Green's theorem in the plane (without proof) - Stoke's theorem (without proof) - Volume integral - Gauss divergence theorem (without proof) and related problems.</p>  |

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

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| <b>CO1</b> | Solve the differential equations related to various engineering fields.                      |
| <b>CO2</b> | Solve the second and higher order differential equations and its applications.               |
| <b>CO3</b> | Identify solution methods for partial differential equations that model physical processes.  |
| <b>CO4</b> | Interpret the physical meaning of different operators such as gradient, curl and divergence. |

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| <b>CO5</b> | Estimate the work done against a field, circulation and flux using vector calculus. |
|------------|---|

**Text books:**

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

**Reference books:**

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
5. Higher Engineering Mathematics, B. V. Ramana, Mc Graw Hill Education, 2017.

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|---------------------------|----------------------------|----------|----------|----------|----------|
| <b>I-Year-II Semester</b> | <b>Engineering Physics</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| 23SH2T04                  |                            | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**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.

**Unit-1: (10 hrs)****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-2: (9 hrs)****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-3: (9 hrs)****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’s 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 & ferrimagnetic materials – domain concept for ferromagnetism & domain walls (Qualitative) – hysteresis – soft and hard magnetic materials.

**Unit-4: (10 hrs)****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-5: (10 hrs)**

**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.

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

|            |  |
|------------|--|
| <b>CO1</b> | Analyze the intensity variation of light due to polarization, interference and diffraction.    |
| <b>CO2</b> | Familiarize with the basics of crystals and their structures.                                  |
| <b>CO3</b> | Summarize various types of polarization of dielectrics and classify the magnetic materials.    |
| <b>CO4</b> | Explain fundamentals of quantum mechanics and apply it to one dimensional motion of particles. |
| <b>CO5</b> | Identify the type of semiconductor using Hall effect.  |

**Text books:**

1. “Applied Physics” by T. Vijaya Krishna, T. Madhu Mohan, B. K. Pandey, Manoj K. Harbola, S. Chaturvedi - Cengage, 2020.
2. “A Text book of Engineering Physics” by M.N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy, S. Chand Publications, 11th Edition 2019.
3. Engineering Physics -D. K. Bhattacharya and Poonam Tandon, Oxford press (2015)

**Reference books:**

1. Engineering Physics –Shatendra Sharma, Jyotsna Sharma, Pears on Education, 2018.
2. Engineering Physics”-Sanjay D.Jain, D.Sahasrabudhe and Girish, University Press.2010
3. Engineering Physics -M. R. Srinivasan, New Age international publishers (2009).
4. Fundamentals of Physics- Halliday, Resnick and Walker, Wiley (2006).
5. Physics for Scientists & Engineers, Serway and Jewett, Cengage (2019).

**e-Resources**

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

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|---------------------------|---|----------|----------|----------|----------|
| <b>I-Year-II Semester</b> | <b>Basic Civil and Mechanical Engineering</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| 23CE2T01                  |   | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**Course objectives:**

- To bridge the gap between the various engineering courses by identifying the importance of Civil and Mechanical Engineering of in different sectors and industries. Civil and Mechanical Engineering sub-divisions such as engineering materials, construction techniques, different manufacturing processes, different thermal and mechanical transmission systems, preliminary concepts of surveying and acquire preliminary knowledge on Transportation and its importance in nation's economy.

**PART A: BASIC CIVIL ENGINEERING****Unit-1: (10 hrs)**

**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-2: (9 hrs)**

**Surveying:** Objectives of Surveying- Horizontal Measurements- Angular Measurements-

Introduction to Bearings Levelling instruments used for levelling -Simple problems on levelling and bearings - Contour mapping.

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

**Unit-3: (5 hrs)**

**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).

**Text books:**

1. M. S. Palanichamy, Basic Civil Engineering, McGraw Hill Education, 4th edition, 2017
2. S. S. Bhavikatti, Basic Civil Engineering, New Age International, 2010
3. Srikrishna A. Dhale and Kiran M. Tajne, Basics of Civil Engineering, 2014.

**Reference books:**

1. G. Shanmugam and M. S. Palanichamy, Basic Civil and Mechanical

- Engineering, McGraw Hill Education, 2018.
2. S. Gopi, Basic Civil Engineering, Pearson, 2018
  3. Introduction to Civil Engineering, Course Material, IIT Madras.

## PART B: BASIC MECHANICAL ENGINEERING

### Unit-3: (4 hrs)

**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** - Classification of Engineering materials & Their applications: Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials. Definition of Strength, Hardness, Ductility and Toughness

### Unit-4: (10 hrs)

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

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

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

### Unit-5: (10 hrs)

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

**Thermal Engineering** - working principle of Boilers (Cochran boiler, Babcock and Wilcox boiler, La Mont boiler), Refrigeration cycle (Ideal Vapour Compression refrigeration cycle) and air-conditioning system (Summer air-conditioning system), IC engines, Otto cycle, Diesel cycle, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles

### Text books:

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.

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

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|------------|---|
| <b>CO1</b> | Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society and also Understand the basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology |
| <b>CO2</b> | Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying. Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation     |
| <b>CO3</b> | Understand the importance of Water Storage and Conveyance Structures so that the social responsibilities of water conservation will be appreciated. Also understand the different manufacturing processes                                   |
| <b>CO4</b> | Demonstrate the working of different mechanical power transmission systems and Basics of robotics   |
| <b>CO5</b> | Understand the working principles of Various power plants   |

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|---------------------------|------------------------------|----------|----------|----------|----------|
| <b>I-Year-II Semester</b> | <b>Communicative English</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| 23SH2T05                  |                              | <b>2</b> | <b>0</b> | <b>0</b> | <b>2</b> |

**Course objectives:**

- To facilitate effective listening, speaking, reading, and writing skills among the students.
- To enhance the LSRW skills in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary.
- To help the students to make them effective in speaking and writing skills and to make them industry ready.

**Unit-1: (10 hrs)****Lesson: HUMAN VALUES: Gift of Magi (Short Story)****Lesson: “How to Fashion Your Own Brand of Success” by Howard Whitman**

**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.

**Grammar:** Parts of Speech, Basic Sentence Structures-forming questions

**Vocabulary:** Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words

**Unit-2: (9 hrs)****Lesson: NATURE: The Brook by Alfred Tennyson (Poem)****Lesson: “How to Conquer the Ten Most Common Causes of Failure” by Louis Binstock**

**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

**Unit-3: (9 hrs)****Lesson: BIOGRAPHY: Elon Musk****Lesson: “How to Develop Your Strength to Seize Opportunities” by Maxwell Maltz**

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| <p><b>Listening:</b> Listening for global comprehension and summarizing what is listened to.</p> <p><b>Speaking:</b> Discussing specific topics in pairs or small groups and reporting what is discussed</p> <p><b>Reading:</b> Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.</p> <p><b>Writing:</b> Summarizing, Note-making, paraphrasing</p> <p><b>Grammar:</b> Verbs - tenses; subject-verb agreement; Compound words, Collocations</p> <p><b>Vocabulary:</b> Compound words, Collocations</p>   |
| <p><b>Unit-4: (10 hrs)</b></p> <p><b>Lesson:</b> <b>INSPIRATION: The Toys of Peace by Saki</b></p> <p><b>Lesson:</b> <b>“How to Raise Your Self-Esteem and Develop Self-confidence” by James W Newman</b></p> <p><b>Listening:</b> Making predictions while listening to conversations/transactional dialogues without video; listening with video.</p> <p><b>Speaking:</b> Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.</p> <p><b>Reading:</b> Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes, or display complicated data.</p> <p><b>Writing:</b> Letter Writing: Official Letters, Resumes</p> <p><b>Grammar:</b> Reporting Verbs, Direct &amp; Indirect Speech, Active &amp; Passive Voice</p> <p><b>Vocabulary:</b> Words often Confused, Jargons</p> |
| <p><b>Unit-5: (10 hrs)</b></p> <p><b>Lesson:</b> MOTIVATION: The Power of Intrapersonal Communication (An Essay)</p> <p><b>Lesson:</b> “How to Eliminate Your Bad Habits” by Benjamin Franklin</p> <p><b>Listening:</b> Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.</p> <p><b>Speaking:</b> Formal oral presentations on topics from academic contexts</p> <p><b>Reading:</b> Reading comprehension.</p> <p><b>Writing:</b> Writing structured essays on specific topics.</p> <p><b>Grammar:</b> Editing short texts identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)</p> <p><b>Vocabulary:</b> Technical Jargons</p>  |

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

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| <b>CO1</b> | Understand the context, topic, and pieces of specific information from social or transactional dialogues. |
| <b>CO2</b> | Apply grammatical structures to formulate sentences and correct word forms.                               |

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| <b>C03</b> | Analyse discourse markers to speak clearly on a specific topic in informal discussions.                 |
| <b>C04</b> | Evaluate reading / listening texts and to write summaries based on global comprehension of these texts. |
| <b>C05</b> | Create a coherent paragraph, essay, and resume.   |

**Text books:**

1. Pathfinder: Communicative English for Undergraduate Students, 1st Edition, Orient Black Swan 2023 (Units 1, 2 & 3)
2. Empowering with Language by Cengage Publications, 2023 (Units 4 & 5)
3. University of Success: OG Mandino Jaico Impression 2019 (5 Selected Lessons)

**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.

**e-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)

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|---------------------------|------------------------|----------|----------|----------|----------|
| <b>I-Year-II Semester</b> | <b>Data Structures</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| 23CS2T01                  |                        | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**Course objectives:**

- To provide the knowledge of basic data structures and their implementations.
- To understand importance of data structures in context of writing efficient programs.
- To develop skills to apply appropriate data structures in problem solving.

**Unit-1: (10 hrs)**

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-2: (9 hrs)**

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-3: (9 hrs)**

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-4: (10 hrs)**

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-5: (10 hrs)**

Trees: Introduction to Trees, Binary Search Tree – Insertion, Deletion & Traversal

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

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|------------|---|
| <b>CO1</b> | <b>Summarize</b> the role of linear data structures in organizing and accessing data efficiently in algorithms.               |
| <b>CO2</b> | <b>Design</b> , implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation. |
| <b>CO3</b> | <b>Develop</b> programs using stacks to handle recursive algorithms, manage program states, and solve related problems.       |

|            |   |
|------------|---|
| <b>CO4</b> | <b>Devise</b> novel solutions to small scale programming challenges involving data structures such queues, dequeues.    |
| <b>CO5</b> | <b>Recognize</b> scenarios where trees, hashing is advantageous, and design hash-based solutions for specific problems. |

**Text books:**

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

|                           |                                |          |          |          |          |
|---------------------------|--------------------------------|----------|----------|----------|----------|
| <b>I-Year-II Semester</b> | <b>Engineering Physics Lab</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| 23SH2P03                  |                                | <b>0</b> | <b>0</b> | <b>2</b> | <b>1</b> |

**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.

**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 photo electric 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.

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

|            |  |
|------------|--|
| <b>CO1</b> | Operate optical instruments like travelling microscope and spectrometer                  |
| <b>CO2</b> | Estimate the wavelengths of different colours using diffraction grating                  |
| <b>CO3</b> | Plot the intensity of the magnetic field of circular coil carrying current with distance |

|            |   |
|------------|---|
| <b>CO4</b> | Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively |
| <b>CO5</b> | Calculate the band gap of a given semiconductor   |
| <b>CO6</b> | Identify the type of semiconductor using Hall effect  |

**Text books:**

1. A Textbook of Practical Physics-S. Balasubramanian, M. N. Srinivasan, S. Chand Publishers, 2017.

**e-Resources:**

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

|                           |                             |          |          |          |            |
|---------------------------|-----------------------------|----------|----------|----------|------------|
| <b>I-Year-II Semester</b> | <b>Engineering Workshop</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b>   |
| 23ME2P03                  |                             | <b>0</b> | <b>0</b> | <b>3</b> | <b>1.5</b> |

**Course objectives:**

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

**List of Experiments: (Student has to complete Two experiments in each Trade)**

1. **Demonstration:** Safety practices and precautions to be observed in workshop.
2. **Wood Working:** Familiarity with different types of woods and tools used in woodworking and make following joints.
  - a. Half – Lap joint
  - b. Mortise and Tenon joint
  - c. Corner Dovetail joint or Bridlejoint
3. **Sheet Metal Working:** Familiarity with different types of tools used in sheet metalworking, 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

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

|   |
|---|
| <b>CO1</b>   Identify workshop tools and their operational capabilities |
|---|

|            |  |
|------------|--|
| <b>CO2</b> | Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry, and welding |
| <b>CO3</b> | Apply fitting operations in various applications   |
| <b>CO4</b> | Apply basic electrical engineering knowledge for House Wiring Practice   |

**Text books:**

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

|                           |                                  |          |          |          |          |
|---------------------------|----------------------------------|----------|----------|----------|----------|
| <b>I-Year-II Semester</b> | <b>Communicative English Lab</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| 23SH2P04                  |                                  | <b>0</b> | <b>0</b> | <b>2</b> | <b>1</b> |

**Course objectives:**

- To expose the students to a variety of self-instructional, learner friendly modes of language learning.
- To train the students in basic communication skills and also make them ready to face job interviews.

**List of Topics:**

1. Vowels & Consonants
2. Neutralization/Accent Rules
3. Communication Skills & JAM
4. Role Play or Conversational Practice
5. E-mail Writing
6. Resume Writing, Cover Letter, SOP
7. Group Discussions-Methods & Practice
8. Debates - Methods & Practice
9. PPT Presentations/ Poster Presentation
10. Interview Skills

**Suggested Software**

- Walden Infotech
- Young India Films

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

|            |   |
|------------|---|
| <b>CO1</b> | Understand the different aspects of the English language proficiency with emphasis on LSRW skills                                   |
| <b>CO2</b> | Apply communication skills through various language learning activities   |
| <b>CO3</b> | Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension |
| <b>CO4</b> | Evaluate and exhibit professionalism in participating in debates and group discussions  |
| <b>CO5</b> | Create effective career objectives  |

**Text books:**

1. Raman Meenakshi, Sangeeta-Sharma. Technical Communication. Oxford Press. 2018.
2. Taylor Grant: English Conversation Practice, Tata McGraw-Hill Education India, 2016.
3. Hewing's, Martin. Cambridge Academic English (B2). CUP, 2012.
4. J. Sethi & P.V. Dhamija. A Course in Phonetics and Spoken English, (2nd Ed), Kindle, 2013

**e-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\\_cBE0Drdx19qkTMOWNw](https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTMOWNw)

**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/UCNfm92h83W2i2jic5Xwp\\_IA](https://www.youtube.com/channel/UCNfm92h83W2i2jic5Xwp_IA)

|                           |                            |          |          |          |            |
|---------------------------|----------------------------|----------|----------|----------|------------|
| <b>I-Year-II Semester</b> | <b>Data Structures Lab</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b>   |
| 23CS2P02                  |                            | <b>0</b> | <b>0</b> | <b>3</b> | <b>1.5</b> |

**Course objectives:**

- The course aims to strengthen the ability of the students to identify and apply the suitable datastructure for the given real-world problem. It enables them to gain knowledge in practical applications of data structures.

**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: Hashing**

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

**Exercise 3: 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 4: 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 5: 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 6: 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 7: 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 8: 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 9: Binary Search Tree**

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

**Exercise 10: Graphs**

Write C programs for implementing the following graph traversal algorithms:

- a) Depth first traversal
- b) Breadth first traversal

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

|            |  |
|------------|--|
| <b>CO1</b> | Explain the role of linear data structures in organizing and accessing data efficiently in algorithms  |
| <b>CO2</b> | Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation   |
| <b>CO3</b> | Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems  |
| <b>CO4</b> | 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 |
| <b>CO5</b> | Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems   |

**Text books:**

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 Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms by Robert Sedgewick.

|                           |   |          |          |          |            |
|---------------------------|---|----------|----------|----------|------------|
| <b>I-Year-II Semester</b> | <b>Health and Wellness, Yoga and Sports</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b>   |
| 23SH2E02                  |   | <b>0</b> | <b>0</b> | <b>1</b> | <b>0.5</b> |

**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.

**Unit-1: (10 hrs)**

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-2: (9 hrs)**

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-3: (9 hrs)**

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.

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

|            |  |
|------------|--|
| <b>CO1</b> | Understand the importance of yoga and sports for Physical fitness and sound health |
| <b>CO2</b> | Demonstrate an understanding of health-related fitness components                  |
| <b>CO3</b> | Compare and contrast various activities that help enhance their health             |
| <b>CO4</b> | Assess current personal fitness levels   |
| <b>CO5</b> | Develop Positive Personality   |

**Text 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.

|                           |                       |          |          |          |          |
|---------------------------|-----------------------|----------|----------|----------|----------|
| <b>I-Year-II Semester</b> | <b>Life Skills-II</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| 23SH2N01                  |                       | <b>2</b> | <b>0</b> | <b>0</b> | <b>0</b> |

### Part-A: Quantitative Ability

|   |
|---|
| <p><b>Unit-1: (10 hrs)</b><br/> <b>Module 1:</b> PERCENTAGE - Formula of percentages, Finding percentages, percentage differences, changes in percentages, computing table of percentages, fraction to percentage and vice versa, Examples and practice problems.<br/> <b>Module 2:</b> PROFIT and LOSS</p> |
| <p><b>Unit-2: (9 hrs)</b><br/> <b>Module 3:</b> DISCOUNT<br/> <b>Module 4:</b> PARTNERSHIP</p>  |

### Part-B: Reasoning Ability

|   |
|---|
| <p><b>Unit-3: (9 hrs)</b><br/> <b>Module 5:</b> Counting Figures<br/> <b>Module 6:</b> Non-Verbal Reasoning</p> |
| <p><b>Unit-4: (10 hrs)</b><br/> <b>Module 7:</b> Finding Missing Terms<br/> <b>Module 8:</b> Arrangements</p>   |

### Part-C: Verbal Ability

|  |
|--|
| <p><b>Unit-5: (10 hrs)</b><br/> <b>Module 9:</b> Understanding professional communication; Contextual Usage of selected vocabulary; Contextual understanding of vocabulary in a paragraph<br/> <b>Module 10:</b> Parts of speech; Subject-verb agreement; Tenses</p> |
| <p><b>Unit-6: (10 hrs)</b><br/> <b>Module 11:</b> Introduction to employability /life skills; Career guidance; Personal grooming and projecting a positive self-image<br/> <b>Module 12:</b> Goal setting &amp; Planning; Ethics, values &amp; Attitude</p>          |

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

|            |  |
|------------|--|
| <b>C01</b> | Enhance application skills in Business Mathematics   |
| <b>C02</b> | Implementation of Mathematical skills in Business  |
| <b>C03</b> | To improve logical visualization and counting in series, analogies and classification (non-verbal reasoning) |
| <b>C04</b> | Implementation of arrangement in circular and row form in daily life   |
| <b>C05</b> | Appreciate the importance of job requisites and attaining them   |
| <b>C06</b> | Recognize the importance of goal setting and building of a ethical, and personal value system                |

**Text books:**

1. Quantitative Aptitude for Competitive Examination by Dr R S Agarwal
2. Fast Track Objective Arithmetic Paperback – 2018 by Rajesh Verma
3. Teach Yourself Quantitative Aptitude, by Arun Sharma
4. The Pearson Guide to Quantitative Aptitude for Competitive Examination by Dinesh Khattar
5. Quantitative Aptitude for all Competitive Exam by Abhijit Gupta
6. Quantitative Aptitude Quantum CAT by Sarvesh K. Verma
7. Reasoning Ability for Competitive Examination by Dr R S Agarwal
8. A Modern Approach to Logical Reasoning (2019-20 Session) by R.S. Aggarwal [S. Chand]
9. How to Prepare for Logical Reasoning for CAT by Arun Sharma [McGraw Hill]
10. Multidimensional Reasoning by Mishra and Kumar Dr. Lal [Upkar's]
11. A Modern Approach to Verbal & Non-Verbal Reasoning (2019-20 Session) by R.S. Aggarwal [S. Chand]
12. A New Approach to Reasoning Verbal & Non-Verbal by B.S. Sijwali and Indu Sijwali [Arihant]
13. Analytical Reasoning (2018-2019) Session by MK Panday
14. How to Crack Test of Reasoning by Jaikishan and Premkishan [Arihant]
15. Logical Reasoning and Data Interpretation for CAT & other MBA exams by K. Sinha Nishit [Pearson]
16. Reasoning for Competitive Exams by K. Sinha Nishit [Pearson]
17. Shortcuts in Reasoning (Verbal, Non-Verbal, Analytical & Critical) for Competitive Exams by Disha Experts
18. Visual Intelligence for Beginners by Matthew Alcot
19. Logical Reasoning & Data Interpretation by Nishit K. Sinha
20. McCarthy, Michael & Felicity O'Dell. English Vocabulary in Use beginner, Cambridge University Press, 2017.
21. McCarthy, Michael & Felicity O'Dell. English Vocabulary in Use Upper-Intermediate, Cambridge University Press, 2017.
22. McCarthy, Michael & Felicity O'Dell. English Vocabulary in Use Advanced, Cambridge University Press, 2017.
23. Sonmez, John. Soft Skills: The Software Developer's Life, Manning Publications, 2014.
24. Tulgan, Bruce. Bridging the Soft Skills Gap: How to Teach the Missing Basics to Today's Young Talent, Pan Macmillan India, 2016

|                           |  |          |          |          |          |
|---------------------------|--|----------|----------|----------|----------|
| <b>II-Year-I Semester</b> | <b>Discrete Mathematics and Graph Theory</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| 23SH3T05                  |  | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**Course objectives:**

- To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning.
- To introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science.

**Unit-1: (10 hrs)****Mathematical Logic**

Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of proof, Predicate Calculus: Predicates, Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus

**Unit-2: (9 hrs)****Set theory**

Sets: Operations on Sets, Principle of Inclusion-Exclusion, Relations: Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and partial Ordering, Hasse Diagrams, Functions: Bijective, Composition, Inverse, Permutation, and Recursive Functions, Lattice and its Properties.

**Unit-3: (9 hrs)****Combinatorics and Recurrence Relations**

Basis of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems.

**Recurrence Relations:**

Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations.

**Unit-4: (10 hrs)****Graph Theory**

Basic Concepts, Graph Theory and its Applications, Subgraphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs.

**Unit-5: (10 hrs)****Multi Graphs**

Multigraphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Coloring and Covering, Chromatic Number, Spanning Trees, Prim's and Kruskal's Algorithms, BFS and DFS Spanning Trees.

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

|            |   |
|------------|---|
| <b>CO1</b> | Build skills in solving mathematical problems   |
| <b>CO2</b> | Comprehend mathematical principles and logic  |
| <b>CO3</b> | Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software |
| <b>CO4</b> | Manipulate and analyze data numerically and/or graphically using appropriate software         |
| <b>CO5</b> | How to communicate effectively mathematical ideas/results verbally or in writing              |

**Text books:**

1. Discrete Mathematical Structures with Applications to Computer Science, J.P. Tremblay and P. Manohar, Tata Mc Graw Hill.
2. Elements of Discrete Mathematics-A Computer Oriented Approach, C. L.Liu and D.P. Mohapatra, 3rd Edition, Tata McGraw Hill.
3. Theory and Problems of Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz and Marc Lars Lipson, 3rd Edition, McGraw Hill.
4. Mathematical Foundations of Computer Science, Dr D. S. C., Prism books PVT LTD.
5. Mathematical Foundations of Computer Science, B. Satyanarayana, T. V. Pradeep Kumar, Sk. Shaw, BS publications, BSP books.

**Reference books:**

1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A.Kandel and T.P. Baker, 2nd Edition, Prentice Hall of India.
2. Discrete Mathematical Structures, Bernard Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
3. Discrete Mathematics, S. K. Chakraborty and B. K. Sarkar, Oxford, 2011.
4. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K.H. Rosen, 7th Edition, Tata Mc Graw Hill.

|                           |  |          |          |          |          |
|---------------------------|--|----------|----------|----------|----------|
| <b>II-Year-I Semester</b> | <b>Managerial Economics and Financial<br/>Analysis</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| 23SH3T07                  |  | <b>2</b> | <b>0</b> | <b>0</b> | <b>2</b> |

**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.

**Unit-1: (10 hrs)****Introduction to Managerial Economics**

Definition of Managerial Economics and Scope – Managerial Economics with other subjects -Demand Concept, types, Law of Demand-Demand Elasticity-Types - Measurement. Demand Forecasting- Factors governing Forecasting, Methods.

**Unit-2: (9 hrs)****Production and Cost Analysis**

Introduction - Production Function – Cobb-Douglas Production Function Least- cost combination - short run and long run Production Function- Isoquants and Isocosts, MRTS - - Laws of Returns - Internal and External Economies of scale.

Cost & Break-Even Analysis - Cost concepts- opportunity costs - Fixed costs, Variable Costs and Total costs - Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems)-Managerial significance and limitations of Break-Even Analysis

**Unit-3: (9 hrs)****Introduction of Markets, Pricing Policies and Business Organizations**

Introduction -meaning, Types of Markets -Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition - Oligopoly- Pricing Methods and Strategies.

Forms of Business Organizations-Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises

**Unit-4: (10 hrs)****Capital Budgeting**

Introduction - 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-5: (10 hrs)****Financial Accounting and Analysis**

Introduction - meaning, significance -Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

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

|            |  |
|------------|--|
| <b>CO1</b> | Define the concepts related to Managerial Economics, financial accounting and management   |
| <b>CO2</b> | Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets and apply these concepts for effective business decision    |
| <b>CO3</b> | Understand the Nature of Competition, Characteristics of Pricing in the different market structure and know the different forms of Business organization |
| <b>CO4</b> | Analyze how to invest their capital and maximize returns and evaluate the capital budgeting techniques   |
| <b>CO5</b> | Develop the accounting statements and evaluate the financial performance of business entity  |

**Text books:**

1. Aryasri: Business Economics and Financial Analysis, 1/e, MGH, 2020.
2. Aryasri: Managerial Economics and Financial Analysis, 4/e, MGH, 2019.
3. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2014.

**Reference books:**

1. Ahuja HI Managerial economics Schand,3/e,2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2019.
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, 2013.

**e-Resources**

1. <https://www.slideshare.net/123ps/managerial-economics-ppt>
2. <https://www.slideshare.net/rossanz/production-and-cost-45827016>
3. <https://www.slideshare.net/darkyla/business-organizations-19917607>
4. <https://www.slideshare.net/balarajbl/market-and-classification-of-market>

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|---------------------------|--|----------|----------|----------|----------|
| <b>II-Year-I Semester</b> | <b>Digital Logic and Computer<br/>Organization</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| 23EC3001                  |  | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**Course objectives:**

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

**Unit-1: (10 hrs)**

**Data Representation:** Binary, Octal and Hexadecimal Numbers, Number base conversions, Complements, Signed binary numbers, Addition and Subtraction of Signed 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-2: (9 hrs)**

**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, VonNeumann Architecture

**Unit-3: (9 hrs)**

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

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

**Unit-4: (10 hrs)**

**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-5: (10 hrs)**

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

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

|            |  |
|------------|--|
| <b>CO1</b> | Explore Data Representation techniques                 |
| <b>CO2</b> | Explore basic structure of Computers                   |
| <b>CO3</b> | Summarize computer arithmetic and process organization |

|            |                                      |
|------------|--------------------------------------|
| <b>CO4</b> | Infer memory organization techniques |
| <b>CO5</b> | Explore I/O organization techniques  |

**Text books:**

1. Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 6th edition, McGraw Hill
2. Digital Design, 6th Edition, M. Morris Mano, Pearson Education.
3. Computer Organization and Architecture, William Stallings, 11th Edition, Pearson.

**Reference books:**

1. Computer Systems Architecture, M. Moris Mano, 3rd Edition, Pearson
2. Computer Organization and Design, David A. Paterson, John L. Hennessy, Elsevier
3. Fundamentals of Logic Design, Roth, 5th Edition, Thomson

**e-Resources**

1. <https://nptel.ac.in/courses/106/103/106103068/>

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|---------------------------|--|----------|----------|----------|----------|
| <b>II-Year-I Semester</b> | <b>Advanced Data Structures and<br/>Algorithm Analysis</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| 23CS3T01                  |  | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**Course objectives:**

- 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

**Unit-1: (10 hrs)**

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-2: (9 hrs)**

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-3: (9 hrs)**

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-4: (10 hrs)**

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-5: (10 hrs)**

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

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

|            |  |
|------------|--|
| <b>CO1</b> | Demonstrate Balanced Binary trees                          |
| <b>CO2</b> | Explore Graph applications & Divide and Conquer techniques |
| <b>CO3</b> | Experiment Greedy and Dynamic programming approaches       |

|            |  |
|------------|--|
| <b>CO4</b> | Apply different case studies on Backtracking and branch & bound techniques |
| <b>CO5</b> | Explore various NP hard and NP complete problems                           |

**Text books:**

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

**e-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. Abdul Bari, Introduction to Algorithms (youtube.com)

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|---------------------------|---|----------|----------|----------|----------|
| <b>II-Year-I Semester</b> | <b>Object Oriented Programming Through<br/>Java</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| 23CS3T02                  |   | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**Course objectives:**

- Identify Java language components and how they work together in applications
- Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- Learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
- Understand how to design applications with threads in Java
- Understand how to use Java APIs for program development

**Unit-1: (10 hrs)**

**Object Oriented Programming:** Basic concepts, Principles

**Program Structure in Java:** Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

**Data Types:** Variables, and Operators :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final

**Introduction to Operators:** Precedence and Associativity of Operators, Assignment Operator ( = ), Basic Arithmetic Operators, Increment (++) and Decrement ( - - ) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

**Control Statements:** Introduction, if Expression, Nested if Expressions, if-else Expressions, Switch Statement, Iteration Statements, while Expression, do-while Loop, for Loop, Nested for Loop, For-Each for Loop, Break Statement, Continue Statement.

**Unit-2: (9 hrs)**

**Classes and Objects:** Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Passing Arguments by Value and by Reference, Keyword this.

**Methods:** Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Static keyword.

**Arrays:** Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

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

**Unit-3: (9 hrs)**

**Inheritance:** Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance, Final Class, Methods and attributes.

**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.

**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

**Unit-4: (10 hrs)**

**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, Serialization (Text Book 2)

**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

**Unit-5: (10 hrs)**

**Java 8 features:** Lambda Expressions, functional Interfaces, Default Methods, Date and Time API.

**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)

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

|            |  |
|------------|--|
| <b>CO1</b> | Explore the fundamentals Java concepts               |
| <b>CO2</b> | List Object oriented concepts through Java           |
| <b>CO3</b> | Implement Inheritance and Java libraries             |
| <b>CO4</b> | Demonstrate Java Exceptions, threads and I/O Streams |
| <b>CO5</b> | Explore Java 8 features and Java FX library          |

**Text books:**

1. The complete Reference Java, 11th edition, Herbert Schildt, TMH
2. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
3. Joy with JAVA, Fundamentals of Object-Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge, 2023.
4. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

**Reference books:**

1. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.
2. Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

**e-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)

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|---------------------------|--|----------|----------|----------|------------|
| <b>II-Year-I Semester</b> | <b>Advanced Data Structures and<br/>Algorithm Analysis Lab</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b>   |
| 23CO3L01                  |  | <b>0</b> | <b>0</b> | <b>3</b> | <b>1.5</b> |

**Course objectives:**

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

**Experiments covering the Topics:**

- Operations on AVL trees, B-Trees, Heap Trees
- Graph Traversals
- Sorting techniques
- Minimum cost spanning trees
- Shortest path algorithms
- 0/1 Knapsack Problem
- Travelling Salesperson problem
- Optimal Binary Search Trees
- N-Queens Problem
- Job Sequencing

**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.
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.

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

|            |   |
|------------|---|
| <b>CO1</b> | Experiment various programs on various Algorithmic approaches |
| <b>CO2</b> | Implement Trees & Graphs applications                         |

|                                 |
|---------------------------------|
| <b>CO3</b>   Demonstrate Divide |
|---------------------------------|

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| <b>Text books:</b> |
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- |  |
|--|
| <ol style="list-style-type: none"><li>1. Fundamentals of Data Structures in C++, Horowitz Ellis, Sahni Sartaj, Mehta, Dinesh, 2nd Edition, Universities Press</li><li>2. Computer Algorithms/C++ Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition, University Press</li><li>3. Data Structures and program design in C, Robert Kruse, Pearson Education Asia</li><li>4. An introduction to Data Structures with applications, Trembley &amp; Sorenson, McGraw Hill</li></ol> |
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| <b>e-Resources:</b> |
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|---|
| <ol style="list-style-type: none"><li>1. <a href="http://cse01-iiith.vlabs.ac.in/">http://cse01-iiith.vlabs.ac.in/</a></li><li>2. <a href="http://peterindia.net/Algorithms.html">http://peterindia.net/Algorithms.html</a></li></ol> |
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|---------------------------|---|----------|----------|----------|------------|
| <b>II-Year-I Semester</b> | <b>Object Oriented Programming Through<br/>Java Lab</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b>   |
| 23CO3L02                  |   | <b>0</b> | <b>0</b> | <b>3</b> | <b>1.5</b> |

**Course objectives:**

- 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:**

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

**Exercise - 2**

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

**Exercise - 3**

- a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.
- b) Write a JAVA program implements method overloading.
- c) Write a JAVA program to implement constructor.
- d) Write a JAVA program to implement constructor overloading.

**Exercise - 4**

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

**Exercise - 5**

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

**Exercise - 6**

- a) Write a JAVA program that describes exception handling mechanism
- b) Write a JAVA program Illustrating Multiple catch clauses
- c) Write a JAVA program for creation of Java Built-in Exceptions
- d) Write a JAVA program for creation of User Defined Exception

**Exercise - 7**

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

**Exercise – 8**

- a) Write a JAVA program that import and use the user defined packages
- b) Without writing any code, build a GUI that display text in label and image in an ImageView (use JavaFX)
- c) Build a Tip Calculator app using several JavaFX components and learn how to respond to user interactions with the GUI
- d) Integrate threading in Java components a window application.

**Exercise – 9**

- a) Demonstrate Java 8 features with suitable examples.

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

|            |  |
|------------|--|
| <b>CO1</b> | Explore OOPs concepts through applications       |
| <b>CO2</b> | Demonstrate Exceptions, Threading and IO streams |
| <b>CO3</b> | Build Java FX applications                       |

|                           |  |          |          |          |          |
|---------------------------|--|----------|----------|----------|----------|
| <b>II-Year-I Semester</b> | <b>Python Programming<br/>(Skill Enhancement Course)</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| 23CO3S01                  |  | <b>0</b> | <b>1</b> | <b>2</b> | <b>2</b> |

**Course objectives:**

- 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

**Unit-1: (10 hrs)**

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.

**Unit-2: (9 hrs)**

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-3: (9 hrs)**

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-4: (10 hrs)**

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.

**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-5: (10 hrs)**

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

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

|            |   |
|------------|---|
| <b>CO1</b> | Explore various operators in Python                             |
| <b>CO2</b> | Demonstrate Functions & Strings                                 |
| <b>CO3</b> | Use various data structures like Lists, tuples and dictionaries |
| <b>CO4</b> | Implement File handling and OOPS concepts                       |
| <b>CO5</b> | Use various Python libraries like numpy                         |

**Text books:**

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

**e-Resources:**

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

|                           |                              |          |          |          |          |
|---------------------------|------------------------------|----------|----------|----------|----------|
| <b>II-Year-I Semester</b> | <b>Environmental Science</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| 23SH3N01                  |                              | <b>2</b> | <b>0</b> | <b>0</b> | <b>0</b> |

**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-1: (10 hrs)**

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-2: (9 hrs)**

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.

**Unit-3: (9 hrs)**

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

- a. Air Pollution.
- b. Water pollution
- c. Soil pollution

|   |
|---|
| <p>d. Marine pollution<br/>e. Noise pollution<br/>f. Thermal pollution<br/>g. Nuclear hazards</p> <p>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</p>  |
| <p><b>Unit-4: (10 hrs)</b></p> <p>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</p> |
| <p><b>Unit-5: (10 hrs)</b></p> <p>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.</p> <p>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..</p>  |

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

|            |  |
|------------|--|
| <b>CO1</b> | Grasp multidisciplinary nature of environmental studies and various renewable and non-renewable resources. |
| <b>CO2</b> | Understand flow and bio-geo- chemical cycles and ecological pyramids.                                      |
| <b>CO3</b> | Understand various causes of pollution and solid waste management and related preventive measures.         |
| <b>CO4</b> | About the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.    |
| <b>CO5</b> | Casus of population explosion, value education and welfare programmes.                                     |

**Text books:**

1. Text book 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.

**Reference books:**

1. Deeksha Dave and E.Sai Baba Reddy, “Textbook of Environmental Science”, Cengage Publications.
2. M.Anji Reddy, “Textbook 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.

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|---------------------------|------------------------|----------|----------|----------|----------|
| <b>II-Year-I Semester</b> | <b>Life Skills-III</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| 23CO3N01                  |                        | <b>2</b> | <b>0</b> | <b>0</b> | <b>0</b> |

### Part-A: Quantitative Ability

|   |
|---|
| <b>Unit-1: (10 hrs)</b><br><b>Module 1:</b> Time and Work<br><b>Module 2:</b> Pipes and Cisterns          |
| <b>Unit-2: (9 hrs)</b><br><b>Module 3:</b> Time, Distance and Speed<br><b>Module 4:</b> Boats and Streams |

### Part-B: Reasoning Ability

|  |
|--|
| <b>Unit-3: (9 hrs)</b><br><b>Module 5:</b> Logical Venn Diagrams<br><b>Module 6:</b> Directions      |
| <b>Unit-4: (10 hrs)</b><br><b>Module 7:</b> Blood Relations<br><b>Module 8:</b> Clocks and Calendars |

### Part-C: Verbal Ability

|   |
|---|
| <b>Unit-5: (10 hrs)</b><br><b>Module 9:</b> Body Language, Cross-cultural communication, Networking skills.<br><b>Module 10:</b> Reading comprehension, Listening comprehension, Drawing Inferences |
| <b>Unit-6: (10 hrs)</b><br><b>Module 11:</b> Spellings, Synonyms and Antonyms, One-word Substitutes.<br><b>Module 12:</b> Idioms, Phrasal verbs, Analogies  |

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

|            |   |
|------------|---|
| <b>CO1</b> | Develop proficiency in solving problems related to time, work, speed, and distances, including real-life applications involving pipes, cisterns, and boats.                           |
| <b>CO2</b> | Enhance logical reasoning skills through understanding and solving problems involving Venn diagrams, directions, blood relations, and time-based scenarios like clocks and calendars. |
| <b>CO3</b> | Improve verbal communication abilities by mastering body language, cross-cultural communication, and networking skills, essential for effective interpersonal interactions            |
| <b>CO4</b> | Strengthen comprehension skills by practicing reading and listening comprehension, and learn to draw inferences from given texts and conversations                                    |

|            |   |
|------------|---|
| <b>CO5</b> | Expand vocabulary and language use by learning correct spellings, synonyms, antonyms, one-word substitutes, idioms, phrasal verbs, and analogies. |
|------------|---|

**Text books:**

1. Quantitative Aptitude for Competitive Examination by Dr R S Agarwal
2. Fast Track Objective Arithmetic Paperback – 2018 by Rajesh Verma
3. Teach Yourself Quantitative Aptitude, by Arun Sharma
4. The Pearson Guide To Quantitative Aptitude For Competitive Examination by Dinesh Khattar
5. Quantitative Aptitude for all Competitive Exam by Abhijit Gupta
6. Quantitative Aptitude Quantum CAT by Sarvesh K. Verma
7. How to Prepare for Data Interpretation by Arun Sharma
8. Logical Reasoning Data Interpretation by Nishit K. Sinha
9. Reasoning Ability for Competitive Examination by Dr R S Agarwal
10. A Modern Approach to Logical Reasoning (2019-20 Session) by R.S. Aggarwal [S.Chand]
11. How to Prepare for Logical Reasoning for CAT by Arun Sharma [McGrawHill]
12. Multidimensional Reasoning by Mishra and Kumar Dr. Lal [Upkar's]
13. A Modern Approach to Verbal & Non-Verbal Reasoning (2019-20 Session) by R.S. Aggarwal [S.Chand]
14. A New Approach to Reasoning Verbal & Non-Verbal by B.S. Sijwali and Indu Sijwali [Arihant]
15. Analytical Reasoning (2018-2019) Session by MK Panday
16. How to Crack Test Of Reasoning by Jaikishan and Premkishan [Arihant]
17. Logical Reasoning and Data Interpretation for CAT & other MBA exams by K. Sinha Nishit [Pearson]
18. Reasoning for Competitive Exams by K. Sinha Nishit [Pearson]
19. How to Prepare for Logical Reasoning for CAT by Arun Sharma [McGrawHill]
20. Shortcuts in Reasoning (Verbal, Non-Verbal, Analytical & Critical) for Competitive Exams by Disha Experts
21. Visual Intelligence for Beginners by Matthew Alcot
22. Analytical Reasoning by M K Pandey
23. Logical Reasoning & Data Interpretation by Nishit K. Sinha
24. Pease, Allan. Body Language: How to Read Others' Thoughts by Their Gestures. UK: Sheldon Press, 1997.
25. Holliday, A., Hyde, M. & Kullman, J. Intercultural Communication: An Advanced Resource Book. London: Routledge, 2004.
26. Thorpe, Edgar & Showick. Objective English for General Competitive Examinations. Pearson Education, 2016.
27. Condon, J. & Yousef, F. An Introduction to Intercultural Communication. New York: Macmillan Publishing Company, 1975.
28. The Ace of Soft Skills: Attitude, Communication and Etiquette for

Success. Pearson Education; 2013.

29. Remesh S., Vishnu R.G., Life Skills for Engineers, Ridhima Publications, 2016.
30. Mishra, P K & J K Verma .Managing Sustainable Development Concepts Issues and Challenges. Associated Publishing Company, 2019.

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|----------------------------|--|----------|----------|----------|----------|
| <b>II-Year-II Semester</b> | <b>Universal Human Values 2–<br/>Understanding Harmony</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| BS&H                       |  | <b>2</b> | <b>1</b> | <b>0</b> | <b>3</b> |

**Course objectives:**

- To help the students appreciate the essential complementary 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 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-1: (10 hrs)**

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-2: (9 hrs)**

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  
 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-3: (9 hrs)**

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-4: (10 hrs)**

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-5: (10 hrs)**

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

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

**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 analyzing 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.
- 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.

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

|            |   |
|------------|---|
| <b>CO1</b> | Define the terms like Natural Acceptance, Happiness and Prosperity                          |
| <b>CO2</b> | Identify one's self, and one's surroundings (family, society nature)                        |
| <b>CO3</b> | Apply what they have learnt to their own self in different day-to-day settings in real life |
| <b>CO4</b> | Relate human values with human relationship and human society                               |
| <b>CO5</b> | Justify the need for universal human values and harmonious existence                        |
| <b>CO6</b> | Develop as socially and ecologically responsible engineers                                  |

**Text books:**

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

**Reference books:**

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, 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 – Pandit Sunderlal
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)

**e-Resources:**

1. <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf>
2. <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf>
3. <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf>

4. <https://fdp-si.aicte-india.org/UHV%20I%20Teaching%20Material/D3-S2%20Respect%20July%2023.pdf>
5. <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf>
6. <https://fdp-si.aicte-india.org/download/FDPteachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf>
7. <https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf>
8. <https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human-values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385>
9. [https://onlinecourses.swayam2.ac.in/aic22\\_ge23/preview](https://onlinecourses.swayam2.ac.in/aic22_ge23/preview)

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|----------------------------|-----------------------------------|----------|----------|----------|----------|
| <b>II-Year-II Semester</b> | <b>Probability and Statistics</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| ES                         |                                   | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**Course objectives:**

- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications Engineering

**Unit-1: (10 hrs)****Descriptive statistics and methods for data science:**

Data science – Statistics Introduction – Population vs Sample –Collection of data – primary and secondary data – Type of variable: dependent and independent Categorical and Continuous variables – Data visualization – Measures of Central tendency – Measures of Variability – Skewness – Kurtosis.

**Unit-2: (9 hrs)****Correlation and Regression:**

Correlation – Correlation coefficient – Rank correlation.

Linear Regression: Straight line – Multiple Linear Regression - Regression coefficients and properties – Curvilinear Regression: Parabola – Exponential – Power curves.

**Unit-3: (9 hrs)****Probability and Distributions:**

Probability– Conditional probability and Baye’s theorem – Random variables – Discrete and Continuous random variables – Distribution functions – Probability mass function, Probability density function and Cumulative distribution functions – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

**Unit-4: (10 hrs)****Sampling Theory:**

Introduction – Population and Samples – Sampling distribution of Means and Variance (definition only) – Point and Interval estimations – Maximum error of estimate – Central limit theorem (without proof) – Estimation using t, chi-square and F-distributions.

**Unit-5: (10 hrs)****Tests of Hypothesis:**

Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Test of significance for large samples and Small Samples: Single and difference means – Single and two proportions – Student’s t- test, F-test, and Chi-square-test.

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

|            |   |
|------------|---|
| <b>CO1</b> | Classify the concepts of data science and its importance                                  |
| <b>CO2</b> | Interpret the association of characteristics and through correlation and regression tools |

|            |   |
|------------|---|
| <b>CO3</b> | Apply discrete and continuous probability distributions                           |
| <b>CO4</b> | Design the components of a classical hypothesis test                              |
| <b>CO5</b> | Infer the statistical inferential methods based on small and large sampling tests |

**Text books:**

1. Miller and Freund's, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2. S. C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

**Reference books:**

1. Shron L. Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
2. Jay L Devore, Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
3. Sheldon M. Ross, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.
4. Johannes Ledolter and Robert V. Hogg, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson, 2010.

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|----------------------------|--------------------------|----------|----------|----------|----------|
| <b>II-Year-II Semester</b> | <b>Operating Systems</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| PC                         |                          | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**Course objectives:**

- 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.

**Unit-1: (10 hrs)**

**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-2: (9 hrs)**

**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-3: (9 hrs)**

**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-4: (10 hrs)**

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

**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-5: (10 hrs)**

**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

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

|            |   |
|------------|---|
| <b>CO1</b> | Summarize various basic features of different operating systems |
| <b>CO2</b> | Analyze process scheduling in OS                                |
| <b>CO3</b> | Summarize various concurrency control techniques                |
| <b>CO4</b> | Analyze various memory management techniques                    |
| <b>CO5</b> | Summarize various file systems and protection techniques        |

**Text books:**

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

**Reference books:**

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

**e-Resources:**

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

|                            |   |          |          |          |          |
|----------------------------|---|----------|----------|----------|----------|
| <b>II-Year-II Semester</b> | <b>Microprocessors and Microcontrollers</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| PC                         |   | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**Course objectives:**

- Understand the architecture, register organization, and signal description of the 8086/8088 microprocessors, including their minimum and maximum modes and physical memory organization
- Comprehend the structure, pin configuration, and memory organization of the 8051 microcontroller, including its I/O ports and addressing modes
- Develop proficiency in programming the 8086 microprocessor using machine-level programs and assembly language, including the use of interrupts, stack structure, and interrupt programming
- Analyze and design interfacing solutions for the 8086 microprocessor with various peripheral devices, including PIO 8255, A/D and D/A converters, stepper motors, and other programmable peripherals.
- Understand the advanced features, architecture, and addressing modes of the 80386 microprocessor, including segmentation, paging, and the virtual 8086 mode, as well as the integration of the 80387 coprocessor
- Examine the evolution from traditional microprocessors to advanced microcontrollers and RISC architectures, including ARM architecture and organization, ARM programming models, and the trade-offs in processor design.

**Unit-1: (10 hrs)**

**8086/8088 MICROPROCESSORS:** Register organization of 8086, Architecture, signal description of 8086, physical memory organization, general bus operation, I/O addressing capability, special purpose activities, Minimum mode, maximum mode of 8086 system and timings, machine language instruction formats, addressing mode of 8086, instruction set of 8086, assembler directives and operators

**Unit-2: (9 hrs)**

**PROGRAMMING WITH 8086 MICROPROCESSOR:** Machine level programs, programming with an assembler, Assembly language programs, introduction to stack, stack structure of 8086/8088, interrupts and interrupt service routines, interrupt cycle of 8086, non-mask able interrupt and mask able interrupts, interrupt programming

**Unit-3: (9 hrs)**

**BASIC AND SPECIAL PURPOSE PROGRAMMABLE PERIPHERALS AND THEIR INTERFACING WITH 8086.** Semiconductor memory interfacing, dynamic RAM interfacing, interfacing i/o ports, PIO 8255 modes of operation of 8255, interfacing to D/A and A/D converters, stepper motor interfacing. Block diagram and functional aspects of 8254 PIT, 8259A, PIC, 8279 keyboard/display controller, 8251 USART, 8257 DMA Controller

**Unit-4: (10 hrs)**

**ADVANCED MICRO PROCESSORS:** Salient features of 0386DX, architecture and signal description of 80386, register organization of 80386 and addressing

modes, data types of 80386, real address mode of 80386, protected mode of 80386, segmentation and Paging, virtual 8086 mode and enhanced mode. Instruction set of 80386. The coprocessor 80387.

**Unit-5: (10 hrs)**

**8051 MICROCONTROLLER:** Introduction to microcontrollers, 8051 Microcontrollers, 8051 pin description, connections, I/O ports and memory organization, MCS51 addressing modes and instructions, assembly language programming tools. Introduction to RISC, processor design tradeoffs, Introduction to 16/32 bit processors, ARM architecture and organization, ARM family, Thumb instructions, programming models of ARM 7, Register set, CPSR, SPSR.

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

|            |  |
|------------|--|
| <b>CO1</b> | Develop programs for different addressing modes                    |
| <b>CO2</b> | 8086 interfacing with different peripherals and implement programs |
| <b>CO3</b> | Describe the key features of serial and parallel communication     |
| <b>CO4</b> | Design a microcontroller for simple applications                   |
| <b>CO5</b> | Illustrate how the different peripherals are interfaced with       |

**Text books:**

1. Douglas V Hall, –Microprocessors and Interfacing Programming and Hardware, New Delhi Tata McGrawHill Publishing Company Limited.
2. A.K.Ray, K.M.Bhurchandi , Advanced Microprocessors and Peripherals, Tata McGraw Hill Publications,2000.
3. Steve Furber, –ARM System on Chip Architecture, second edition, Pearson publications, 2009.
4. Muhammad Ali Mazidi, Janice GillispieMazidi, RolinD.McKinlay, The 051 microcontroller and embedded systems, second edition, Pearson publications.

**Reference books:**

1. Ajay V Deshmukh, Microcontrollers, TATA McGraw Hill publications, 2012.
2. Krishna Kant, –Microprocessors and Microcontrollers, PHI Publications, 2010.
3. N.Sentil Kumar, M.Saravanan, S.Jeevananthan, –Microprocessors and Microcontrollers, Oxford University Press, 2010.

|                            |                          |          |          |          |          |
|----------------------------|--------------------------|----------|----------|----------|----------|
| <b>II-Year-II Semester</b> | <b>Computer Networks</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| PC                         |                          | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**Course objectives:**

- 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

**Unit-1: (10 hrs)**

**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-2: (9 hrs)**

**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.

**Unit-3: (9 hrs)**

**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-4: (10 hrs)**

**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-5: (10 hrs)**

**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

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

|            |   |
|------------|---|
| <b>CO1</b> | Understand the types, architectures, and protocols of various computer networks, including LANs, WANs, and the OSI and TCP/IP reference models.   |
| <b>CO2</b> | Analyze the design issues, error control mechanisms, and multiple access protocols in the Data Link Layer, with a focus on Ethernet technologies and wireless LAN protocols                     |
| <b>CO3</b> | Explore the design, routing algorithms, and traffic management strategies in the Network Layer, including the implementation of IP protocols and internetworking across heterogeneous networks. |
| <b>CO4</b> | Examine the services and protocols in the Transport Layer, including connection management, error control, and congestion control, with emphasis on TCP and UDP protocols.                      |
| <b>CO5</b> | Understand the architecture and protocols of the Application Layer, including email systems, web technologies, and the evolution of the Internet  |

**Text books:**

1. Andrew Tanenbaum, Feamster Wetherall, Computer Networks, 6th Edition, Global Edition

**Reference books:**

1. Behrouz A. Forouzan, Data Communications and Networking, 5th Edition, McGraw Hill Publication, 2017.
2. James F. Kurose, Keith W. Ross, “Computer Networking: A Top-Down Approach”, 6th edition, Pearson, 2019.
3. Youlu Zheng, Shakil Akthar, “Networks for Computer Scientists and Engineers”, Oxford Publishers, 2016.

**e-Resources**

1. <https://nptel.ac.in/courses/106105183/25>
2. <http://www.nptelvideos.in/2012/11/computer-networks.html>
3. <https://nptel.ac.in/courses/106105183/3>

|                            |  |          |          |          |            |
|----------------------------|--|----------|----------|----------|------------|
| <b>II-Year-II Semester</b> | <b>Computer Networks and Operating Systems Lab</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b>   |
| PC                         |  | <b>0</b> | <b>0</b> | <b>3</b> | <b>1.5</b> |

**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 familiarize the use of networking functionality supported by JAVA
- To familiarize with computer networking tools.

**List of Activities/Experiments (Computer Networks):**

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. Use Packet tracer software to build network topology and configure using Distance vector routing protocol.
4. Use Packet tracer software to build network topology and configure using Link State routing protocol.
5. Using JAVA RMI Write a program to implement Basic Calculator.
6. Implement a Chatting application using JAVA TCP and UDP sockets.
7. 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.
8. 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.

**Experiments covering the Topics:**

- UNIX fundamentals, commands & system calls
- CPU Scheduling algorithms, thread processing
- IPC, semaphores, monitors, deadlocks
- Page replacement algorithms, file allocation strategies

- Memory allocation strategies

### Sample Experiments:

1. Practicing of Basic UNIX Commands.
2. Write programs using the following UNIX operating system calls fork, exec, getpid, exit, wait, close, stat, opendir and readdir
3. Simulate the following CPU scheduling algorithms
  - a) FCFS b) SJF c) Priority d) Round Robin
4. Write a program to solve producer-consumer problem using Semaphores.
5. Implement the following memory allocation methods for fixed partition
  - a) First fit b) Worst fit c) Best fit
6. Simulate the following page replacement algorithms
  - a) FIFO b) LRU c) LFU
7. Simulate Paging Technique of memory management.
8. Implement Bankers Algorithm for Dead Lock avoidance

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

|            |   |
|------------|---|
| <b>CO1</b> | Understand the different types of network cables and devices, and develop the skills to configure and test network setups, including wired and wireless LANs.                       |
| <b>CO2</b> | Execute and analyze network commands such as Ping, Tracert, and FTP, and configure network topologies using routing protocols in simulation tools like Packet Tracer.               |
| <b>CO3</b> | Develop networking applications in JAVA, such as a basic calculator, chatting applications, and custom network commands using RMI, TCP, and UDP sockets.                            |
| <b>CO4</b> | Monitor and inspect network traffic using tools like Wireshark to analyze HTTP traffic, reject specific packets, and monitor specific network services.                             |
| <b>CO5</b> | Simulate and implement key operating system concepts, including CPU scheduling algorithms, memory management techniques, and deadlock avoidance strategies using UNIX system calls. |

### Text books:

1. ShivendraS.Panwar, Shiwen Mao, Jeong-dong Ryoo, and Yihan Li, "TCP/IP Essentials:A Lab-Based Approach", Cambridge University Press, 2004.
2. Operating System Concepts, Silberschatz A, Galvin P B, Gagne G, 10th Edition, Wiley, 2018.

### Reference books:

1. Cisco Networking Academy, "CCNA1 and CCNA2 Companion Guide", Cisco Networking Academy Program, 3rd edition, 2003.
2. Elloitte Rusty Harold, "Java Network Programming", 3rd edition, O'REILLY, 2011.
3. Modern Operating Systems, Tanenbaum A S, 4th Edition, Pearson, 2016

### e-Resources:

1. <https://www.netacad.com/courses/packet-tracer> - Cisco Packet Tracer.
2. Ns Manual, Available at: <https://www.isi.edu/nsnam/ns/ns-documentation.html>, 2011.
3. [https://www.wireshark.org/docs/wsug\\_html\\_chunked/](https://www.wireshark.org/docs/wsug_html_chunked/) -Wireshark.
4. <https://nptel.ac.in/courses/106105183/25>
5. <http://www.nptelvideos.in/2012/11/computer-networks.html>
6. <https://nptel.ac.in/courses/106105183/3>
7. [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)
8. <https://www.cse.iitb.ac.in/~mythili/os/>
9. <http://peterindia.net/OperatingSystems.html>

|                            |   |          |          |          |            |
|----------------------------|---|----------|----------|----------|------------|
| <b>II-Year-II Semester</b> | <b>Microprocessors and Microcontrollers</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b>   |
| PC                         |   | <b>0</b> | <b>0</b> | <b>3</b> | <b>1.5</b> |

**Course objectives:**

- The students are required to develop the necessary Algorithm, Flowchart and Assembly Language Program Source Code for executing the following functions using MASM/TASM software and to verify the results with necessary Hardware Kits

**PART-I: MICROPROCESSOR 8086**

1. Introduction to MASM/TASM.
2. Arithmetic operation- Multi byte Addition and Subtraction, Multiplication and Division- Signed and unsigned Arithmetic operation, ASCII-Arithmetic operation.
3. Logic operations-Shift and rotate-Converting packed BCD to unpacked BCD, BCD to ASCII conversion.
4. By using string operation and Instruction prefix: Move Block, Reverse string, Sorting, Inserting, Deleting, Length of the string, String comparison.
5. DOS/BIOS programming: Reading keyboard (Buffered with and without echo)- Display characters, Strings.

**PART-II: INTERFACING WITH MICROPROCESSOR**

1. 8259 - Interrupt Controller-Generate an interrupt using 8259 timer.
2. 8279 - Keyboard Display- Write a program to display a string of characters.
3. 8255 - PPI-Write ALP to generate sinusoidal wave using PPI.
4. 8251- USART-Write a program in ALP to establish Communication between two processors.

**PART-III: MICROCONTROLLER 8051**

1. Reading and Writing on a parallel port.
2. Timer in different modes.
3. Serial communication implementation.

**PART-IV: INTERFACING WITH MICROCONTROLLER**

Write C programs to interface 8051 chip to Interfacing modules to Develop single chip solutions.

1. Simple Calculator using 6-digit seven segment display and Hex Keyboard interface to 8051.
2. Alphanumeric LCD panel and Hex keypad input interface to 8051.
3. External ADC and Temperature control interface to 8051.
4. Generate different waveforms Sine, Square, Triangular, and Ramp, etc. using DAC interface to 8051; change the frequency and Amplitude.

**EQUIPMENT REQUIRED FOR LABORATORY**

1. MASM/TASM software
2. 8086 Microprocessor Kits

3. 8051 Micro Controller kits
4. Interfaces/peripheral subsystems
  - a. 8259 PIC
  - b. 8279-KB/Display
  - c. 8255 PPI
  - d. 8251 USART
  - e. A/D and D/AC Interface

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

|            |  |
|------------|--|
| <b>CO1</b> | Develop and execute Assembly Language Programs (ALPs) using MASM/TASM for arithmetic, logical, and string operations on the 8086 microprocessor.                           |
| <b>CO2</b> | Interface and program peripheral devices like the 8259 Interrupt Controller, 8279 Keyboard Display, 8255 PPI, and 8251 USART with the 8086 microprocessor                  |
| <b>CO3</b> | Implement basic read/write operations, timers, and serial communication using the 8051 microcontroller.  |
| <b>CO4</b> | Write C programs to interface the 8051 microcontroller with external devices like seven-segment displays, LCD panels, ADCs, and DACs to develop single-chip solutions      |
| <b>CO5</b> | Design and test embedded system applications using microprocessors and microcontrollers, such as simple calculators, temperature control systems, and waveform generation. |

|                            |  |          |          |          |          |
|----------------------------|--|----------|----------|----------|----------|
| <b>II-Year-II Semester</b> | <b>Full Stack Development-1<br/>(Skill Enhancement Course)</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| SEC                        |  | <b>0</b> | <b>1</b> | <b>2</b> | <b>2</b> |

**Course objectives:**

- 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

**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

**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

### 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. Javascript 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))

### 10. Node.js

- a. Write a program to show the workflow of JavaScript code executable by creating web server in Node.js.
- b. Write a program to transfer data over http protocol using http module.
- c. Create a text file src.txt and add the following content to it. (HTML, CSS, Javascript, Typescript, MongoDB, Express.js, React.js, Node.js)
- d. Write a program to parse an URL using URL module.

- e. Write a program to create an user-defined module and show the workflow of Modularization of application using Node.js

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

|            |  |
|------------|--|
| <b>CO1</b> | Experiment on HTML features like Lists, tables, frames and forms |
| <b>CO2</b> | Explore various CSS style sheets                                 |
| <b>CO3</b> | Solve client-side problems using java script elements            |
| <b>CO4</b> | Implement various events and functions                           |
| <b>CO5</b> | Explore server-side operations using Node JS                     |

**Text books:**

1. Programming the World Wide Web, 7th Edition, Robert W Sebesta, Pearson, 2013.
2. Web Programming with HTML5, CSS and JavaScript, John Dean, Jones & Bartlett Learning, 2019 (Chapters 1-11).
3. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2nd edition, APress, O'Reilly.

**e-Resources:**

1. <https://www.w3schools.com/html>
2. <https://www.w3schools.com/css>
3. <https://www.w3schools.com/js/>
4. <https://www.w3schools.com/nodejs>
5. <https://www.w3schools.com/typescript>

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|----------------------------|---------------------------------------|----------|----------|----------|----------|
| <b>II-Year-II Semester</b> | <b>Design Thinking and Innovation</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| BS&H                       |                                       | <b>1</b> | <b>0</b> | <b>2</b> | <b>2</b> |

**Course objectives:**

- Familiarize students with design thinking process as a tool for breakthrough innovation.
- Aims to equip students with design thinking skills and ignite the minds to create innovative ideas.
- Student can develop solutions for real-time problems.

**Unit-1: (10 hrs)****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-2: (9 hrs)****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-3: (9 hrs)****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

**Unit-4: (10 hrs)****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-5: (10 hrs)****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.

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

|            |  |
|------------|--|
| <b>CO1</b> | Define the concepts related to design thinking                               |
| <b>CO2</b> | Explain the fundamentals of Design Thinking and innovation                   |
| <b>CO3</b> | Apply the design thinking techniques for solving problems in various sectors |
| <b>CO4</b> | Analyse to work in a multidisciplinary environment                           |
| <b>CO5</b> | Evaluate the value of creativity   |
| <b>CO6</b> | Formulate specific problem statements of real time issues                    |

**Text books:**

1. Change by design, Tim Brown, Harper Bollins (2009)
2. Design Thinking for Strategic Innovation, Idris Mootee, 2013, John Wiley & Sons.

**Reference books:**

1. Design Thinking in the Classroom by David Lee, Ulysses press
2. Design the Future, by Shrrutin N Shetty, Norton Press
3. Universal principles of design- William lidwell, kritinaholden, Jill butter.
4. The era of open innovation – chesbrough.H

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|---------------------------|-----------------------|----------|----------|----------|----------|
| <b>II-Year-I Semester</b> | <b>Life Skills-IV</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                           |                       | <b>2</b> | <b>0</b> | <b>0</b> | <b>0</b> |

### Part-A: Quantitative Ability

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| <b>Unit-1: (10 hrs)</b><br><b>Module 1:</b> Races and Games<br><b>Module 2:</b> Geometry and Mensuration |
| <b>Unit-2: (9 hrs)</b><br><b>Module 3:</b> Sequences<br><b>Module 4:</b> Statistics                      |

### Part-B: Reasoning Ability

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|---|
| <b>Unit-3: (9 hrs)</b><br><b>Module 5:</b> Syllogisms<br><b>Module 6:</b> Logical Connectives     |
| <b>Unit-4: (10 hrs)</b><br><b>Module 7:</b> Cubes and Dices<br><b>Module 8:</b> Crypto Arithmetic |

### Part-C: Verbal Ability

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| <b>Unit-5: (10 hrs)</b><br><b>Module 9:</b> Conflict Management, Social Responsibility/Sustainable Development, Creative Thinking<br><b>Module 10:</b> Cloze Test, Correction of Errors, Ordering of Words |
| <b>Unit-6: (10 hrs)</b><br><b>Module 11:</b> e-mail Writing, Oral Presentations, Power Point Presentations<br><b>Module 12:</b> Ethical approach to Technology, Adaptability, Empathy                      |

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

|            |   |
|------------|---|
| <b>CO1</b> | Develop problem-solving skills in quantitative areas, including races, games, geometry, mensuration, sequences, and statistics  |
| <b>CO2</b> | Enhance logical reasoning abilities by mastering syllogisms, logical connectives, cubes and dices, and crypto arithmetic problems.  |
| <b>CO3</b> | Build verbal communication skills by learning conflict management, understanding social responsibility, fostering creative thinking, and improving grammatical accuracy through cloze tests and error correction. |
| <b>CO4</b> | Acquire proficiency in professional communication by practicing e-mail writing, delivering oral presentations, and creating effective PowerPoint presentations  |
| <b>CO5</b> | Cultivate an ethical approach to technology, adaptability, and empathy, essential for personal and professional growth  |

**Text books:**

31. Quantitative Aptitude for Competitive Examination by Dr R S Agarwal
32. Fast Track Objective Arithmetic Paperback – 2018 by Rajesh Verma
33. Teach Yourself Quantitative Aptitude, by Arun Sharma
34. The Pearson Guide To Quantitative Aptitude For Competitive Examination by Dinesh Khattar
35. Quantitative Aptitude for all Competitive Exam by Abhijit Gupta
36. Quantitative Aptitude Quantum CAT by Sarvesh K. Verma
37. How to Prepare for Data Interpretation by Arun Sharma
38. Logical Reasoning Data Interpretation by Nishit K. Sinha
39. Reasoning Ability for Competitive Examination by Dr R S Agarwal
40. A Modern Approach to Logical Reasoning (2019-20 Session) by R.S. Aggarwal [S.Chand]
41. How to Prepare for Logical Reasoning for CAT by Arun Sharma [McGrawHill]
42. Multidimensional Reasoning by Mishra and Kumar Dr. Lal [Upkar's]
43. A Modern Approach to Verbal & Non-Verbal Reasoning (2019-20 Session) by R.S. Aggarwal [S.Chand]
44. A New Approach to Reasoning Verbal & Non-Verbal by B.S. Sijwali and Indu Sijwali [Arihant]
45. Analytical Reasoning (2018-2019) Session by MK Panday
46. How to Crack Test Of Reasoning by Jaikishan and Premkishan [Arihant]
47. Logical Reasoning and Data Interpretation for CAT & other MBA exams by K. Sinha Nishit [Pearson]
48. Reasoning for Competitive Exams by K. Sinha Nishit [Pearson]
49. How to Prepare for Logical Reasoning for CAT by Arun Sharma [McGrawHill]
50. Shortcuts in Reasoning (Verbal, Non-Verbal, Analytical & Critical) for Competitive Exams by Disha Experts
51. Visual Intelligence for Beginners by Matthew Alcot
52. Analytical Reasoning by M K Pandey
53. Logical Reasoning & Data Interpretation by Nishit K. Sinha
54. Pease, Allan. Body Language: How to Read Others' Thoughts by Their Gestures. UK: Sheldon Press, 1997.
55. Holliday, A., Hyde, M. & Kullman, J. Intercultural Communication: An Advanced Resource Book. London: Routledge, 2004.
56. Thorpe, Edgar & Showick. Objective English for General Competitive Examinations. Pearson Education, 2016.
57. Condon, J. & Yousef, F. An Introduction to Intercultural Communication. New York: Macmillan Publishing Company, 1975.
58. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success. Pearson Education; 2013.
59. Remesh S., Vishnu R.G., Life Skills for Engineers, Ridhima Publications, 2016.

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60. Mishra, P K & J K Verma .Managing Sustainable Development Concepts Issues and Challenges. Associated Publishing Company, 2019.