# B.Sc., ELECTRONICS

## SYLLABUS

## FROM THE ACADEMIC YEAR
## 2023-2024 ONWARDS

# MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI

**(As per TANSCHE common syllabus template)**

# Contents

The learning outcomes-based approach implies that the outcomes are identified and considered according to the ground-work of plans. Course contents, learning activities and assessment types are designed to be consistent with the achievement of desired learning outcomes. The learning outcomes are in terms of knowledge, professional attitude, work ethics, critical thinking, self-managed learning, and adaptability, problem solving skills, communication skills, interpersonal skills and group works. At the end of a particular course/program, assessment is carried out to determine whether the desired outcomes are being achieved. This outcome assessment provides feedback to ensure that element in the teaching and learning environment are acting in concert to facilitate the nurturing of the desired outcomes. The expected learning outcomes are used as reference points that would help formulate graduate attributes, qualification descriptors, programme learning outcomes and course learning outcomes which in turn help not only in curriculum planning and development, but also in delivery and review of academic programmes.

The overall objectives of the learning outcomes-based on the curriculum framework, these are: Help formulate graduate attributes, qualification descriptors, program learning outcomes and course learning outcomes that are expected to be demonstrated by the holders of qualification. Enable prospective students, parents, employers and others to understand the nature and level of learning outcomes or attributes a graduate of a programme should be capable of demonstrating on successful completion of the programme of study. Maintain national standards and international comparability of learning outcomes and academic standards to ensure global competitiveness, and to facilitate student/graduate mobility. Provide higher education institutions an important point of reference for designing teaching-learning strategies, assessing student learning level, and periodic review of programme and academic research.

The emerging trends in electronics is a program that needs to develop a specialized skill set among the graduates to cater the need for industries. In recent years, electronic science has made unprecedented growth in terms of new technologies, new ideas and principles. The research organizations and industries that work in this frontier area are in need of highly skilled and scientifically oriented manpower. This manpower can be available only with flexible, adaptive and progressive training programs and a cohesive interaction among the research organizations, academicians and industries. The key areas of study within the subject area of electronic science comprises of: Semiconductor devices, Analog and digital circuit design, Microprocessors & microcontrollers, Communication techniques, IoTs for Electronics, artificial intelligence, embedded systems, machine learning,computer hardware’s, computer coding/programming skills in high/low level languages, etc.

| LEARNING OUTCOME-BASED CURRICULUM FRAMEWORK GUIDELINES BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME | |
|---|---|
| **Programme:** | **B.Sc. ELECTRONICS** |
| **Programme Code:** | |
| **Duration:** | **3 Years (UG)** |
| **Programme Outcomes:** | **PO1: Disciplinary knowledge:** A comprehensive knowledge and understanding phenomena of one or more disciplines that form a part of an undergraduate programme of study<br>**PO2: Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally; Communicate with others confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically and present complex information in a clear and concise manner to different groups.<br>**PO3: Critical thinking:** Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.<br>**PO4: Problem solving:** Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.<br>**PO5: Analytical reasoning**: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyse and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.<br>**PO6: Research-related skills**: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation<br>**PO7: Cooperation/Team work:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team<br>**PO8: Scientific reasoning**: Ability to analyseinterprets and draws conclusions from quantitative/qualitative data; and critically evaluates ideas, evidence and experiences from an open-minded and reasoned perspective.<br>**PO9: Reflective thinking**: Critical sensibility to lived experiences, with self-awareness and reflexivity of both self and society.<br>**PO10 Information/digital literacy:** Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data. |

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| | **PO 11 Self-directed learning**: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.<br><br>**PO 12 Multicultural competence:** Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.<br><br>**PO 13: Moral and ethical awareness/reasoning**: Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to ones work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.<br><br>**PO 14: Leadership readiness/qualities:** Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.<br><br>**PO 15: Lifelong learning:** Ability to acquire knowledge and skills, how to learn, that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling. |
| **Programme Specific Outcomes:** | On successful completion of Bachelor of Science (B.Sc) in Electronics programme, the student should be able to:<br><br>**PSO1: Disciplinary Knowledge:** Understand the fundamental principles, concepts and theories related to electronics science. Also, exhibit proficiency in performing experiments in the laboratory.<br>**PSO2: Critical Thinking:** Analyse complex problems, evaluate information, synthesize information, apply theoretical concepts to practical situations, identify assumptions and biases, make informed decisions and communicate effectively<br>**PSO3: Problem Solving:** Employ theoretical concepts and critical reasoning ability with physical, mathematical and technical skills to solve problems, acquire data, analyse their physical significance and explore new design possibilities.<br>**PSO4: Analytical & Scientific Reasoning:** Apply scientific methods, collect and analyse data, test hypotheses, evaluate evidence, apply |

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|---|---|
| | statistical techniques and use computational models.<br>**PSO5: Research related skills:** Formulate research questions, conduct literature reviews, design and execute research studies, communicate research findings and collaborate in research projects.<br>**PSO6: Self-directed &Lifelong Learning:** Set learning goals, manage their own learning, reflect on their learning, adapt to new contexts, seek out new knowledge, collaborate with others and to continuously improve their skills and knowledge, through ongoing learning and professional development, and contribute to the growth and development of their field. |

| PO/PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
|---|---|---|---|---|---|---|
| **PO1** | ✓ | | | | | |
| **PO2** | | ✓ | | | | |
| **PO3** | | | ✓ | | | |
| **PO4** | | | | ✓ | | |
| **PO5** | | | | | ✓ | |
| **PO6** | | | | | | ✓ |

**2. Highlights of the revamped Curriculum**:

- Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, lab and project with viva-voce examinations, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application-oriented content wherever required.
- The core subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training, devising statistical models and algorithms for providing solutions to industry orreal-life situations. The curriculum also facilitates peer learning with advanced statistical topics in the final semester, catering to the needs of stakeholders with aptitude.
- The general term, "problem solving" skills are included as mandatory components in the 'Training for competitive examinations' course at the final semester.
- The curriculum is designed so as to strengthen the industry-academia interface and provide more job opportunities for the students.
- The Internship during the second-year vacation will help the students gain valuable work experience that connects classroom knowledge to real world experience and to narrow down and focus on the career path.

- A practical and project with viva-voce components areenabling the student with application of conceptual knowledge to practical situations. The state of art technologies in conducting a scientific and systematic way is ensured. Such innovative provisions of the industrial training, project and internships will give students an edge over the counterparts in the job market.
- State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature are incorporated as elective courses, covering conventional to the latest topics.

**Valueadditionsinthe revamped curriculum:**

| Semester | NewlyintroducedComponents | Outcome/ Benefits |
|---|---|---|
| **I** | **FoundationCourse**<br>To ease the transition of learningfrom higher secondary to highereducation,providinganoverviewofthepedagogyoflearningliteratureand analyzing theworldthroughtheliterarytoanewperspective. | ➢ Impart confidenceamongthe students<br>➢ Createinterestforthesubject |
| **I, II, III, IV** | **SkillEnhancementpapers**(Discipline centric/Generic/Entrepreneurial) | ➢ Industryreadygraduates<br>➢ Skilledhumanresource<br>➢ Studentsareequippedwithessentialskillsto makethememployable |
| | | ➢ Trainingonlanguageandcommunicationskillsenablethe student's gain knowledgeandexposureinthecompetitiveworld. |
| | | ➢ Discipline centric skillwilling provethe technicalknow-howofsolvingreallifeproblems. |
| **III, IV, V& VI** | Elective papers | ➢ Strengthening thedomainknowledge<br>➢ Introducing thestakeholders to theState-of Arttechniquesfrom the streamsofmulti-disciplinary,crossdisciplinaryandinterdisciplinarynature<br>➢ Emerging topics inhigher education/industry/communicationnetwork/healthsectoretc.areintroducedwithHands-ontraining. |

| | | |
|---|---|---|
| **IV** | Elective papers | ➢ Exposuretoindustrymoldsstudentsinto solutionproviders<br>➢ GeneratesIndustryreadygraduates<br>➢ Employmentopportunitiesenhanced |
| **V** | Elective papers | ➢ Self-learning isenhanced<br>➢ Applicationoftheconcepttorealsituatio nisconceivedresultingIntangibleoutco me |
| **VI** | Electivepapers | ➢ Enriches the studybeyondthe course.<br>➢ Developingaresearchframework andpresenting themindependent andIntellectualideaseffectively. |
| **Extra Credits: ForAdvancedLearners/Honorsdegree** | | ➢ Tocatertotheneedsofpeerlearners/resea rch aspirants |
| **SkillsacquiredfromtheCourses** | Knowledge, Problem solving, Analytical ability,Professionalcompetency,Professionalcommunica tionandTransferrableskill | |

# Credit Distribution for UG Programmes

| Sem I | Credit | H | Sem II | Credit | H | Sem III | Credit | H | Sem IV | Credit | H | Sem V | Credit | H | Sem VI | Credit | H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part 1. Language – Tamil | 3 | 6 | Part.1. Language – Tamil | 3 | 6 | Part.1. Language – Tamil | 3 | 6 | Part.1. Language – Tamil | 3 | 6 | 5.1 Core Course – \CC IX | 4 | 5 | 6.1 Core Course – CC XIII | 4 | 6 |
| Part.2 English | 3 | 6 | Part.2 English | 3 | 6 | Part.2 English | 3 | 6 | Part.2 English | 3 | 6 | 5.2 Core Course – CC X | 4 | 5 | 6.2 Core Course – CC XIV | 4 | 6 |
| 1.3 Core Course – CC I | 4 | 5 | 2..3 Core Course – CC III | 4 | 5 | 3.3 Core Course – CC V | 4 | 5 | 4.3 Core Course – CC VII Core Industry Module | 4 | 5 | 5. 3. Core Course CC -XI | 4 | 5 | 6.3 Core Course – CC XV | 4 | 6 |
| 1.4 Core Course – CC II+Allied | 3+3 | 3+2 | 2.4 Core Course – CC IV+ Allied | 3+3 | 3+2 | 3.4 Core Course – CC VI+ Allied | 3+3 | 3+2 | 4.4 Core Course – CC VIII+ Allied | 3+3 | 3+2 | 5. 4. Core Course –/ Project with viva-voce CC -XII | 4 | 5 | 6.4 Elective -VII Generic/ Discipline Specific | 3 | 5 |
| 1.5 Elective I Generic/ Discipline Specific | 3 | 4 | 2.5 Elective II Generic/ Discipline Specific | 3 | 4 | 3.5 Elective III Generic/ Discipline Specific | 3 | 4 | 4.5 Elective IV Generic/ Discipline Specific | 3 | 3 | 5.5 Elective V Generic/ Discipline Specific | 3 | 4 | 6.5 Elective VIII Generic/ Discipline Specific | 3 | 5 |
| 1.6 Skill Enhancement Course SEC-1 | 2 | 2 | 2.6 Skill Enhancement Course SEC-2 | 2 | 2 | 3.6 Skill Enhancement Course SEC-4, (Entrepreneurial Skill) | 1 | 1 | 4.6 Skill Enhancement Course SEC-6 | 2 | 2 | 5.6 Elective VI Generic/ Discipline Specific | 3 | 4 | 6.6 Extension Activity | 1 | - |
| 1.7 Skill Enhancement -(Foundation Course) | 2 | 2 | 2.7 Skill Enhancement Course – SEC-3 | 2 | 2 | 3.7 Skill Enhancement Course SEC-5 | 2 | 2 | 4.7 Skill Enhancement Course SEC-7 | 2 | 2 | 5.7 Value Education | 2 | 2 | 6.7 Professional Competency Skill | 2 | 2 |
| | | | | | | 3.8 E.V.S. | - | 1 | 4.8 E.V. S | 2 | 1 | 5.8 Summer Internship /Industrial Training | 2 | | | | |
| | **23** | **30** | | **23** | **30** | | **22** | **30** | | **25** | **30** | | **26** | **30** | | **21** | **30** |
| **Total – 140 Credits** | | | | | | | | | | | | | | | | | |

# Choice Based Credit System (CBCS), Learning Outcomes Based Curriculum Framework (LOCF) Guideline Based Credit and Hours Distribution System for all UG courses including Lab Hours

## First Year – Semester-I

| Part | List of Courses | Credit | No. of Hours |
|---|---|---|---|
| Part-1 | Language – Tamil | 3 | 6 |
| Part-2 | English | 3 | 6 |
| Part-3 | Core Courses& Elective Courses [in Total] | 13 | 14 |
| Part-4 | Skill Enhancement Course SEC-1 | 2 | 2 |
| | Foundation Course | 2 | 2 |
| | | **23** | **30** |

## Semester-II

| Part | List of Courses | Credit | No. of Hours |
|---|---|---|---|
| Part-1 | Language – Tamil | 3 | 6 |
| Part-2 | English | 3 | 6 |
| Part-3 | Core Courses& Elective Courses including laboratory [in Total] | 13 | 14 |
| Part-4 | Skill Enhancement Course -SEC-2 | 2 | 2 |
| | Skill Enhancement Course -SEC-3 (Discipline / Subject Specific) | 2 | 2 |
| | | **23** | **30** |

## Second Year – Semester-III

| Part | List of Courses | Credit | No. of Hours |
|---|---|---|---|
| Part-1 | Language – Tamil | 3 | 6 |
| Part-2 | English | 3 | 6 |
| Part-3 | Core Courses& Elective Courses including laboratory [in Total] | 13 | 14 |
| Part-4 | Skill Enhancement Course -SEC-4 (Entrepreneurial Based) | 1 | 1 |
| | Skill Enhancement Course -SEC-5 (Discipline / Subject Specific) | 2 | 2 |
| | E.V.S | - | 1 |
| | | **22** | **30** |

## Semester-IV

| Part | List of Courses | Credit | No. of Hours |
|---|---|---|---|
| Part-1 | Language – Tamil | 3 | 6 |
| Part-2 | English | 3 | 6 |
| Part-3 | Core Courses& Elective Courses including laboratory [in Total] | 13 | 13 |
| Part-4 | Skill Enhancement Course -SEC-6 (Discipline / Subject Specific) | 2 | 2 |

| | | | |
|---|---|---|---|
| | Skill Enhancement Course -SEC-7 (Discipline / Subject Specific) | 2 | 2 |
| | E.V.S | 2 | 1 |
| | | **25** | **30** |

**Third Year - Semester-V**

| Part | List of Courses | Credit | No. of Hours |
|---|---|---|---|
| **Part-3** | Core Courses including Project / Elective Based | 22 | 26 |
| **Part-4** | Value Education | 2 | 2 |
| | Internship / Industrial Visit / Field Visit | 2 | 2 |
| | | **26** | **30** |

**Semester-VI**

| Part | List of Courses | Credit | No. of Hours |
|---|---|---|---|
| **Part-3** | Core Courses including Project / Elective Based & LAB | 18 | 28 |
| **Part-4** | Extension Activity | 1 | - |
| | Professional Competency Skill | 2 | 2 |
| | | **21** | **30** |

**Consolidated Semester wise and Component wise Credit distribution**

| Parts | Sem I | Sem II | Sem III | Sem IV | Sem V | Sem VI | Total Credits |
|---|---|---|---|---|---|---|---|
| **Part I** | 3 | 3 | 3 | 3 | - | - | 12 |
| **Part II** | 3 | 3 | 3 | 3 | - | - | 12 |
| **Part III** | 13 | 13 | 13 | 13 | 22 | 18 | 92 |
| **Part IV** | 4 | 4 | 3 | 6 | 4 | 1 | 22 |
| **Part V** | - | - | - | - | - | 2 | 2 |
| **Total** | 23 | 23 | 22 | 25 | 26 | 21 | **140** |

***Part I. II, and Part III components will be separately taken into account for CGPA calculation and classification for the under graduate programme and the other components. IV, V have to be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree.**

| MethodsofEvaluation- Theory | | |
|---|---|---|
| **Internal Evaluation** | ContinuousInternalAssessmentTest | 25 Marks |
| | Assignments | |
| | Seminars | |
| | AttendanceandClassParticipation | |
| **External Evaluation** | EndSemesterExamination | 75 Marks |
| | Total | 100 Marks |
| **Methods of Evaluation-Practical** | | |
| **Internal Evaluation** | Lab performance, attendance, record note book maintenance, model practical examination | 50 Marks |
| **External Evaluation** | EndSemesterExamination with viva-voce | 50 Marks |
| | | |
| **MethodsofAssessment** | | |
| **Recall(K1)** | Simpledefinitions,MCQ,Recallsteps,Conceptdefinitions | |
| **Understand/Comprehend (K2)** | MCQ,True/False,Shortessays,Conceptexplanations, short summaryor Overview | |
| **Application (K3)** | Suggestidea/conceptwithexamples, suggest formulae, Solveproblems, Observe,Explain | |
| **Analyze(K4)** | Problem-solvingquestions, finish aprocedureinmanysteps,Differentiate | |
| | Betweenvariousideas,Mapknowledge | |
| **Evaluate(K5)** | Longer essay/Evaluationessay,Critiqueorjustifywithprosandcons | |
| **Create(K6)** | Checkknowledgeinspecificoroffbeatsituations,Discussion,Debatingor Presentations | |

## FIRST SEMESTER

| Sl.No. | Course Category | Course | Credit distribution | | | | Overall Credits | Total contact Hours/week | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | S | | | CIA | ESE | Total |
| 1 | Part –I | Language- Tamil | L | | | | 3 | 6 | 25 | 75 | 100 |
| 2 | Part –II | English | L | | | | 3 | 6 | 25 | 75 | 100 |
| 3 | Part -III | CC-1 | L | | | | 4 | 5 | 25 | 75 | 100 |
| 4 | Part -III | CC-2 | | | P | | 3 | 3 | 50 | 50 | 100 |
| 5 | Part -III | AL-1 | L | | | | 3 | 2 | 25 | 75 | 100 |
| 6 | Part -III | Elective I Generic / Discipline Specific | L | | | | 3 | 4 | 25 | 75 | 100 |
| 7 | Part –IV | SEC-1 (NME) | L | | | | 2 | 2 | 25 | 75 | 100 |
| 8 | Part –IV | SE-FC | L | | | | 2 | 2 | 25 | 75 | 100 |
| | | Total | | | | | 23 | 30 | | | |

## SECOND SEMESTER

| Sl.No. | Course Category | Course | Credit distribution | | | | Overall Credits | Total contact Hours/week | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | S | | | CIA | ESE | Total |
| 1 | Part –I | Language-Tamil | L | | | | 3 | 6 | 25 | 75 | 100 |
| 2 | Part –II | English | L | | | | 3 | 6 | 25 | 75 | 100 |
| 3 | Part -III | CC-3 | L | | | | 4 | 5 | 25 | 75 | 100 |
| 4 | Part -III | CC-4 | | | P | | 3 | 3 | 50 | 50 | 100 |
| 5 | Part -III | AL-2 | L | | | | 3 | 2 | 25 | 75 | 100 |
| 6 | Part -III | Elective II Generic / Discipline Specific | L | | | | 3 | 4 | 25 | 75 | 100 |
| 7 | Part –IV | SEC-2 (NME) | L | | | | 2 | 2 | 25 | 75 | 100 |
| 8 | Part –IV | SEC-3 | L | | | | 2 | 2 | 25 | 75 | 100 |
| | | Total | | | | | 23 | 30 | | | |

## THIRD SEMESTER

| Sl.No | Course Category | Course | Credit distribution | | | | Overall Credits | Total contact Hours/week | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | S | | | CIA | ESE | Total |
| 1 | Part –I | Language-Tamil | L | | | | 3 | 6 | 25 | 75 | 100 |
| 2 | Part –II | English | L | | | | 3 | 6 | 25 | 75 | 100 |
| 3 | Part –III | CC-5 | L | | | | 4 | 5 | 25 | 75 | 100 |
| 4 | Part –III | CC-6 | | | P | | 3 | 3 | 50 | 50 | 100 |
| 5 | Part –III | AL-3 | L | | | | 3 | 2 | 25 | 75 | 100 |
| 6 | Part –III | Elective III Generic / Discipline Specific | L | | | | 3 | 4 | 25 | 75 | 100 |
| 7 | Part –IV | SEC-4 | L | | | | 1 | 1 | 25 | 75 | 100 |
| 8 | Part –IV | SEC-5 | L | | | | 2 | 2 | 25 | 75 | 100 |
| 9 | Part –IV | E.V. S | L | | | | - | 1 | 25 | 75 | 100 |
| | Total | | | | | | 22 | 30 | | | |

## FOURTH SEMESTER

| Sl.NO | Course Category | Course Code | Course | Credit distribution | | | | Overall Credits | Total contact Hours/week | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | S | | | CIA | ESE | Total |
| 1 | Part –I | | Language-Tamil | L | | | | 3 | 6 | 25 | 75 | 100 |
| 2 | Part –II | | English | L | | | | 3 | 6 | 25 | 75 | 100 |
| 3 | Part –III | | CC VII | L | | | | 4 | 5 | 25 | 75 | 100 |
| 4 | Part –III | | CC VIII | | | P | | 3 | 3 | 50 | 50 | 100 |
| 5 | Part –III | | AL IV | L | | | | 3 | 2 | 25 | 75 | 100 |
| 6 | Part –III | | Elective IV Generic / Discipline Specific | L | | | | 3 | 3 | 25 | 75 | 100 |
| 7 | Part –IV | | SEC-6 | L | | | | 2 | 2 | 25 | 75 | 100 |
| 8 | Part –IV | | SEC-7 | L | | | | 2 | 2 | 25 | 75 | 100 |
| 9 | Part –IV | | EVS | L | | | | 2 | 1 | 25 | 75 | 100 |
| Total | | | | | | | | 25 | 30 | | | |

## FIFTH SEMESTER

| Sl. NO | Course Category | Course | Credit distribution | | | | Overall Credits | Total contact Hours/week | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | S | | | CIA | ESE | Total |
| 1 | Part -III | CC- IX | L | | | | 4 | 5 | 25 | 75 | 100 |
| 2 | Part –III | CC –X | L | | | | 4 | 5 | 25 | 75 | 100 |
| 3 | Part -III | CC- XI | | | P | | 4 | 5 | 50 | 50 | 100 |
| 4 | Part -III | Core course/ Project with viva- voce- XII | | | | | 4 | 5 | 25 | 75 | 100 |
| 5 | Part -III | Elective-5 | L | | | | 3 | 4 | 25 | 75 | 100 |
| 6 | Part -III | Elective-6 | L | | | | 3 | 4 | 25 | 75 | 100 |
| 7 | Part -IV | Value Education | | | | | 2 | 2 | 25 | 75 | 100 |
| 8 | Part -IV | Internship/ Industrial visit/ Field visit | | | | | 2 | - | 25 | 75 | 100 |
| | Total | | | | | | 26 | 30 | | | |

## SIXTH SEMESTER

| | Course Category | Course Code | Course | Credit distribution | | | | Overall Credits | Total contact Hours/week | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | S | | | CIA | ESE | Total |
| 1 | Part -III | | CC-XIII | L | | | | 4 | 6 | 25 | 75 | 100 |
| 2 | Part -III | | CC-XIV | L | | | | 4 | 6 | 25 | 75 | 100 |
| 3 | Part -III | | CC-XV | | | P | | 4 | 6 | 50 | 50 | 100 |
| 4 | Part -III | | Elective-7 | L | | | | 3 | 5 | 25 | 75 | 100 |
| 5 | Part -III | | Elective-8 | L | | | | 3 | 5 | 25 | 75 | 100 |
| 6 | Part -IV | | Extension activity | | | | | 1 | - | - | - | - |
| 7 | Part -IV | | Professional competency skill | L | | | | 2 | 2 | 25 | 75 | 100 |
| | | Total | | | | | | 21 | 30 | | | |

### Credit Distribution for B.Sc., ELECTRONICS

| S.No | Part | Course Details | Credit |
|---|---|---|---|
| 1 | **III** | Core | 68 |
| 2 | | Elective Generic/ Discipline Specific Elective | 24 |
| 3 | **I& II** | Language & English<br>(Lang – 4x3=12<br>Eng – 4x3=12) | 24 |
| 4 | **IV& V** | NME(2x2) | 4 |
| 5 | | EVS(1x2) | 2 |
| 6 | | Value Education(1x2) | 2 |
| 7 | | Extension Activity(1x1) | 1 |
| 8 | | • Ability Enhancement [AECC]- Soft Skill (4x2=8)<br>• Skill Enhancement Course [4 Courses x 2 credits =8 credits], SEC-4: 1 Credit<br>• Summer internship/ Industrial training (2x1=2 credits)<br>• Foundation course<br>• Professional Competency Skill | 8<br>9<br>2<br>2<br>2 |
| | | | **140** |

**Remarks: English Soft Skill Two Hours Will be handled by English Teachers (4+2 = 6 hours for English).**

| Subject Code | Subject Name | Category | L | T | P | S | Credits | Inst. Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| | **BASICELECTRONICDEVICES** | **Core Course – 1 (CC-I)** | **5** | **0** | **-** | **-** | **4** | **5** | **25** | **75** | **100** |

**Course objectives**

| | |
|---|---|
| **CO1** | Learn the fundamental components of passive electronic devices. |
| **CO2** | Provide the in-depth knowledge of basic semiconductors. |
| **CO3** | Understand the basicconcepts of semiconductors and its characteristics |
| **CO4** | Examines the principles and operations of transistors and understand the basics of UJT and SCR characteristics |
| **CO5** | Know the basics of FETs and MOSFET components |

| UNIT | Details | No.of Hours | Course Objectives |
|---|---|---|---|
| I | Type of resistors – color code –construction of various types of resistors (carbon composition, carbon film, wire-wound etc.)– power ratings - capacitors (ceramic, mica polystyrene electrolytic) – fixed and variable capacitors | 12 | CO1 |
| II | Atomic structure, Bohr's atom model – energy levels -energy bands –classification of solids and energy bands – forbidden energy gap – intrinsic and extrinsic semiconductors, P type and N type semiconductors– majority and minority carriers | 12 | CO2 |
| III | PN junction- Biasing a PN junction – forward and reverse biasing – PN junction diode: characteristics -static and dynamic resistance - diode rectifiers: Half wave and Full wave rectifier – Bridge rectifier – clippers and clampers - Zener diode – Characteristics-voltage regulation using Zener diode | 12 | CO3 |
| IV | Bipolar transistor – UJT – Common Base, Common Emitter & Common Collector configurations and their characteristics – transistor biasing methods - Transistor as switch, amplifier – SCR | 12 | CO4 |
| V | FET Constructional features-working Principle, features and characteristics - JFET and MOSFET and their characteristics – enhancement and depletion type | 12 | CO5 |
| | **Total** | 60 | |

| Course Outcomes | | |
|---|---|---|
| **Course Outcomes** | On completion of this course, students can able to | |
| **CO1** | Study the basic semiconductor devices and their characterisation. | PO5, PO6, PO10 |
| **CO2** | Gain the knowledge of detailed functions of semiconductors. | PO10 |
| **CO3** | Understand the various types of semiconductor devices behaviours, different types of semiconductors | PO11 |
| **CO4** | Explain the principles and working mechanism of different types of semiconductors and the scope of application. | PO4, PO11 |
| **CO5** | Understand the concept of device functionalities andhelp the students to understand the basic electronic devices | PO4, PO11 |
| **Text Books** | | |
| 1 | V.K.Mehta, "Principles of electronics", S.Chand & Co., | |
| 2 | B.L.Theraja, "Basic solid-state electronics", S.Chand & Co., | |
| **References Books** | | |
| 1 | Semiconductor Physics and Devices-Basic Principles \| 4$^{th}$Edition. by **Donald A. Neamen**(2021) | |
| **Web Resources** | | |
| 1 | https://www.electronics-tutorials.ws/diode/diode_1.html | |
| 2 | https://www.electronicshub.org/types-of-semiconductor-devices/ | |
| 3 | https://www.britannica.com/technology/semiconductor-device | |

| Methods of Evaluation | | |
|---|---|---|
| **Internal Evaluation** | Continuous Internal Assessment Test | 25 Marks |
| | Assignments | |
| | Seminars | |
| | Attendance and Class Participation | |
| **External Evaluation** | End Semester Examination | 75 Marks |
| | Total | 100 Marks |

| Methods of Assessment | |
|---|---|
| **Recall (K1)** | Simple definitions, MCQ, Recall steps, Concept definitions |
| **Understand/ Comprehend (K2)** | MCQ, True/False, Short essays, Concept explanations, short summary or overview |
| **Application (K3)** | Suggest idea/concept with examples, suggest formulae, solve problems, Observe, Explain |
| **Analyse (K4)** | Problem-solving questions, finish a procedure in many steps, Differentiate between various ideas, Map knowledge |

| | |
|---|---|
| **Evaluate (K5)** | Longer essay/ Evaluation essay, Critique or justify with pros and cons |
| **Create (K6)** | Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations |

**Mapping with Programme Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | | | | | M | M | | | | M | |
| **CO2** | | | | | | | | | | M | M |
| **CO3** | | | | | | | | | | | S |
| **CO4** | | | | M | | | | | | | S |
| **CO5** | | | | M | | | | | | | S |

| Subject Code | Subject Name | Category | L | T | P | S | Credits | Inst. Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| | **BASIC ELECTRONIC DEVICES LAB** | **Core Course II-Practical I (CC-II)** | **-** | **-** | **3** | **-** | **3** | **3** | **50** | **50** | **100** |

**Course Objectives**

| | |
|---|---|
| CO1 | Gain knowledge of electronics components |
| CO2 | Examine the current & voltage characteristics of semiconductor devices |
| CO3 | Identifythe various device parameters from I-V characteristics |
| CO4 | Extract important information from the graphical plots of device characteristics |
| CO5 | Interpret the experimental data to understand the behaviour of the device |

| UNIT | Details | No.of Hours | Course Objectives |
|---|---|---|---|
| I | PN Junctiondiode and Zenerdiode Characteristics | 6 | CO1 |
| II | Bipolar Junction Transistor (BJT) Characteristics (Input and Output) – Common Base (CB); BJT Characteristics (Input and Output) – Common Emitter (CE); BJT Characteristics | 6 | CO2 |

| | | | |
|---|---|---|---|
| | (Input and Output)– Common Collector (CC); Measurement of stability factor of self-biasing method; Measurement of stability factor of fixed-biasing method | | |
| III | Field Effect Transistor (FET)characteristics | 6 | CO3 |
| IV | Photoconductivity measurements ofLDR; Photodiode characteristics; Phototransistor characteristics | 6 | CO4 |
| V | UJT and SCR characteristics | 6 | CO5 |
| | Total | 30 | |

**Course Outcomes**

| **Course Outcomes** | On completion of this course, students will; | |
|---|---|---|
| CO1 | Practice with active and passive semiconductor devices | PO4, PO7, PO8, PO9, PO11 |
| CO2 | Learn the semiconductor device characteristics. | PO4, PO7, PO8, PO9 |
| CO3 | Understand the basic semiconductor components working principles and methodology used inside the laboratory environment | PO4, PO7, PO8, PO9, PO11 |
| CO4 | Design, construct the electronic circuits and observe the characteristics. | PO4, PO7, PO8, PO9 |
| CO5 | Study and compare semiconductor device characterisation | PO4, PO7, PO8, PO9 |

**Text Books**

| | |
|---|---|
| 1 | V.K.Mehta, “Principles of electronics”, S.Chand & Co |
| 2 | B.L.Theraja, “Basic solid-state electronics”, S.Chand & Co |

**References Books**

| | |
|---|---|
| 1 | Semiconductor Physics and Devices-Basic Principles, 4$^{th}$Edition. by **Donald A. Neamen**(2021) |

**Web Resources**

| | |
|---|---|
| 1 | https://www.electronics-tutorials.ws/diode/diode_1.html |
| 2 | https://www.electronicshub.org/types-of-semiconductor-devices/ |
| 3 | https://www.britannica.com/technology/semiconductor-device |

**Methods of Evaluation**

| | | |
|---|---|---|
| **Internal Evaluation** | Continuous Internal Assessment Test | 25 Marks |
| | Assignments | |
| | Seminars | |
| | Attendance and Class Participation | |
| **External** | End Semester Examination | 75 Marks |

| Evaluation | | |
|---|---|---|
| | Total | 100 Marks |
| **Methods of Assessment** | | |
| **Recall (K1)** | Simple definitions, MCQ, Recall steps, Concept definitions | |
| **Understand/ Comprehend (K2)** | MCQ, True/False, Short essays, Concept explanations, short summary or overview | |
| **Application (K3)** | Suggest idea/concept with examples, suggest formulae, solve problems, Observe, Explain | |
| **Analyze (K4)** | Problem-solving questions, finish a procedure in many steps, Differentiate between various ideas, Map knowledge | |
| **Evaluate (K5)** | Longer essay/ Evaluation essay, Critique or justify with pros and cons | |
| **Create (K6)** | Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations | |

**Mapping with Programme Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | | | M | | | L | M | L | | M |
| CO2 | | | | S | | | L | L | L | | |
| CO3 | | | | S | | | M | M | L | | M |
| CO4 | | | | S | | | M | L | L | | |
| CO5 | | | | S | | | M | L | L | | |

| Subject Code | Subject Name | Category | L | T | P | S | Credits | Inst. Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| | **INTRODUCTION OF C LANGUAGE** | **Allied Course – 1 (AL-I)** | **0** | **3** | **-** | **-** | **3** | **2** | **25** | **75** | **100** |

**Course objectives**

| | |
|---|---|
| **CO1** | Understand the basic C programming language |
| **CO2** | Learn data structures and concepts |
| **CO3** | Know the statements of C-program |
| **CO4** | Understand functions, pointers and structures |

| **CO5** | Use arrays, pointers and strings to the C-program | | |
|---|---|---|---|
| **UNIT** | **Details** | **No.of Hours** | **Course Objectives** |
| I | **INTRODUCTION**: Concept of Programming Languages - High Level, Low Level, Assembly Language – Concept of Algorithms and Flow Charts - Language translators: Assemblers, Compilers, Interpreters<br>(Only concept and differences) | 4 | CO1 |
| II | **DATA CONCEPTS**: Overview of C, Features of C fundamentals - Character Set, Identifiers, Keywords, Data Types, Constants, Variables, Operators - Arithmetic, Logical, Relational, Unary, Assignment,Conditional and Bitwise Operators – expressions | 4 | CO2 |
| III | **STATEMENTS**: Structure of C Program - Library Functions - Data input and output, Compilation andExecution of C programs - Control Statements - IF Statement, IF…ELSE Statement, Nesting of IF …ElseStatement – Operator - Switch Statement - Loop Controls – FOR, WHILE, DO-WHILE Loops, Break - Continue, Exit, GO...TO Statement. | 4 | CO3 |
| IV | **FUNCTIONS**: The Need of a Function - definition - User Defined and Library Function - Prototype of a<br>Function - Calling of a function - Function Argument - Passing arguments to function - Return Values -Nesting of Function - main () - Command Line Argument - Recursion. | 4 | CO4 |
| V | **ARRAYS AND STRINGS**: Arrays -Single and Multi-dimensional arrays, Declaration and Initializationof arrays and strings, pointers and one-dimensional arrays-Structures-Definition, declaration of structurevariables, accessing structure members unions-Data files-opening and closing a data file, creating a datafile. | 4 | CO5 |
| | **Total** | 20 | |

**Course Outcomes**

| **Course Outcomes** | On completion of this course, students can able to: | |
|---|---|---|
| **CO1** | Study the concept of basic C-programming language. | PO5, PO6, PO10 |
| **CO2** | Gain the knowledge of data types. | PO10 |
| **CO3** | Understand the various types of statements | PO11 |
| **CO4** | Define, Explain and Need of a function | PO4, PO11 |
| **CO5** | Understand the Arrays and Strings of C-program | PO4, PO11 |

**Text Books**

| | |
|---|---|
| 1 | E. Balaguruswami, Programming with C, TMH. |

| | |
|---|---|
| 2 | Byron Gottfried, Programming with C, Schaum's Outline Series,TMH. |
| **References Books** | |
| 1 | Mahapatra, Thinking in C, PHI. |
| 2 | Brain W Kernighan and Dennis M Ritchie, The C Programming language, PHI |
| 3 | Dennis & Ritchie: "Programming in C". |
| **Web Resources** | |
| 1 | www.cprogramming.com |
| 2 | https://archive.nptel.ac.in/courses |
| 3 | www.programmersheaven.com |

| **Methods of Evaluation** | | |
|---|---|---|
| **Internal Evaluation** | Continuous Internal Assessment Test | 25 Marks |
| | Assignments | |
| | Seminars | |
| | Attendance and Class Participation | |
| **External Evaluation** | End Semester Examination | 75 Marks |
| | Total | 100 Marks |

| **Methods of Assessment** | |
|---|---|
| **Recall (K1)** | Simple definitions, MCQ, Recall steps, Concept definitions |
| **Understand/ Comprehend (K2)** | MCQ, True/False, Short essays, Concept explanations, short summary or overview |
| **Application (K3)** | Suggest idea/concept with examples, suggest formulae, solve problems, Observe, Explain |
| **Analyse (K4)** | Problem-solving questions, finish a procedure in many steps, Differentiate between various ideas, Map knowledge |
| **Evaluate (K5)** | Longer essay/ Evaluation essay, Critique or justify with pros and cons |
| **Create (K6)** | Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations |

**Mapping with Programme Outcomes:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | | | | | M | M | | | | M | |
| **CO2** | | | | | | | | | | M | M |
| **CO3** | | | | | | | | | | | S |
| **CO4** | | | | M | | | | | | | S |
| **CO5** | | | | M | | | | | | | S |

| Subject Code | Subject Name | Category | L | T | P | S | Credits | Inst. Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| | **INTRODUCTION OF ROBOTICS AND AUTOMATION** | Elective Generic / Discipline Specific Elective-I**(DSE-I)** | **4** | **-** | **-** | **-** | **3** | **4** | **25** | **75** | **100** |

| **Course Objectives** | |
|---|---|
| CO1 | Attain the knowledge ofrobotics and automation. |
| CO2 | Study the sensors/ driver's activity, artificial intelligence |
| CO3 | Identify the robotics control and automation |
| CO4 | Describe the CNC machine features |
| CO5 | Understand sensors for robots, machine control and logical control assemblies |

| UNIT | Details | No.of Hours | Course Objectives |
|---|---|---|---|
| I | **INTRODUCTION:** Introduction of Robotics and programmable automation, historicalbackground, laws of robotics, robot definition, robot anatomy and systems, human systems androbotics. Specification of robotics | 12 | CO1 |
| II | **ROBOT DRIVES:** Actuators and control, Function of drive systems, general types of fluids,pump classification pneumatic system, Hydraulic system, Directional control valves, Process control valves, Rotary actuators electrical drives, DC: motors, stepper motor and drivesmechanisms. | 12 | CO2 |
| III | **ROBOTEND-EFFECTORS:** Robot End-Effectors Classification of end-effectors, drivesystem for grippers, mechanical, magnetic, vacuum and adhesive grippers, hooks, scoops andothers devices, active and passive Grippers. | 12 | CO3 |
| IV | **SENSORS AND INTELLIGENT ROBOTS:** Sensors and Intelligent Robots Artificialintelligence and automated manufacturing, AI and robotics, need for sensing systems, sensorydevices, types of sensors, robot vision systems- Robot Languages and programming Differentlanguages, Computer numerical control- Features of CNC-CNC machine control unit CNCsoftware | 12 | CO4 |
| V | **PROGRAMMABLE LOGIC CONTROLLERS (PLC):** Discrete Process Control-Logiccontrol, Sequencing-Ladder logic diagrams-Programmable logic controllers-Components | 12 | CO5 |

| | | | |
|---|---|---|---|
| | of thePLC, PLC operating cycle-Additional capabilities of PLC, Programming the PLC-Personalcomputers using soft logic. Introduction to HMI, DCS and SCADA systems | | |
| | Total | 60 | |

| **Course Outcomes** | | |
|---|---|---|
| **Course Outcomes** | On completion of this course, students will; | |
| CO1 | Explain the robotics and automation | PO1 |
| CO2 | Differentiate the essential and non-essential automation and logic controls | PO1 |
| CO3 | Assess the intelligent robots and sensors | PO4, PO5, PO6 |
| CO4 | Discuss and evaluate the end effectors | PO4, PO5, PO6 |
| CO5 | Appraise the PLC logics | PO5, PO6, PO9 |

**Text Books**

1. Robotics technology and flexible automation by S.R. DEB Tata Mc Graw Hill.
2. Mikell P. Groover, –Automation Production systems and Computer Integrated Manufacturing, Prentice-Hall India, New Delhi, 1987. Pearson Education, New Delhi
3. W. Bolton, –Mechatronics, Pearson Education Asia, 2002.
4. Introduction to robotics, mechanics and control by John J. Craig from Addison Wesley

**References Books**

1. Robotics principles and practice by Dr. K.C. Jain and Dr. L.N Agarwal from Khanna publishers
2. Introduction to robotics, mechanics and control by John J. Craig from Addison Wesley
3. Mikell P. Groover, –Industrial Robotics-Technology, Programming and Applications, Mc Graw Hill, New Delhi,1986
4. K.S. Fu, R.C. Gonzalez and C S G Lee, Robotics: Control, Sensing, Vision and Intelligence, McGraw Hill, New Delhi, 1987.

**Web Resources**

| | |
|---|---|
| 1 | https://onlinecourses.nptel.ac.in |
| 2 | https://cac.annauniv.edu |
| 3 | https://www.plctraininginchennai.net/ |

**Methods of Evaluation**

| | | |
|---|---|---|
| **Internal Evaluation** | Continuous Internal Assessment Test | 25 Marks |
| | Assignments | |
| | Seminars | |
| | Attendance and Class Participation | |
| **External Evaluation** | End Semester Examination | 75 Marks |
| | Total | 100 Marks |

**Methods of Assessment**

| | |
|---|---|
| **Recall (K1)** | Simple definitions, MCQ, Recall steps, Concept definitions |
| **Understand/ Comprehend (K2)** | MCQ, True/False, Short essays, Concept explanations, Short summary or overview |
| **Application (K3)** | Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain |
| **Analyze (K4)** | Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge |
| **Evaluate (K5)** | Longer essay/ Evaluation essay, Critique or justify with pros and cons |
| **Create (K6)** | Check knowledge in specific or off-beat situations, Discussion, Debating or Presentations |

**Mapping with Programme Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | M | | | | | | | | | | |
| CO2 | M | | | | | | | | | | |
| CO3 | | | | S | S | S | | | | | |
| CO4 | | | | S | S | S | | | | | |
| CO5 | | | | | S | S | | | S | | |

| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | **CIA** | **External** | **Total** |
| | **CONSUMER ELECTRONIC APPLIANCES** | **Skill enhancement Course (SEC-1 NME)** | **2** | **-** | **-** | **-** | **2** | **2** | **25** | **75** | **100** |

**Course Objectives**

| | |
|---|---|
| CO1 | Describe the concepts of microwave ovens |
| CO2 | Understand the concepts of washing machines |
| CO3 | Know about air conditioners and refrigerators |
| CO4 | Gain knowledge about home or office digital devices |

| | | | |
|---|---|---|---|
| CO5 | Learn about digital access services such as LAN, MODEM, ATM | | |
| **UNIT** | **Details** | **No.of Hours** | **Course Objectives** |
| I | **MICROWAVE OVENS:** Microwaves - Properties and generation Magnetrons, Waveguides microwave oven block diagram - LCD timer with alarm – Single chip controllers – Types of microwave ovens- microwave Cooking-Features and parts of microwave oven-Wiring and safety instructions – Microwave cookware - Operating problem and solutions-Care and cleaning | 6 | CO1 |
| II | **WASHING MACHINES:** Electronic controller for washing machines - Washing machine hardware –Washing cycle-Hardware and software development - Types of washing machines -Fuzzy logic washing machines - Features of washing machines. | 6 | CO2 |
| III | **AIR CONDITIONERS AND REFRIGERATORS:** Air Conditioning - Components of air conditioning systems - All water air conditioning systems - All air conditioning systems –Remote control buttons-Combination systems- Unitary and central air conditioning systems - Split air conditioners-Refrigeration- Refrigerants-Refrigeration Systems-Domestic Refrigerators | 6 | CO3 |
| IV | **HOME / OFFICE DIGITAL DEVICES:** Facsimile machine –Basic fax machine operations-Group 3 fax machines- Xerographic copier, Process-Extension to dynamic copier - Digital clocks - Block diagram of a digital clock-LSI digital clock. | 6 | CO4 |
| V | **DIGITAL ACCESS SERVICES:** ISDN-The Internet- LAN - Functions and networks – MODEM - Barcode- Barcode Scanner and decoder -Bluetooth and Wireless enabled devices – Electronic Fund Transfer - Automated Teller Machines (ATMs) - Set-Top boxes - Digital cable TV | 6 | CO5 |
| | Total | 30 | |

| **Course Outcomes** | | |
|---|---|---|
| **Course Outcomes** | On completion of this course, students will; | |
| CO1 | Identify the consumer electronic application | PO1, PO5, PO6 |
| CO2 | Associate various digitally made instruments | PO1, PO2, PO3, PO5, PO6, PO9 |
| CO3 | Choose the appropriate digital services | PO1, PO5, PO6 |

| | | |
|---|---|---|
| CO4 | Acquire the knowledge of digital devices enhancement | PO4, PO5, PO6 |
| CO5 | Recommend the usage of alternate digital resources | PO1, PO5, PO6 |
| **Text Books** | | |
| 1. | Consumer Electronics - S.P. Bali, Pearson Education, New Delhi, 2005. | |
| 2. | Consumer electronics by Deepak Arora, Eagle Prakashan, Jalandhar. | |
| **References Books** | | |
| 1 | Consumer electronics by Yagnik and Jain- Ishan Publication | |
| 2 | Service manuals, BPB Publication, New Delhi | |
| **Web Resources** | | |
| 1 | https://archive.nptel.ac.in/courses | |
| 2 | https://esdm-skill.deity.gov.in | |

**Methods of Evaluation**

| | | |
|---|---|---|
| **Internal Evaluation** | Continuous Internal Assessment Test | 25 Marks |
| | Assignments | |
| | Seminars | |
| | Attendance and Class Participation | |
| **External Evaluation** | End Semester Examination | 75 Marks |
| | Total | 100 Marks |

**Methods of Assessment**

| | |
|---|---|
| **Recall (K1)** | Simple definitions, MCQ, Recall steps, Concept definitions |
| **Understand/ Comprehend (K2)** | MCQ, True/False, Short essays, Concept explanations, short summary or overview |
| **Application (K3)** | Suggest idea/concept with examples, suggest formulae, solve problems, Observe, Explain |
| **Analyze (K4)** | Problem-solving questions, finish a procedure in many steps, Differentiate between various ideas, Map knowledge |
| **Evaluate (K5)** | Longer essay/ Evaluation essay, Critique or justify with pros and cons |
| **Create (K6)** | Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations |

**Mapping with Programme Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | | | | S | S | | | | | |
| CO2 | S | S | | M | S | S | | | M | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO3 | | | | M | S | S | | | | | |
| CO4 | S | | | S | S | M | | | | | |
| CO5 | S | | | | S | S | | | | | |

| Subject Code | Subject Name | Category | L | T | P | S | Credits | Inst. Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| | **FOUNDATION OF ELECTRONICS& COMPUTERS** | **Skill enhancement (Foundation Course)** | **2** | **-** | **-** | **-** | **2** | **2** | **25** | **75** | **100** |

**Course Objectives**

| | |
|---|---|
| CO1 | Describe the concepts of basic semiconductors |
| CO2 | Understand the concepts of diode circuits |
| CO3 | Know about transistors and amplifiers |
| CO4 | Gain knowledge of computer software's and languages |
| CO5 | Learn how to solve problems and their concepts |

| UNIT | Details | No.of Hours | Course Objectives |
|---|---|---|---|
| I | **SEMICONDUCTOR BASICS:** Introduction to semiconductor materials, intrinsic & extrinsicsemiconductors. p-type semiconductors, n- type semiconductors, p-n junction diode | 6 | CO1 |
| II | **DIODE CIRCUITS:** Clipper, clamping circuits, half wave and full wave rectifiers, center tapped andbridge rectifiers, Block diagram of DC power supply, Zener diode asvoltage regulator | 6 | CO2 |
| III | **TRANSISTORS AND FEEDBACK AMPLIFIERS:** BJT, FET, and MOSFET transistors action, Transistor configurations, Concept of feedback, negative and positive feedback, oscillators, Study of Hartley, Colpitts oscillators and crystal oscillator, IC, VLSI and ULSI | 6 | CO3 |
| IV | **COMPUTER SOFTWARE & LANGUAGES:**<br>i) Type of Software's - System Architecture<br>ii) Machine Language - Assembly Language - High Level Language - Object Oriented Languages | 6 | CO4 |
| V | **PROBLEM SOLVING CONCEPTS FOR THE COMPUTER:** Constant Variables - Data Types - Functions -Operators - Expressions and Equations - **Organizing the Solution:** Analysing the problem - Algorithm - Flowchart - Pseudo code | 6 | CO5 |

| | | | |
|---|---|---|---|
| | **PROGRAMMING STRUCTURE:** Modules and their function - Local and Global variables - Parameters - Return values - Sequential Logic Structure | | |
| | Total | 30 | |

| **Course Outcomes** | | |
|---|---|---|
| **Course Outcomes** | On completion of this course, students will; | |
| CO1 | Identify the basics of computer and electronic applications | PO1, PO5, PO6 |
| CO2 | Understand and differentiate the concepts of basic semiconductors | PO1, PO2, PO3, PO5, PO6, PO9 |
| CO3 | Learn amplifiers and circuit theory | PO1, PO5, PO6 |
| CO4 | Acquire the knowledge of problem-solving concepts | PO4, PO5, PO6 |
| CO5 | Recommend the usage of software's in electronic devices | PO1, PO5, PO6 |

| **Text Books** | |
|---|---|
| 1. | Basic and Applied Electronics-T. K Bandyopadhyay, Books and Allied Pvt Ltd (2002) |
| 2. | B.L.Theraja, "Basic solid-state Electronics", S.Chand&Co |
| 3. | V.K.Mehta, "Principles of Electronics", S.Chand& Co |
| 4. | R.L.Boylestad, L.Nashelsky, Electronic Devices and Circuit Theory, Pearson Education (2006). |
| 5. | Pradeep K.Sinha and Priti Sinha, (2004) ―Computer Fundamentals‖, Sixth Edition, BPB Publications |
| 6. | Maureen Sprankle and Jim Hubbard, (2009) ―Problem Solving and Programming Concept, Ninth Edition, Prentice Hall. |

| **References Books** | |
|---|---|
| 1 | N Bhargava, D C Kulshreshtha and S C Gupta, Basic Electronics and linear circuits, Tata McGraw-Hill (2007). |
| 2 | J. Millman and C. Halkias, Integrated Electronics, Tata McGraw Hill (2001). |
| 3 | C. S. V. Murthy, (2009)―Fundamentals of Computers‖, Third Edition, Himalaya Publishing House |

| **Web Resources** | |
|---|---|
| 1 | http://www.tutorialspoint.com/computer_fundamentals/ |
| 2 | http://www.top-windows-tutorials.com/computer-basics/ |
| 3 | http://www.homeandlearn.co.uk/ |
| 4 | https://archive.nptel.ac.in/courses |

| **Methods of Evaluation** | | |
|---|---|---|
| **Internal Evaluation** | Continuous Internal Assessment Test | 25 Marks |
| | Assignments | |
| | Seminars | |
| | Attendance and Class Participation | |

| | | |
|---|---|---|
| **External Evaluation** | End Semester Examination | 75 Marks |
| | Total | 100 Marks |
| **Methods of Assessment** | | |
| **Recall (K1)** | Simple definitions, MCQ, Recall steps, Concept definitions | |
| **Understand/ Comprehend (K2)** | MCQ, True/False, Short essays, Concept explanations, short summary or overview | |
| **Application (K3)** | Suggest idea/concept with examples, suggest formulae, solve problems, Observe, Explain | |
| **Analyze (K4)** | Problem-solving questions, finish a procedure in many steps, Differentiate between various ideas, Map knowledge | |
| **Evaluate (K5)** | Longer essay/ Evaluation essay, Critique or justify with pros and cons | |
| **Create (K6)** | Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations | |

**Mapping with Programme Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | | | | S | S | | | | | |
| CO2 | S | S | | M | S | S | | | M | | |
| CO3 | | | | M | S | S | | | | | |
| CO4 | S | | | S | S | M | | | | | |
| CO5 | S | | | | S | S | | | | | |

## SEMESTER II

| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | **CIA** | **External** | **Total** |
| | **DIGITAL ELECTRONICS** | **Core Course III (CC-III)** | **4** | **-** | **-** | **-** | **4** | **5** | **25** | **75** | **100** |
| **Course Objectives** | | | | | | | | | | | |
| CO1 | Study the basic principles of number systems and codes | | | | | | | | | | |

| | | | |
|---|---|---|---|
| CO2 | Understand the basic concepts of digital logic families | | |
| CO3 | Analyse arithmetic circuits. | | |
| CO4 | Observe various Latches | | |
| CO5 | Study registers and memories. | | |
| **Unit** | **Details** | **No.of Hours** | **Course Objectives** |
| I | **NUMBER SYSTEM AND CODES:** Decimal, Binary, Octal and Hexadecimal number systems, base conversions. representation of signed and unsigned numbers, BCD code. binary, octal and hexadecimal- BCD-Excess3, Gray code-alphanumeric codes. | 12 | CO1 |
| II | **DIGITAL LOGIC FAMILIES:** Fan-in, Fan out, Noise Margin, Power Dissipation, Figure of merit, Speed power product, comparison of TTL and CMOS families. Truth Tables of OR, AND, NOT, NOR, NAND, EX-OR, Universal gates, Basic postulates and fundamental theorems of Boolean algebra, Demorgan's Theorem. Karnaugh Maps: two, three and four variable K-Map | 12 | CO2 |
| III | **ARITHMETIC CIRCUITS:** Binary addition. Half and Full Adder. Half and Full subtractor, Binary Adder/Subtractor. Multiplexers, De-multiplexers, Decoders, Encoders. Parity checker – parity generators – code converters | 12 | CO3 |
| IV | **LATCHES:** Latches, Flip-flops - SR, JK, D, T, and Master-Slave - Edge triggering – Level triggering asynchronous ripple or serial counter – Asynchronous Up/Down counter - Synchronous counters – Synchronous Up/Down counters – Programmable counters – Modulo–n counter | 12 | CO4 |
| V | **REGISTERS AND MEMORIES:** Registers – shift registers - Universal shift registers – Shift register counters – Ring counter – Shift counters-Memory devices -classification of memories – ROM – ROM organization - PROM – EPROM – EEPROM – EAPROM, RAM – RAM organization – Static RAM Cell | 12 | CO5 |
| | Total | 60 | |

**Course Outcomes**

| **Course Outcomes** | On completion of this course, students will; | |
|---|---|---|
| CO1 | Describe the outcomes of number systems. | PO6, PO9 |
| CO2 | Know the concept of logical families. | PO6, PO7, PO9 |
| CO3 | Explain the methods of arithmetic circuits. | PO6, PO9 |
| CO4 | Describe latches, registers and memories. | PO6, PO9 |
| CO5 | Elaborate on the digital logic families | PO6, PO9 |

| Text Books | |
|---|---|
| 1 | Digital Principles & Applications – Albert Paul Malvino & Leach |
| 2 | Digital Fundamentals – Thomas L. Floyd – Prentice Hall |
| 3 | Digital Electronics-an introduction to Theory and Practice - William H.Gothmann Prentice Hall |
| **References Books** | |
| 1 | Digital Practice using Integrated Circuits – R. P. Jain and Anand |
| 2 | Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd. |
| 3 | Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill. |
| 4 | Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001, PHI Learning |
| 5 | Digital Principles, R. L. Tokheim, Schaum's Outline Series, Tata McGraw- Hill (1994) |
| **Web Resources** | |
| 1 | https://onlinelibrary.wiley.com/doi/book/10.1002/9780470510520 |
| 2 | https://www.freebookcentre.net/electronics_communication_books/Digital-Electronics-Books-Download.html |

| Methods of Evaluation | | |
|---|---|---|
| **Internal Evaluation** | Continuous Internal Assessment Test | 25 Marks |
| | Assignments | |
| | Seminars | |
| | Attendance and Class Participation | |
| **External Evaluation** | End Semester Examination | 75 Marks |
| | Total | 100 Marks |

| Methods of Assessment | |
|---|---|
| **Recall (K1)** | Simple definitions, MCQ, Recall steps, Concept definitions |
| **Understand/ Comprehend (K2)** | MCQ, True/False, Short essays, Concept explanations, short summary or overview |
| **Application (K3)** | Suggest idea/concept with examples, suggest formulae, solve problems, Observe, Explain |
| **Analyze (K4)** | Problem-solving questions, finish a procedure in many steps, Differentiate between various ideas, Map knowledge |
| **Evaluate (K5)** | Longer essay/ Evaluation essay, Critique or justify with pros and cons |
| **Create (K6)** | Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations |

**Mapping with Programme Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | | | | | M | | | M | | |
| CO2 | | | | | | M | L | | M | | |
| CO3 | | | | | | M | | | M | | |
| CO4 | | | | | | M | | | M | | |
| CO5 | | | | | | M | | | M | | |

| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | **CIA** | **External** | **Total** |
| | **DIGITAL ELECTRONICS LAB** | **CCIV-CORE PRACTICAL II (CC-II-P)** | **-** | **-** | **3** | **-** | **3** | **3** | **50** | **50** | **100** |

| **Course Objectives** | |
|---|---|
| CO1 | Understand the principles of motility test. |
| CO2 | Understand the basic concepts of staining methods. |
| CO3 | Learn the bacterial count using different methods and anaerobic culture. |
| CO4 | Study the morphological demonstration of microorganisms and identification. |
| CO5 | Study the biochemical identification of the bacteria. |

| **No. of Experiments** | **Details** | **No.of Hours** | **Course Objectives** |
|---|---|---|---|
| 1 | Study and verify truth tables of AND, OR, NOT, NAND, NOR and XOR gates | | CO1 |
| 2 | Design all logic gates using NAND gate | | CO2 |
| 3 | Design all logic gates using NOR gate | | CO3 |
| 4 | Verify Demorgan's theorem | | CO4 |
| 5 | Construction of gates using discrete components | | CO5 |

| | | | |
|---|---|---|---|
| 6 | Code conversion | | |
| 7 | Truth table verification of Half adder and Full adder | | |
| 8 | Truth table verification of Half subtractor and Full subtractor | | |
| 9 | Multiplexer using 74153 IC and De-Multiplexer using 74155 IC | | |
| 10 | Encoder using 74147 IC and Decoder using 7442 IC | | |
| 11 | Study of M-S and J-K Flip flops using 7476 IC | | |
| 12 | Parallel-in and Parallel-out Shift register using 7495 IC | | |
| 13 | Up counter using 7490 IC or 7493 IC | | |
| 14 | Clock generation using NAND or NOR gate | | |
| | Total | 30 | |

| **Course Outcomes** | | |
|---|---|---|
| **Course Outcomes** | On completion of this course, students will; | |
| CO1 | Describe and verify logic gates truth tables. | PO6, PO7, PO8, PO9, PO11 |
| CO2 | Demonstrate logic gates using NAND and NOR gates. | PO6, PO7, PO8, PO9, PO11 |
| CO3 | Construct and verify theorems. | PO6, PO7, PO8, PO9, PO11 |
| CO4 | Demonstrate Adder, Subtractor, Multiplexor, Encoder, Decoder | PO6, PO7, PO8, PO9, PO11 |
| CO5 | Describe Flip-flops, shift registers, clock generation using ICs. | PO6, PO7, PO8, PO9, PO11 |

| **Text Books** | |
|---|---|
| 1 | M. Morris Mano Digital System Design, Pearson Education Asia (FourthEdition) |
| 2 | Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994) |
| **References Books** | |
| 1 | W. H. Gothmann, Digital Electronics: An Introduction To Theory And Practice, Prentice Hall of India (2000) |
| 2 | R. L. Tokheim, Digital Principles, Schaum‘s Outline Series, Tata McGraw- Hill (1994) |
| **Web Resources** | |
| 1 | https://www.technicalbookspdf.com/electronic-engineering/digital-electronics/ |
| 2 | https://easyengineering.net/digital-electronics-by-godse/ |

| **Methods of Evaluation** | | |
|---|---|---|
| **Internal Evaluation** | Continuous Internal Assessment Test | 50 Marks |
| | Assignments | |
| | Seminars | |
| | Attendance and Class Participation | |
| **External Evaluation** | End Semester Examination | 50 Marks |

| | Total | 100 Marks |
|---|---|---|
| **Methods of Assessment** | | |
| **Recall (K1)** | Simple definitions, MCQ, Recall steps, Concept definitions | |
| **Understand/ Comprehend (K2)** | MCQ, True/False, Short essays, Concept explanations, Short summary or overview | |
| **Application (K3)** | Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain | |
| **Analyze (K4)** | Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge | |
| **Evaluate (K5)** | Longer essay/ Evaluation essay, Critique or justify with pros and cons | |
| **Create (K6)** | Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations. | |

**Mapping with Programme Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | | | | | M | L | M | L | | M |
| CO2 | | | | | | M | M | L | M | | L |
| CO3 | | | | | | L | M | M | L | | M |
| CO4 | | | | | | L | M | M | M | | M |
| CO5 | | | | | | M | M | M | M | | M |

| **Subject Code** | **Subject Name** | **Category** | **L** | **T** | **P** | **S** | **Credits** | **Inst. Hours** | **Marks** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | **CIA** | **External** | **Total** |
| | **INTRODUCTION TO PYTHON LANGUAGE** | **Allied Course – 2 (AL-2)** | **0** | **3** | **-** | **-** | **3** | **2** | **25** | **75** | **100** |
| **Course objectives** | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| **CO1** | Understand the basic python programming language | | |
| **CO2** | Learn data structures and concepts | | |
| **CO3** | Know the files, exceptions of python program | | |
| **CO4** | Understand tuples, dictionaries and dictionaries | | |
| **CO5** | Use and adopt GUI in python program | | |
| **UNIT** | **Details** | **No.of Hours** | **Course Objectives** |
| I | **BASICS OF PYTHON PROGRAMMING:** Features of Python, variables and identifiers, operators andexpressions. **Decision control Statements:** Selection/Conditional branching statements, basic loopstructures/iterative Statements, nested loops, break, continue, and pass Statements. **Functions and Modules:**function definition, function call, more on defining functions, recursive functions, modules. | 4 | CO1 |
| II | **DATA STRUCTURES: Strings:** Introduction, built-in string methods and functions, slice operation, StringModule. Regular Expressions. **Lists:** Introduction, nested list, cloning lists, basic list operations, list methods.**Functional programming:**filter(), map(),reduce() function. | 4 | CO2 |
| III | **FILES AND EXCEPTIONS:** Read and writing files, pickling, handling exceptions. Built-in and user-definedexceptions. OOPS Concepts: Introduction, classes and object, class method and self-argument, the init () method,class variables and object variables, public and private data members, Inheritance, Operator Overloading. | 4 | CO3 |
| IV | **TUPLES:** Introduction, basic tuple operations, tuple assignment, tuples for returning multiple values, nested tuples, tuple methods and functions. **Set:** Introduction, Set operations. **Dictionaries:** Basic operations, sortingitems, looping over dictionary, nested dictionaries, built-in dictionary functions. | 4 | CO4 |
| V | **GRAPHICAL USER INTERFACES**: Behaviour of terminal-based programs and GUI-based programs, Codingsimple GUI-based programs, other useful GUI resources. **GUI Programming:** Graphical User Interfaces, Usingthe tkinter Module, Display text with Label Widgets, Organizing, Widgets with Frames, Button Widgets and InfoDialog Boxes, Getting Input with Entry Widget, Using Labels as Output Fields, Radio Buttons, Check Buttons. | 4 | CO5 |
| | **Total** | 20 | |
| **Course Outcomes** | | | |
| **Course Outcomes** | On completion of this course, students can able to: | | |

| | | |
|---|---|---|
| **CO1** | Study the concept of basic python programming language. | PO5, PO6, PO10 |
| **CO2** | Gain the knowledge of data types. | PO10 |
| **CO3** | Understand the various types of files and exceptions | PO11 |
| **CO4** | Define, Explain and Need of python program | PO4, PO11 |
| **CO5** | Understand the tuples and GUI interfaces of python | PO4, PO11 |
| **Text Books** | | |
| 1 | Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning. | |
| 2 | Think Python First Edition, by Allen B. Downey, Orielly publishing | |
| **References Books** | | |
| 1 | Reema Thareja, "Python programming using problem solving approach", Oxford university press. | |
| 2 | Allen Downey," Think Python: How to Think Like a Computer Scientist", O'Reilly publications,2nd Edition | |
| 3 | Albert Lukaszewski, "My SQL for python", PACKT publishers | |
| 4 | Mark Lutz, "Learning Python", O'Reilly Publications | |
| **Web Resources** | | |
| 1 | http://nptel.ac.in/courses/117106113/34 | |
| 2 | www.scipy-lectures.org/intro/language/python_language.html | |

| **Methods of Evaluation** | | |
|---|---|---|
| **Internal Evaluation** | Continuous Internal Assessment Test | 25 Marks |
| | Assignments | |
| | Seminars | |
| | Attendance and Class Participation | |
| **External Evaluation** | End Semester Examination | 75 Marks |
| | Total | 100 Marks |

| **Methods of Assessment** | |
|---|---|
| **Recall (K1)** | Simple definitions, MCQ, Recall steps, Concept definitions |
| **Understand/ Comprehend (K2)** | MCQ, True/False, Short essays, Concept explanations, short summary or overview |
| **Application (K3)** | Suggest idea/concept with examples, suggest formulae, solve problems, Observe, Explain |
| **Analyse (K4)** | Problem-solving questions, finish a procedure in many steps, Differentiate between various ideas, Map knowledge |
| **Evaluate (K5)** | Longer essay/ Evaluation essay, Critique or justify with pros and cons |
| **Create (K6)** | Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations |

**Mapping with Programme Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | | | | | M | M | | | | M | |
| **CO2** | | | | | | | | | | M | M |
| **CO3** | | | | | | | | | | | S |
| **CO4** | | | | M | | | | | | | S |
| **CO5** | | | | M | | | | | | | S |

| Subject Code | Subject Name | Category | L | T | P | S | Credits | Inst. Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| | **OPERATIONAL AMPLIFIERS AND ITS APPLICATIONS** | **Elective Generic /Discipline Specific Elective II** | **4** | **-** | **-** | **-** | **3** | **4** | **25** | **75** | **100** |

**Course Objectives**

| | |
|---|---|
| CO1 | Understand the OPAMPs and study the parameters of IC. |
| CO2 | To gain knowledge ofOPAMP circuit design |
| CO3 | Understand the working of multivibrators using IC 555 timer and V-F inter-conversion using special application ICs 565 and 566 |
| CO4 | To understand the principle of PLL and signal conditioning circuits |
| CO5 | Study various fixed and variable IC regulators |

| Unit | Details | No.of Hours | Course Objectives |
|---|---|---|---|
| I | **Basic Operational Amplifier:** Concept of differential amplifiers (Dual input balanced and unbalanced output), constant current bias, current mirror, cascaded differential amplifier stages with concept of level translator, block diagram of an operational amplifier (IC 741)<br>**Op-Amp parameters:** input offset voltage, input offset current, input bias current, differential input resistance, input capacitance, offset voltage adjustment range, input voltage range, common mode rejection ratio, slew rate, supply voltage rejection ratio. | 12 | CO1 |
| II | **Op-Amp Circuits:** Open and closed loop configuration, | 12 | CO2 |

| | | | |
|---|---|---|---|
| | Frequency response of an op-amp in open loop and closed loop configurations, Inverting, Non-inverting, Summing and difference amplifier, Integrator, Differentiator, Voltage to current converter, Current to voltage converter. Comparators: Basic comparator, Level detector, Voltage limiters, Schmitt Trigger. | | |
| III | **Signal generators:** Phase shift oscillator, Wein bridge oscillator, Square wave generator, triangle wave generator, saw tooth wave generator, and Voltage controlled oscillator (IC 566).<br>**Multivibrators (IC555):** Block diagram, Astable and monostable multivibrator circuit, Applications of Monostable and Astable multivibrators. | 12 | CO3 |
| IV | **Phase locked loops (PLL):** Block diagram, phase detectors, IC565. 37 Fixed and variable IC regulators: IC 78xx and IC 79xx -concepts only, IC LM317- output voltage equation | 12 | CO4 |
| V | **Signal Conditioning circuits:** Sample and hold systems**, Active filters:** First order low pass and high pass Butterworth filter, Second order filters, Band pass filter, Band reject filter, All pass filter, Log and antilog amplifiers. | 12 | CO5 |
| | Total | 60 | |

| **Course Outcomes** | | |
|---|---|---|
| **Course Outcomes** | On completion of this course, students will; | |
| CO1 | Gain knowledge about the basics of OPAMP | PO1, PO4, PO11 |
| CO2 | Exemplify the applications of OPAMP | PO4, PO10, PO11 |
| CO3 | Acquire square wave using different modes of 555 timer IC | PO4, PO7, PO11 |
| CO4 | Design application-oriented circuits using Op-amp ICs. | PO7, PO8, PO11 |
| CO5 | Understand the non-ideal behaviour by parameter measurement of Op-amp | PO10, PO11 |

| **Text Books** | |
|---|---|
| 1. | R. A. Gayakwad, Op-Amps and Linear IC‘s, Pearson Education (2003) |
| 2. | R. F. Coughlin and F. F. Driscoll, Operational amplifiers and Linear Integrated circuits, Pearson Education (2001) |
| 3 | J. Millman and C.C. Halkias, Integrated Electronics, Tata McGraw-Hill (2001) |

| **References Books** | |
|---|---|
| 1 | A.P.Malvino, Electronic Principals,6th Edition , Tata McGraw-Hill,(2003) |
| 2 | K.L.Kishore,OP-AMP and Linear Integrated Circuits, Pearson(2011) |

**Web Resources**

| | |
|---|---|
| 1 | https://www.e-booksdirectory.com/details.php?ebook=1469 |
| 2 | https://www.jameco.com/z/ISBN-0945053290-Master-Publishing-Timer-Op-Amp-and-Optoelectronic-Circuits-and-Projects-Book-Vol-1-By-Forrest-Mims_2112743.html |

| **Methods of Evaluation** | | |
|---|---|---|
| **Internal Evaluation** | Continuous Internal Assessment Test | 25 Marks |
| | Assignments | |
| | Seminars | |
| | Attendance and Class Participation | |
| **External Evaluation** | End Semester Examination | 75 Marks |
| | Total | 100 Marks |

| **Methods of Assessment** | |
|---|---|
| **Recall (K1)** | Simple definitions, MCQ, Recall steps, Concept definitions |
| **Understand/ Comprehend (K2)** | MCQ, True/False, Short essays, Concept explanations, short summary or overview |
| **Application (K3)** | Suggest idea/concept with examples, suggest formulae, solve problems, Observe, Explain |
| **Analyze (K4)** | Problem-solving questions, finish a procedure in many steps, Differentiate between various ideas, Map knowledge |
| **Evaluate (K5)** | Longer essay/ Evaluation essay, Critique or justify with pros and cons |
| **Create (K6)** | Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations |

**Mapping with Programme Outcomes**:

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | L | | | M | | | | | | | S |
| CO2 | | | | L | | | | | | M | S |
| CO3 | | | | L | | | M | | | | S |
| CO4 | | | | | | | S | S | | | S |
| CO5 | | | | | | | | | | M | S |

| Subject Code | Subject Name | Category | L | T | P | S | Credits | Inst. Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| | **ELECTRONIC TROUBLE SHOOTING** | **Skill Enhancement Course - SEC-2 (NME)** | **2** | **-** | **-** | **-** | **2** | **2** | **25** | **75** | **100** |

**Course Objectives**

| | |
|---|---|
| CO1 | Learn about electronic equipment's |
| CO2 | Make student understand the preparations and precautions of e-trouble shooting |
| CO3 | Learn trouble shooting techniques |
| CO4 | Impart knowledge on testing e-components |
| CO5 | Learn knowledge on both analog and digital troubleshooting techniques |

| Unit | Details | No.of Hours | Course Objectives |
|---|---|---|---|
| I | **RELIABILITY OF ELECTRONIC EQUIPMENTS** Failures-Causes of Failures-Maintenance-Advantages of proper Maintenance, MaintenancePolicy-Preventive Maintenance, Corrective Maintenance-Basic Procedure of Service andMaintenance | 5 | CO1 |
| II | **PREPARATIONS AND PRECAUTIONS** Troubleshooting Procedure-Fault Location-Fault Repair-Repair Verification-Perform Root cause Analysis-Fault Finding Aids-Service Manual-Test and Measurement Equipment- Multimeter-Cathode Ray Oscilloscope - Function Generators | 5 | CO2 |
| III | **TROUBLESHOOTING TECHNIQUES** Functional Area Approach-Split Half Technique-Input to Output Technique-Output to input Technique-Divergent Paths Technique-Convergent paths Technique-Feedback Paths Technique-Switching Paths Technique, Measurement Techniques | 5 | CO3 |
| IV | **TESTING OF PASSIVE COMPONENTS** Resistors, Preset, L.D.R, Capacitors, Inductors, Transformers, Passive component testing usingC.R.O-Testing Semiconductor Devices-Diode, Zener diode, L.E.D, Transistor, MOSFET,Thyristors, Testing of Active components using C.R.O. | 5 | CO4 |
| V | **TROUBLE SHOOTING-DIGITAL INSTRUMENTS** Summary of Gates, Digital Logic Families-I.C packages, Digital Test Instruments-LogicProbe-Logic Pulser-Logic Clip-Digital I.C Tester, Faults in Digital circuits, Precautions duringDigital Troubleshooting-Troubleshooting-Power supply, SMPS, | 5 | CO5 |

| | | | |
|---|---|---|---|
| | Oscilloscope | | |
| | Total | 25 | |
| **Course Outcomes** | | | |
| **Course Outcomes** | On completion of this course, students will; | | |
| CO1 | Learn the importance of analog and digital electronic troubleshooting | PO5, PO6, PO7, PO8, PO10 | |
| CO2 | Study the precautions and preparations of trouble shooting | PO5, PO6, PO7, PO8, PO10 | |
| CO3 | Know the methods of trouble shooting | PO5, PO6, PO7, PO8, PO10 | |
| CO4 | Learn the importance and necessary of testing components | PO5, PO6, PO7, PO10 | |
| CO5 | Create awareness and motivation of starting a new career to service industries | PO5, PO6, PO7, PO10 | |

| Text Books | |
|---|---|
| 1. | Maintenance of Electronic Equipment's-K.Sudeep Singh - Kataria and Sons |

| References Books | |
|---|---|
| 1. | Electronic troubleshooting 4th Edition by Daniel and Aram |

| Web Resources | |
|---|---|
| 1 | https://www.sapnaonline.com/books/troubleshooting-electronic-equipment-includes-repair-rs-khandpur-0070483574-9780070483576 |
| 2 | https://www.allaboutcircuits.com/textbook/ |

| Methods of Evaluation | | |
|---|---|---|
| Internal Evaluation | Continuous Internal Assessment Test | 25 Marks |
| | Assignments | |
| | Seminars | |
| | Attendance and Class Participation | |
| External Evaluation | End Semester Examination | 75 Marks |
| | Total | 100 Marks |

| Methods of Assessment | |
|---|---|
| **Recall (KI)** | Simple definitions, MCQ, Recall steps, Concept definitions |
| **Understand / Comprehend (K2)** | MCQ, True/False, Short essays, Concept explanations, Short summary or overview |
| **Application (K3)** | Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain |
| **Analyse (K4)** | Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge |
| **Evaluate (K5)** | Longer essay/ Evaluation essay, Critique or justify with pros and cons |
| **Create (K6)** | Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations |

**Mapping with Programme Outcomes**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | | | | S | M | M | M | | S | |
| CO2 | | | | | S | M | M | M | | S | |
| CO3 | | | | | S | M | M | M | | S | |
| CO4 | | | | | S | S | L | | | S | |
| CO5 | | | | | S | S | M | | | S | |

| Subject Code | Subject Name | Category | L | T | P | S | Credits | Inst. Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| | **COMPUTER HARDWARE** | **Skill Enhancement Course - SEC-3** | **2** | **-** | **-** | **-** | **2** | **2** | **25** | **75** | **100** |

| Course Objectives | | | |
|---|---|---|---|
| CO1 | Acquire knowledge on the concepts of computer hardware. | | |
| CO2 | Describe the concept of memories, CPU and peripherals. | | |
| CO3 | Discuss about power management in PC hardware system | | |
| CO4 | Demonstrate PC drives and understand with latest device configurations. | | |
| CO5 | Understand the latest hardware usage and architecture. | | |
| **Unit** | **Details** | **No.of Hours** | **Course Objectives** |
| I | **CPU:** CPU essentials – processor modes – modern CPU concepts – Architectural performance features – the Intel's CPU | 5 | CO1 |
| II | **MEMORY CONCEPT:** Essential memory concepts – memory organizations – memory packages –modules – logical memory organizations – memory considerations – memory types – memory techniques – selecting and installing memory | 5 | CO2 |
| III | **MOTHERBOARD:** Active motherboards – sockets and slots – Intel D850GB – Pentium4 mother board – expansion slots – form factor – upgrading a mother board – chipsets –north bridge – south bridge | 5 | CO3 |
| IV | **POWER SUPPLY:** Power supplies and power management – concepts of switching regulation – potential Power problems – power management. The floppy drive – magnetic storage – magnetic recording principles – data and disk organization – floppy drive – hard drive – data organization and hard drive – sector layout | 5 | CO4 |
| V | **DRIVES:** IDE drive standard and features – Hard drive electronics – CDROM drive construction – CDROM electronics – DVD-ROM – DVD media – DVD drive and decoder. | 5 | CO5 |
| | Total | 25 | |

| Course Outcomes | | |
|---|---|---|
| **Course Outcomes** | On completion of this course, students will; | |
| CO1 | Discuss the overall aspects of PC Hardware system | PO1, PO5, PO7 |
| CO2 | Familiarize with the recent technologies of computer drives. | PO1, PO2 |
| CO3 | Explain the hardware system and understand with the latest device practices. | PO1, PO5 |
| CO4 | Understand very well about the computer motherboard architectures and peripherals. | PO7, PO8, PO10 |
| CO5 | Understand the essentials of computer hardware's | PO5, PO7, PO8 |

| Text Books | |
|---|---|
| 1 | Stephen J. Bigelow, ―Trouble Shooting, maintaining and Repairing PCs‖, Tata McGraw-Hill, New Delhi, 2001. |
| 2 | Craig Zacker & John Rourke, ―The complete reference: PC hardware, Tata Mc Graw-Hill, New Delhi,2001. |
| **References Books** | |
| 1 | Mike Meyers,Introduction to PC Hardware and Troubleshooting, Tata McGraw-Hill, New Delhi,2003 |
| 2 | B.Govindarajulu,IBMPC and Clones hardware trouble shooting andMaintenance, Tata McGraw-Hill, New Delhi,2002 |
| **Web Resources** | |
| 1 | https://egyankosh.ac.in/bitstream/123456789/33613/1/Unit-13.pdf |
| 2 | https://cdn.ttgtmedia.com/searchSystemsChannel/downloads/Windows7Bible.pdf |

| Methods of Evaluation | | |
|---|---|---|
| **Internal Evaluation** | Continuous Internal Assessment Test | 25 Marks |
| | Assignments | |
| | Seminars | |
| | Attendance and Class Participation | |
| **External Evaluation** | End Semester Examination | 75 Marks |
| | Total | 100 Marks |

| Methods of Assessment | |
|---|---|
| **Recall (K1)** | Simple definitions, MCQ, Recall steps, Concept definitions |
| **Understand/ Comprehend (K2)** | MCQ, True/False, Short essays, Concept explanations, Short summary or overview |
| **Application (K3)** | Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain |
| **Analyze (K4)** | Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge |
| **Evaluate (K5)** | Longer essay/ Evaluation essay, Critique or justify with pros and cons |
| **Create (K6)** | Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations |

**Mapping with Programme Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | | | | S | | S | | | | |
| CO2 | M | | | | S | | | | | | |
| CO3 | S | | | | S | | | | | | |
| CO4 | | | | | | | S | S | | S | |
| CO5 | | | | | S | | S | S | | | |