

B.Sc., ELECTRONICS AND COMMUNICATION

SYLLABUS

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

**MANONMANIAM SUNDARANAR
UNIVERSITY, TIRUNELVELI**
(As per TANSCHÉ common syllabus template)

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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 AND COMMUNICATION
Programme Code:	
Duration:	3 Years (UG)
Programme Outcomes:	<p>PO1: Disciplinary knowledge: A comprehensive knowledge and understanding phenomena of one or more disciplines that form a part of an undergraduate programme of study</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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</p> <p>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</p> <p>PO8: Scientific reasoning: Ability to analyse/interpret and draws conclusions from quantitative/qualitative data; and critically evaluates ideas, evidence and experiences from an open-minded and reasoned perspective.</p> <p>PO9: Reflective thinking: Critical sensibility to lived experiences, with self-awareness and reflexivity of both self and society.</p> <p>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.</p>

	<p>PO 11 Self-directed learning: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p>
<p>Programme Specific Outcomes:</p>	<p>On successful completion of Bachelor of Science (B.Sc) in Electronics programme, the student should be able to:</p> <p>PSO1: Disciplinary Knowledge: Understand the fundamental principles, concepts and theories related to electronics science. Also, exhibit proficiency in performing experiments in the laboratory.</p> <p>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</p> <p>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.</p> <p>PSO4: Analytical & Scientific Reasoning: Apply scientific methods, collect and analyse data, test hypotheses, evaluate evidence, apply</p>

	<p>statistical techniques and use computational models.</p> <p>PSO5: Research related skills: Formulate research questions, conduct literature reviews, design and execute research studies, communicate research findings and collaborate in research projects.</p> <p>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.</p>
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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 or real-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 are enabling 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.

Value additions in the revamped curriculum:

Semester	Newly introduced Components	Outcome/ Benefits
I	Foundation Course To ease the transition of learning from higher secondary to higher education, providing an overview of the pedagogy of learning literature and analyzing the world through the literary to an e-w perspective.	<ul style="list-style-type: none"> ➤ Impart confidence among the students ➤ Create interest for the subject
I, II, III, IV	Skill Enhancement papers (Discipline centric/Generic/Entrepreneurial)	<ul style="list-style-type: none"> ➤ Industry ready graduates ➤ Skilled human resource ➤ Students are equipped with essential skills to make them employable
		<ul style="list-style-type: none"> ➤ Training on language and communication skills enable the student's gain knowledge and exposure in the competitive world.
		<ul style="list-style-type: none"> ➤ Discipline centric skill willing prove the technical know-how of solving real life problems.
III, IV, V & VI	Elective papers	<ul style="list-style-type: none"> ➤ Strengthening the domain knowledge ➤ Introducing the stakeholders to the State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and interdisciplinary nature ➤ Emerging topics in higher education/industry/communication network/health sector etc. are introduced with Hands-on training.

IV	Elective papers	<ul style="list-style-type: none"> ➤ Exposure to industry molds students into solution providers ➤ Generates Industry ready graduates ➤ Employment opportunities enhanced
V	Elective papers	<ul style="list-style-type: none"> ➤ Self-learning is enhanced ➤ Application of the concept to real situation is conceived resulting Intangible outcome
VI	Elective papers	<ul style="list-style-type: none"> ➤ Enriches the study beyond the course. ➤ Developing a research framework and presenting them independent and Intellectual idea effectively.
Extra Credits: For Advanced Learners/Honors degree		<ul style="list-style-type: none"> ➤ To cater to the needs of peer learners/research aspirants
Skills acquired from the Courses		Knowledge, Problem solving, Analytical ability, Professional competency, Professional communication and Transferable skill

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		
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 and COMMUNICATION

S.No	Part	Course Details	Credit
1	III	Core	68
2		Elective Generic/ Discipline Specific Elective	24
3	I& II	Language & English (Lang – 4x3=12 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		<ul style="list-style-type: none"> • Ability Enhancement [AECC]- Soft Skill (4x2=8) 8 • Skill Enhancement Course [4 Courses x 2 credits =8 credits], SEC-4: 1 Credit 9 • Summer internship/ Industrial training (2x1=2 credits) 2 • Foundation course 2 • Professional Competency Skill 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 basic concepts 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 and help 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	Identify the 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 Junction diode and Zener diode 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 of LDR; 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)
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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 (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 and Execution 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 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 Initialization of arrays and strings, pointers and one-dimensional arrays-Structures-Definition, declaration of structure variables, 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	
	Assignments	
	Seminars	
	Attendance and Class Participation	
		25 Marks
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	4	-	-	-	3	4	25	75	100
Course Objectives											
CO1	Attain the knowledge of robotics 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, historical background, laws of robotics, robot definition, robot anatomy and systems, human systems and robotics. 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 drives mechanisms.								12	CO2	
III	ROBOT END-EFFECTORS: Robot End-Effectors Classification of end-effectors, drive system for grippers, mechanical, magnetic, vacuum and adhesive grippers, hooks, scoops and other devices, active and passive Grippers.								12	CO3	
IV	SENSORS AND INTELLIGENT ROBOTS: Sensors and Intelligent Robots Artificial intelligence and automated manufacturing, AI and robotics, need for sensing systems, sensory devices, types of sensors, robot vision systems- Robot Languages and programming Different languages, Computer numerical control- Features of CNC-CNC machine control unit CNC software								12	CO4	
V	PROGRAMMABLE LOGIC CONTROLLERS (PLC): Discrete Process Control-Logic control, Sequencing-Ladder logic diagrams-Programmable logic controllers-Components of the PLC, PLC operating cycle-Additional capabilities of								12	CO5	

	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		
									CI A	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		
									CI A	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 & extrinsic semiconductors. 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 and bridge rectifiers, Block diagram of DC power supply, Zener diode as voltage 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: i) Type of Software's - System Architecture 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 PROGRAMMING STRUCTURE: Modules and their function - Local and Global variables - Parameters - Return values - Sequential								6	CO5	

	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	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	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		
									CI A	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)	-	-	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 (Fourth Edition)		
2	Thomas L. Floyd, 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 and expressions. Decision control Statements: Selection/Conditional branching statements, basic loop structures/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-defined exceptions. 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, sorting items, looping over dictionary, nested dictionaries, built-in dictionary functions.	4	CO4
V	GRAPHICAL USER INTERFACES: Behaviour of terminal-based programs and GUI-based programs, Coding simple GUI-based programs, other useful GUI resources. GUI Programming: Graphical User Interfaces, Using the 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
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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		
									CI A	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 of OPAMP 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	<p>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)</p> <p>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.</p>								12	CO1	
II	<p>Op-Amp Circuits: Open and closed loop configuration, Frequency response of an op-amp in open loop and closed loop configurations, Inverting, Non-inverting, Summing and difference amplifier, Integrator, Differentiator, Voltage to</p>								12	CO2	

	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). 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		

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CI A	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, Maintenance Policy-Preventive Maintenance, Corrective Maintenance-Basic Procedure of Service and Maintenance								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 using C.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-Logic Probe-Logic Pulser-Logic Clip-Digital I.C Tester, Faults in Digital circuits, Precautions during Digital Troubleshooting-								5	CO5	

	Troubleshooting-Power supply, SMPS, 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		
									CI A	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 PCsl, 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			