Department of

Electronics and Computer Science Engineering

CURRICULUM

Second Year B.Tech. Engineering Program
With effect from 2025-26

Institute

Vision

To be a reputed Technological and Management Institute imparting Quality Education and developing Core Human Values (H3).

(H3): Honest - Humble - Human Being

Mission

We are committed for Enrichment of the Institute by disseminating the knowledge to achieve academic excellence and develop industry ready technical manpower

Department

Vision:

To be a center of excellence in Electronics and Computer Science Engineering by nurturing innovative, ethical and socially responsible Engineers capable of addressing global technological challenges.

Mission:

Provide high quality education in electronics and computer Science through balanced curriculum, hands-on learning, and interdisciplinary integration and also ethical practices, sustainability and lifelong learning to meet societal and industrial needs.

Program Outcomes (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4).
3. **Design/development of solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5).
4. **Conduct investigations of complex problems:** Conduct investigations of complex engineering problems using research- based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
5. **Modern tool usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6).
6. **The engineer and the world:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
7. **Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9).
8. **Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

9. **Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.
10. **Project management and finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
11. **Life-long learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8).

Department of Electronics and Computer Science Engineering

Program Specific Outcomes (PSOs)

Upon successful completion of UG course, the students will attain following Program Specific Outcomes:

1. Apply the knowledge of electronics, circuits, and embedded system to design, test and implements efficient hardware solution for real world application

2. Develop reliable software solutions using programming; algorithms, database and system architecture of various engineering and industrial programs

3. Design and build smart system by integrating hardware and software technologies such as IoT, AI, Machine Learning and Automation to address Societal and industrial challenges

B.Tech. Program with one Major and one Minor (Credits)
Semester wise Indicative Credit Distribution

Semester		I	II	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course (BSC)	BSC/ESC									
Engineering Science Course (ESC)										
Programme Core Course (PCC)	Programme Courses									
Programme Elective Course (PEC)										
Multidisciplinary Minor (MDM)	Multi-disciplinary Courses									
Open Elective (OE)										
Vocational and Skill Enhancement Course (VSEC)	Skill Courses									
Ability Enhancement Course (AEC -01), Modern Indian Language (AEC-02)	Humanities Social Science and Management (HSSM)									
Entrepreneurship/Economics/ Management Courses (EEM)										
Indian Knowledge System (IKS)										
Value Education Course (VEC)										
Internship / OJT (Int/OJT)	Experiential Learning Courses (ELC)									
Project (Proj)										
Community Engagement Activity (CEA) / Field Project (FP)										
Co-curricular & Extracurricular Activities (CCA)	Liberal Learning Course (LLC)									
Total Credits (Major)										

Shri Ambabai Talim Sanstha's

SANJAY BHOKARE GROUP OF INSTITUTES, MIRAJ

Teaching and Evaluation Scheme

Program: B. Tech. Electronics & Computer Science Engineering

Class.: **Second Year, B. Tech.** Semester: **SEM - III** W.E.F.: **2025-2026**

Sr. No.	Course Code	Course Title	Course Category	Teaching Scheme				Course Credits	Evaluation scheme						
									Theory				Practical		Total
									CIE			ESE	CIE	ESE	
				L	T	P	Contact Hrs/wk		CA-I	MSE	CA-II				
01	25EC301T	Mathematics for Electronics and Computing	PCC	3	-	-	3	3	15	20	15	50	-	-	100
02	25EC302T	Analog Electronics and Circuit Design	PCC	3	-	-	3	3	15	20	15	50	-	-	100
03	25EC302L	Analog Electronics and Circuit Design Lab	PCC	-	-	2	2	1	-	-	-	-	30	20	50
04	25EC303T	Operating Systems and System Architecture	PCC	3	-	-	3	3	15	20	15	50	-	-	100
05	25EC304T	Data Structures	PCC	3	-	-	3	3	15	20	15	50	-	-	100
06	25EC304L	Data Structures Lab	PCC	-	-	2	2	1	-	-	-	-	30	20	50
07	25EC305T	Multidisciplinary Minor-1 (Fundamentals of IoT)	MDM-1	2	-	-	2	2	15	20	15	50	-	-	100
08	25EC306T	Universal Human Values	VEC	2	-	-	2	2	15	20	15	50	-	-	100
09	25EC307	Entrepreneurship and Innovation	VEC	2	-	-	2	2	-	-	-	-	30	20	50
10	25EC308L	Seminar-I	ELC	-	-	2	2	1	-	-	-	-	30	20	50
11	25EC309L	PCB Design Lab	PCC	-	-	2	2	1	-	-	-	-	30	20	50
Total				18	-	8	26	22	90	120	90	300	150	100	850

L: Lecture, **T:** Tutorial, **P:** Practical, **CA-I:** Continuous Assessment-I, **CA-II:** Continuous Assessment-II, **CIE**: Continuous in Semester Evaluation, **ESE**: End Semester Examination

	BSC/ESC		Program Courses		Multidisciplinary Courses		Skill Courses	Humanities Social Science and Management (HSSM)				Experiential Learning Courses (ELC)			Liberal Learning Courses (LLC)
Course Category	BSC	ESC	PCC	PEC	MDM	OE	VSEC	AEC-01, AEC-02	EEM	IKS	VEC	Int/OJT	Proj.	CEA/FP	CCA

Credits	0	-	15	-	2	-	-	-	-	-	4	-	1	-	-
Cum. Sum															

Teaching and Evaluation Scheme

Program: B. Tech. Electronics & Computer Science Engineering

Class.: **Second Year, B. Tech.** Semester: **SEM - IV** W.E.F.: **2025-2026**

Sr. No.	Course Code	Course Title	Course Category	Teaching Scheme				Course Credits	Evaluation scheme						
									Theory				Practical		Total
									CIE			ESE	CIE	ESE	
				L	T	P	Contact Hrs/wk		CA-I	MSE	CA-II				
01	25EC401T	Applied Probability & Statistics in Electronics and Computing	PCC	3	-	-	3	3	15	20	15	50	-	-	100
02	25EC402T	Operational Amplifiers and Linear Integrated Circuits	PCC	3	-	-	3	3	15	20	15	50	-	-	100
03	25EC403T	Computer Network and Protocols	PCC	3	-	-	3	3	15	20	15	50	-	-	100
04	25EC403L	Computer Network and Protocols Lab	PCC	-	-	2	2	1	-	-	-	-	30	20	50
05	25EC404T	Digital Electronics & Microprocessor	PCC	3	-	-	3	3	15	20	15	50	-	-	100
06	25EC404L	Digital Electronics & Microprocessor Lab	PCC	-	-	2	2	1	-	-	-	-	30	20	50
07	25EC405T	Multidisciplinary Minor-2 (Sensor and Wireless Sensor Network)	MDM-2	2	-	-	2	2	15	20	15	50	-	-	100
08	25EC406L	Computer Hardware Maintenance & Networking	VSEC	1	-	2	3	2	-	-	-	-	60	40	100
09	25EC407	Constitution of India	VEC	2	-	-	2	2	15	20	15	-	-	-	50
10	25EC408	Quantitative and Logical Aptitude Development	AEC	1	1	-	3	2	30	40	30	-	-	-	100
Total				19	1	6	26	22	150	160	150	290	60	40	850

L: Lecture, **T:** Tutorial, **P:** Practical, **CA-I:** Continuous Assessment-I, **CA-II:** Continuous Assessment-II, **CIE**: Continuous in Semester Evaluation, **ESE**: End Semester Examination

	BSC/ESC		Program Courses		Multidisciplinary Courses		Skill Courses	Humanities Social Science and Management (HSSM)				Experiential Learning Courses (ELC)			Liberal Learning Courses (LLC)
Course Category	BSC	ESC	PCC	PEC	MDM	OE	VSEC	AEC-01, AEC-02	EEM	IKS	VEC	Int/OJT	Proj.	CEA/FP	CCA
Credits	-	-	14	-	2	-	2	2	-	-	2	-	-	-	-
Cum. Sum															

Multidisciplinary Minor (MDM)

- Students should select any one minor, excluding those offered by their parent department, from the diverse range of minors available.
- Students should complete all courses within their selected minor in order to earn credits.

MDM Name	Sr. No	Course Code	Course Name	Sem	Offered by Department
	1				Civil Engineering
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	1				Computer Science (AIML) Engineering
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	1				Computer Science Engineering
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	1				Electrical Engineering
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	1				Electronics & Telecommunica
	2				

	3				tion Engineering
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	1	**25EC305T**	Fundamentals of IoT		Electronics & Computer Engineering
	2	**25EC405T**	Sensors and Wireless Sensor Network		
	3	**25EC505T**	Communication Protocol and Networking for IoT tools and platforms		
	4	**25EC605T**	Security Privacy and Data Management		
	5	**25EC705T**	Robotics		
	6				
	7				
	8				
	9				
	10				
	1				Mechanical Engineering
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				

Second Year B. Tech (Electronics & Computer Science Engineering) Semester -III

Course Code	25EC301T		Course Name	Mathematics for Electronics and Computing			
Teaching Scheme				Evaluation Scheme			
L	T	Credits		CA-I	MSE	CA-II	ESE
3	-	3		15	20	15	50

Course Prerequisites:

Students should have a basic understanding of algebra, calculus, differential equations, linear algebra, and fundamental concepts of sets and functions to effectively grasp Laplace transforms, fuzzy sets, and their engineering applications.

Course Objective:

- To introduce fundamental concepts of Laplace Transform & Inverse Laplace transform and its applications.
- To give insights about the properties, operations and relations on Fuzzy sets.
- To introduce fundamental concepts of Mathematics and their applications in engineering fields
- To develop Mathematical skills and enhance thinking power of students.

Course Outcome:

CO-1	Comprehend the fundamental knowledge of the Laplace transforms and its properties for elementary functions.
CO-2	Use Laplace Transform and Inverse Laplace Transform to solve linear differential equations with constant coefficients
CO-3	Understand the concept of Fuzzy sets with case studies.
CO-4	Apply interpolation techniques for estimating unknown data points within a given range.
CO-5	Apply numerical methods for differentiation and integration to solve engineering problems.

Course Contents

Unit-I	**Laplace Transform**	Hours: 9
Definition – conditions for existence ; Transforms of elementary functions ; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by t^n , scale change property, transforms of functions divided by t, transforms of integral of functions, transforms of derivatives ; Evaluation of integrals by using Laplace transform ; Transforms of some special functions- periodic function, Heaviside unit step function, Dirac delta function		
Unit-II	**Inverse Laplace Transform**	Hours:9
Introductory remarks; Inverse transforms of some elementary functions; General methods of finding		

inverse transforms; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms; Applications to find the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients

Unit-III	**Fuzzy Sets**	Hours:9

Introduction to characteristics functions, First decomposition theorem, Fuzzy relations, examples, Fuzzy equations, Operations on Fuzzy set

Unit-IV	**Interpolation and Approximation**	Hours:9

Lagrange's interpolation formula, forward and backward difference interpolation formula, Newton's divided difference interpolation formula, Hermite interpolation formula.

Unit-V	**Numerical Differentiation and Integration**	Hours:9

Numerical differentiation, methods based on interpolation, Error analysis, numerical integration, methods based on interpolation, Newton cotes methods, Error estimates for trapezoidal and Simpson's rule

Text Books:

1. Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, New Delhi.
2. A course in Engineering Mathematics (Vol III) by Dr. B. B. Singh, Synergy Knowledgeware, Mumbai.
3. "A Text Book of Applied Mathematics", P. N. and J. N. Wartikar, Vol I and II", Vidyarthi Griha Prakashan, Pune, 2006

Reference Books:

1. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, New York.
2. "Advanced Engineering Mathematics", Wylie C.R, Tata McGraw Hill Publication, 8th Edition, 1999.
3. "Numerical Analysis", E Balguruswamy. Tata McGraw Hill Publications.

MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:

https://www.coursera.org/specializations/mathematics-engineers
https://onlinecourses.nptel.ac.in/noc25_ma19/preview

Second Year B. Tech (Electronics & Computer Science Engineering) Semester -III

Course Code	25EC302T		Course Name	Analog Electronics And Circuit Design			
Teaching Scheme				Evaluation Scheme			
L	T	Credits		CA-I	MSE	CA-II	ESE
3	-	3		15	20	15	50

Course Prerequisites:

Students should know basic electrical concepts (voltage, current, resistance), circuit analysis (AC/DC), semiconductor devices (diodes, transistors), basic calculus, and have some experience with circuit simulation tools like SPICE.

Course Objective:

- Understand the fundamentals of analog circuit behavior, including voltage, current, power, and signal characteristics in resistive and reactive networks
- Understand the fundamentals of analog circuit behavior, including voltage, current, power, and signal characteristics in resistive and reactive networks.
- Design and analyze analog signal processing circuits, including active filters, oscillators, and waveform generators.
- Use simulation tools (e.g., SPICE) to model and verify analog circuit behavior before hardware implementation.
- Develop practical skills through hands-on lab experiments, including circuit prototyping, testing, and troubleshooting.

Course Outcome:

CO-1	Analyze the behavior and characteristics of electronic components such as diodes, BJTs, and MOSFETs in various configurations.
CO-2	Design and evaluate rectifier circuits, voltage regulators, and waveform shaping circuits using diodes and transistors.
CO-3	Simulate analog circuits using electronic design automation (EDA) tools and validate theoretical predictions through simulation results.
CO-4	Demonstrate practical skills in building, testing, and troubleshooting analog electronic circuits in a laboratory environment.
CO-5	Evaluate and select appropriate analog circuit solutions for real-world engineering problems with consideration for efficiency, cost

Course Contents

Unit-I	Unregulated Power Supply	Hours:8

Specification and ratings of diodes (P-N junction, Zener and power diode) and transistor (low power, high power & switching.
Rectifiers: Half wave, full wave: centre tap and bridge type, analysis for different parameters: PIV, TUF, efficiency, ripple factor, regulation, etc.
Filters: Need of filters, Types: capacitor, inductor, LC, CLC, Analysis for ripple factor and regulation.
Design of unregulated power supply with and without filter.

Unit-II	**Voltage Regulators**	Hours:7
Need of voltage regulator, Stabilization factors, Analysis & Design of Shunt regulator (using Zener diode & BJT), series voltage regulator (using BJT) Series voltage regulator with Pre- regulator & Overload protection circuit		
Unit-III	**Wave Shaping Circuits**	Hours:7
Low pass & high pass RC circuits (square & step response), High pass RC circuit as a differentiator, Low pass RC circuit as integrator. Clipping circuits: Classification, diode clippers, transistor clippers, Transfer characteristics, Design & analysis of clipper circuits. Clamping circuits: Classification, clamping operations, Clamping circuit theorem, practical clamping circuits, Voltage multipliers: Doubbler, Trippler & Qudrappler circuits.		
Unit-IV	Oscillators	Hours:6
Barkhausen's criteria, Frequency and amplitude stability, Classification RC oscillators: RC phase shift & Wein bridge oscillator analysis & design using BJT & FET LC oscillators: Colpit's & Hartely's oscillators analysis and design using BJT, Crystal oscillator		
Unit-V	**IC Regulators**	Hours:6
Study and design of regulators using IC's :78XX, 79XX, 723, LM317 Switching regulator: Introduction, study of LM3524.		
Text Books:		
1. Allen Mottershed – 'Electronic devices & circuits'-Prentice- Hall India 2. J. Millman & C.Halkias -'Electronic devices & circuits'-IInd Edition- Tata McGraw Hill Publication 3. N.C. Goyal & R.K. Khetan-'A Monograph on Electronics Design Principles'-Vth Edition- Khanna Publishers		
Reference Books:		
1. National Semiconductor Data Manual. 2. M.S. Roden, G.L. Carpenter 'Electronic Design- From Concept to reality'-IV th Edition- Shroff publisher & Distributors		
MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:		
https://www.coursera.org/learn/linear-circuits https://onlinecourses.nptel.ac.in/noc21_ee26/preview		

Second Year B. Tech (Electronics & Computer Science Engineering) Semester -III

Course Code	**25EC303T**		**Course Name**	**Operating System & System Architecture**			
Teaching Scheme				**Evaluation Scheme**			
L	**T**	**Credits**		**CA-I**	**MSE**	**CA-II**	**ESE**
3	-	3		15	20	15	50
Course Prerequisites:							
• Fundamentals of Operating Systems • Process Scheduling and Synchronization							

- Memory Management Techniques
- Architecture of Modern Systems
- Performance Evaluation of Computer Systems

Course Objective:

1. **Understand the fundamentals of Operating Systems**: Gain knowledge of OS functions, process management, memory management, and I/O systems.
2. **Analyze process scheduling and synchronization mechanisms**: Understand process management concepts and how inter-process communication and synchronization are handled in OS.
3. **Explore the memory management techniques**: Learn about paging, segmentation, and virtual memory, and how they manage the allocation of system resources.
4. **Study the architecture of modern systems**: Understand CPU design, data paths, control units, and how instructions are executed in different system architectures.
5. Evaluate the performance of computer systems: Gain insights into performance metrics such as clock cycles, throughput, and latency, and how this influence system efficiency

Course Outcome:

CO-1	Implement and manage processes in an OS: Students will be able to create, schedule, and terminate processes in an OS, implementing scheduling algorithms like FCFS, Round Robin.
CO-2	Apply memory management techniques: Students will be able to effectively implement paging, segmentation, and virtual memory concepts to optimize memory usage.
CO-3	Analyze system architecture design: Students will gain an understanding of the CPU's data path, control unit, and how instruction sets are executed in different CPU architectures.
CO-4	Perform inter-process communication and synchronization: Students will be able to implement inter-process communication methods (shared memory, message passing) and use synchronization techniques like semaphores and mutexes.
CO-5	Evaluate system performance: Students will be able to measure system performance, understanding the importance of clock cycles, throughput, and latency in optimizing computer system design.

Course Contents

Unit-I	**Introduction to Operating Systems & Process Management**	Hours:8

- **Operating System Basics**: Definition, functions, types of OS (Batch, Multi Programmed Multitasking, Real Time, Distributed).
- **Process Management**: Process states, process control block (PCB), process scheduling

algorithms (FCFS, Round Robin).

- **Inter-Process Communication (IPC)**: Shared memory, message passing

Unit-II	**Memory, File Systems & I/O Management**	Hours:8

- Memory Management: Contiguous allocation, paging, segmentation, virtual memory.
- Page Replacement Algorithms: FIFO, LRU, Optimal.
- File Systems: File types, access methods, allocation methods (contiguous, linked, indexed).
- I/O Systems: Programmed I/O, interrupt-driven I/O, Direct Memory Access (DMA)

Unit-III	**Synchronization, Deadlock & Advanced OS Concepts**	Hours:7

- **Deadlock**: Conditions, prevention, detection, and recovery.
- **Synchronization**: Critical section, semaphores, mutexes, monitors.
- **Advanced OS Concepts**: Virtual machines, OS design for modern hardware.

Unit-IV	**System Architecture – CPU Design & Instruction Set**	Hours:7

- **System Architecture Basics**: CPU, data path, control unit.
- **Instruction Set Architecture (ISA)**: Types of instructions, addressing modes, instruction format.
- **System Performance**: Clock cycle, throughput, latency

Unit-V	**Memory Hierarchy, Pipelining, and Modern Architectures**	Hours:8

- **Memory Hierarchy**: Registers, cache, main memory, secondary storage.
- **Cache Memory**: Cache mapping techniques (direct-mapped, set-associative, fully-associative), replacement policies (FIFO, LRU).
- **Pipelining**: Pipeline stages, hazards (data, control, structural).
- **Parallelism**: SIMD, MIMD.
- **Modern Architectures**: RISC, CISC, ARM architecture.

Text Books:

Operating System Concepts by Abraham Silberschatz, Peter B. Galvin, and Greg Gagne

Reference Books:

1. Operating System Concepts" by Abraham Silberschatz, Peter B. Galvin, Greg Gagne
2. Modern Operating Systems" by Andrew S. Tanenbaum, Herbert Bos.
3. Operating Systems: Design and Implementation" by Andrew S. Tanenbaum
4. The Design of the UNIX Operating System" by Maurice J. Bach
5. Linux Kernel Development" by Robert Love

MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:
https://www.coursera.org/learn/os-power-user https://onlinecourses.nptel.ac.in/noc22_cs35/preview

Second Year B. Tech (Electronics & Computer Science Engineering) Semester -III

Course Code	25EC304T		Course Name	Data Structures & Algorithms using C			
Teaching Scheme				Evaluation Scheme			
L	T	Credits		CA-I	MSE	CA-II	ESE
3	-	3		15	20	15	50

Course Prerequisites:

- Fundamental Data Structures
- Object-Oriented Programming (OOP) concepts applied to data structures
- Algorithm time and space complexity analysis
- Problem-solving using data structures and algorithm

Course Objective:

1. Understand and implement fundamental data structures
2. Apply object-oriented programming concepts such as classes, inheritance, and polymorphism in data structure implementations.
3. Analyze the time and space complexity of algorithms to evaluate their efficiency.
4. Develop problem-solving skills by applying appropriate data structures and algorithms to real-world scenarios

Course Outcome:

CO-1	Understand the fundamental concepts of data structures, algorithm efficiency and abstract data types
CO-2	Implement and analyze stack and queue data structures including circular and priority queues
CO-3	Implement various types of linked lists (singly, doubly, circular) and perform operations such as insertion, deletion, inversion, and concatenation
CO-4	Construct and traverse binary trees and graphs using standard algorithm.
CO-5	Compare and analyze various searching and sorting algorithms

Course Contents

Unit-I	**Introduction to Data structures**	Hours:7

- Primitive and non-primitive data structures, Abstract Data Types, Array of structure, Nested Structure, Passing structure to Function, Algorithm and its efficiency, Asymptotic Notations,

Recursion: Direct and Indirect recursion, analysis of recursive function

Unit-II	**Stack and Queue**	Hours:7

Fundamentals stack and queue as ADT, Representation and Implementation of stack and queue, Application of stack for expression evaluation and for expression conversion, Priority queue, Doubly Ended Queue, circular queue.

Unit-III	**Linked Lists**	Hours:8

Concept of linked list ,Singly linked list, doubly linked list and dynamic storage management, circular linked list, Operations such as insertion, deletion, inversion, concatenation, Applications.

Unit-IV	**Trees and Graphs**	Hours:8

Trees Basic terminology, binary trees and its representation, binary tree traversals, AVL Tree, Binary Search Trees, Heaps and its operations, Graph Terminologies, Representation of the Graph- Adjacency Matrix and Adjacency List, Graph Traversal Techniques- BFS and DFS, Warshall's Algorithm

Unit-V	**Searching & Sorting Technique**	Hours:7

Searching: Importance of searching, Linear search, Binary search, Sorting: Internal and External Sorts, Insertion, Heap, Quick sort, Merge sort, bubble sort, Hashing – concept, hashing methods, hash collision, hash collision resolution methods.

Text Books:

1. Data Structure using C- A. M. Tanenbaum, Y. Langsam, M. J. Augenstein (PHI)
2. Data Structures- A Pseudo code Approach with C – Richard F. Gilberg and Behrouz A. Forouzon, Cengage Learning, Second Edition.
3. Schaum's Outlines Data Structures – Seymour Lipschutz (MGH), Tata McGraw-Hill.
4. Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures, A Pseudocode Approach With C",Cengage Learning, Second Edition, 2014

Reference Books:

1. N. B. Venkateshwarlu, E. V. Prasad, "C and Data Structures", S. Chand and Company, 201

MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:

https://onlinecourses.nptel.ac.in/noc21_cs20/preview

Second Year B. Tech (Electronics & Computer Science Engineering) Semester -III

Course Code	25EC305T		Course Name				
Teaching Scheme				Evaluation Scheme			
L	T	Credits		CA-I	MSE	CA-II	ESE
2	-	2		15	20	15	50

Course Prerequisites:

Course Objective:
1.

CO-1	
CO-2	
CO-3	
CO-4	
CO-5	

Course Contents

Unit-I		Hours:
Unit-II		Hours:6
Unit-III		Hours:4
Unit-IV		Hours:6
Unit-V		Hours:

Text Books:
Reference Books:
MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:

Second Year B. Tech (Electronics & Computer Science Engineering) Semester -III

Course Code	25EC306T		Course Name	Universal Human Values			
Teaching Scheme				Evaluation Scheme			
L	T	Credits		CA-I	MSE	CA-II	ESE
2	-	2		15	20	15	50

Course Prerequisites:

- Basic language comprehension and communication skills
- Open-mindedness to diverse perspectives and value systems
- Critical thinking and reflection ability
- No technical or specialized prior knowledge needed
- Empathy and self-awareness (helpful but not mandatory)
- Basic understanding of social and cultural contexts

Course Objective:

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

Course Outcome:

CO-1	Understand core human values like truth, love, peace, non-violence, justice, and responsibility.
CO-2	Develop self-awareness and reflect on personal beliefs and behaviors.
CO-3	Apply ethical reasoning to personal and professional decision-making.
CO-4	Cultivate empathy, compassion, and effective interpersonal communication.
CO-5	Recognize social responsibility and contribute positively to society and the environment.

Course Contents

Unit-I	**Introduction to Value Education**	Hours:

- Understanding Value Education
- Self-exploration as the Process for Value Education
- Continuous Happiness and Prosperity – the Basic Human Aspirations

- Right Understanding, Relationship and Physical Facility - Happiness and Prosperity – Current Scenario - Method to Fulfil the Basic Human Aspirations		
Unit-II	**Harmony in the Human Being**	Hours:
Understanding Human being as the Co-existence of the Self and the Body - Distinguishing between the Needs of the Self and the Body - The Body as an Instrument of the Self - Understanding Harmony in the Self - Harmony of the Self with the Body - Programme to Ensure self-regulation and Health		
Unit-III	**Harmony in the Family and Society**	Hours:
- Harmony in the Family – the Basic Unit of Human Interaction - Values in Human-to-Human Relationship - 'Trust' – the Foundational Value in Relationship - 'Respect' – as the Right Evaluation - Understanding Harmony in the Society - Vision for the Universal Human Order		
Unit-IV	**Harmony in the Nature (Existence)**	Hours:
- Understanding Harmony in the Nature - Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature - Realizing Existence as Co-existence at All Levels - The Holistic Perception of Harmony in Existence		
Unit-V	**Implications of the Holistic Understanding – a Look at Professional Ethics**	Hours:
- Natural Acceptance of Human Values - Definitiveness of (Ethical) Human Conduct - A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order - Competence in Professional Ethics - Holistic Technologies, Production Systems and Management Models-Typical Case Studies Strategies for Transition towards Value-based Life and Profession		
Text Books:		
1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999. 2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004. 3. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi		
Reference Books:		
1. Slow is Beautiful - Cecile Andrews 2. Economy of Permanence - J C Kumarappa 3. Bharat Mein Angreji Raj – Pandit Sunderlal		
MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:		
https://onlinecourses.nptel.ac.in/noc25_hs219		

Second Year B. Tech (Electronics & Computer Science Engineering) Semester -III

Course Code	25EC307		Course Name	Entrepreneurship and Innovation			
Teaching Scheme				Evaluation Scheme			
L	T	Credits		CA-I	MSE	CA-II	ESE
2	-	-		15	20	15	-

Course Prerequisite

- Creativity and Idea Generation
- Leadership and Team Management
- Resilience and Risk Tolerance
- Negotiation and Persuasion
- Decision Making Under Uncertainty
- Networking and Relationship Building

Course Objective:

01. To understand the foundational concepts and significance of entrepreneurship.
02. To develop the ability to generate and recognize innovative business ideas.
03. To learn how to create a sustainable and scalable business model.
04. To gain knowledge of legal and ethical considerations in starting a business.
05. To acquire skills in market research and competitor analysis.
06. To understand different funding sources and develop financial management strategies.
07. To enhance the ability to write compelling project proposals for innovative business ideas.

Course Outcome:

CO-1	To cultivate an entrepreneurial mindset navigating the journey from idea inception to startup creation.
CO-2	To Develop a sustainable business model for a tech-based product or service.
CO-3	To identify different funding sources and financial management.
CO-4	To write project proposals for innovative business ideas.
CO-5	To cultivate an entrepreneurial mindset navigating the journey from idea inception to startup creation.

Course Contents

Unit-I	**Introduction to Entrepreneurship**	Hours:5

Concept of Entrepreneurship, factors affecting the emergence of entrepreneurship, Types of Entrepreneurs. Entrepreneurial approach. Characteristic of successful entrepreneurs; Entrepreneurship process; Women Entrepreneurs, Social entrepreneurship, International Entrepreneurship. Entrepreneurial challenges. Difference Startup and Entrepreneurship

Unit-II	**Legal and Ethical Considerations**	Hours:5
Legal issues – Forming a business entity, considerations, and criteria, requirements for the formation of a Private/Public Limited Company, Intellectual Property Rights, Business Structures and Incorporation, Ethical Issues in Startup.		
Unit-III	**Ideation and Opportunity Recognition**	Hours:4
Techniques for Generating Ideas, Identifying Market Needs, Validating Ideas, Project: Pitch an Initial Idea.		
Unit-IV	**Business Models and Planning**	Hours:
Methods to Initiate Ventures, Business Plan- Advantages of business planning, Perspectives in business plan preparation, business plan elements, Business Model Canvas; Value Proposition, Customer Segments, and Channels, Project: Develop a Business Model Canvas.		
Unit-V	**Market Research and Analysis**	Hours:4
Understanding Market Size and Trends, Competitor Analysis, Customer Discovery and Validation, Project: Conduct Market Research		
Text Books:		
1.Kumar, Arya, Entrepreneurship: Creating and Leading an Entrepreneurial Organization, Pearson, India. 2.Hishrich., Peters, Entrepreneurship: Starting, Developing and Managing a New Enterprise, Irwin. Department of Commerce, University of Delhi 14.		
Reference Books:		
• Ramachandran, K., Entrepreneurship Development, Tata McGraw Hill, India. • Roy, Rajeev, Entrepreneurship, Oxford University Press. 2 Just Aspire: Notes on Technology, Entrepreneurship and the Future by Ajai Chowdhry 3 School To Startup, by Rohit Sinha.		
MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:		
• https://www.coursera.org/learn/open-innovation-entrepreneurship?utm_source • https://www.moocable.com/mooc/view/innovation-business-models-and-entrepreneurship-30869?utm_source		

Second Year B. Tech (Electronics & Computer Science Engineering) Semester -III

Course Code	25EC302L	**Course Name**	Analog Electronics and Circuit Design Lab	
Teaching Scheme			**Evaluation Scheme**	
P	**Credits**		**CIE**	**ESE**
2	2		30	50
Course Prerequisites:				
Students should know basic electrical concepts (voltage, current, resistance), circuit analysis (AC/DC), semiconductor devices (diodes, transistors), basic calculus, and have some experience with circuit simulation tools like SPICE				
Course Objective:				
• Understand the fundamentals of analog circuit behavior, including voltage, current, power, and signal characteristics in resistive and reactive networks • Understand the fundamentals of analog circuit behavior, including voltage, current, power, and signal characteristics in resistive and reactive networks.				

- Design and analyze analog signal processing circuits, including active filters, oscillators, and waveform generators.
- Use simulation tools (e.g., SPICE) to model and verify analog circuit behavior before hardware implementation.
- Develop practical skills through hands-on lab experiments, including circuit prototyping, testing, and troubleshooting

Course Outcome:	
CO-1	Analyze the behavior and characteristics of electronic components such as diodes, BJTs, and MOSFETs in various configurations.
CO-2	Design and evaluate rectifier circuits, voltage regulators, and waveform shaping circuits using diodes and transistors.
CO-3	Simulate analog circuits using electronic design automation (EDA) tools and validate theoretical predictions through simulation results.
CO-4	Demonstrate practical skills in building, testing, and troubleshooting analog electronic circuits in a laboratory environment.
CO-5	Evaluate and select appropriate analog circuit solutions for real-world engineering problems with consideration for efficiency, cost,

Course Contents

Exp. No.	Experiment Title	CO
1	Study of ratings of electronic components and lab. Equipment.	
2	Design & analysis of Half wave rectifier (HWR) with & without filter by calculating performance parameters	
3	Design & analysis of Full wave rectifier (FWR) with & without filter by calculating performance parameters	
4	Design & analysis of Bridge rectifier with & without filter by calculating performance parameters	
5	Design & analysis of Zener shunt regulator.	
6	a. Study of RC low pass filter as an integrator b. Study of frequency response of low pass filter	
7	a. Study of RC high pass filter as a differentiator b. Study of frequency response of high pass filter	
8	Design of Schmitt trigger	
9	Study of different clamper circuits: positive, negative & bias	
10	Design of Wein bridge oscillator using BJT.	
11	Design of RC phase shift oscillators using BJT/ FET.	
12	Design of Collpitt's oscillators using BJT	
13	Design of Hartly oscillators using BJT	

Second Year B. Tech (Electronics & Computer Science Engineering) Semester -III

Course Code	25EC304L	Course Name	Data Structures & Algorithms using C	
Teaching Scheme			Evaluation Scheme	
P	Credits		CIE	ESE
2	2		30	20

Course Prerequisites:

Fundamental Data Structures

- Object-Oriented Programming (OOP) concepts applied to data structures
- Algorithm time and space complexity analysis
- Problem-solving using data structures and algorithm

Course Objective:

1.Understand and implement fundamental data structures

2. Apply object-oriented programming concepts such as classes, inheritance, and polymorphism in data structure implementations.

3. Analyze the time and space complexity of algorithms to evaluate their efficiency.

4. Develop problem-solving skills by applying appropriate data structures and algorithms to real-world scenario

Course Outcome:

CO-1	Understand the fundamental concepts of data structures, algorithm efficiency and abstract data types
CO-2	Implement and analyze stack and queue data structures including circular and priority queues
CO-3	Implement various types of linked lists (singly, doubly, circular) and perform operations such as insertion, deletion, inversion, and concatenation
CO-4	Construct and traverse binary trees and graphs using standard algorithm.
CO-5	Compare and analyze various searching and sorting algorithms

Course Contents

Exp. No.	Experiment Title	CO
1	Implement stack using array.	
2	Implement Queue using array.	
3	Implement basic operations on Singly/Doubly linked lists, such as insertion, deletion, and traversal.	
4	Implement basic operations on Circular linked lists, such as insertion, deletion, and traversal.	
5	Implement a stack /Queue using a linked list.	
6	Implement a searching algorithm (binary search, linear search).	
7	Implement a hash table.	

8	Implement a sorting algorithm (quicksort, bubble sort).	
9	Implement a binary search tree.	
10	Implement a graph traversal algorithm (e.g., depth-first search, breadth-first search).	
11	Implement stack using array.	
12	Implement Queue using array.	
13	Implement basic operations on Singly/Doubly linked lists, such as insertion, deletion, and traversal.	

Second Year B. Tech (Electronics & Computer Science Engineering) Semester -III

Course Code	25EC308L	**Course Name**	Seminar-I	
Teaching Scheme			**Evaluation Scheme**	
P	**Credits**		**CIE**	**ESE**
2	1		30	20

Course Prerequisites:

1. Basic research and academic writing skills
2. Good comprehension and summarization ability
3. Basic knowledge of the chosen topic area (subject-specific)
4. Familiarity with tools like PowerPoint or LaTeX (for presentations)
5. Basic communication and public speaking skills
6. Ability to work independently and manage time

Course Objective:

Encourage students to search, select, and analyze relevant literature or technical sources, Help students organize thoughts and present them in a structured written format.

Course Outcome:

CO-1	Improved public speaking and presentation skills
CO-2	Ability to conduct focused research and review literature
CO-3	Skills in technical writing and academic formatting
CO-4	Enhanced confidence in communicating ideas
CO-5	Critical thinking and problem-solving through discussion

Course Contents

The students shall study in group of two members (or individual) on some special topic beyond the scope of the syllabus under the subjects of Electronics Engineering, Computer Science Engineering Artificial Intelligence, Data Science, or inter discipline branch from current literature, by referring the current technical journal or reference books, under the guidance of the teacher. The students shall prepare his report and deliver talk on the topic for other students of his class in the presence of his guide and internal examiner. The student is permitted to use audio-visual aids or any other such teaching aids.

Second Year B. Tech (Electronics & Computer Science Engineering) Semester -III

Course Code	25EC309L	Course Name	PCB Design Lab	
Teaching Scheme			Evaluation Scheme	
P	Credits		CIE	ESE
2	1		30	50

Course Prerequisites:

- Understanding of electronic components (resistors, capacitors, diodes, transistors, ICs)
- Familiarity with Ohm's Law, Kirchhoff's Laws, voltage, current, and power concepts
- Basic skills in file handling, CAD tools, and using Windows/Linux OS

Course Objective:

- To introduce the fundamentals of printed circuit board design, fabrication, and assembly processes.
- To develop an understanding of schematic capture, component libraries, and layout design using PCB CAD tools.
- To enable students to design single-layer, double-layer, and multi-layer PCBs considering electrical, mechanical, and thermal constraints.
- To impart knowledge of signal integrity, grounding, EMI/EMC considerations, and design for manufacturability (DFM).
- To provide practical exposure in PCB prototyping, testing, and troubleshooting for real-world electronic circuits and systems

Course Outcome:

CO-1	Explain the principles of PCB design, fabrication, and assembly processes.
CO-2	Use PCB CAD tools to create schematic diagrams and component libraries.
CO-3	Design and simulate single-layer, double-layer, and multi-layer PCBs for electronic circuits.
CO-4	Apply design rules considering signal integrity, grounding, EMI/EMC, and thermal management.
CO-5	Develop and test PCB prototypes, and troubleshoot common design and fabrication issues.
CO-6	Evaluate PCB layouts for manufacturability, reliability, and cost-effectiveness.

Course Contents

Exp. No.	Experiment Title	CO
1	Pcb design and fabrication process	
2	Design pcb layout for half-wave rectifier	
3	Design pcb layout for full-wave rectifier	
4	Design pcb layout for regulator circuit using 7805	
5	Design pcb layout for inverting amplifier using op-amp	
6	Design pcb layout for a stable multivibrator using ic555	

7	Design pcb layout for rc phase shift oscillator using bjt	
8	Design pcb layout for full adder circuit	
9	Design pcb layout for rs flip flop with logic circuit	
10	Design pcb layout for flashing led using 555 timer ic	
11	Pcb design and fabrication process	
12	Design pcb layout for half-wave rectifier	
13	Design pcb layout for full-wave rectifier	

Second Year B. Tech (Electronics & Computer Science Engineering) Semester -IV

Course Code	EC		**Course Name**	**Applied Probability and Statistics in Electronics and Computing**			
Teaching Scheme				**Evaluation Scheme**			
L	**T**	**Credits**		**CA-I**	**MSE**	**CA-II**	**ESE**
3	-	-		15	20	15	50

Course Prerequisites:

1. Students should have a solid understanding of Calculus
2. Knowledge of Linear Algebra is required.
3. A background in Basic Probability is essential.
4. Familiarity with Basic Statistics is necessary.

Course Objective:

- To develop basic of statistics, probability and random variables.
- The primary objective of this course is to provide mathematical background and sufficient experience so that the student can read, write, and understand sentences in the language of probability theory, as well as solve probabilistic problems in engineering and applied science

Course Outcome:

CO-1	Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
CO-2	Understand the basic concepts of one- and two-dimensional random variables and apply in engineering applications.
CO-3	Apply the concept random processes in engineering disciplines.
CO-4	Understand and apply the concept of correlation and spectral densities
CO-5	The students will have an exposure of various distribution functions and help in acquiring skills in handling situations involving more than one variable. Able to analyze the response of random inputs to linear time invariant systems

Course Contents

Unit-I	**Probability Theory**	Hours:7
Definition of probability: classical, empirical and axiomatic approach of probability, Addition theorem of probability, Multiplication theorem of probability, Bayes 'theorem of inverse probability, Properties of probabilities with proofs, Examples.		
Unit-II	**Random Variable and Mathematical Expectation**	Hours:7

Random variables, Probability distributions, Probability mass function, Probability density function, Mathematical expectation, Join and marginal probability distributions, Properties of expectation and variance with proofs. Theoretical Probability Distributions: Binomial distribution, Poisson distribution, Normal distribution, Fitting of binomial distributions, Properties of binomial, Poisson and normal distributions, Relation between binomial and normal distributions, Relation between Poisson and normal distributions, Importance of normal distribution, Examples.		
Unit-III	**Correlation**	Hours:7
Introduction, Types of correlation, Correlation and causation, Methods of studying correlation, Karl Pearson's correlation coefficient, Spearman's rank correlation, Coefficient, Properties of Karl Pearson's correlation coefficient and Spearman's rank correlation coefficient, Probable errors		
Unit-IV	**Linear Regression Analysis**	Hours:7
Introduction, Linear and non-linear regression, Lines of regression, Derivation of regression lines of y on x and x on y, Angle between the regression lines, Coefficients of regression, Theorems on regression coefficient, Properties of regression coefficient		
Unit-V	**Estimation and Hypothesis**	Hours:6
Estimation, Large Sample Estimation of a Population Mean, Small Sample Estimation of a Population Mean, Large Sample Estimation of a Population Proportion, Sample Size Considerations, Testing Hypotheses, The Elements of Hypothesis Testing, Large Sample Tests for a Population Mean, The Observed Significance of a Test, Small Sample Tests for a Population Mean, Large Sample Tests for a Population Proportion		
Text Books:		
• S. C. Gupta, Fundamentals of Statistics, Himalaya Publishing House, 7th Revied and Enlarged Edition, 2016		
Reference Books:		
1. G. V. Kumbhojkar, Probability and Random Processes, C. Jamnadas and Co., 14th Edition, 2010. 2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.		
MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:		
• https://www.mooclab.club/resources/probability-the-science-of-uncertainty-and-data.1450/?utm_source • https://onlinecourses.nptel.ac.in/noc24_ma39/preview?utm_source		

Second Year B. Tech (Electronics & Computer Science Engineering) Semester -IV

Course Code	25EC402T		**Course Name**	**Operational Amplifier and Linear Integrated Circuit**			
Teaching Scheme				**Evaluation Scheme**			
L	**T**	**Credits**		**CA-I**	**MSE**	**CA-II**	**ESE**
3	-	3		15	20	15	50
Course Prerequisites:							
• Understanding of voltage, current, resistance, power, and energy							

• Knowledge of Thevenin's and Norton's Theorems, Superposition, and Maximum Power Transfer	
Course Objective:	
• Provide foundational knowledge of operational amplifiers and various linear integrated circuits • Familiarize students with the electrical characteristics, parameters, and limitations of op-amps and linear ICs. • Develop the ability to analyze and design linear and non-linear applications using op-amps. • Introduce the design of active filters, oscillators, waveform generators, and voltage regulators using linear ICs. • Enhance practical skills through simulation, hardware implementation, and testing of op-amp and linear IC-based circuits. • Prepare students to apply linear IC concepts in solving real-world engineering problems and mini-projects.	
Course Outcome:	
CO-1	Explain the internal structure, characteristics, and parameters of operational amplifiers and other linear integrated circuits
CO-2	Analyze the performance of op-amp circuits and various linear IC-based configurations using theoretical and practical methods.
CO-3	Interpret op-amp parameters such as input bias current, slew rate, CMRR, PSRR, and their effects on circuit performance
CO-4	Design and implement linear and non-linear applications of op-amps such as amplifiers, ilters, waveform generators, and voltage regulators
CO-5	Utilize linear ICs in real-time applications by constructing and testing circuits using simulation and hardware tools.

Course Contents

Unit-I	**Introduction to op-amp**	Hours:8
Introduction to op-amp: definition, symbol, block diagram, ideal characteristics of Op-amp, AC, DC analysis of dual input balanced output type differential amplifier. Comparative study of other configurations of differential amplifiers, Analysis of typical op-amp, equivalent circuit, op-amp parameters, equivalent circuit of op-amp, study of IC 741, CA3140		
Unit-II	**Op-amp configurations & frequency response**	Hours:4
Open loop configuration, closed loop configurations, frequency Response, Stability considerations, Frequency Compensation, Slew Rate.		
Unit-III	**Applications of Op-amp**	Hours:8
Summing, Scaling & Averaging Amplifiers using Op-amps, Differential amplifier using opamp, Subtract or Circuit, Instrumentation amplifier, V to I & I to V Converter, Precision Rectifiers, Log & Anti-log Amplifiers, Study of comparator, Schmitt Trigger, Window Detector, Clippers & Clampers, Peak Detectors, Sample & Hold Circuits.		
Unit-IV	**Active Filters**	Hours:6
Introduction of filters, Analysis & Design of following filters, First & Second order High Pass filter, First & Second order Low Pass filter, Band Pass filter (Narrowband & Wideband), Band Reject filter (Narrowband & Wideband), All Pass Filter, Sallen & Key Filter Structure (First & Second order), Chebyshev Filter.		
Unit-V	**Waveform Generators**	Hours:8

Analysis & Design of Square wave generator, Triangular wave generator, Sawtooth wave generator. Analysis & Design of RC phase shift oscillator, RC wein bridge oscillator, Colpitts oscillator, Hartley oscillator, Crystal oscillator, Multivibrator using op-amp. IC 555 Timer, Block Diagram, Multivibrator using IC 555.
Text Books:
1. Op-amp & Linear Integrated Circuits by Ramakant Gaykwad. 4th ed. Pearson Publications 2. Linear Integrated Circuits Analysis , Design & Applications by Nair
Reference Books:
1. Linear integrated circuits-GANESH BABU (SCITECH PUB) 2. Op-amp & LIC-K.LAL KISHOR 3. Microelectronic Circuits Analysis & Design by Rashid
MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:
• https://onlinecourses.nptel.ac.in/noc22_ee27/preview?utm_source=chatgpt.com • https://www1.mooc-list.com/course/introduction-electronics-coursera?utm_source=chatgpt.com

Second Year B. Tech (Electronics & Computer Science Engineering) Semester -IV

Course Code	25EC403T		Course Name	Computer Network and Protocols			
Teaching Scheme				Evaluation Scheme			
L	T	Credits		CA-I	MSE	CA-II	ESE
3	-	3		15	20	15	50

Course Prerequisites:

- Basic knowledge of computer systems
- Fundamentals of operating systems
- Understanding of digital logic and number systems (binary, hexadecimal)
- Knowledge of data structures and algorithms
- Basic programming skills (C / C++ / Java / Python)

Course Objective:

1. Understand and implement fundamental Computer Network.
2. Apply the relevant Transmission Media and Switching Techniques as per need to establish network.
3. Analyze working of the error detection and correction method in data link layer.
4. Identify functions and features of the network layer.

5. Understand different protocols of the Application layer.	
Course Outcome:	
CO-1	Analyze the functioning of Computer Network and networks models
CO-2	Implement and analyze different wired and wireless LAN Technologies.
CO-3	Analyze the design issue and transmission errors with respect to data link layer
CO-4	Configure different TCP/IP services
CO-5	Understand different protocols, security measures and encryption method used in Application Layer.

Course Contents

Unit-I		Hours:6
Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet. Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless transmission		
Unit-II		Hours:6
Data Link Layer - Design issues, Error Detection & Correction, Elementary Data Link Layer Protocols, sliding window protocols Multiple Access Protocols - ALOHA, CSMA, CSMA/CD, CSMA/CA, Collision free protocols, Ethernet- Physical Layer, Ethernet Mac Sub layer, Data link layer switching: Use of bridges, learning bridges, spanning tree bridges, repeaters, hubs, bridges, switches, routers and gateways		
Unit-III		Hours:6
Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, , Count to Infinity Problem, Link State Routing, Path Vector Routing, Congestion Control Algorithms , IP addresses, CIDR, Subnetting, SuperNetting, IPv4, Packet Fragmentation, IPv6 Protocol, Transition from IPv4 to IPv6, ARP,RARP		
Unit-IV		Hours:6
Transport Layer: Services provided to the upper layers elements of transport protocol addressing connection establishment, Connection release, Error Control & Flow Control, Crash Recovery. The Internet Transport Protocols: UDP, Introduction to TCP, The TCP Service Model, The TCP Segment Header, The Connection Establishment, The TCP Connection Release, The TCP Sliding Window, The TCP Congestion Control Algorithm		
Unit-V		Hours:4
Application Layer –Domain name system, SNMP, Electronic Mail; the World WEB, HTTP, Streaming audio and video.		
Text Books:		
1. A. Tanenbaum, Computer Networks, PHI Publication, 5th Edition, 2011.		
Reference Books:		
1. B. Forouzan, Data Communications and Networking, McGraw Hill Publication, 5th Edition, 2013. 2. Larry Peterson and Bruce Davie, Computer Networks: A Systems Approach, Morgan Kufman Publication, 5th Edition, 2012.		

3. S. Keshav, An Engineering Approach to Computer Networking, Addison-WesleyProfessional.

4. D. Comer, Computer Networks and Internet, Pearson Education, 6th Edition, 2014.

5. M. Gallo, W. Hancock, Computer Communications and Networking Technologies, Brooks/Cole Publisher, 2001.

MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:

- https://www.mygreatlearning.com/academy/learn-for-free/courses/basics-of-computer-networking?utm_source
- https://elearn.nptel.ac.in/shop/nptel/computer-networks-and-internet-protocol/?utm_source=chatgpt.com&v=c86ee0d9d7ed

Second Year B. Tech (Electronics & Computer Science Engineering) Semester -IV

Course Code	25EC404T		Course Name	Digital Electronics and Microprocessor			
Teaching Scheme				Evaluation Scheme			
L	T	Credits		CA-I	MSE	CA-II	ESE
3	-	3		15	20	15	50

Course Prerequisites:15

- Basic understanding of number systems (binary, decimal, hexadecimal)
- Familiarity with basic mathematics and logic operations
- Basic knowledge of electrical and electronic concepts (voltage, current, components)
- Understanding of basic computer hardware (CPU, memory, I/O devices)
- Logical reasoning and analytical skills

Course Objective:

- Introduce the basic concepts of number systems, Boolean algebra, and logic gates.
- Develop the ability to analyze and design combinational and sequential logic circuits.
- Learn to design adders, subtractors, multiplexers, demultiplexers, encoders, decoders, and comparators.
- Understand the internal architecture, instruction set, and operation of microprocessors.
- Gain practical exposure to designing microprocessor-based systems.

Course Outcome:

CO-1	**Explain** the fundamentals of number systems, Boolean algebra, and logic gates.
CO-2	Analyze and design combinational and sequential logic circuits for various digital applications.
CO-3	Illustrate the architecture, functional blocks, and operation of 8085/8086 microprocessors.
CO-4	assembly language programs to perform arithmetic, logical, and control operations.
CO-5	Demonstrate interfacing of microprocessors with memory and peripheral devices.

Course Contents

Unit-I	**Digital Fundamentals**	Hours:9
Number Systems – Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Codes – Binary, BCD, Excess 3, Gray, Alphanumeric codes, Boolean theorems, Logic gates, Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map Minimization and QuineMcCluskey method of minimization.		
Unit-II	**Combinational logic circuit design**	Hours:9
Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder -Multiplexer, Demultiplexer, Decoder, Priority Encoder. Code converters Binary to Grey code converter, Grey to Binary code converter.		
Unit-III	**Sequential logic circuit design**	Hours:8
Sequential Logic: Latches and Flip-Flops. RS, JK, Master slave flip flops, T & D flip flops with various triggering methods, Conversion of flip flops,		
Unit-IV	**8085 Microprocessor**	Hours:8
Hardware Architecture, pin diagram – Functional Building Blocks of Processor – Memory organization – I/O ports and data transfer concepts– Timing Diagram – Interrupts		
Unit-V	**8085 assembly language programming**	Hours:8
The 8085-programming model, instruction classification, instruction and data format, Writing and execution assembly language program. The 8085 instruction-data transfer operations, addressing modes, Arithmetic operation, Flag concept and cautions, Logic operations, Branch operations.		

Text Books:

1.R.P. Jain, —Modern digital electronics‖, 3rd edition, 12threprint Tata McGraw Hill Publication,2007.

2. Anand Kumar, —Fundamentals of digital circuits‖ 1st edition, Prentice Hall of India, 2001.

Reference Books:

1. Douglas V. Hall, Microprocessors & Interfacing, McGraw Hill International Edition, 1992.
2. Microprocessor-Architecture, programming and application with 8085, gaonkar, penram international

MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:

https://onlinecourses.nptel.ac.in/noc25_cs25/preview?utm_source=chatgpt.com

Second Year B. Tech (Electronics & Computer Science Engineering) Semester -IV

Course Code	25EC405T	**Course Name**	**Multidisciplinary Minor-2()**
Teaching Scheme			**Evaluation Scheme**

L	T	Credits		CA-I	MSE	CA-II	ESE
2	-	2					

Course Prerequisites:

Course Objective:

Course Outcome:

CO-1	
CO-2	
CO-3	
CO-4	
CO-5	

Course Contents

Unit-I		Hours:
Unit-II		Hours:
Unit-III		Hours:
Unit-IV		Hours:
Unit-V		Hours:

Text Books:
Reference Books:
MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:

Second Year B. Tech (Electronics & Computer Science Engineering) Semester -IV

Course Code	25EC406T		Course Name	Computer Hardware Maintenance and Networking			
Teaching Scheme				Evaluation Scheme			
L	T	Credits		CA-I	MSE	CA-II	ESE
1	-	2		30	-	30	40

Course Prerequisites:
Course Objective:
Course Outcome:
CO-1
CO-2
CO-3
CO-4
CO-5

Course Contents

Unit-I	**Computer Hardware Components and Maintenance**	Hours:
Study of motherboard components and CMOS setup, Upgrading RAM and verifying performance Installation of hard drive and optical drive, Data recovery from hard drive.		
Unit-II	**Peripheral Devices and Troubleshooting**	Hours:
Troubleshooting keyboard, monitor, and printer problems, Installation and configuration of printer and other peripherals		
Unit-III	**Desktop Assembly and Networking Interfaces**	Hours:
Disassembly and assembly of a desktop computer, Installation and configuration of Network Interface Card (NIC)		
Unit-IV	**Networking Setup and Configuration**	Hours:
Preparation of straight-through and cross-over Ethernet cables using crimping tool and testing, Installation of a network switch and connecting systems, Assigning and configuring static IP addresses		
Unit-V		Hours:

Text Books:

1. **B. Govindarajalu** – *Computer Hardware: Installation, Interfacing, Troubleshooting and Maintenance* – Tata McGraw Hill.
2. **Behrouz A. Forouzan** – *Data Communications and Networking* – McGraw Hill (widely used for basics of

networking).

Reference Books:

- *Computer Hardware: Installation, Interfacing, Troubleshooting and Maintenance* — K. L. James
- *Computer Maintenance and Troubleshooting* — Jitendra Pate

MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:

Computer Fundamentals — SWAYAM (IGNOU)

Second Year B. Tech (Electronics & Computer Science Engineering) Semester -IV

Course Code	25EC407		Course Name	Constitution of India			
Teaching Scheme				Evaluation Scheme			
L	T	Credits		CA-I	MSE	CA-II	ESE
2	-	2		15	20	15	-

Course Prerequisites:

- Basic knowledge of India's independence movement, British colonial impact, and key events like the Quit India Movement.
- Understanding of democracy, federalism, and the structure of India's political system (Parliament, President, Judiciary).
- Keeping up with constitutional amendments, landmark judgments, and understanding the role of the judiciary in interpretation.

Course Objective:

1. To understand the meaning and significance of constitutional law and constitutionalism in the context of democratic governance in India.
2. To explore the historical development and framing of the Constitution of India, including key influences and amendments.
3. To examine the structure and features of the Indian Constitution, including federalism, fundamental rights, directive principles, and duties.
4. To analyze the distribution of powers between the Union and State governments, along with the functioning of the parliamentary system and emergency provisions.
5. To study the role of local self-government and the scope of individual rights, especially the rights to equality, freedom, and personal liberty

Course Outcome:

CO-1	Understand the foundational concepts of constitutional law and constitutionalism, and explain their role in democratic governance.
CO-2	Describe the historical evolution and salient features of the Indian Constitution, including its structure, key principles, and influences.
CO-3	Identify and explain the framework of Fundamental Rights, Duties, and Directive

	Principles of State Policy as provided in the Constitution.
CO-4	Analyze the distribution of legislative and financial powers in India's federal system, along with the roles of key institutions like the President and Parliament.
CO-5	Evaluate constitutional provisions related to emergency powers, constitutional amendments, and local self-government, and their impact on governance and individual rights.

Course Contents

Unit-I		Hours:
Meaning of the constitution law and constitutionalism, Historical perspective of the Constitution of India, Salient features and characteristics of the Constitution of India		
Unit-II		Hours:
Scheme of the fundamental rights, The scheme of the Fundamental Duties and its legal status, The Directive Principles of State Policy – Its importance and implementation		
Unit-III		Hours:
Federal structure and distribution of legislative and financial powers between the Union and the States, Parliamentary Form of Government in India – The constitution powers and status of the President of India, Amendment of the Constitutional Powers and Procedure		
Unit-IV		Hours:
The historical perspectives of the constitutional amendments in India, Emergency Provisions : National Emergency, President Rule, Financial Emergency Local Self Government – Constitutional Scheme in India		
Unit-V		Hours:
Scheme of the Fundamental Right to Equality, Scheme of the Fundamental Right to certain Freedom under Article 19, Scope of the Right to Life and Personal Liberty under Article 21.		
Text Books:		
• "Introduction to the Constitution of India" by D.D. Basu • "Constitution of India" by P.M. Bakshi • "The Constitution of India: A Commentary" by M.P. Jain		
Reference Books:		
• "Indian Government and Politics" by B.L. Fadia • "Our Constitution" by Subhash C. Kashyap		
MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:		
• NPTEL (National Programme on Technology Enhanced Learning): "Constitutional Law" by IITs and IISc • Swayam (Ministry of Education, Government of India): "Introduction to the Indian Constitution"		

Second Year B. Tech (Electronics & Computer Science Engineering) Semester -IV

Course Code	25EC408		Course Name	Quantative and Logical Aptitude Development			
Teaching Scheme				Evaluation Scheme			
L	T	Credits		CA-I	MSE	CA-II	ESE
2	1	-		30	40	30	-

Course Prerequisites:

1. Basic Mathematical Skills
2. Logical and Analytical Thinking
3. Familiarity with Basic Functions and Graphs
4. Basic Probability Concepts

Course Objective:

1. Equip students with problem-solving skills for competitive exams and placements.
2. Develop logical reasoning and analytical thinking.
3. Improve time management for efficient problem-solving under exam conditions.
4. Strengthen foundational knowledge in arithmetic, algebra, and probability.
5. Prepare students for placement tests and major competitive exams

Course Outcome:

CO-1	Solve complex quantitative problems accurately.
CO-2	Demonstrate strong logical and analytical reasoning abilities.
CO-3	Interpret and analyze data effectively.
CO-4	Apply time-efficient problem-solving strategies.
CO-5	Understand and solve problems involving probability and statistics.

Course Contents

Unit-I	Number Systems and Arithmetic	Hours:
Number Types: Natural Numbers, Integers, Prime Numbers, Rational/Irrational Numbers. **Arithmetic Operations:** Fractions, Percentages, Averages, Profit & Loss		
Unit-II	Algebra and Modern Math	Hours:
Algebra Basics: Polynomials, Quadratic Equations, Progressions (AP, GP). **Sets and Venn Diagrams:** Set Operations, Applications in Problem Solving.		
Unit-III	Logical Reasoning and Analytical Thinking	Hours:
Verbal Reasoning: Analogies, Antonyms, Syllogisms. **Non-Verbal Reasoning:** Patterns, Series, Cube & Dice.		
Unit-IV	Data Interpretation and Critical Reasoning	Hours:
Data Interpretation: Bar Graphs, Pie Charts, Tables. **Data Sufficiency:** Identifying Data Requirements for Solving Problems.		
Unit-V	Advanced Problem Solving (Permutation, Combination, Probability)	Hours:
Permutations & Combinations: Basic Principles and Problems., **Probability:** Fundamentals, Probability Calculations		

Text Books:

- "Quantitative Aptitude for Competitive Examinations" by R.S. Aggarwal
- "How to Prepare for Quantitative Aptitude for the CAT" by Arun Sharma
- "A Modern Approach to Verbal and Non-Verbal Reasoning" by R.S. Aggarwal

Reference Books:

- "Quantitative Aptitude" by Dr. N.K. Sharma

• "Fast Track Objective Arithmetic" by Rajesh Verma
MOOCs Course (Course name and Weblink) / Supplementary Readings / Videos:
• Udemy: "Aptitude and Logical Reasoning" • NPTEL: "Mathematical Methods in Engineering"

Second Year B. Tech (Electronics & Computer Science Engineering) Semester -IV

Course Code	25EC403L	Course Name	Computer Network and Protocol Lab	
Teaching Scheme			Evaluation Scheme	
P	Credits		CIE	ESE
2	2		30	20

Course Prerequisites:

- Basic knowledge of computer systems
- Fundamentals of operating systems
- Understanding of digital logic and number systems (binary, hexadecimal)
- Knowledge of data structures and algorithms
- Basic programming skills (C / C++ / Java / Python)

Course Objective:

1. Understand and implement fundamental Computer Network.
2. Apply the relevant Transmission Media and Switching Techniques as per need to establish network.
3. Analyze working of the error detection and correction method in data link layer.
4. Identify functions and features of the network layer.
5. Understand different protocols of the Application layer.

Course Outcome:

CO-1	Analyze the functioning of Computer Network and networks models
CO-2	Implement and analyze different wired and wireless LAN Technologies.
CO-3	Analyze the design issue and transmission errors with respect to data link layer
CO-4	Configure different TCP/IP services
CO-5	Understand different protocols, security measures and encryption method used in Application Layer.

Course Contents

Exp. No.	Experiment Title	CO
1	Create and Test standard straight network cable and Cross network cable using crimping tool	

2	Study of network devices in detail	
3	Write a 'C' program for parity check error detection	
4	Write a 'C' program for Cyclic Redundancy Check(CRC) error detection	
5	Write a 'C' program for error correction using Hamming code	
6	Implements different TCP/IP network commands to troubleshoot computer network.	
7	Implement FTP server to transfer file from one system to another system	
8	Implement IP addresses for intranet in Class A, Class B, and Class C.	
9	Configure HTTP server on given operating system.	
10		
11		
12		
13		

Second Year B. Tech (Electronics & Computer Science Engineering) Semester -IV

Course Code	25EC404L	**Course Name**	Digital Electronics and Microprocessor Lab	
Teaching Scheme			**Evaluation Scheme**	
P	**Credits**		**CIE**	**ESE**
2	2		30	20

Course Prerequisites:

- Basic understanding of number systems (binary, decimal, hexadecimal)
- Familiarity with basic mathematics and logic operations
- Basic knowledge of electrical and electronic concepts (voltage, current, components)
- Understanding of basic computer hardware (CPU, memory, I/O devices)
- Logical reasoning and analytical skills

Course Objective:

- Introduce the basic concepts of number systems, Boolean algebra, and logic gates.
- Develop the ability to analyze and design combinational and sequential logic circuits.
- Learn to design adders, subtractors, multiplexers, demultiplexers, encoders, decoders, and comparators.
- Understand the internal architecture, instruction set, and operation of microprocessors.

Gain practical exposure to designing microprocessor-based systems

Course Outcome:

CO-1	Explain the fundamentals of number systems, Boolean algebra, and logic gates.
CO-2	Analyze and design combinational and sequential logic circuits for various digital applications.
CO-3	Illustrate the architecture, functional blocks, and operation of 8085/8086 microprocessors.
CO-4	assembly language programs to perform arithmetic, logical, and control operations.
CO-5	Demonstrate interfacing of microprocessors with memory and peripheral devices.

Course Contents

Exp. No.	Experiment Title	CO
1	Study about logic gates and verify their truth tables	
2	To study and verify NAND and NOR gates as a universal gate	
3	Design of half adder & full adder	
4	Design of half subtractor & full subtractor	
5	Implement 4-bit Binary to Gray code converter	
6	Implement multiplexer and demultiplexer	
7	To study and verify Demorgan's theorem	
8	Design and verification of Flipflops	
9	Study of architecture of microprocessor 8085.	
10	WAP on Addition of two 8-bit numbers	
11	WAP on Addition of two 16-bit numbers	
12	WAP on Subtraction of two 8-bit numbers.	
13	WAP on Subtraction of two 16-bit numbers.	

Second Year B. Tech (Electronics & Computer Science Engineering) Semester -IV

Course Code	25EC406L	Course Name	Computer Hardware & Networking	
Teaching Scheme			Evaluation Scheme	
P	Credits		CIE	ESE
02	02		60	40

Course Prerequisites:

- Basic understanding of computer components (CPU, RAM, storage, motherboard)
- Fundamental electronics / electrical basics (voltage, current, power)
- Familiarity with binary system / number representation
- Operating system basics (how software interacts with hardware)
- Basic safety practices (ESD precautions, handling hardware)
- Basic networking concepts (what is a network, devices like router, switch, cables)

Course Objective:

1. To understand the functional components of computer hardware and their configuration
2. To develop skills in assembling, upgrading, and troubleshooting desktop systems and peripherals
3. To gain practical knowledge of networking hardware, cabling, and configuration
4. To prepare students for diagnosing and resolving common hardware and network issue

Course Outcome:

CO-1	Identify and explain motherboard components, memory, storage devices, and peripheral setups.
CO-2	Assemble, disassemble, and troubleshoot desktop systems and hardware peripherals.
CO-3	Prepare and test Ethernet cables, configure NICs, and connect systems using network devices.
CO-4	Assign IP addresses and demonstrate basic network configuration and troubleshooting.
CO-5	Demonstrate problem-solving skills in diagnosing, repairing, and maintaining computer hardware and networks.

Course Contents

Exp. No.	Experiment Title	CO
1	**Study of Motherboard Components and CMOS Setup**	
2	**Upgrading RAM/Memory and Verifying System Performance**	
3	**Installation of Hard Drive and Optical Drive**	
4	**Data Recovery from a Hard Drive**	
5	**Troubleshooting Keyboard, Monitor, and Printer Issues**	
6	**Installation and Configuration of a Network Interface Card (NIC)**	
7	**Disassembly and Assembly of a Desktop Computer**	
8	**Preparation of Ethernet Cables (Straight-through & Cross-over) using Crimping Tool and Testing**	
9	**Installation of a Network Switch and Connecting Systems**	
10	**Assigning and Configuring Static IP Address to a Computer System**	
11		
12		
13		