



**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA
(JHAJJAR)
(An Autonomous Institute)**

‘A’ GRADE ACCREDITED BY NAAC

**Scheme of Studies and Examinations
(Under NEP-2020)**

B-SCHEME

Bachelor of Technology (Electronics and Communication Engineering)

2nd Year

(Academic Session: 2026-27)



APPROVED BY AICTE, NEW DELHI AND AFFILIATED TO MDU, ROHTAK

1. DEFINITION OF CREDIT

1	1 Hr. Lecture (L) per week	1 Credit
2	1 Hr. Tutorial (T) per week	1 Credit
3	2 Hr. Practical (Lab) per week	1 Credit
4	2 Hr. Project per Week	1 Credit

2. RANGE OF CREDIT

As per AICTE guidelines, a student shall be eligible to receive an Undergraduate Degree with Honors/Minors/Specialization upon earning additional 18-20 credits beyond the prescribed about 160 major credits. The minor variation is allowed as per the need of the respective disciplines.

However the Board of Studies after deliberation and discussion framed the curriculum and scheme of Examination has finalized 170 credits for the award of Undergraduate Degree (B.Tech in Electronics & Communication Engineering.) and additional 20 credits for B.Tech Honors/Minors/Specialization. Furthermore as per the AICTE/UGC SWAYAM Credit Framework Regulations, credit transfer for SWAYAM/NPTEL courses is permitted subject to the approval of the Chairperson, Board of Studies (BOS). A classroom course may be considered equivalent to a SWAYAM/NPTEL course if a majority of the course contents and syllabus components are substantially similar.

3. STRUCTURE OF UNDERGRADUATE ENGINEERING PROGRAM (B. TECH)

Sr. No.	Category	Breakup of Credits
1	Professional Core Courses	69
2	Professional Elective Courses (Relevant to chosen specialization/branch)	12
3	Multidisciplinary Open Elective Courses	09
4	Basic Science Courses	21
5	Engineering Science Courses	25
6	Humanities and Social Sciences including Management courses	12
7	Training/Seminar/Internship/Project	20
8	Value Added Courses	2
9	Mandatory Courses	Non-Credit
	Total Credits	170

4. COURSE CODE AND DEFINITIONS

Sr. No.	Category	Course Code
1	Professional Core Courses (Theory Courses)	PCC
2	Professional Core Courses (Lab Courses)	LC
3	Professional Elective Courses (Relevant to chosen specialization/branch)	PEC
4	Multidisciplinary Open Elective Courses	OEC
5	Basic Science Courses	BSC
6	Engineering Science Courses	ESC
7	Humanities and Social Sciences including Management courses	HSMC
8	Training	PT
9	Seminar	SM
10	Internship	INT
11	Project	PROJ
12	Value Added Courses	VAC
13	Mandatory Courses (Non Credit)	MC

General Notes:

1. Students will be required to obtain passing marks in Mandatory Non-Credit Courses.
2. Students will be allowed to use non programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.
3. Students will be permitted to opt for any elective course run by the department. However, the department shall offer those electives for which they have expertise. The choice of the students for any elective shall not be binding for the department to offer, if the department does not have expertise. To run the elective course a minimum of 1/3rd students of the class should opt for it.

**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA,
JHAJJAR (HR.)**

Scheme of Studies and Examination

B.Tech (Electronics & Communication Engineering) – 3rd Semester

W.e.f. 2026-27

Sr. No.	Category	Course Code	Course Title	Hours per week			Total Load Per Week	Credits	Examination Schedule (Marks)				Exam Duration in Hours
				L	T	P			Assessment	End Semester Examination		Total	
										Theory	Practical		
1	Professional Core courses	PCC-ECE-201B	Electronic Devices	3	0	0	3	3	30	45		75	3
2	Engineering Science Courses	PCC-CSE-203B	Data Structures	3	0	0	3	3	30	45		75	3
3	Professional Core courses	PCC-ECE-205B	Computer Organization & Architecture	3	0	0	3	3	30	45		75	3
4	Basic Science Courses	BSC-MECE-207B	Mathematics-III	3	1	0	4	4	40	60		100	3
5	Professional Core Courses	PCC-ECE-209B	Signal Systems and Network Analysis	3	1	0	4	4	40	60		100	3
6	Humanities and Social Sciences including Management Courses	HSMC-02B	Economics for Engineers	3	0	0	3	3	30	45		75	3
7	Professional Core Courses	LC-ECE-211B	Electronic Devices Lab	0	0	2	2	1	10	-	15	25	
8	Professional Core Courses	LC-ECE-213B	Signal Systems and Network Analysis Lab	0	0	2	2	1	10	-	15	25	
9	Professional Core Courses	LC-ECE-215B	Electronic Workshop & PCB Design Lab	0	0	2	2	1	10	-	15	25	
10	Mandatory Courses	*MC-201B	Environmental Science	2	0	0	2	-	20	30	-	-	3
Total Credits								23				575	
NOTE 1: *MC-201B: - It is a mandatory non –credit course in which the students will be required passing marks.													
Minor/Honors (Hons.)/Specialization in VLSI Design and Technology													
I	Classroom OR MOOCs	Refer to Annexure-I	Minor/Honors (Hons.)/Specialization (Table –II)	4	0	0	4	4	40	60		100	3

**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA,
JHAJJAR (HR.)**

Scheme of Studies and Examination

B.Tech (Electronics & Communication Engineering) – 4th Semester

W.e.f. 2026-27

Sr. No.	Category	Course Code	Course Title	Hours per week			Total Load Per Week	Credits	Examination Schedule (Marks)				Exam Duration in Hours
				L	T	P			Assessment	End Semester Examination		Total	
										Theory	Practical		
1	Professional Core Courses	PCC-ECE-202B	Analog & Digital Communication	3	0	0	3	3	30	45	-	75	3
2	Professional Core Courses	PCC-ECE-204B	Analog Electronic Circuits	3	0	0	3	3	30	45	-	75	3
3	Professional Core Courses	PCC-ECE-206B	Digital Electronics	3	1	0	4	4	40	60	-	100	3
4	Professional Core Courses	PCC-ECE-208B	Microprocessor and Microcontroller	3	0	0	3	3	30	45	-	75	3
5	Professional Elective Courses	Refer to Annexure-I	Professional Elective (Table –I)	3	0	0	3	3	30	45	-	75	3
6.	Humanities and Social Sciences including Management Courses	HSMC-01B	Fundamental of Management and Organizational Behavior	3	0	0	3	3	30	45	-	75	3
7.	Professional Core Courses	LC-ECE-218B	Analog & Digital Communication lab	0	0	2	2	1	10	-	15	25	-
8.	Professional Core Courses	LC-ECE-220B	Analog Electronics Circuit Lab	0	0	2	2	1	10	-	15	25	-
9.	Professional Core Courses	LC-ECE-222B	Digital Electronics Lab	0	0	2	2	1	10	-	15	25	-
10.	Professional Core Courses	LC-ECE-224B	Microprocessor and Microcontroller Lab	0	0	2	2	1	10	-	15	25	-
11.	Project	*PROJ-226B	Project Based Learning/Micro Project	0	0	2	2	1	25	-	-	25	-
Total Credits								24				600	
NOTE 1: *PROJ-226B: - It is an innovative learning approach in which students actively participate in real-world projects, micro projects, and demonstrations to solve practical problems. This approach fosters critical thinking, creativity, teamwork and hands-on technical skills while encouraging experiential, application-oriented and self-directed learning. The evaluation will be carried out on the basis of specified rubrics.													
NOTE 2: At the end of 4th semester each student has to undergo Practical Training of 4/6 weeks in an Industry/ Institute/Professional Organization/ Research Laboratory/ training centre etc. and submit a report along with a certificate from the organization & its evaluation shall be carried out in the 5th Semester.													
NOTE 3: Students must choose one course from the Professional Elective–I category (Table I). They may also opt for Massive Open Online Courses (MOOCs) offered through the SWAYAM, SWAYAM Plus, or NPTEL platforms, subject to the approval of the concerned Chairperson, Board of Studies/Head of the Department.													
Minor/Honors (Hons.)/Specialization in VLSI Design and Technology													
I	Classroom	MLECEVLSI-203B	Digital Design with Verilog Lab	0	0	2	2	1	10	-	15	25	-
II	Classroom OR MOOCs	Refer to Annexure-I	Minor/Honors (Hons.)/Specialization (Table –II)	4	0	0	4	4	40	60	-	100	3

Annexure-I

Professional Elective Courses (Table-I)

S. No	Course Code	Course Name
1	PEC-ECE-210B	Scientific Computing
2	PEC-ECE-212B	Power Electronics
3	PEC-ECE-214B	Introduction to Artificial Intelligence
4	PEC-ECE-216B	Introduction to MEMS
5	-----	MOOCs offered through SWAYAM, SWAYAM Plus, or NPTEL platforms

Minor/Honors (Hons.)/Specialization in VLSI Design and Technology (Table-II)

S. No	Course Code	Course Name
1	#MECEVLSI-201B	VLSI Technology
2	#MECEVLSI-202B	Digital Design with Verilog

#Note 1: The above course may be altered in even/odd semester as per availability of courses on NPTEL/Swayam platform with prior approval of the Chairperson of BOS.

Note 2: The laboratory course Digital Design with Verilog Lab (MLECEVLSI-204B) shall be offered along with the theory course Digital Design with Verilog (MECEVLSI-202B) in the same semester, subject to the availability of the theory course on the NPTEL/SWAYAM platform and with the prior approval of the Chairperson, Board of Studies (BoS).

Course Code	PCC-ECE-201B				
Category	Professional Core Courses				
Course Title	Electronic Devices				
Scheme and Credits	L	T	P	Credits	Semester-III
	3	0	0	3	
Course Objectives	The objectives of this course are ● To understand the fundamental concepts and operating principles of semiconductor devices. ● To study the characteristics and practical applications of various semiconductor devices. ● To design and analyze basic electronic circuits using semiconductor components. ● To explore biasing techniques and equivalent models for device operation in amplification and switching applications.				
Assessment	30 Marks				
End Semester Examination	45 Marks				
Total	75 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to:

COs	Skills Demonstrated
CO1	Understand and apply the fundamental concepts, working operations and characteristics of semiconductor devices to design electronic circuits and systems.
CO2	Apply diode principles to design and analyze its applications in rectifiers, Clippers, Clampers, filters, voltage doubler circuits.
CO3	Analyze biasing techniques used in amplifiers to determine their stability conditions for establishing a proper operating point.
CO4	Describe the working principles and applications of special purpose semiconductor devices used in electronics circuits.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (covering all units) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Basic Semiconductor And PN-Junction Theory: Introduction, Atomic Structure, Band Theory of Semiconductors, Effect of Temperature on Conduction, Drift Current, Donor & Acceptor Impurities in Semiconductor, Law of Mass Action, Hall's Effect, Hall Coefficient & Mobility, continuity equation. Characteristics Of Diode: PN-Junction, Construction Types, Unbiased Junction, Biased Junction, Space Charge Region, Diode Characteristics & Parameters, Diode Capacitance, Diode Resistance, DC And AC Load Lines, Diode Testing, Zener And Avalanche Breakdown Diodes, Temperature Characteristics of Diode, Reverse Recovery Time, Switching Characteristics of Diode.

Unit-II	Diode Applications: Half Wave, Full Wave Center Tapped, Full Wave Bridge(Rectification), Series Clipping Circuit, Shunt Clipping Circuit, Clamping Circuit, Bridge Voltage Doubler, Filtering Circuit Using Capacitor & Inductor. Special Semiconductor Devices: Optoelectronic Devices, Photoconductors, Photo Diode, Photo Voltaic Sensor, Solar Cells, LED, LCD, Laser Diode, Schottky Diode, Tunnel Diode ,SCR, TRIAC, DIAC, UJT, IGBT, Opto Coupler.
Unit-III	Junction Transistor: Introduction, Construction Of Junction Transistor, Circuit Symbols, Transistor Operation, Unbiased Transistor, Operation Of Biased Transistor, Transistor Current Components, DC & AC Load Line, Operating Point, Transistor Configuration CB, CE, CC, Input/Output Characteristics, Early Effect(Base Width Modulation), Eber's-Moll-Model of Transistor, Maximum Rating of Transistor, Transistor Testing, Transistor as an amplifier. BJT Biasing: Bias Stability, Instability Due To β, Thermal Stability, Stability Factor, Fixed Biased Circuits, Effect of Emitter Resistor, Collector to Base Bias, Voltage Divider Biasing, Advantage & drawbacks of Biasing Techniques, Stability Factor calculation of Biasing Techniques, Bias Compensation by various device, Thermal Runway, Transistor Dissipation, Thermal Resistance, Condition of Thermal Stability.
Unit-IV	Small Signal Circuit: Two Port Network, Hybrid (H-Parameter) Model, Typical Values of H-Parameter Model, Conversion of CE, CB, CC Configuration to Equivalent Hybrid Model, CB Circuit Analysis, CE circuit with & without R_E analysis, CC circuit analysis, Analysis of CE, CB & CC Configuration with approximate Hybrid Model, Miller's Theorem, Dual of Miller Theorem. FET: Introduction, The Junction FET, Basic Construction, Operation, P- Channel FET, N-Channel FET, High Frequency Model of FET, Low Frequency FET Amplifiers, Transfer Characteristics of FET. JFET and MOSFET Structure, Operation and characteristics.

Suggested Readings:

- Electronics Device & Circuit by J.B. Gupta -S.K. Kataria and Sons.
- Electronics Device & Circuit by Sahdev, S.K 2nd Edition—Dhanpat Rai & sons.
- Integrated Electronics by Millman Halkias -- TMH.
- Electronics Device Circuit by David. A. Bell -- Oxford.
- Principal of Electronics Device & Circuit by Theraja , B.L, Sedha, RS, S Chand.
- Electronics Device & Circuit by Maini, A.K; Agarwal, Varsha—Wiley India.

Useful Video Links:

Unit No.	Topics	Links
Unit-I	Basic Semiconductor Introduction	https://youtu.be/CXFtbpYaBXw?si=yAkLNOIiRFCCo7te
	Characteristics of Diode	https://youtu.be/OkYKCnVkJI4?si=zAN6-T2SNOou2hkl
Unit-II	Clipper Circuit	https://www.youtube.com/watch?v=1hfhih839oU
	Special Semiconductor Devices	https://www.youtube.com/watch?v=o_d9j67Zm7k
Unit-III	Introduction to BJT	https://youtu.be/qFaAk9YPURw?si=74PmQzvApKquQF1R
	Transistor Configuration	https://www.youtube.com/watch?v=x8WxZjKrvTc
	BJT Biasing	https://www.youtube.com/watch?v=1vRgDzJ2yOU
Unit-IV	H-parameter	https://youtu.be/N5YIsVY5uBM?si=AAAdMvHVVN_mNKG00
	Small Signal Amplifier	https://www.youtube.com/watch?v=5MLVr9r6Vzk&list=PL-IC1WV1OE4kRdcpTfgtNjFpR8XEpdDu7O

Course Code	PCC-CSE-203B				
Category	Engineering Science Courses				
Course Title	Data Structures				
Scheme and Credits	L	T	P	Credits	Semester-III
	3	0	0	3	
Course Objectives	The objectives of this course are to ● To introduce the basics of data structures and algorithms. ● To explain stacks, linked lists and trees with their implementation. ● To understand sorting, hashing and graph algorithms with complexity analysis. ● To evaluate algorithm efficiency in terms of time and space complexity.				
Assessment	30 Marks				
End Semester Examination	45 Marks				
Total	75 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Define the key terminologies of data structures and algorithms including their classifications, operations, and performance characteristics.
CO2	Describe the design and implementation of various linear and non-linear data structures, and their real-world applications including hashing and binary trees.
CO3	Apply appropriate data structures such as arrays, stacks, queues, linked lists, trees, and graphs to solve computational problems effectively.
CO4	Analyze the efficiency of algorithms and operations in searching, sorting, and traversals using time and space complexity metrics.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (covering all units) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Introduction: Basic Terminologies: Concept of Data Structure, Choice of right Data Structure, Algorithms, how to design and develop algorithm, Complexity of algorithm. Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Searching: Linear Search and Binary Search Techniques and their complexity analysis. Arrays: Array Definition, Types, Operations on array and their complexity analysis.
Unit-II	Stacks and Queues: Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation -corresponding algorithms and complexity analysis. Tower of Hanoi problem. Queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each type of Queues: Algorithms and their analysis.

Unit-III	Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis. Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Path length, Huffman's algorithm, Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.
Unit-IV	Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Selection Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing. Graph: Basic Terminologies, Sequential representation of graphs, Adjacency matrices. Graph search and traversal algorithms and complexity analysis.

Suggested Readings:

- Fundamentals of Data Structures by Ellis Horowitz, Tata McGraw-Hill
- Algorithms, Data Structures, and Problem Solving with C++, by Mark Allen Weiss, Addison-Wesley
- Data Structures and Algorithms by Narasimha Karumanchi.
- Data Structures Using C by Aaron M.

Useful Video Links:

Unit No	Topics	Links
Unit-I	Introduction to Data Structures and Algorithms	https://www.youtube.com/watch?v=zWg7U0OEaE&list=PLBF3763AF2E1C572F
	Linear Search Algorithm	https://www.youtube.com/watch?v=C46QfTjVCNU
	Binary Search	https://www.youtube.com/watch?v=V_T5NuccwRA
Unit-II	Stacks	https://youtu.be/g1USSZVWDsY?list=PLBF3763AF2E1C572F
	Stack and its Applications	https://www.youtube.com/watch?v=aG0HjeXBUDU
	Queues and Linked Lists	https://youtu.be/PGWZUgzDMYI?list=PLBF3763AF2E1C572F
Unit-III	Linked Lists-I	https://www.youtube.com/watch?v=K7VIKIUdo20
	Trees	https://youtu.be/tORLeHHtazM?list=PLBF3763AF2E1C572F
	Search Trees-II	https://www.youtube.com/watch?v=5jQGqaAUzOI
	AVL Trees	https://youtu.be/mRGQyIRWAsI?list=PLBF3763AF2E1C572F
Unit-IV	Sorting	https://youtu.be/4OxBvBXon5w?list=PLBF3763AF2E1C572F
	Hashing	https://www.youtube.com/watch?v=2-h9193Ztqg
	Graphs	https://youtu.be/9zpSs845wf8?list=PLBF3763AF2E1C572F

Course Code	PCC-ECE-205B					
Category	Professional Core Courses					
Course Title	Computer Organization & Architecture					
Scheme and Credits	L	T	P	Credits	Semester-III	
	3	0	0	3		
Course Objectives	The objectives of this course are • To develop understanding of data representation and coding. • To gain knowledge of computer organization and CPU architecture. • To build insight into pipelining and parallel processing. • To acquire familiarity with I/O organization and memory hierarchy.					
Assessment	30 Marks					
End Semester Examination	45 Marks					
Total	75 Marks					
Duration of Exam	03 Hours					

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Apply data representation techniques, register transfer and micro-operations for efficient data processing.
CO2	Analyze instruction codes, registers, memory operations, and I/O mechanisms in optimizing CPU-I/O communication efficiency.
CO3	Apply architectural concepts and parallel processing principles in designing of CPU.
CO4	Describe the hierarchy, types, and operational mechanisms of memory organization for system optimization.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (covering all units) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Data representation: Data Types, Complements, Fixed-Point Representation, Conversion of Fractions, Floating-Point Representation, Gray codes, Decimal codes, Alphanumeric codes, Error Detection Codes Register Transfer and Microoperations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Microoperations, Logic Microoperations, Shift Microoperations, Arithmetic Logic Shift Unit.

Unit-II	Basic Computer Organization and Design : Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instruction, Input-Output Instruction, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic. Central Processing Unit : General Register Organization, Stack organization, Instruction Format, Addressing Modes, Data Transfer and Manipulation, Program Control, RISC, CISC.
Unit-III	Pipeline and Vector Processing: Introduction to Parallel Processors, Amdahl's Law, parallel bus architectures, Parallelism via Instructions -Instruction-Level Parallelism (ILP) Thread-Level Parallelism (TLP) ,Data-Level Parallelism (DLP) Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors, SIMD Array Processors, Pipeline Hazards.
Unit-IV	Input-output Organization: I/O device interface, I/O transfers–program controlled, interrupt driven and DMA, Privileged and Non-Privileged Instructions, Software Interrupts. Memory organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Associative Mapping, Direct Mapping, Set-Associative Mapping, Writing into Cache, Cache Initialization, Virtual Memory.

Suggested Readings:

- Computer System Architecture by M.Morris Mano, Pearson
- Computer Organization and Design: The Hardware/Software Interface by David A. Patterson and John L. Hennessy, Elsevier.
- Computer Organization and Embedded Systems by Carl Hamacher, McGraw Hill Higher Education.
- Computer Architecture and Organization by latest edition by John P. Hayes, WCB/McGraw-Hill
- Computer Organization and Architecture: Designing for Performance by William Stallings, Pearson Education
- Computer System Design and Architecture by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

Useful Video Links:

Unit No.	Topics	Links
Unit I	Data Types	https://www.youtube.com/watch?v=0OoNpd41ZiI
	Error Detection Codes	https://www.youtube.com/watch?v=U7-h2hyM1Dc
	Floating-Point Representation	https://www.youtube.com/watch?v=4gNs7B4ZTjc
	Register Transfer and Microoperations	https://www.youtube.com/watch?v=mNNyW00eEc
Unit II	Instruction Cycle	https://www.youtube.com/watch?v=_W4Yd-yiyog
	Design of Accumulator Logic	https://www.youtube.com/watch?v=Veas4VD5b54
	RISC, CISC	https://www.youtube.com/watch?v=ZW1gb3h-f9k
	Addressing Modes	https://www.youtube.com/watch?v=_CH4cm5PhK8
Unit III	Pipeline and Vector Processing	https://www.youtube.com/watch?v=QLmDUABw0dE
	Array Processors	https://www.youtube.com/watch?v=WlQqig_awGw
	Amdahl's Law	https://www.youtube.com/watch?v=2dYV_IADfFI
Unit IV	Privileged & Non-Privileged Instructions	https://www.youtube.com/watch?v=z0URQryCbI0
	Memory organization	https://www.youtube.com/watch?v=lKVu02WjhoI
	Memory Hierarchy	https://www.youtube.com/watch?v=zwovvWfkuSg

Course Code	BSC-MECE-207B				
Category	Basic Science Courses				
Course Title	Mathematics-III				
Scheme and Credits	L	T	P	Credits	Semester-III
	3	1	0	4	
Course Objectives	The objectives of this course are • To understand and classify first and second-order linear partial differential equations, and apply appropriate solution techniques including complementary function and particular integral methods. • To solve and analyze physical models such as wave and diffusion equations using methods like separation of variables and D'Alembert's solution.				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Define partial differential equations and probability distributions, including their properties and physical relevance.
CO2	Solve second-order PDEs using complementary functions and particular integrals.
CO3	Apply probability concepts, including conditional probability and Bayes' Theorem, for real-world problems using discrete and continuous distributions.
CO4	Implement numerical methods (Bisection, Newton-Raphson, Euler, Runge-Kutta) for solving equations and ODEs with a focus on accuracy and efficiency.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/sections) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Partial Differential Equations: Partial Differential Equations of higher order, Solution to homogeneous and non-homogeneous linear partial differential equations of second order by complementary function and particular integral method, Initial and boundary conditions, D'Alembert's solution of the wave equation, Separation of variables method to simple problems in Cartesian coordinates.
Unit-II	Probability and Statistics: Measure of central tendency, Basic concept of Probability, Conditional Probability, Bayes' Theorem, Random Variables, Discrete and Continuous Distributions, Binomial, Poisson and Normal Distribution, Linear Regression and Correlation.
Unit-III	Numerical Methods 1: Solution of polynomial and transcendental equations – Bisection method, Regula-Falsi method and Newton-Raphson method, Finite differences, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference and Lagrange's formulae, Numerical differentiation, Numerical integration, Trapezoidal rule and Simpson's 1/3rd and 3/8 rules

Unit-IV	Numerical Methods 2: Taylor's series, Euler and modified Euler's methods, Runge-Kutta method of fourth order for solving first and second order ordinary differential equations. Matrix inversion (Gauss Seidel, Gauss Elimination Method, LU Decomposition).
----------------	--

Suggested Readings:

- Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons
- Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers
- Higher Engineering Mathematics by B. V. Ramana, TMH
- A text book of Engineering Mathematics by N. P. Bali and Manish Goyal, Laxmi Publications
- A text book of Engineering Mathematics by Mathur, A.B., PHI Learning
- Numerical Methods by Balagurusamy, E, TMH
- Introductory Methods of Numerical Analysis by S. S. Sastry, PHI
- Business Statistics by T.R. Jain and S.C. Aggarwal, VK Global Publications Pvt. Ltd.

Useful Video Links:

Unit No.	Topics	Links
Unit I	Definition of Partial Differential Equations	https://www.youtube.com/watch?v=KlZqe4UC1jk
	Second-order linear partial differential equations	https://www.youtube.com/watch?v=PVUfuiUWaZQ
	Solution to homogenous and non-homogenous linear P.D.E	https://www.youtube.com/watch?v=5eZbgxmpK3Q&t=520s
	Separation of variables method	https://www.youtube.com/watch?v=DgvQzfLpaTY&t=92s
Unit II	Basic concept of Probability, Conditional probability, Bays' theorem	https://youtu.be/60vHy2lA4o4 https://www.youtube.com/watch?v=ZFMcWe_SNyI https://www.youtube.com/watch?v=-ELHOnLwE9U
	Discrete and Continuous Distributions	https://www.youtube.com/watch?v=ruWsWnik7YY
	Binomial, Poisson and Normal Distribution	https://www.youtube.com/watch?v=eH4bao6elis
	Measure of central tendency	https://www.youtube.com/watch?v=X48cZ6DGaSw
	Linear Regression and Correlation	https://www.youtube.com/watch?v=_WM8vzYSQhs
Unit III	Bisection method, Regula-Falsi method and Newton-Raphson method	https://www.youtube.com/watch?v=3j0c_FhOt5U&list=PLU6SqDYcYsflk1VhXxIYNPFU67ym6gae8 https://www.youtube.com/watch?v=FLiKUWUVrEI&list=PLU6SqDYcYsflk1VhXxIYNPFU67ym6gae8&index=2 https://www.youtube.com/watch?v=7eHuQXMCovA&list=PLU6SqDYcYsflk1VhXxIYNPFU67ym6gae8&index=5
	Interpolation using Newton's forward and backward difference formulae, Newton's divided difference and Lagrange's formulae	https://www.youtube.com/watch?v=Y-yMQvYpltU https://www.youtube.com/watch?v=zdyUwzOm1zw https://www.youtube.com/watch?v=2h0R0Uka1HI
	Numerical integration, Trapezoidal rule and Simpson's 1/3rd and 3/8 rules	https://www.youtube.com/watch?v=EA76ONWBgK4&list=PLhSp9OSVmeyJBkLSO51JFPSEIIoeRiaJy
Unit IV	Taylor's series	https://www.youtube.com/watch?v=0JxwRqIM5t8&t=879s
	Euler and modified Euler's methods	https://www.youtube.com/watch?v=zD-Mg4ZUGsE&t=776s https://www.youtube.com/watch?v=zD-Mg4ZUGsE
	Runge-Kutta method	https://www.youtube.com/watch?v=iSO9DFcMDog

Course Code	PCC-ECE-209B				
Category	Professional Core Courses				
Course Title	Signal Systems & Network Analysis				
Scheme and Credits	L	T	P	Credits	Semester-III
	3	1	0	4	
Course Objectives	The objectives of this course are • To provide knowledge of signals and systems in time and frequency domains. • To introduce Fourier and Laplace methods for signal analysis. • To explain electrical network analysis using standard techniques and parameters. • To study transient response, network functions, and topology analysis.				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Explain and summarize various types of signals and systems by interpreting their properties and characteristics in time and frequency domains.
CO2	Apply Fourier Series and Fourier Transform techniques to determine signal spectra and evaluate system responses for different excitation signals.
CO3	Apply node, mesh and matrix analysis methods along with network theorems to determine responses of electrical networks.
CO4	Analyze electrical network behavior using network functions, pole-zero plots, two-port parameter relationships, state variable models and graph theory concepts.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/sections) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Introduction to Signal: Signal definition and classification with examples; continuous/discrete-time, analog/digital, deterministic/random, even/odd, causal/non-causal, real/complex, periodic/a periodic, energy/power, and elementary discrete-time signals. . Introduction to Systems: Continuous –Time & Discrete Time System, classifications of Systems: Causal and Non-causal Systems, Time-variant and Time-invariant Systems, Stable and Unstable Systems, Linear and non-linear systems, Static and Dynamic System, Invertible and inverse Systems.

Unit-II	Fourier Series (FS): Definition, Frequency domain representation of a signal, Existence of Fourier Series, Types of Fourier Series, Fourier Spectrum, Dirichlet's Condition, Concept of Gibbs phenomenon, Properties of Fourier Series. Fourier Transforms (FT): Definition, conditions of existence of FT, properties, magnitude and phase spectra, Some important FT theorems, Parseval's theorem, Inverse FT. State Space Analysis: State Variable Model, Variable Model using Physical variables, Variable Model using Phase variables.
Unit-III	Fundamentals of Network Analysis: Node and Mesh Analysis, matrix approach of network containing voltage and current sources. source transformation and duality. Network theorems: Superposition, reciprocity, Thevenin's, Norton's, Maximum power Transfer theorem. Network Functions: Terminal pairs or Ports, Network functions for one-port and two port networks, poles and zeros of Network functions, Time domain behavior from the pole-zero plot.
Unit-IV	Two port network and interconnections: Characteristics and parameters of two port networks, Network Configurations, short-circuit Admittance parameters, open-circuit impedance parameters, Transmission parameters, hybrid parameters, Inter-relationships between parameters of two-port network sets, Inter-connection of two port networks. Network Topology: Basic terminology of network topology, Principles of network topology, graph matrices, network analysis using graph Theory.

Suggested Readings:

- Network Analysis by M.E. Van, Valkenburg., Pearson Education, 3rd Edition
- Circuits and Network by Sudhakar A. Shyammohan, S. P., TMH
- Network Analysis and Synthesis by Raja, P; Singh, K.K, Raja, Umesh Publications
- Network Theory by Soni K.M., S.K. Kataria and Sons
- Network Theory and Filter Design by Aatre, Vasudev K, New Age International
- Signals & Systems by A. V. Oppenheim, A. S. Willsky, with S. Nawab, Pearson Education , 2nd Edition
- Signals & Systems by Nagrath & R. Ranjan, TMH
- Digital Signal Processing, Principles, Algorithms, & Applications by J. G. Proakis, D. G. Manolakis, Pearson Education, 4th Edition
- Signals & Systems by Dr. Sanjay Sharma, Katsons Books
- Digital Signal Processing By S. Salivahanan
- Signals & Systems by A. Anand Kumar, PHI , 3RD Edition

Useful Video Links:

Unit No.	Topics	Links
Unit-I	Basics of S&S	https://www.youtube.com/watch?v=PkFS5HutDiM&list=PLgwJf8NK-2e64X9h-rshDvVI76uD0gDOF&index=2
	LTI System	https://www.youtube.com/watch?v=EIYYhwTP1jk&list=PLBlnK6fEyqRhWw8GLfNIaWj7onqai8VjV
Unit-II	Fourier Transform	https://www.youtube.com/watch?v=rCw-FVegWJA&list=PLBlnK6fEyqRhkN2yGQpH40Pk-paIJzzvv
	Laplace Transform	https://www.youtube.com/watch?v=c9NibpoQjDk&t=9s
	State Variable technique	https://www.youtube.com/watch?v=DSvBXXnZv34&list=PLW6YlvHa65xg5asFyEm6hx0wjHNcaVpTT

Unit-III	Fundamentals of Network Analysis	https://www.youtube.com/watch?v=YhJWrhW3vjE&list=PL9RcWoqXmzaLG1SpJk_istSmesK4mZBiZ
Unit-IV	Two port network and interconnections	https://www.youtube.com/watch?v=pn777Ya0OHk&list=PLBlnK6fEyqRjQZj_QXvH8sp1lOWtjQCtT
	Transient Response of RC, RL, and RLC Circuits to various excitation signals	https://www.youtube.com/watch?v=Vb_OFPpynpg&list=PLgwJf8NK-2e58RyKZzw9t3mfXUqpJL6nV

Course Code	HSMC-02B				
Category	Humanities and Social Science including Management Courses				
Course Title	Economics for Engineers				
Scheme and Credits	L	T	P	Credits	Semester-III
	3	0	0	3	
Course Objectives	The objectives of this course are • To introduce the basic concepts of economics and their relevance to science, engineering, and national development. • To develop a foundational understanding of microeconomic principles such as demand, supply, production, cost, and market structures. • To equip students with tools to apply economic reasoning to real-world pricing, output, and market decisions. • To familiarize students with macroeconomic elements like the Indian economy, banking system, privatization, and globalization.				
Assessment	30 Marks				
End Semester Examination	45 Marks				
Total	75 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Describe economic concepts, the connection between economics with engineering and technological development, along with economic laws relevant to resource based decision making in society.
CO2	Explain economic growth theories and illustrate the role of engineering and technology in supporting economic development.
CO3	Apply theories of consumption and production to the design and development of engineering products.
CO4	Analyze market conditions; evaluate cost structures and financial aspects to assess the feasibility of engineering projects.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (covering all units) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Definition of Economics: Various Definitions, Types of Economics, Micro and Macro Economics, Nature of Economic Problem, Production Possibility Curve, Economic Laws and their Nature, Relationship between Science, Engineering, Technology and Economic Development. Demand: Meaning of Demand, Law of Demand, Elasticity of Demand, Meaning, Factors affecting the Elasticity of Demand, Practical Application and Importance.
Unit-II	Production: Meaning of Production and Factors of production, Law of Variable Proportions, Returns to Scale, Internal and External Economies and Diseconomies of Scale, Various concepts of Cost of Production- Fixed Cost, Variable Cost, Money Cost, Real Cost, Accounting Cost, Marginal Cost, Opportunity Cost, Shape of Average Cost, Marginal Cost, Total Cost etc. in short run and long run.

Unit-III	Market: Meaning of Market, Types of Market- Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly (main features). Supply: Supply and Law of Supply, Role of Demand and Supply in Price Determination and Effect of Changes in Demand and Supply on Prices.
Unit-IV	Indian Economy: Nature and Characteristics of Indian Economy as underdeveloped, developing and mixed economy (brief and elementary introduction). Privatization: Meaning, Merits and Demerits. Globalization of the Indian Economy: Merits and Demerits Banking: Concept of a Bank, Commercial Bank, Central Bank, Functions of a Bank, Difference between Commercial and Central Bank.

Suggested Readings:

- Modern Microeconomics: Theory and Applications by H.L. Ahuja, S. Chand & Company Pvt. Ltd.
- Indian Economy by S.K. Misra & V.K. Puri, Himalaya Publishing House
- Indian Economy : Principles and Policies by Srirangam, SriRam, ; Rohit Deo, Pearson Education
- Managerial Economics by R. Cauvery et al., S. Chand & Company Pvt. Ltd.
- Microeconomic Theory by Andreu; Whinston, Michael D ; Green, Jerry R, Oxford University Press.
- Principles of Economics by Case, Karl E; Fair, Ray C ; Oster, Sharon E, Pearson Education

Useful Video Links:

Unit No.	Topics	Links
Unit-I	Fundamental concepts of microeconomics, including definitions, types, and the nature of economic problems.	https://www.youtube.com/watch?v=IFtOcNbej0o&list=PLFNFJbo2hfBGRTCMuroZGyKNzacwmAH2L
Unit-II	Production and Cost of production	https://www.youtube.com/watch?v=VU1zySe-8NA
Unit-III	Theory of Markets	https://www.youtube.com/watch?v=HylqSa58lqQ
Unit-IV	Nature and characteristics of the Indian economy, highlighting aspects of underdevelopment and development.	https://www.youtube.com/watch?v=ME-0GOhhZcs&list=PLFW6lRTa1g83winAoIK92HL4xTytJaW7S

Course Code	LC-ECE-211B				
Category	Professional Core Courses				
Course Title	Electronic Devices Lab				
Scheme and Credits	L	T	P	Credits	Semester-III
	0	0	2	1	
Course Objectives	The objectives of this course are • To study the characteristics and applications of various electronic devices. • To analyze different transistor configurations and their behavior. • To explore the operation of field-effect transistors and their amplifier circuits. • To understand and test special semiconductor devices used in practical applications.				
Assessment	10 Marks				
End Semester Examination	15 Marks				
Total	25 Marks				
Duration of Exam					

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Examine the behavior of PN junction diodes under different biasing conditions and their applications in electronic circuits and filters.
CO2	Demonstrate the characteristics of special purpose semiconductor devices of thyristor family used in triggering and switching circuits.
CO3	Design and analyze transistor configurations in amplifiers and switches to optimize the performance of electronic circuits.
CO4	Demonstrate and analyze the characteristics of field-effect transistors under different configurations for electronic circuit applications.

List of Experiments

Sr.No.	Contents
1	To study and Analyze the characteristics of diode.
2	To study and Analyze zener diode as a voltage regulator.
3	To study and Analyze half wave and full wave rectifiers.
4	To study and Analyze power supply filters.
5	To study and Analyze diodes as a clipper and clamper.
6	To study and design of a DC voltage doubler.
7	To study and Analyze transistor as a constant current source in CE configuration
8	To study and Analyze CB & CC transistor configuration.
9	To study and Analyze CE amplifier for voltage, current and power gains input, output impedances.
10	To study characteristics of FET.
11	To study and Analyze FET common source amplifier.
12	To study characteristics of SCR.
13	To study characteristics of DIAC.
14	To study UJT as a relaxation oscillator.

Note: At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment under topic beyond syllabus.

Useful Video Links:

Sr. No.	Topics	Links
1	Characteristics of diode.	https://www.youtube.com/shorts/wVVDrphYtLI
2	Clipper and Clamper Circuits	https://www.youtube.com/watch?v=JAWswYG-jDA
3	DC voltage doubler	https://www.youtube.com/watch?v=779NQxJZeFc
4	UJT as a relaxation oscillator	https://www.youtube.com/watch?v=8AK0rxgsN9o
5	CE amplifier	https://www.youtube.com/watch?v=0iRs1XMNChI
6	Transistor configuration.	https://www.youtube.com/watch?v=DJHmaOb6Z7s

Course Code	LC-ECE-213B				
Category	Professional Core Courses				
Course Title	Signal Systems and Network Analysis Lab				
Scheme and Credits	L	T	P	Credits	Semester-III
	0	0	2	1	
Course Objectives	The objectives of this course are • To introduce circuit simulation tools for network analysis. • To analyze RLC circuits in time and frequency domains. • To design and study low-pass, high-pass, and band-pass filters. • To calculate and analyze two-port network parameters.				
Assessment	10 Marks				
End Semester Examination	15 Marks				
Total	25 Marks				
Duration of Exam					

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Demonstrate standard signals and visualize time-domain behaviors using circuit simulation tools.
CO2	Analyze RC, RL, and RLC circuits for transient and steady-state responses.
CO3	Design and examine the filter circuits by determining their frequency response characteristics.
CO4	Determine and verify two-port parameters and assess their effect on connected networks.

List of Experiments

Sr. No.	Contents
1	Introduction of circuit creation & simulation by relevant software.
2	To study various commands for creating two and three dimensional plots using simulation software.
3	Write a program to plot the continuous time and discrete time Step Function using simulation software.
4	Write a program to plot the continuous time and discrete time Impulse Function using simulation software.
5	Write a program to perform amplitude-scaling, time-scaling and time shifting on a given signal using simulation software.
6	Write a program to plot the continuous time and discrete Ramp Function using simulation software.
7	To plot the transient response of RC, RL circuit.
8	To find the resonance frequency, bandwidth of RLC series circuit.
9	To plot the frequency response of a low pass filter and determine half-power frequency.
10	To plot the frequency response of high pass filters and determines the half-power frequency.
11	To plot the frequency response of band-pass filters and determines the band-width.
12	To calculate and verify "Z" & "Y" parameters of a two port network.
13	To determine the equivalent parameter of parallel connections of two port networks and study loading effect.
14	To calculate and verify "ABCD" parameters of a two port network.

Note: At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiments under topic beyond the syllabus.

Useful Video Links:

Sr. No.	Topics	Links
1	Introduction of circuit creation & simulation software like TINAPRO	https://www.youtube.com/watch?v=REQ9K3qqp-0&list=PLsMtCcsO-QfbYqJOsWwcg97gtN0GxungD
2	Analyze the transient response of RC, RL, and RLC circuits using simulation tools to evaluate circuit behavior and performance.	https://www.youtube.com/watch?v=86OpfpZchOY
3	To calculate and verify "Z" & "Y" parameters of a two port network.	https://www.youtube.com/watch?v=Op__l8_kMes
4	To plot the frequency responses of a high pass filter and determine the half-power frequency.	https://www.youtube.com/watch?v=lagfhNjMuQM
5	To calculate and verify "ABCD" parameters of a two port network.	https://www.youtube.com/watch?v=5Q1coA-0-Tg
6	To plot the frequency response of a band-pass filter and determine the band-width.	https://www.youtube.com/watch?v=MG_OvKdhqiQ
7	Introduction to MATLAB	https://www.youtube.com/watch?v=0x4JhS1YpzI&list=PLjVLYmrlmjGcNZrPa9bRg0JVlcxLX4Mu9
8	Amplitude-scaling, Time-scaling and Time shifting on a given signal.	https://www.youtube.com/watch?v=IO3K7UpKcgY

Course Code	LC-ECE-215B				
Category	Professional Core Courses				
Course Title	Electronic Workshop & PCB Design Lab				
Scheme and Credits	L	T	P	Credits	Semester-III
	0	0	2	1	
Course Objectives	The objectives of this course are ● To understand and simulate electronic circuits using software tools. ● To learn the operation of PCB fabrication machines. ● To practice PCB fabrication processes and techniques. ● To design, assemble, and test printed circuit boards				
Assessment	10 Marks				
End Semester Examination	15 Marks				
Total	25 Marks				
Duration of Exam					

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Understand and apply simulation and PCB design tools for the design and development of electronic circuits.
CO2	Implement the process of etching, UV exposure, drilling and coating for PCB fabrication using standard tools and techniques.
CO3	Analyze circuit parameters and component behavior to design compact and efficient PCBs for optimized system performance.
CO4	Evaluate the functionality and performance of fabricated electronic circuits through testing and validation procedures.

List of Experiments

Sr. No.	Contents
1	Introduction & Hands on experience to use circuit creation & simulation software like TINAPRO, Edwin XP etc.
2	Identification of various active and passive devices used for circuit designing. such as R, C, L, transformers, relays, switches, bread board, universal printed circuit board, diode, Zener diode, light emitting diode, transistors etc.
3	To study the process of PCB fabrication and assembly, including etching, post-etching treatments and various component mounting techniques.
4	Design and verify half wave rectifier with software like TINAPRO/EdwinXP.
5	Design and verify full wave rectifier with software like TINAPRO/EdwinXP.
6	Design and verify half adder with software like TINAPRO/EdwinXP.
7	Design and verify full adder with software like TINAPRO/EdwinXP.
8	Convert the power supply circuit into PCB & simulates its 2D & 3D view.
9	To test the functionality and performance of the electronic circuit.
10	Design and simulate a regulated power supply circuit using LM317/7805 IC and convert it into a PCB layout.
11	Fabricate a simple electronic project on a PCB and test its functionality.

Note: At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiments under topic beyond the syllabus.

Useful Video Links:

Exp No.	Topics	Links
1	TINA- Introduction and DC Simulation	https://youtu.be/51ztp8zgEG8
2	Etching of PCB	https://youtu.be/QbAug00Ball
3	Exposing to UV Light & Developing	https://youtu.be/ILRdnfEM7YI
4	Power supply circuit using LM317/7805 IC and convert it into a PCB layout.	https://www.youtube.com/watch?v=d-j0onzzuNQ

Course Code	*MC-201B				
Category	Mandatory Courses				
Course Title	Environmental Science				
Scheme and Credits	L	T	P	Credits	Semester-III
	2	0	0	-	
Course Objectives	The objectives of this course are • Create awareness of the multidisciplinary nature and importance of environmental studies, including the sustainable management and conservation of natural resources. • Develop an understanding of ecosystem dynamics, biodiversity, pollution types, and their impacts on environmental and human health. • Foster critical thinking on social, ethical, and legislative aspects of environmental protection, emphasizing the role of individuals and society. • Engage students in practical learning through fieldwork and case studies to apply environmental concepts for sustainable development and responsible citizenship.				
Assessment	20 Marks				
End Semester Examination	30 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				
Remarks	The subject of Environmental Studies will be included as a qualifying paper in all UG Courses and the students will be required to qualify the same otherwise the final result will not be declared and degree will not be awarded. The duration of the course will be 40 lectures. The examination will be conducted along with the semester examinations. The marks in this qualifying paper will not be included in determining the percentage of marks obtained for the award of degree. However, these marks will be shown in the detailed marks certificate of the students.				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Describe key concepts of environmental studies, types of natural resources, ecosystem structures, pollution types, major environmental laws and human-environment interactions.
CO2	Explain the interrelationships among ecosystems, biodiversity, pollution, social issues, environmental ethics and related legislation for sustainable development.
CO3	Apply principles of environmental management, pollution control, disaster preparedness and sustainable practices in real-world and field-based environmental contexts.
CO4	Analyze environmental problems, population growth impacts, climate change, welfare programs and the role of information technology in promoting public health and environmental sustainability.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 4 parts (covering all units) of 1.5 marks each and remaining eight questions of 6 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	The Multidisciplinary nature of environmental studies. Definition scope and importance. Natural Resources: Renewable and non-renewable resources, Natural resources and associated problems. a) Forest resources: Use and over-exploitation: deforestation, case studies. Timber extraction, mining dams and their effects on forests and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams- benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes, caused by agriculture and overgrazing, effects of modern agriculture, fertilizer pesticide problems, Water logging, salinity, case studies. e) Energy resources: Growing energy needs; renewable and non- renewable energy sources, use of alternate energy sources, case studies. f) Land resources: Land as are source, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources, equitable use of resources for sustainable life styles
Unit-II	Ecosystems: Producers, Consumers and Decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, Food web sand ecological pyramids, Introduction, types, characteristic features, structure and function of Forest ecosystem, Grass land ecosystem, Desert ecosystem and Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Biodiversity and its conservation: Introduction, Definition, Genetic, Species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-spots of biodiversity. Threats to biodiversity, habitat loss, poaching of wild life, man-wild life conflicts, Endangered and endemic species of India, In-situ and ex-situ conservation of biodiversity.
Unit-III	Environmental Pollution: Definition, Causes, Effects and Control Measures of Air Pollution, Water Pollution, Soil Pollution, Marine Pollution, Noise Pollution, Thermal Pollution, Nuclear Hazards. Solids Waste Management: Causes, Effects and Control Measures of Urban and Industrial Wastes, Role of an Individual in Prevention of Pollution, Pollution Case Studies. Disaster Management: Floods, Earthquake, Cyclone and Landslides. Social issues and the Environment: From unsustainable to sustainable development, Urban problems related to energy, Water conservation, Rain Water Harvesting, Watershed Management, Resettlement and Rehabilitation of People, its problems and concerns case studies. Environmental Ethics: Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies, Waste land reclamation, Consumerism and waste products, Environment Protection Act, Air (Prevention and Control of pollution) Act, Water (Prevention and Control of pollution) Act, Wild life Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness.

Unit-IV	Human population and the Environment: Population growth, Variation among Nations, Population explosion-Family Welfare Programme, Environment and human health, Human Rights. Value Education, HIV/AIDS, Woman and Child Welfare Role of Information Technology in Environment and human health. Case Studies. Field Work (Field work equal to 10 lecture hours)-Visit to a local area to document environmental assets- river/forest/grassland/hill/mountain, Visit to a local polluted site-urban/Rural/Industrial/ Agricultural, Study of common plants, insects, birds, Study of simple ecosystems-pond, river, hills, slopes, etc.
----------------	--

Suggested Readings:

- Environmental Biology by K.C. Agarwal, Nidi Pub. Ltd., Bikaner
- The Biodiversity of India by Bharucha, MA Pin Publishing Pvt. Ltd., Ahmedabad.
- Hazardous Waste Incineration by R.C. Brunner, McGraw Hill Inc., 1989
- Environmental Chemistry by A.K. De, Wiley Eastern Ltd.
- Global Biodiversity Assessment by V.H. Heywood & R.T. Watson, Cambridge University Press, 1995, 1140p.
- Environmental Protection and Laws by H. Jadhav & V.M. Bhosale, Himalaya Pub. House, Delhi, 1995, 284p.
- Matter Hazardous by A.K. Mhaskar, Techno-Science Publications.
- Waste Water Treatment by M.N. Rao & A.K. Datta, Oxford & IBH Publ. Co. Pvt. Ltd., 1987, 345p.
- Environmental Chemistry by B.K. Sharma, Goel Publ. House, Meerut, 2001.
- Survey of the Environment, The Hindu.
- Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II by R.K. Trivedi, Enviro Media.
- Introduction to Air Pollution by R.K. Trivedi & P.K. Goel, Techno-Science Publications.
- Environmental Management by K.D. Wagner, W.B. Saunders Co., Philadelphia, USA, 1998, 499p.
- A Textbook of Environmental Education by Dr. J.P. Yadav, G.V.S. Publishers.

Useful Video Links:

Unit No.	Topics	Links
Unit-I	Environment Science: Introduction	https://www.youtube.com/watch?v=5QxxaVfgQ3k
	Natural Resources	https://www.youtube.com/watch?v=CXCT2R1K6Ts
	Ecosystem	https://www.youtube.com/watch?v=1dBU6HB8G6s
Unit-II	Biodiversity and its conservation	https://archive.nptel.ac.in/courses/102/104/102104068/
Unit-III	Sustainable Water Management In Urban Areas	http://digimat.in/nptel/courses/video/127106004/L29.ht
	Environmental Pollution	https://archive.nptel.ac.in/courses/123/105/123105001/
Unit-IV	Population and population growth	https://archive.nptel.ac.in/courses/102/104/102104068/
	National Family Welfare Programme	https://www.youtube.com/watch?v=X5F99L8ZEtc

Course Code	PCC-ECE-202B				
Category	Professional Core Courses				
Course Title	Analog and Digital Communication				
Scheme and Credits	L	T	P	Credits	Semester-IV
	3	0	0	3	
Course Objectives	The objectives of this course are • To understand the basic concepts of communication systems and the impact of noise on signals. • To study various techniques used for signal transmission and reception. • To learn methods for converting signals between analog and digital forms. • To understand the working principles of radio transmitters and receivers.				
Assessment	30 Marks				
End Semester Examination	45 Marks				
Total	75 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Define basic terminologies, signal types, communication modes and media used in analog and digital systems.
CO2	Understand and apply analog & pulse modulation and demodulation techniques used in communication systems for effective signal transmission.
CO3	Describe the structure and function of various radio transmitters and receivers used in communication systems.
CO4	Classify various modulation techniques and examine the impact of noise on signal quality and system performance

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (covering all units) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Introduction : Modulation, Demodulation, Radio Frequency Spectrum, Signals & their classification, Limitations & Advantages of a Communication System, Comparison of Analog & Digital Communication Systems, Historical Perspective, Modes & Medias of Communication. Noise: Sources of Noise, External & Internal Noise, Noise Ratio, Noise Figure, Noise Temperature, Noise in Communication Systems, Pre-Emphasis & De-Emphasis.
Unit-II	Amplitude Modulation: Basic definition & derivation for Modulation & Modulation Index, Modulation & Demodulation of AM, Suppressed Carrier Modulation: - SSB-SC, DSB-SC, VSB Modulation & Demodulation, Comparison of various AM Systems, Generation and Detection (Demodulation) of AM Waves. Quadrature Amplitude Modulation. Angle Modulation: Basic definition & derivation for Modulation & Modulation Index, Generation of FM & PM waves, Bandwidth & Frequency Spectrum of FM, Types of FM, Demodulation of FM & PM waves, Comparison between AM, FM & PM.

Unit-III	Pulse Analog Modulation: Sampling theory, Multiplexing & Demultiplexing (TDM, FDM), Sampling Techniques, PAM, PWM, PPM, Modulation & Demodulation techniques. Pulse Digital Modulation: Quantization, Elements of Pulse Code Modulation, Noise, Bandwidth & Channel Capacity of PCM System. Delta Modulation (DM), Adaptive Delta Modulation (ADM), Differential Pulse Code Modulation (DPCM). Comparison of PCM/DM/ADM/DPCM.
Unit-IV	Digital Carrier Modulation and Demodulation Techniques: coherent and non-coherent modulation and demodulation techniques including ASK, FSK, PSK, QPSK, MSK, and DPSK; M-ary modulation schemes including M-PSK, M-FSK, and M-QAM. Performance comparison of digital modulation techniques (ASK, FSK, PSK). Transmitters & Receivers: Basic Block Diagram of Radio Transmitter, Classification of Radio Transmitters, Basic Block Diagram of Radio Receiver, Classification of Radio Receivers.

Suggested Readings:

- Electronic Communication Systems, By Kennedy – TMH
- Communication Systems, By Singh & Sapre – TMH
- Communication System (Analog & Digital), Sanjay Sharma, Kataria & sons.
- Digital and Analog Communication Systems by Couch, Leon W, Pearson Education
- Communication System, By Manoj Duhan – I. K. International
- Analog Communication Systems by Chakraborty P, Dhanpat Rai & Company
- Communication System by Haykin, Simon, Wiley India

Useful Video Links:

Unit No.	Topics	Links
Unit-I	Introduction to Communication System	https://www.youtube.com/watch?v=INn5EQ9l5PE
	Noise in communication system	https://www.youtube.com/watch?v=u9nuKs2RAe0
Unit-II	Analog Modulation & Demodulation	https://www.youtube.com/watch?v=kAs8OerKRmc&list=PLgwJf8NK-2e7uyUYrpgUUQowmRuKxRdwp
Unit-III	Pulse Analog & Digital Modulation	https://youtu.be/TM47sEXeaj8?list=PLDp9Jik5WjRvjQ6ruRFC6hZcxnOsp3BE
Unit-IV	Digital Carrier Modulation and Demodulation Techniques	https://www.youtube.com/watch?v=01zv0thaAUw
	Radio Transmitters & Receivers	https://www.youtube.com/watch?v=iUBC-S_zLk4

Course Code	PCC-ECE-204B				
Category	Professional Core Courses				
Course Title	Analog Electronic Circuits				
Scheme and Credits	L	T	P	Credits	Semester- IV
	3	0	0	3	
Course Objectives	The objectives of this course are • To study working operation and behavior of transistors and amplifiers. • To understand different types of feedback which affects the overall performance of the circuit? • To learn working operation of oscillator circuits. • To study power amplifiers, voltage regulators, and the basics of operational amplifiers with practical circuit applications.				
Assessment	30 Marks				
End Semester Examination	45 Marks				
Total	75 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Analyze the frequency response of BJTs and multistage amplifiers to determine gain, bandwidth, and high-frequency performance.
CO2	Design and implement feedback mechanism in amplifiers and oscillators used for improving the performance of analog circuits.
CO3	Classify power amplifiers and voltage regulators to ensure efficient power management in analog and mixed-signal circuits.
CO4	Understand and apply the process, principles and characteristics of operational amplifiers and IC fabrication for designing the electronic circuits.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (covering all units) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Multistage Amplifier: Classifications of amplifiers, Multistage amplifier voltage gain, RC Coupled Transistor Amplifier, Frequency response of RC Coupled Transistor Amplifier, Lower & Upper Cut off Frequency response, Transformer Coupled Amplifier, Direct Coupled Amplifier, Cascode Amplifier, Darlington Pair Amplifier, Distortion In Amplifiers. Feedback Amplifiers: Feedback concept, Transfer Gain with Feedback, General Characteristics of Negative Feedback, Effects of Negative Feedback on gain, Transfer gain, Input and Output Resistance calculation of feedback amplifiers/topologies: Voltage Series Feedback topology, Voltage Shunt, Current Series & Current Shunt topology.

Unit-II	Oscillators: Barkhausen Criterion, Condition for Sustained Oscillations & Frequency of Oscillations, Oscillator with RC Feedback circuit (RC Phase Shift, Wien Bridge), Tuned Collector Oscillator, LC Feedback circuits (Hartley, Colpitts) oscillators, Crystal Oscillator. Power Amplifier: Definition, Application & Types of Power Amplifiers, Class - A, B, AB, C, D power amplifier, Push Pull Amplifiers, Distortion in Simple & Push Pull Amplifier, Complementary Push Pull Amplifier and Integrated Circuit Power Amplifier.
Unit-III	Voltage Regulators: Voltage Regulation, Basic Series Regulators, Basic Shunt Regulators, Power Supply Parameters, Basic Switching Regulators, Step up Configuration, Step down Configuration, IC Voltage Regulator, SMPS. Integrated Circuit Fabrication Process: oxidation, diffusion, ion implantation, photolithography, etching, chemical vapour deposition, sputtering, twin-tub CMOS process.
Unit-IV	Operational Amplifier Fundamentals: Block Diagram Representation, Ideal Op-Amp, OP-AMP Equivalent Circuit, Ideal Voltage Transfer Curve, Input Offset Voltage, Input Bias Current, Input Offset Current, Output Offset Voltage, Thermal Drift, Common Mode Configuration and CMRR, Slew Rate, Frequency Response of Op-Amp, Open loop and closed loop Configurations of an Op-Amp, Op-Amp as summing, scaling and averaging amplifier, Integrator, Differentiator. Operational Amplifier Applications: Linear and non-linear applications-ADC and DAC, Multivibrators, Astable Multivibrator, Monostable Multivibrator, Bistable Multivibrator, 555 Timer, Monostable & Astable Operation with 555 Timer.

Suggested Readings:

- Integrated Electronics By Millman Halkias -- TMH.
- Electronics Device & Circuit By Robert Boylestad, Louis Nashelsky, 11th Edition, Pearson Education.
- Electronics Device & Circuit Theory By Nagrath, I.J., PHI Learning
- Electronics Device & Integrated Circuit By Singh, A K, PHI Learning
- A Textbook of Electronic Devices and Circuits by Gupta, J.B., S.K. Kataria and Sons
- Integrated Electronics : Analog and Digital Circuits and Systems by Millman, Jacob, TMH
- Applications and Design with analog Integrated Circuits by Jacob, Michael, Pearson Education

Useful Video Links:

Unit No.	Topics	Links
Unit-I	RC Coupled Amplifiers	https://youtu.be/BSR26SU3R2U
Unit-II	Power Amplifiers	https://youtu.be/huDZjQcEBMg
Unit-III	Voltage regulators	https://youtu.be/R_QnIAEk7Go
Unit-IV	Operational Amplifier	https://youtu.be/clTA0pONnMs

Course Code	PCC-ECE-206B				
Category	Professional Core Courses				
Course Title	Digital Electronics				
Scheme and Credits	L	T	P	Credits	Semester- IV
	3	1	0	4	
Course Objectives	The objectives of this course are ● To learn fundamentals of digital logic and Boolean algebra. ● To design combinational and sequential logic circuits. ● To understand ADC/DAC and memory devices. ● To study programmable logic devices like FPGA and CPLD.				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Understand the knowledge of Boolean algebra, K-MAP and other digital design methods for simplification and optimization of digital circuits.
CO2	Design and implement combinational logic circuits using logic gates for arithmetic operations, code conversion, and control applications.
CO3	Understand and apply the concepts of latches, flip-flops, and counters in designing synchronous and asynchronous circuits for memory and storage applications.
CO4	Analyze memory types and programmable logic device architectures to interpret the functional organization.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/sections) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Logic Simplification: Review of Boolean Algebra and De Morgan's Theorem, Digital codes, Logic gates and their operations, Realization of logic gates using universal gates, Number system, Representation of Boolean functions in sum of products (SOP) form and product of sums (POS), Addition and subtractions of a complements numbers, Minimization of Boolean functions using Karnaugh map and Quine McCuskey methods, Error detection and correction techniques using Parity Check method and Hamming Code
Unit-II	Combinational Logic Design: Half and Full Adders, Half and Full Subtractors, Multiplexers, Demultiplexers, Encoder, Decoder, Magnitude Comparators, Priority encoder, Parallel Adders, Adder with Look Ahead Carry, BCD Adder.

Unit-III	Sequential Logic Design: Latches, Concept of edge triggered and level triggered clock, S-R, JK and Master-Slave JK FF, D FF, T FF, Conversions of FF, Ripple and Synchronous counters, Ring and Johnson counter, UP & DOWN counter, Sequence Generator, Shift registers.
Unit-IV	A/D and D/A Converter: Sample and hold circuit, weighted resistor and R -2 R ladder D/A Converters, specifications for D/A converters. A/D converters: Quantization, parallel - comparator, successive approximation, counting type, dual-slope ADC, specifications of ADCs. Programmable Logic Devices: ROM, PLA, PAL, SRAM, DRAM. FPGA and CPLDs

Suggested Readings:

- Modern digital Electronics by R.P. Jain, Tata McGraw Hill, 4th edition.
- Switching Theory & Logic Design by A.Anand Kumar, PHI.
- Digital Electronics Circuit and System by V K Puri, TMH.
- Digital Circuits and Systems by D.V. Hall, Tata McGraw Hill.
- Principle of Digital Electronics by K Meena, PHI
- Logic & Computer Fundamentals by Morris Mano, Pearson Education, 4th Edition.

Useful Video Links:

Unit No.	Topics	Links
Unit-I	Boolean Algebra	https://www.youtube.com/shorts/xtAYbY_Pz7I
Unit-II	Multiplexer	https://www.youtube.com/watch?v=p6yPvw88BJk
	Combinational Circuits	https://www.youtube.com/watch?v=fXrbYMDDevDU
Unit-III	Sequential Circuits	https://www.youtube.com/watch?v=S0mKCNLmCh4&list=PLgwJf8NK-2e4mEQv0ttgW-am4wiqrpdcX
	Counter	https://www.youtube.com/watch?v=NTCrCYPoA5A&list=PLgwJf8NK-2e6lcDg0NxW-_yO6BI5dPBp8
Unit-IV	Finite state machines	https://www.youtube.com/watch?v=LOZxYBOKRLg
	PLD's	https://www.youtube.com/watch?v=m6975d-U6j8

Course Code	PCC-ECE-208B					
Category	Professional Core Courses					
Course Title	Microprocessor and Microcontroller					
Scheme and Credits	L	T	P	Credits	Semester- IV	
	3	0	0	3		
Course Objectives	The objectives of this course are ● To understand the architecture and instruction set of microprocessors (8086, x86) and microcontrollers (8051, ARM). ● To develop low-level programming skills using assembly language. ● To learn peripheral interfacing concepts such as timers, I/O ports, ADC/DAC, and communication protocols. ● To explore advanced processors and embedded system using ARM Architecture.					
Assessment	30 Marks					
End Semester Examination	45 Marks					
Total	75 Marks					
Duration of Exam	03 Hours					

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Describe the features and architecture of Intel processors and microcontrollers for signal descriptions and system design.
CO2	Use addressing modes and instructions of microprocessors and microcontrollers to write simple and efficient assembly programs.
CO3	Classify the interrupts and modes of operation in microprocessors and microcontrollers and analyze their impact on system performance and functionality.
CO4	Apply appropriate data transfer schemes and hardware for transfer data between the of peripheral devices for interfacing I/O devices.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (covering all units) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Fundamentals of Microprocessors and Programming: Introduction to Microprocessors: Evolution, 8-bit/16-bit (8085/8086), Architecture, Pin configuration, Addressing modes and register organization of 8085. 8086 Architecture: Pin configuration, Register organization, Addressing Modes, Memory Segmentation, Instruction Set of 8086, Minimum/Maximum Mode, Assembly language programming of 8086.

Unit-II	Microprocessor Interfacing Overview of Intel Pentium family processor, Overview of Multi-core Processors and Mobile Processor, Memory Interfacing, Peripheral Interfacing (8255 PPI, 8254 Timer, 8237 DMA, 8259 PIC), Concepts of Interrupts and DMA. Memory Concepts: Cache Memory, Virtual Memory – Mapping and Access Mechanisms.
Unit-III	8051 Microcontroller and Interfacing: 8051 Architecture: RAM/ROM layout, machine cycle, I/O structure, Instruction Set: Addressing Modes, Data Transfer, Arithmetic, Logical, Branching, Assembly Language Programming. Peripherals and Interfacing: Timers/Counters, Serial Communication, Interrupts, ADC, DAC, LCD, LED, Keypad.
Unit-IV	ARM Processor Architecture and Instruction set : RISC vs. CISC, ARM Design Philosophy, ARM Architecture: States (ARM, Thumb, Jazelle), Register, Sets, Modes, Pipelining ARM Instruction Set: Data Processing, Load/Store, Branch, Conditional Execution, SWI, Vector Tables, Exception Handling.

Suggested Readings:

- Microprocessors and interfacing by D. V. Hall,, TMH, 2nd Edition.
- Microprocessor 8086: Architecture, Programming and Interfacing by Sunil Mathur, PHI Publisher
- Microprocessors and Microcontrollers by Sunil Mathur, Jeebananda Panda, PHI Publisher
- Advanced Microprocessors and Peripherals Architectures, Programming and Interfacing by Ray A. K. and Burchandi, TMH.
- The Intel Microprocessors 8086- Pentium Processor by Brey, 8th Edition, Pearson Education.
- The X86 PC: Assembly Language, Design and interfacing by M. A. Mazidi, J. P. Maizidi and Danny Causey, 5th Edition, Pearson Education.
- Microcontrollers: Architectures, Programming, Interfacing and System Design by Raj Kamal, Pearson Education

Useful Video Links:

Unit No.	Topics	Links
Unit-I	Microprocessors and Interfacing – NPTEL Focuses on the interfacing aspects of microprocessors, covering essential concepts and practical applications	https://www.youtube.com/playlist?list=PLdlPA9pGVVtaUwRP-2Eaux10vo_USuDy1
	Microprocessors & Microcontrollers by Prof. Sunil Mathur	https://www.youtube.com/@profsunilmathur8809
Unit-II	Advanced Microprocessors and Memory Systems	https://www.youtube.com/playlist?list=PLuv3GM6-gsE01L9yDO0e5UhQapkCPGnY3
Unit-III	8051 Microcontroller and Interfacing ,The 8051 Microcontroller and Embedded Systems by Prof. Santanu Chattopadhyay (IIT Kharagpur)	https://www.youtube.com/playlist?list=PLEPI1RnS5drMCNu1VPDwdrRO_U0awwTxJ
Unit-IV	ARM Processor Architecture and Embedded Design, Embedded System Design with ARM by Prof. Dhananjay V. Gadre (IIT Delhi). Focuses on ARM architecture and its application in embedded system design, offering practical insights and examples.	https://www.youtube.com/playlist?list=PLbRMhDVUMngcJu5oUhpgpYqtOn7DmSfuU

Course Code	PEC-ECE-210B				
Category	Professional Elective Courses				
Course Title	Scientific Computing				
Scheme and Credits	L	T	P	Credits	Semester- IV
	3	0	0	3	
Course Objectives	The objectives of this course are • To understand different types of errors in numerical computation. • To understand advanced computational techniques. • To solve linear and nonlinear systems, and perform data fitting.				
Assessment	30 Marks				
End Semester Examination	45 Marks				
Total	75 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Define errors, stability, conditioning and other key terminologies related to computer arithmetic and numerical methods.
CO2	Describe the purpose, strengths, and application areas of numerical methods used in solving engineering and scientific problems.
CO3	Apply methods to solve linear and nonlinear systems, data fitting, interpolation, differentiation, integration, and differential equations.
CO4	Analyze the performance, accuracy, and limitations of numerical algorithms and their applications in simulation, optimization, and signal processing.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (covering all units) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Introduction: Sources of Approximations, Data Error and Computational, Truncation Error and Rounding Error, Absolute Error and Relative Error, Sensitivity and Conditioning, Backward Error Analysis, Stability and Accuracy Computer Arithmetic: Floating Point Numbers, Normalization, Properties of Floating Point System, Rounding, Machine Precision, Subnormal and Gradual Underflow, Exceptional Values, Floating-Point Arithmetic, Cancellation.
Unit-II	System of linear equations: Linear Systems, Solving Linear Systems, Gaussian elimination, Pivoting, Gauss-Jordan, Norms and Condition Numbers, Symmetric Positive Definite Systems and Indefinite System, Iterative Methods for Linear Systems Linear least squares: Data Fitting, Linear Least Squares, Normal Equations Method, Orthogonalization Methods, QR factorization, Gram-Schmidt Orthogonalization, Rank Deficiency, and Column Pivoting Eigen values and singular values: Eigen values and Eigenvectors, Methods for Computing All Eigen values, Jacobi Method, Methods for Computing Selected Eigenvalues, Singular Values Decomposition, Application of SVD

Unit-III	Nonlinear equations: Fixed Point Iteration, Newton's Method, Inverse Interpolation Method Optimization: One-Dimensional Optimization, Multidimensional Unconstrained Optimization, Nonlinear Least Squares Interpolation: Purpose for Interpolation, Choice of Interpolating, Function, Polynomial Interpolation, Piecewise Polynomial Interpolation Numerical Integration And Differentiation: Quadrature Rule, Newton-Cotes Rule, Gaussian Quadrature Rule, Finite Difference Approximation
Unit-IV	Initial Value Problems for ODES, Euler's Method, Taylor Series Method, RungeKutta Method, Extrapolation Methods, Boundary Value Problems For ODES, Finite Difference Methods, Finite Element Method, Eigen value Problems Partial Differential Equations, Time Dependent Problems, Time Independent Problems, Solution for Sparse Linear Systems, Iterative Methods Fast Fourier Transform, FFT Algorithm, Limitations, DFT, Fast polynomial Multiplication, Wavelets, Random Numbers And Simulation, Stochastic Simulation, Random Number Generators, Quasi-Random Sequences

Suggested Readings:

- Scientific Computing: An Introductory Survey by Heath Michael T., McGrawHill, latest edition.
- Numerical Recipes: The Art of Scientific Computing by Press William H., Saul A. Teukolsky, Vetterling William T and Brian P. Flannery, Cambridge University Press, latest edition
- Introduction To Computational Mathematics by Xin-she Yang (Ed.), World Scientific Publishing Co.
- Computational Science by Kiryanov D. and Kiryanova E., Infinity Science Press, latest edition
- Scientific Computing With MATLAB And Octave by Quarteroni, Alfio, Saleri, Fausto, Gervasio and Paola, Springer, latest edition.

Useful Video Links:

Unit No	Topics	Links
Unit-I	Data Error and Computational, Truncation Error and Rounding Error	https://www.youtube.com/watch?v=nPZmfpFrgPo
Unit-II	Positive Definite Systems and Indefinite System	https://www.youtube.com/watch?v=ttMZB5Gm_fm
Unit-III	One-Dimensional Optimization, Multidimensional Unconstrained Optimization	https://www.youtube.com/?bp=wgUCEAE%3D
Unit-IV	Solution for Sparse Linear Systems	https://www.youtube.com/watch?v=gwqbNtFuvWU

Course Code	PEC-ECE-212B				
Category	Professional Elective Courses				
Course Title	Power Electronics				
Scheme and Credits	L	T	P	Credits	Semester- IV
	3	0	0	3	
Course Objectives	The objectives of this course are • To understand the construction and working of power electronic devices. • To design and analyze rectifiers, inverters, choppers, and converters. • To study different control techniques for AC and DC electric drives. • To explore real-world applications of power electronics in systems like UPS and electric vehicles.				
Assessment	30 Marks				
End Semester Examination	45 Marks				
Total	75 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Explain the construction, working principles, and characteristics of power electronic devices.
CO2	Analyze single-phase and three-phase controlled rectifier circuits and inverter configurations for various load conditions.
CO3	Apply the concepts of choppers, dual converters, and cyclo- for efficient power control and conversion in electrical systems.
CO4	Implement thyristor-based control strategies for DC and AC electric drives and identify real- world applications of power.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (covering all units) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Role of power electronics, SCR- Construction, working principles of SCR, V-I characteristics of SCR, Two transistor analogy of SCR, Protection of SCR, Different methods of SCR triggering, Different commutation circuits for SCR, Construction, working principle & V-I characteristics of DIAC, TRIAC, IGBT, GTO, MOSFET, UJT. Basic idea about the selection of Heat sink for thyristors.
Unit-II	Controlled Rectifiers: Single phase half wave-controlled rectifier with R, R-L Load & concept of freewheeling diode, Single phase half controlled full wave rectifier with R, R-L Load), Single phase fully controlled full wave rectifier (centre tapped and bridge), Three phase full wave half-controlled and fully controlled bridge rectifier (R Load)
Unit-III	Inverters: Principle of operation of basic inverter circuits, concepts of duty cycle, series & parallel, inverters & their applications. Choppers: Introduction, types of choppers (Class A, Class B, Class C, Class D and Class E). Step up and step-down choppers. Comparison of various choppers.

Unit-IV	Dual Converters and cyclo-converters: Introduction, types & basic working principle of dual converters and cyclo-converters & their applications. Thyristorised Control of Electric Drives: DC drive control (half-wave, full-wave, and chopper-fed drives), AC drive control (phase control, V/f control, inverter/cycloconverter drives, and slip control) applications of power electronic devices. UJT as relaxation oscillator.
----------------	--

Suggested Readings:

- Power electronics by Muhammad H. Rashid, Prentice Hall of India.
- Power electronics by PC Sen, 2nd edition, TMH.
- Power Electronics: Devices, Circuits, and Matlab Simulation by Alok Jain, Pernam international Publication.
- Power Electronics by M H Rashid, 3rd Edition, Pearson Education.
- Power Electronics and drive by Sachin Sharma, Vayu Education.

Useful Video Links:

Unit No	Topics	Links
Unit-I	Two transistor analogy of SCR	https://www.youtube.com/watch?v=uN42NhZCU_M
Unit-II	Single phase half controlled full wave rectifier	https://www.youtube.com/watch?v=IFrbdI9AsQE
Unit-III	Step up and step-down choppers	https://www.youtube.com/watch?v=8UbLt2U1Ydw
Unit-IV	Thyristorised Control of Electric drives DC drive control	https://www.youtube.com/watch?v=q4YECr8R5I

Course Code	PEC-ECE-214B					
Category	Professional Elective Courses					
Course Title	Introduction to Artificial Intelligence					
Scheme and Credits	L	T	P	Credits	Semester-IV	
	3	0	0	3		
Course Objectives	The objectives of this course are • To understand the fundamentals of artificial intelligence. • To study AI search and problem-solving techniques. • To learn knowledge representation and logical reasoning methods. • To explore planning and probabilistic reasoning in AI systems.					
Assessment	30 Marks					
End Semester Examination	45 Marks					
Total	75 Marks					
Duration of Exam	03 Hours					

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
CO2	Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
CO3	Analyze Supervised Learning Vs. Learning Decision Trees.
CO4	Design and Implement the applications of Probabilistic Reasoning and Bayesian Networks.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (covering all units) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Introduction to AI - Intelligent Agents, Problem-Solving Agents, Searching for Solutions - Breadth-first search, Depth-first search, Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces.
Unit-II	Games - Optimal Decisions in Games, Alpha-Beta Pruning, Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Knowledge-Based Agents, Logic Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses.
Unit-III	First-Order Logic - Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution. Knowledge Representation: Ontological Engineering, Categories and Objects, Events.

Unit-IV	Planning - Definition of Classical Planning, Algorithms for Planning with State Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches. Hierarchical Planning. Probabilistic Reasoning: Acting under Uncertainty, Basic Probability Notation Bayes' Rule and Its Use, Probabilistic Reasoning, Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions.
----------------	--

Suggested Readings:

- Introduction to Artificial Intelligence by Rajendra Akerkar, PHI Publications.
- Artificial Intelligence: A modern approach by Stuart Russell & Peter Norvig, Pearson Publications Fourth Edition.
- Modern Microeconomics: Theory and Applications by H.L. Ahuja, S. Chand & Company Pvt. Ltd.
- Introduction to Artificial Intelligence and Machine Learning by Dr. Swapna, Dr, Bharat Kumar GJ, Dr. Bhoomeshwar Bala, Walnut publications.

Useful Video Links:

Unit No.	Topics	Links
Unit-I	Introduction to Artificial Intelligence	https://www.youtube.com/watch?v=uB3i-qV6VdM&list=PLxCzCOWd7aiHGhOHV-nwb0HR5US5GFKFI
Unit-II	Constraint Satisfaction Problem (CSP) in AI with Example Constraint Satisfaction Algorithm Works	https://www.youtube.com/watch?v=AgyCSmDVk5s https://www.youtube.com/watch?v=udOfKqeLVSg
Unit-III	First order/Predicate logic Artificial Intelligence Negation of Quantifiers Predicate Logic	https://www.youtube.com/watch?v=Aw3EOSr64j0 https://www.youtube.com/watch?v=XYfTz5gziBk
Unit-IV	Planning Introduction - Artificial Intelligence Planning Graph in Artificial Intelligence	https://www.youtube.com/watch?v=TK7ORfbT5UI&list=PLAhr0cis_HGUOO9ISd4dTJ-37qCFtlBgh https://www.youtube.com/watch?v=JGrU9Bcf4wA&list=PLAhr0cis_HGUOO9ISd4dTJ-37qCFtlBgh&index=7

Course Code	PEC-ECE-216B					
Category	Professional Elective Courses					
Course Title	Introduction To MEMS					
Scheme and Credits	L	T	P	Credits	Semester-IV	
	3	0	0	3		
Course Objectives	The objectives of this course are • The objectives of this course are • To introduce fundamentals of MEMS, microsystems, scaling, and their applications. • To provide knowledge of MEMS fabrication and micromachining techniques. Applications. • To Develop understanding of mechanical behaviour in MEMS structure. • To Familiarize with modeling and analysis of MEMS devices.					
Assessment	30 Marks					
End Semester Examination	45 Marks					
Total	75 Marks					
Duration of Exam	03 Hours					

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Define MEMS concepts, scaling principles and applications of micro/nano sensors and actuators.
CO2	Explain MEMS fabrication and micromachining techniques for development of microsystems.
CO3	Apply fundamental stress, strain, and energy principles to analyze the mechanical behavior of MEMS structures.
CO4	Analyze MEMS devices using finite element and coupled electromechanical approaches.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (covering all units) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Overview of MEMS and Microsystems: Introduction Microsystems vs. MEMS, Microsystems and Microelectronics, the Multidisciplinary Nature of Microsystems design and manufacture, Application of MEMS in various industries.
Unit-II	Review of Basic MEMS fabrication modules: Oxidation, Deposition Techniques, Lithography (LIGA), and Etching. Micromachining: Surface Micromachining, sacrificial layer processes, Stiction; Bulk Micromachining, Isotropic Etching and Anisotropic Etching, Wafer Bonding.
Unit-III	Mechanics of solids in MEMS/NEMS: Stresses, Strain, Hooke's law, Poisson effect, Linear, Thermal Expansion, Bending; Energy methods. Introduction to Scaling, Scaling in Geometry, Rigid Body dynamics, Electrostatic forces, Electromagnetic forces, Electricity, Fluid Mechanics, Heat Transfer.
Unit-IV	Overview of Finite Element Method, Modeling of Coupled Electromechanical Systems: Electrostatics, Coupled electro mechanics.

Suggested Readings:

- Microsystem Design by Stephen D.Senturia, Kluwer academic publisher,2001.
- Micro-Electromechanical systems by S. E.Lyshevski .
- Fundamentals of Nano-and Microengineering by M. Madou, CRC press, 2005.
- Fundamentals of Microfabrication by M. Madou, CRC Press, 1997.
- Micromachined Transducers Sourcebook by G. Kovacs, McGraw-Hill, Boston, 1998.
- Micromechanical Transducers by M.H. Bao , New York, 2000.

Useful Video Links:

Unit No.	Topics	Links
Unit-I	Introduction to MEMS & Microsystems MEMS Introduction and Applications	https://www.youtube.com/watch?v=j9y0gfN9WMg onlinecourses.nptel.ac.in
Unit-II	MEMS Fabrication	https://onlinecourses.nptel.ac.in/noc19_ee40/preview
Unit-III	Mechanics of Solids	https://nptel.ac.in/courses/105104160
Unit-IV	A brief Introduction of Micro-Sensors	http://digimat.in/nptel/courses/video/108106165/108106165.html

Course Code	HSMC-01B				
Category	Humanities and Social Sciences including Management Courses				
Course Title	Fundamental of Management and Organizational Behavior				
Scheme and Credits	L	T	P	Credits	Semester-IV
	3	0	0	3	
Course Objectives	The objectives of this course are • To introduce students to foundational management theories, functions, and organizational concepts to build a strong conceptual framework. • To develop understanding of individual and group behavior, motivation, communication, and leadership in organizational settings. • To equip students with practical skills to manage interpersonal processes, conflicts, and team dynamics effectively. • To foster critical analysis of organizational structures, cultures, and change mechanisms to enhance adaptability and effectiveness in organizations.				
Assessment	30 Marks				
End Semester Examination	45 Marks				
Total	75 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Define fundamental management concepts, functions, organizational processes, and organizational behavior elements.
CO2	Explain the roles, skills, and interrelationships in management, individual behaviors, group dynamics, and communication processes within organizations.
CO3	Apply principles of management, motivation techniques, leadership styles, and conflict management strategies to solve organizational behavior challenges.
CO4	Analyze organizational structure, culture, change processes, and behavioral dynamics to support effective decision-making and organizational development.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (covering all units) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit No.	Contents
Unit-I	Introduction of Management: Meaning, Definitions, Nature of Management; Managerial Levels, Skills and Roles in an Organization. Functions of Management: Planning, Organizing, Staffing, Directing & Controlling, Interrelationship of Managerial Functions, Scope of Management, Importance of Management, Difference between Management and Administration.

Unit-II	Introduction of Organization: Meaning and Process of Organization, Management v/s Organization. Fundamentals of Organizational Behavior: Concepts, Evolution, Importance and Relationship with other Fields, Contemporary Challenges and Opportunities of OB Individual Processes and Behavior: Personality, Concept, Determinants and Applications. Perception: Concept, Process and Applications. Learning: Brief Introduction. Motivation: Concept, Techniques and Importance.
Unit-III	Interpersonal Processes: Teams and Groups, Definition of Group, Stages of Group Development, Types of Groups, Meaning of Team, Merits and Demerits of Team, Difference between Team and Group, Conflict- Concept, Sources, Types, Management of Conflict. Leadership: Concept, Function, Styles, Qualities of Leadership. Communication: Meaning, Process, Channels of Communication, Importance and Barriers of Communication.
Unit-IV	Organizational Processes: Organizational Structure, Meaning and Types of Organizational Structure and their effect on Human Behavior. Organizational Culture: Elements, Types and Factors affecting Organizational Culture. Organizational Change: Concept, Types and Factors affecting Organizational Change, Resistance to Change.

Suggested Readings:

- Fundamentals of Management by Robbins, S.P. and Decenzo, Pearson Education, New Delhi.
- Organisational Behaviour by Robbins, S.P. & Judge, T.A., Prentice Hall of India, New Delhi.
- Management concept practice and cases by Ghuman Karminder, AswathappaK.,TM, New Delhi.
- Fundamental of Management by Chhabra T. N., Sun India Publications, New Delhi.
- Organizational Behaviour by Stephen P Robin, Pearson Education.
- Organizational Behaviour by McShane, Steven L, Tata McGraw Hill, New Delhi.
- Organizational Behaviour by FC Sharma, Shree mahavir publications.

Useful Video Links:

Unit No.	Topics	Links
Unit-I	Nature and Scope of Management	https://nptel.ac.in/courses/110105146
Unit-II	Perception and Personality	https://nptel.ac.in/courses/110103433
Unit-III	Group Dynamics	https://archive.nptel.ac.in/courses/110/106/110106145/
Unit-IV	Organizational Change, Resistance to Change.	https://nptel.ac.in/courses/110105146

Course Code	LC-ECE-218B				
Category	Professional Core Courses				
Course Title	Analog & Digital Communication Lab				
Scheme and Credits	L	T	P	Credits	Semester- IV
	0	0	2	1	
Course Objectives	The objectives of this course are • To understand the basic principles of analog modulation and demodulation techniques like AM, FM, and PM. • To learn and observe the waveform analysis of pulse modulation and demodulation methods. • To study digital modulation techniques such as ASK, FSK, and PSK with waveform analysis.				
Assessment	10 Marks				
End Semester Examination	15 Marks				
Total	25 Marks				
Duration of Exam					

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Apply various analog modulation schemes for representation of AM, FM, PM signals.
CO2	Implement various analog detection methods for optimized & effective signal reception.
CO3	Examine the performance and applications of various pulse modulation & demodulation techniques used in communication systems.
CO4	Categorize different digital modulation & demodulation schemes used in modern communication systems.

List of Experiments

Sr. No.	Contents
1	To study and waveform analysis of amplitude modulation and determine the modulation index of amplitude modulation.
2	To study and waveform analysis of amplitude demodulation by any method.
3	To study and waveform analysis of frequency modulation and determine the modulation index of frequency modulation.
4	To study and waveform analysis of frequency demodulation by any method.
5	To study and waveform analysis of phase modulation.
6	To study Phase demodulation.
7	To study Pulse amplitude modulation and demodulation.
8	To study Pulse width modulation and demodulation.
9	To study Pulse position modulation and demodulation.
10	To study Pulse code modulation.
11	To study delta modulation.
12	To study Amplitude Shift Keying (ASK) modulation.
13	To study Frequency Shift Keying (FSK) modulation.
14	To study Phase Shift Keying (PSK) modulation.

Note: At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiments under topic beyond syllabus.

Useful Video Links:

Sr. No.	Topics	Links
1	Analog Modulation & Demodulation	https://www.youtube.com/watch?v=kAs8OerKRmc&list=PLgwJf8NK-2e7uyUYrpgUUQowmRuKxRdwp
2	Pulse Analog & Digital Modulation	https://www.youtube.com/watch?v=TM47sEXeaj8&list=PLDp9Jik5WjRvjQ6ruRFC6hZcxnOsp3BE
3	Digital Carrier Modulation And Demodulation Techniques	https://www.youtube.com/watch?v=01zv0thaAUw

Course Code	LC-ECE-220B					
Category	Professional Core Courses					
Course Title	Analog Electronics Circuit Lab					
Scheme and Credits	L	T	P	Credits	Semester- IV	
	0	0	2	1		
Course Objectives	The objectives of this course are ● To understand the characteristics and AC analysis of RC coupled amplifiers. ● To understand the operation and characteristics of different oscillators, regulators and timers. ● To understand the operation of the power supply.					
Assessment	10 Marks					
End Semester Examination	15 Marks					
Total	25 Marks					
Duration of Exam						

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Analyze the characteristics and frequency response of different transistor amplifier configurations.
CO2	Examine the effects of negative feedback topologies on the performance of amplifiers.
CO3	Apply oscillator and op-amp principles to design and analyze circuits for signal generation and processing.
CO4	Demonstrate and apply the principles and working operations of IC regulators, SMPS, and 555 timers in analog circuits.

List of Experiments

Sr. No.	Contents
1	To analyze and study frequency response of RC coupled amplifier.
2	To analyze and study different types of feedback topologies.
3	To analyze and study RC phase shift oscillator.
4	To analyze and study the wein bridge oscillator.
5	To analyze and study three terminal IC voltage regulator.
6	To draw characteristics of a transistor.
7	To analyze and study inverting and non-inverting op-amp amplifiers.
8	To analyze and study the 555 timer as a square wave generator.
9	To analyze and study SMPS power supply.
10	To analyze and study working of Push-Pull amplifiers.
11	To analyze and study op-amp amplifiers as a differentiator.
12	To analyze and study op-amp amplifiers as an integrator.

Note: At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment under topic beyond syllabus.

Useful Video Links:

Sr. No.	Topics	Links
1	Frequency response of RC coupled amplifier.	https://www.youtube.com/watch?v=ru72wIF6epU
2	Characteristics of a transistor.	https://www.youtube.com/shorts/8dN_4qNJALE
3	555 timer as a square wave generator	https://www.youtube.com/shorts/wjN-7eiuIgY
4	Wein bridge oscillator	https://www.youtube.com/watch?v=_TD0xG5FbCs
5	SMPS	https://www.youtube.com/shorts/5DQP-41mlQk
6	Working of Push-Pull amplifier	https://www.youtube.com/watch?v=NuW2ztF27R8
7	Inverting and non-inverting op-amp amplifiers	https://www.youtube.com/watch?v=EOZyofNXWXc

Course Code	LC-ECE-222B				
Category	Professional Core Courses				
Course Title	Digital Electronics Lab				
Scheme and Credits	L	T	P	Credits	Semester- IV
	0	0	2	1	
Course Objectives	The objectives of this course are ● To learn the basics of digital electronics and use logic gates and ICs. ● To design and check different combinational and sequential logic circuits. ● To understand the working operation of adders, subtractors, multiplexers, flip-flops, and counters in digital systems. ● To learn to build and test ADC, DAC, and practical counters for various applications.				
Assessment	10 Marks				
End Semester Examination	15 Marks				
Total	25 Marks				
Duration of Exam					

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Understand and apply operational principles of logic gates used in digital systems.
CO2	Analyze and verify the operation of sequential circuits used in digital systems
CO3	Verify the truth tables and behavior of combinational circuits with different states and inputs.
CO4	Perform and verify the operation of ADC and DAC circuits for digital system applications.

List of Experiments

Sr.No.	Contents
1	To study the operation of logic gates and verify their truth tables.
2	To verify the operation of universal gates.
3	To design and verify the operation of Binary-to-Gray and Gray-to-Binary code converters.
4	To design Half Adder and Full Adder circuits using gates.
5	To design and verify the operation of Half Subtractor and Full Subtractor circuits.
6	To study and verify the operation of Multiplexer and De-Multiplexer circuits.
7	To study the operation of Encoder and Decoder circuits.
8	To design and verify the operation of BCD-to-Seven Segment Decoder circuits.
9	To analyze and verify the operation and characteristic behavior of S-R, J-K, T, and D flip-flops under different input conditions.
10	To design and verify the operation of Decade counter using JK flip flops.
11	To design and verify the operation of 4-bit SISO and SIPO shift registers.
12	To analyze and verify the operation and performance characteristics of ADC and DAC circuits for digital system applications.

Note: At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment under topic beyond syllabus.

Useful Video Links:

Sr. No.	Topics	Links
1	To study & design basic gates.	https://de-iitr.vlabs.ac.in/exp/truth-table-gates/
2	To study and realize logic functions with the help of universal gates.	https://de-iitr.vlabs.ac.in/exp/half-full-adder/
3	To verify the operation of Multiplexer & De-multiplexer.	https://de-iitr.vlabs.ac.in/exp/multiplexer-demultiplexer/
4	To perform half adder and full adder	https://de-iitr.vlabs.ac.in/exp/half-full-adder/
5	To perform half subtractor and full subtractor.	https://de-iitr.vlabs.ac.in/exp/half-full-subtractor/index.html
6	To verify the truth table of S-R, J-K, T & D Type flip flop.	https://de-iitr.vlabs.ac.in/exp/truth-tables-flip-flops/
7	To design & verify the operation of 3 bit synchronous counter.	https://de-iitr.vlabs.ac.in/exp/4bit-synchronous-asynchronous-counter/
8	To design & verify operation of Asynchronous counter.	https://de-iitr.vlabs.ac.in/exp/4bit-synchronous-asynchronous-counter/

Course Code	LC-ECE-224B					
Category	Professional Core Courses					
Course Title	Microprocessor and Microcontroller Lab					
Scheme and Credits	L	T	P	Credits	Semester- IV	
	0	0	2	1		
Course Objectives	The objectives of this course are • To understand architecture and working of Microprocessor and Microcontroller. • To learn assembly programming for arithmetic and data operations. • To provide hands-on experience in interfacing various peripherals with processor based systems.					
Assessment	10 Marks					
End Semester Examination	15 Marks					
Total	25 Marks					
Duration of Exam						

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Explain the architecture and functioning of microprocessors and microcontroller using model kits and instruction sets.
CO2	Develop and debug assembly language programs for arithmetic, logical and data manipulation tasks using instruction sets.
CO3	Apply interfacing techniques to connect peripherals with computing devices for practical applications.
CO4	Analyze embedded control algorithms for hardware interfacing and timing operations using microcontroller kit.

List of Experiments

Sr.No.	Contents
1	To study the architecture and functional blocks of the 8085 and 8086 microprocessors using trainer kit.
2	Write and execute program to perform arithmetic operations such as addition, subtraction, multiplication and division using 8085 instruction set.
3	Write a program to add the content of the memory location to the content of other memory location and store the result in 3 rd memory location using 8086 instruction set.
4	Write a program to add 16 bit number using 8086 instruction set.
5	Write a program for multiplication of two 16 bit numbers using 8086 instruction set.
6	Write a program for division of two 16 bit numbers using 8086 instruction set.
7	Write a program to calculate the factorial of a given number using the 8086 instruction set.
8	Write a program to find the average of two given numbers using the 8086 instruction set.
9	Write a program to find the largest number in a data array using 8086 Instruction set.
10	Write and execute an 8086 assembly language program to interface and control a stepper motor using the 8255 (PPI).
11	To study the architecture and functioning of the 8051 microcontroller using trainer kit.
12	Write and execute a program to generate a square wave using the 8051 microcontroller.
13	Write and execute a program to interface an LED with the 8051 microcontroller and generate a blinking effect using software delay.

Note: At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment under topic beyond syllabus.

Useful Video Links:

Sr. No.	Topics	Links
1	Introduction of Microprocessor 8085 Trainer Kit. Introduction of Microprocessor 8086 Trainer Kit	https://www.youtube.com/watch?v=GSPxk6GYf2Y&list=PLbEc0iDORYCp1yLvEfNxbZOZ4ITPUv_4f https://www.youtube.com/watch?v=GZibA34SU0c
2	Write a program to find the average of two given numbers using the 8086 instruction set.	https://www.youtube.com/watch?v=nOt9Wa-CIRo&list=PLNdrDld4dxVrRU4OmzVCR6UUgyRYMqul&index=10
3	Write a program to find the largest number in a data array using 8086 Instruction set.	https://www.youtube.com/watch?v=vNRGKG8ujVc&list=PLNdrDld4dxVrRU4OmzVCR6UUgyRYMqul&index=12
4	Write a program to calculate the factorial of a given number using the 8086 instruction set..	https://www.youtube.com/watch?v=riliLJP0Q_0&list=PLNdrDld4dxVrRU4OmzVCR6UUgyRYMqul&index=13
5	To write and execute an 8086 assembly language program to interface a stepper motor using 8255 PPI and control its rotation.	https://www.youtube.com/watch?v=lj5L1nGZAwg
6	To write and execute a program to interface an LED with the 8051 microcontroller and generate a blinking effect using software delay.	https://www.youtube.com/watch?v=aGVn4xGrAfY

Course Code	PROJ-226B				
Category	PROJECT				
Course Title	Project Based Learning/Micro Project				
Scheme and Credits	L	T	P	Credits	Semester- IV
	0	0	2	1	
Course Objectives	The objectives of this course are • To expose students to domains related real-world engineering problem. • To introduce structured approaches for project planning, execution, documentation and technical presentation. • To enable the use of engineering concepts, tools and technologies for developing practical project solutions. • To create awareness of ethical, economic, environmental, and sustainability considerations in engineering projects.				
Assessment	25 Marks				
End Semester Examination	-				
Total	25 Marks				
Duration of Exam					

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Identify domain specific real world or engineering problems and applications suitable for project development.
CO2	Explain the principles, methodology and systematic process for project execution, reporting and technical presentation.
CO3	Apply appropriate engineering knowledge, tools and techniques to develop solutions for identified problem.
CO4	Analyze ethical practices, economics associated with different technologies suitable for project development.
CO5	Justify design choices, performance parameters, and technical constraints of the developed solution.
CO6	Design and develop a cost effective, environmental friendly, functional prototype addressing a defined engineering problem.

Guidelines:

- The Project Based Learning (PBL)/Micro Project course is intended to promote experiential learning, innovation, creativity, critical thinking and problem-solving abilities through the development of a small-scale engineering project, case study, technical model, simulation, design activity or technical presentation.
- Students shall undertake the project individually or in groups consisting of a maximum of four members under the guidance and supervision of an assigned faculty mentor.
- The project shall focus on identifying and addressing a real-world problem, engineering challenge, societal need, industry requirement, sustainability issue, or emerging technological application relevant to Electronics and Communication Engineering or allied disciplines.
- Students shall perform a preliminary study involving literature survey, technology review, need analysis,

problem investigation, market survey, or application analysis to identify a suitable project topic.

- The selected work shall contribute to the attainment of Course Outcomes (COs), Programme Outcomes (POs), Programme Specific Outcomes (PSOs), UNSDGs and Washington Accord Knowledge Profiles (WK1-WK8).
- In consultation with the faculty mentor, students shall define the problem statement, objectives, scope of work, methodology, resource requirements, implementation plan and expected outcomes.
- The project shall incorporate considerations related to technical feasibility, functionality, safety, reliability, cost effectiveness, environmental impact, sustainability and ethical engineering practices wherever applicable.
- Faculty mentors shall conduct periodic reviews to monitor progress and provide guidance related to technical development, project management, documentation, presentation skills, innovations and professional practices.
- Students shall demonstrate teamwork, communication skills, leadership qualities, professional ethics, accountability and effective time management throughout the project duration.
- Continuous assessment shall be carried out through periodic reviews, demonstrations, project documentation and viva-voce examinations based on predefined rubrics.
- The final report shall include the problem statement, objectives, literature review, methodology, design approach, implementation details, results, analysis, conclusions, limitations and future scope of work.

Course Code	MECEVLSI-201B				
Course Title	VLSI Technology				
Scheme and Credits	L	T	P	Credits	Semester-III/IV
	4	0	0	4	
Course Objectives	The objectives of this course are • To introduce the basics of MOS fundamentals, fabrication technology and CMOS process steps. • To explain layout design rules, stick diagrams, and lambda-based design methodology. • To understand the complete VLSI design flow from RTL to GDSII using CAD tools. • To develop the ability to apply CAD tools for chip-level design and verification through case studies.				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Define VLSI evolution, Moore's Law and complete IC fabrication process flow stages.
CO2	Explain MOS capacitor and MOSFET operation, scaling concepts and short-channel effects in modern devices.
CO3	Apply CMOS fabrication processes, lithography, etching, metallization and integration techniques.
CO4	Analyze advanced VLSI technologies, reliability issues and TCAD-based process and device simulations.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/sections) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Introduction to VLSI Technology: Evolution of IC technology: SSI, MSI, LSI, VLSI, ULSI and Moore's Law and scaling challenges. Overview of fabrication process flow (wafer preparation, oxidation, lithography, etching, doping), Comparison of VLSI Design vs VLSI Technology focus, metallization, planarization (CMP), detailed process integration

Unit-II

MOSFET Fundamentals & Scaling: - MOS capacitor and MOSFET structure, Threshold voltage, channel formation, short-channel effects, Scaling theories, constant field scaling, constant voltage scaling, High-k dielectrics, metal gates, Fin FETs. MOSFET I-V characteristics, velocity saturation, sub threshold conduction, DIBL, mobility degradation.

Unit-III

Fabrication Technology: -Wafer fabrication steps: oxidation, diffusion, ion implantation, Photolithography and mask design, Etching techniques (wet, dry, plasma), Metallization and interconnect technology, Process integration for CMOS, CMP, isolation techniques, advanced lithography.

Unit-IV

Advanced VLSI Technology: -Low-power and high-speed technology trends, SOI (Silicon-on-Insulator), Emerging technologies, Reliability issues: hot carrier effects, NBTI, electro migration, TCAD basics, process and RTL device/Process/device simulation basics. Reliability testing methodologies, Packaging and yield issues.

Suggested Readings

- VLSI Technology by Simon M. Sze (McGraw Hill)
- CMOS VLSI Design: A Circuits and Systems Perspective by Neil H.E. Weste & David Harris
- Introduction to VLSI Design Flow by Sneh Saurabh
- VLSI Fabrication Principles: Silicon and Gallium Arsenide by Sorab K. Ghandhi
- Modern VLSI Design: System-on-Chip Design by Wayne Wolf

Useful Video Links

Unit No.	Topic	Link
Unit-I	Evolution of IC technology	https://www.youtube.com/watch?v=g6CCJAbdkK8&list=PLHO2NKv71TvsSqYwVvUCZwNkY-jUyUhdS
	Overview of fabrication process flow	https://www.youtube.com/watch?v=Uj0QJliffcI
Unit-II	MOS capacitor and MOSFET structure	https://www.youtube.com/watch?v=faiEVOOCe-s
	short-channel effects, High-k dielectrics	https://www.youtube.com/watch?v=ftdNBEwNDm0
Unit-III	Wafer fabrication steps Photolithography Etching techniques.	https://www.youtube.com/watch?v=Tacv0fA9n_s
	Metallization and interconnect technology.	https://www.youtube.com/watch?v=HSn3G3r69QE&list=PLLy_2iUCG87AMeXL_nGI5_6-L-hD8IK6i
Unit-IV	Low-power and high-speed technology trends.	https://www.youtube.com/watch?v=KvN3JXICzdM
	Emerging technologies: CNTFETs, TFETs, Quantum devices.	https://www.youtube.com/watch?v=U9I9yFTxa6c&list=PLwdnzlV3o goVGGv52O5biztwOcUewLEf5

NPTEL Link

nptel.ac.in/courses/117106093

Course Code	MECEVLSI-202B				
Course Title	Digital Design with Verilog				
Scheme and Credits	L	T	P	Credits	Semester-III/IV
	4	0	0	4	
Course Objectives	The objectives of this course are • To introduce the fundamentals of Boolean algebra, logic gates, and HDL programming. • To explain the design and implementation of combinational and sequential circuits using HDL and CMOS concepts. • To understand finite state machines (FSMs), test benches, and simulation for digital systems. • To develop the ability to prototype digital designs on FPGA platforms and analyze performance.				
Assessment	40 Marks				
End Semester Examination	60 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Define Boolean algebra concepts, truth tables, logic gates, and canonical representations of digital logic.
CO2	Explain CMOS logic principles and structural behavior of digital circuits.
CO3	Simplify Boolean expressions and design combinational, sequential, and finite state machine circuits.
CO4	Analyze FPGA architecture, timing constraints and resource utilization for digital circuit implementation.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/sections) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Logic Fundamentals & Boolean Algebra: Boolean laws, truth tables, canonical forms (SOP, POS), Number Systems, Logic gates, Base conversions and signed number representation (1's & 2's only), Binary codes, Code converters, Prime Implicants, Minimization techniques: K-map, Quine-McCluskey (Tabulation method).

Unit-II

Combinational Circuit Design: CMOS Combinational Circuit: Design Half Adder, Full Adder, Multiplexer and Demultiplexer using CMOS. CMOS Sequential logic circuits: Design SR latch, SR flip flop, JK flip flop, D flip flop using CMOS. Comparator design, parity checker, decoders, multipliers. Ripple carry adder, Carry look-ahead adder. BCD adders, code converters.

Unit-III

Sequential Circuit Design: Flip-flops (SR, JK, D, T) – CMOS latch and flip-flop design Registers (SISO, SIPO, PISO, PIPO) – CMOS register structures, Counters (asynchronous, synchronous, modulo N) – CMOS counter design, FSMs (Mealy & Moore) with Verilog. FSM minimization techniques, Implementation of flip-flops, counters, and registers in Verilog, ASM charts. RTL sequential multiplier.

Unit-IV

HDL Modeling & FPGA Prototyping: VHDL/Verilog syntax, modeling styles (behavioral, dataflow, structural) Test benches and simulation (Model Sim, Vivado) FPGA synthesis, mapping, implementation, FSM testing, ASM methodology, Timing constraints and clock distribution in FPGA and optimization strategies.

Suggested Readings

- Digital Logic Circuits: With VHDL and Verilog Programs – A. Nagoor Kani
- Fundamentals of Digital Logic with VHDL Design – Stephen D. Brown & Zvonko Vranesic
- Digital Design: With an Introduction to Verilog HDL – M. Morris Mano & Michael Ciletti
- Digital Design Using Verilog- Charles H. Roth Jr., Lizy Kurian John
- Digital Systems Design Using Verilog-Charles H. Roth Jr., Lizy Kurian John
- Verilog Digital System Design-Zainalabedin Navabi

Useful Video Links

Unit No.	Topic	Link
Unit-I	Boolean laws	https://www.youtube.com/watch?v=yqDDwJalxUk
	Minimization using k- map	https://www.youtube.com/watch?v=BPBiyc0OBw
Unit-II	Design Half Adder	https://www.youtube.com/watch?v=85XxQZqBNlg
	CMOS Sequential logic circuit: Design SR latch	https://www.youtube.com/watch?v=jm0PGDSSBkI
Unit-III	Logic Gate design using pass transistor:	https://www.youtube.com/watch?v=eqnMAaYU4OY
	Basic principle, non-ideal effects, domino CMOS logic, high performance dynamic CMOS circuits, clocking issues, clock distribution	https://www.youtube.com/watch?v=q8adOpQx7tc
Unit-IV	VLSI design methodology, design Hierarchy	https://www.youtube.com/watch?v=9QgdNsl9qwk&list=PLyqSpQzTE6M8iOrfy70ELk9W72JG5a98V
	Lambda-based design rules.	https://www.youtube.com/watch?v=OAxlM8up7QY

NPTEL Link

nptel.ac.in/courses/106103358

Course Code	MLECEVLSI-203B				
Course Title	Digital Design with Verilog Lab				
Scheme and Credits	L	T	P	Credits	Semester-III/IV
	0	0	2	1	
Course Objectives	The objectives of this course are • To introduce HDL programming for combinational and sequential circuits. • To explain FSM modeling and simulation using CAD tools • To understand FPGA synthesis and mapping of digital designs. • To develop the ability to analyze timing and functionality of FPGA prototypes.				
Assessment	10 Marks				
End Semester Examination	15 Marks				
Total	25 Marks				
Duration of Exam					

Course Outcomes: After successful completion of this course, the students will be able to

COs	Skills Demonstrated
CO1	Design combinational digital circuits using HDL and demonstrate their functional behavior through simulation results.
CO2	Design sequential digital circuits using HDL and their functional operation through simulation.
CO3	Realize finite state machine-based digital systems using HDL and implement them on FPGA platforms.
CO4	Evaluate HDL-based digital designs by judging logical correctness and timing performance using simulation waveforms.

List of Experiments

Sr. No.	Contents
1	Design of half-adder and full adder using Verilog/VHDL.
2	Design and verify multiplexer and de-multiplexer circuits using HDL.
3	Implement and simulate encoder and decoder circuits using HDL.
4	Develop HDL models for basic logic gates and verify their logical operation.
5	Design and simulate SR, JK, D, and T flip-flops using HDL.
6	Implement up, down, and modulo-N counters using HDL.
7	Design and simulate SISO, SIPO, PISO, and PIPO registers using HDL.
8	Implement CMOS-based latches and flip-flops and study their sequential behavior.
9	Design and simulate a traffic light controller using finite state machine modeling in HDL.
10	Model and verify Mealy and Moore finite state machines using HDL.

Useful Video Links

Sr. No .	Topic	Link
1	Design of half-adder and full adder using Verilog/VHDL.	https://youtu.be/IDbQq_t3N8I
2	Multiplexer and Demultiplexer design with HDL.	https://www.youtube.com/watch?v=BbhJnd0A9dI
3	Encoder and decoder implementation	https://www.youtube.com/watch?v=uiQuoUxPJZY
4	HDL coding for basic gates (AND, OR, NOT, NAND, NOR, XOR).	https://www.youtube.com/playlist?list=PLgwJf8NK-2e5JBjCNCZ7tqc2XjbezGjS8
5	Traffic light controller using FSM in Verilog.	https://www.youtube.com/watch?v=hJhBhEcCc-c
6	HDL modeling of Mealy and Moore FSMs	https://www.youtube.com/watch?v=EzMWYmRkHFQ&list=PLBlnK6fEyqRhduNC2PI4FPJqAhwoNTe1d