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

'A' GRADE ACCREDITED BY NAAC

Evaluation Scheme & Syllabus For

Bachelor of Technology (Electronics and Communication Engineering)

2nd Year

(Effective from the Session: 2025-26)

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

Credits of 160-180 for a student to be eligible to get an Undergraduate Degree in Electronics and Communication Engineering.

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

Sr. No.	**Category**	**Breakup of Credits**
1	Professional Core Courses	70
2	Program Elective Courses (Relevant to chosen specialization/branch)	15
3	Multidisciplinary Open Elective Courses	09
4	Basic Science Courses	21
5	Engineering Science Courses	24
6	Humanities and Social Sciences including Management courses	15
7	Practical Training	10
8	Project	6
9	Mandatory Courses (Non credit)	
	Total Credits	170*

**Minor variation is allowed as per need of the respective disciplines.*

4. COURSE CODE AND DEFINITIONS

Sr. No.	Category	Course Code
1	Professional Core Courses	PCC
2	Program Elective Courses (Relevant to chosen specialization/branch)	PEC
3	Multidisciplinary Open Elective Courses	OEC
4	Basic Science Courses	BSC
5	Engineering Science Courses	ESC
6	Humanities and Social Sciences including Management courses	HSMC
7	Practical Training	PT
8	Mandatory Courses (Non credit)	MC
9	Project	PROJ
10	Lab Courses	LC

GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.), DELHI-NCR

Scheme of Studies and Examination

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

***W.e.f.* 2025-26**

Sr. No.	Category	Course Code	Course Title	Lectures per week			Total Load Per Week	Credits	Examination Scheme (Marks)				Exam Duration in Hours
				Lecture (L)	Tutorial (T)	Practical (P)			Assessment	End Semester Examination		Total	
										Theory	Practical		
1	Professional Core courses	PCC-ECE-201A	Electronic Devices	3	0	0	3	3	40	60		100	3
2	Engineering Science Courses	PCC-CSE-203A	Data Structure	3	0	0	3	3	40	60		100	3
3	Professional Core Courses	PCC-ECE-205A	Analog & Digital Communication	3	0	0	3	3	40	60		100	3
4	BSC Courses	BSC-MECE-209A	Mathematics-III	3	1	0	4	4	40	60		100	3
5	Professional Core Courses	PCC-ECE-211A	Signal Systems and Network Analysis	3	0	0	3	3	40	60		100	3
6	MAC Courses	*MC-201A	Environmental Science	2	0	1	3			60	40		3
7	HSMC Courses	HSMC-02A	Economics for Engineers	3	0	0	3	3	40	60		100	3
8	Professional Core Courses	LC-ECE-213A	Electronic Devices Lab	0	0	2	2	1	25	-	25	50	3
9	Professional Core Courses	LC-ECE-215A	Analog & Digital Communication lab	0	0	2	2	1	25	-	25	50	3
10	Professional Core Courses	LC-ECE-217A	Signal Systems and Network Analysis Lab	0	0	2	2	1	25	-	25	50	3
11	Professional Core Courses	LC-ECE-219A	Electronic Workshop & PCB Design Lab	0	0	2	2	1	25	-	25	50	3
Total Credits								23				800	

*MC-201A is a mandatory non –credit course in which the students will be required passing marks.

GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.), DELHI-NCR

Scheme of Studies and Examination

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

***W.e.f.* 2025-26**

Sr. No.	Category	Course Code	Course Title	Lectures per week			Total Load Per Week	Credits	Examination Scheme (Marks)				Exam Duration in Hours
				Lecture (L)	Tutorial (T)	Practical (P)			Assessment	End Semester Examination		Total	
										Theory	Practical		
1	Professional Core Courses	PCC-ECE-202A	Analog Electronic Circuits	3	0	0	3	3	40	60		100	3
2	Professional Core Courses	PCC-ECE-204A	Digital Electronics	3	1	0	4	4	40	60		100	3
3	Professional Core Courses	PCC-ECE-206A	Microprocessor and Microcontroller	3	0	0	3	3	40	60		100	3
4	Engineering Science Courses	PCC-CSE-207A	Python Programming	3	0	0	3	3	40	60		100	3
5	Program Elective Courses	Refer to Annexure-I	Program Elective (Table –I)	3	0	0	3	3	40	60		100	3
6.	HSMC Courses	HSMC-01A	Fundamental of Management and Organizational Behavior	3	0	0	3	3	40	60		100	3
7.	Engineering Science Courses	LC-CSE-213A	Python Programming Lab	0	0	2	2	1	25		25	50	3
8.	Professional Core Courses	LC-ECE-216A	Analog Electronics Circuit Lab	0	0	2	2	1	25		25	50	3
9.	Professional Core Courses	LC-ECE-218A	Digital Electronics Lab	0	0	2	2	1	25		25	50	3
10.	Professional Core Courses	LC-ECE-220A	Microprocessor and Microcontroller Lab	0	0	2	2	1	25		25	50	3
Total Credits								**23**				**800**	

NOTE: 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 typed report along with a certificate from the organization & its evaluation shall be carried out in the 5th Semester.

Annexure-I
Program Elective Courses (Table-I)

S. No	Course Code	Course Name
1	PEC-ECE-208A	Bio-Medical Electronics
2	PEC-ECE-210A	Scientific Computing
3	PEC-ECE-212A	Power Electronics
4	PEC-ECE-214A	Computer Vision

Course Code	**PCC-ECE-201A**					
Category	Professional Core Course					
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. ● Study the characteristics and practical applications of various semiconductor devices. ● Design and analyze basic electronic circuits using semiconductor components. ● Explore biasing techniques and equivalent models for device operation in amplification and switching applications.					
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 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 8 parts of 1.5 marks each from all units 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	**Basic Semiconductor And PN-Junction Theory:** Introduction, Atomic Structure, Band Theory of Semiconductors, Effect of Temperature on Conduction, Drift Current, Donor & Accepter 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, Transistor as oscillator. **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-T2SNOou2hkI
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=AAdMvHVVN_mNKG00
	Small Signal Amplifier	https://www.youtube.com/watch?v=5MLVr9r6Vzk&list=PL-IC1WV1OE4kRdcpTfgtNjFpR8XEpDu7O

Course Code	**PCC-CSE-203A**				
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 the concept of Stacks, Queues, Linked Lists, Trees, related operations and their implementation. ● To understand sorting, hashing, and graph algorithms, including their design and complexity analysis ● To develop the ability to evaluate algorithm efficiency in terms of time and space complexity.				
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	Recall the fundamental concepts 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 8 parts of 1.5 marks each from all units 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:** 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, Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press. Programming in ANSI C by E. Balaguruswamy, Tata McGraw-Hill
- Algorithms, Data Structures, and Problem Solving with C++, Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company.
- How to Solve it by Computer, 2nd Impression by R.G. Dromey, Pearson Education.
- Data Structures and Algorithms Made Easy 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=zWg7U0OEAoE&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=K7VIKlUdo20
	Trees	https://youtu.be/tORLeHHtazM?list=PLBF3763AF2E1C572F
	Search Trees-II	https://www.youtube.com/watch?v=5jQGqaAUzOI
	AVL Trees	https://youtu.be/mRGQylRWAsI?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-205A**				
Category	Professional Core Course				
Course Title	**Analog and Digital Communication**				
Scheme and Credits	L	T	P	**Credits**	**Semester-III**
	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. ● Compare various techniques used for signal transmission and reception. ● Learn methods for converting signals between analog and digital forms. ● Understand the working principles of radio transmitters and receivers.				
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 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 8 parts of 1.5 marks each from all units 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 :** 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, Quadrature Amplitude Modulation, SSB-SC, DSB-SC, VSB Modulation & Demodulation, Comparison of various AM Systems, Generation of AM waves. **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 & De multiplexing (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**: Digital Modulation Formats, Coherent Binary Modulation & Demodulation: ASK, BFSK, BPSK, Coherent Quadrature Modulation & Demodulation Techniques: QPSK, MSK. Non Coherent BFSK, Differential PSK, M-Ary Modulation & Demodulation Techniques: M-Ary PSK, M-Ary QAM, M-Ary FSK. **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
- Communiation 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://www.youtube.com/watch?v=TM47sEXeaj8&list=PLDp9Jik5WjRvjqQ6ruRFC6hZcxnOsp3BE
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	**BSC-MECE-209A**				
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 make the students • Understand and classify first and second-order linear partial differential equations, and apply appropriate solution techniques including complementary function and particular integral methods. • 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	Classify 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	Analyze 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 of 1.5 marks each from all units 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 homogenous and non-homogenous linear partial differential equations of second order by complimentary 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, Baye's 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=PLU6SqdYcYsfIk1VhXxIYNPFU67ym6gae8 https://www.youtube.com/watch?v=FliKUWUVrEI&list=PLU6SqdYcYsfIk1VhXxIYNPFU67ym6gae8&index=2 https://www.youtube.com/watch?v=7eHuQXMCOvA&list=PLU6SqdYcYsfIk1VhXxIYNPFU67ym6gae8&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-211A**				
Category	Professional Core Course				
Course Title	**Signal Systems & Network Analysis**				
Scheme and Credits	L	T	P	**Credits**	**Semester-III**
	3	0	0	3	
Course Objectives	The objectives of this course are to • Provide foundational knowledge on classification and representation of signals and systems in time and frequency domains. • Introduce Fourier and Laplace techniques for analyzing continuous and discrete-time signals and system responses. • Explain systematic procedures for analyzing electrical networks using theorems, transformations and two-port parameters. • Study transient responses, network functions, and topology-based analysis using poles, zeros, and graph-theory approaches.				
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	Describe various types of signals and systems with their time and frequency domain characteristics.
CO2	Apply Fourier and Laplace transforms to analyze signal spectra and system behavior under standard excitation signals.
CO3	Solve electrical networks using mesh, node, and matrix methods and determine behavior using theorems and two-port parameters.
CO4	Analyze transient responses, network functions, and topology using pole-zero plots, graph theory, and state variable modeling techniques.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units 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, Classification with examples, Continuous –Time & Discrete –Time, Continuous –valued & Discrete –valued, Analog & Digital, Deterministic & Random, One Dimensional & Multi Dimensional, Even/Symmetric, Odd/Anti symmetric signals, Causal, Non causal ; Anti causal; Real & Complex, Periodic & Aperiodic, Energy & Power signals 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:

- Fundamentals of Electric Circuit" by C.K Alexander and Sadiku.
- Network Analysis by M.E. Van, Valkenburg., 3rd Edition, Pearson Education
- 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, 2nd Edition, Pearson Education
- Signals & Systems by Nagrath & R. Ranjan, TMH
- Digital Signal Processing, Principles, Algorithms, & Applications by J. G. Proakis, D. G. Manolakis 4th Edition, Pearson Education
- 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.google.com/search?q=basics+of+signals+and+system+nptel+lectures&oq=basics+of+signals+and+system+nptel+lectures&aqs=chrome..69i57j33i10i160l2j33i671.33428j0j15&sourceid=chrome&ie=UTF-8#fpstate=ive&vld=cid:1ac57207,vid:DVuEYt0J11c,st:0_
	LTI System	https://www.youtube.com/watch?v=vk42imdZ6Pc
Unit-II	Fourier Transform	https://youtu.be/l2I2hys8uGQ?si=noWoflLMPtI4Fl3q
	Laplace Transform	https://www.youtube.com/watch?v=c9NibpoQjDk&t=9s
	State Variable technique	https://www.youtube.com/watch?v=d34nosv-_uc
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	***MC-201A**				
Category	MAC Course				
Course Title	**Environmental Science**				
Scheme and Credits	L	T	P	**Credits**	**Semester-III**
	2	0	1	-	
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	40 Marks				
End Semester Examination	60 Marks				
Total	100 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 8 parts of 1.5 marks each from all units 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	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 to10 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	**HSMC-02A**				
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 • Introduce the basic concepts of economics and their relevance to science, engineering, and national development. • Develop a foundational understanding of microeconomic principles such as demand, supply, production, cost, and market structures. • Equip students with tools to apply economic reasoning to real-world pricing, output, and market decisions. • Familiarize students with macroeconomic elements like the Indian economy, banking system, privatization, and globalization.				
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	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 8 parts of 1.5 marks each from all units 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	**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-213A**				
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. ● Analyze different transistor configurations and their behavior. ● Explore the operation of field-effect transistors and their amplifier circuits. ● Understand and test special semiconductor devices used in practical applications.				
Assessment	25 Marks				
End Semester Examination	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

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-215A**					
Category	Professional Core Courses					
Course Title	**Analog & Digital Communication Lab**					
Scheme and Credits	L	T	P	**Credits**	**Semester- III**	
	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. ● Learn and observe the waveform analysis of pulse modulation and demodulation methods. ● Study digital modulation techniques such as ASK, FSK, and PSK with waveform analysis.					
Assessment	25 Marks					
End Semester Examination	25 Marks					
Total	50 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 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=PLDp9Jik5WjRvjqQ6ruRFC6hZcxnOsp3BE
3	Digital Carrier Modulation And Demodulation Techniques	https://www.youtube.com/watch?v=01zv0thaAUw

Course Code	**LC-ECE-217A**				
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 using software tools for analyzing electrical networks. ● Understand and analyze circuits with R, L and C components in time and frequency domains. ● Design and evaluate low-pass, high-pass and band-pass filters through simulations. ● Calculate and interpret two-port network parameters and their system impact.				
Assessment	25 Marks				
End Semester Examination	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

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

COs	Skills Demonstrated
CO1	Simulate 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 test filter circuits by plotting frequency responses and finding key frequencies.
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 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 equivalent parameter of parallel connections of two port network 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 experiment under topic beyond 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 response of 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 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-219A**				
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 relevant software. ● Learn the operation of machines used in PCB fabrication and gain hands-on experience. ● Practice PCB fabrication processes such as etching, drilling, and coating. ● Develop skills to design, assemble, and test printed circuit boards for practical applications.				
Assessment	25 Marks				
End Semester Examination	25 Marks				
Total	50 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 concepts and tools for simulation, optimization, and PCB design in electronic circuit development.
CO2	Implement the process of PCB fabrication including etching, UV exposure, drilling and coating 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 experiment under topic beyond 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/QbAuq00BalI

3	Exposing to UV Light & Developing	https://youtu.be/ILRdnfEM7YI

Course Code	**PCC-ECE-202A**				
Category	Professional Core Course				
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. • Understand different types of feedback which affects the overall performance of the circuit. • Learn working operation of oscillator circuits. • Study power amplifiers, voltage regulators, and the basics of operational amplifiers with practical circuit applications.				
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	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 8 parts of 1.5 marks each from all units 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	**High Frequency Analysis of BJT and Multistage Amplifier:** Hybrid Pi Model, CE Short Circuit Gain, Frequency Response, Alpha Cut off Frequency, Gain Bandwidth Product, Emitter Follower at High Frequencies. RC Coupled Transistor Amplifier, Lower & Upper Cut off Frequency, Frequency Response curve & Bandwidth, 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, Advantages & disadvantages, Input And Output Resistance, Voltage Series Feedback topology, Voltage Shunt, Current Series & Current Shunt topology ,Equivalent circuit for each topology, Effects of Negative Feedback.

Unit-II	**Oscillators:** Introduction, Barkhausen Criterion, Oscillator with RC Feedback circuit (RC Phase Shift, Wien Bridge), Tuned Collector, Tuned Base Oscillator, LC Feedback circuits (Hartley, Colpitts), Condition for Sustained Oscillations & Frequency of Oscillations, Crystal Oscillator. **Power Amplifier:** Definition, Application & Types of Power Amplifiers, Amplifier Classes of Efficiency (Class - A, B, AB, C), Push Pull Amplifiers, Distortion in Simple & Push Pull Amplifier, Complementary Push Pull Amplifier, Integrated Circuit Power Amplifier , Introduction to MOSFET & CLASS D 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, Effect of Variation in Power Supply Voltages on Offset Voltage, Common Mode Configuration and CMRR, Frequency Response of OP-AMP: Open Loop Response, Close Loop Response, Input and Output Impedances, Effect of Finite Gain Bandwidth Product, Slew Rate, OP-AMP as 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-204A**				
Category	Professional Core Course				
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 basic concepts of Boolean algebra, number systems, logic simplification, and error detection techniques. ● Design and study logic circuits used for arithmetic, control, and memory functions. ● Understand the working of analog-to-digital and digital-to-analog converters. ● Introduced various programmable devices like FPGAs and CPLDs for building digital systems.				
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	Apply 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 of FPGA and CPLD systems.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2 marks each from all units 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 McCuskeymethods, Error detection and correction 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, Building blocks like 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. P**rogrammable 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,4th Edition, Pearson Education.

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=fXrbYMDevDU
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-_yO6Bl5dPBp8
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-206A**				
Category	Professional Core Course				
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 ● Understand the architecture and instruction set of microprocessors (8086, x86) and microcontrollers (8051, ARM). ● Develop low-level programming skills using assembly language. ● Learn peripheral interfacing concepts such as timers, I/O ports, ADC/DAC, and communication protocols. ● Explore advanced processors and embedded system using ARM Architecture				
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	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 8 parts of 1.5 marks each from all units 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	**Fundamentals of Microprocessors and Interfacing:** Introduction to Microprocessors: Evolution, 8-bit/16-bit (8086), Architecture, Pin configuration, Addressing modes and register organization of 8085. **8086 Architecture**: Register organization, Addressing Modes, Memory Segmentation, Instruction Set of 8086, Minimum/Maximum Mode, Memory Interfacing, Peripheral Interfacing (8255 PPI, 8254 Timer), Concepts of Interrupts and DMA.
Unit-II	**Advanced Microprocessors and Memory Systems :** **X86 Microprocessor Family**: 80186, 80286, 80386, and 80486 – Architectural Features, Pentium to Pentium IV: Enhancements and features, Multi-core Processors and Mobile Processor Architectures. **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 Embedded Design :** 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, Embedded System Applications.

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=PLbRMhDVUMngcJu5oUhgpgYqtOn7DmSfuU

Course Code	**PCC-CSE- 207A**				
Category	Engineering Science Courses				
Course Title	**Python Programming**				
Scheme and Credits	L	T	P	**Credits**	**Semester-IV**
	3	0	0	3	
Course Objectives	The objectives of this course are • To introduce Python programming fundamentals, including syntax, data types, control structures and basic python libraries. • To develop skills in Python data structures, functions, recursion and python libraries like NumPy, Pandas, Tkinter etc.. • To explore Python's graphical programming, image processing, and GUI development.				
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 core concepts of Python syntax, data types, control structures, data structures, libraries, and GUI tools.
CO2	Explain the functionality of Python programming constructs, data handling techniques, and graphical modules.
CO3	Develop Python programs for data processing, file handling, numerical computing, graphics, and GUI applications.
CO4	Analyze and integrate Python programming constructs, data structures, libraries, graphics, image processing, and GUI techniques to solve real-world problems effectively.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) 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:** Installing Python; basic syntax, interactive shell, editing, saving, and running a script; data types; variables, assignments; numerical types; arithmetic operators and expressions; Loops and selection statements, Control statements String manipulations: subscript operator, indexing, slicing a string; text files: reading/writing text and numbers from/to a file; creating and reading a formatted file.
Unit-II	**Lists, Tuple, dictionary and Design with functions:** Basic list operators, replacing, inserting, removing an element; searching and sorting lists; Tuple: creating tuples, accessing elements, tuple immutability, operations, tuple methods, tuples vs. lists; dictionary literals, adding, and removing keys, accessing and replacing values; traversing dictionaries. Hiding redundancy, complexity; arguments and return values; Program structure and design. Recursive functions.

Unit-III	**Introduction to NumPy:** NumPy arrays, Array Indexing and Slicing, Array Operations, Array Manipulation, Linear Algebra with NumPy, Random Number Generation and Statistics. **Introduction to Pandas:** Pandas Series, Pandas Data Frames, Data Frame Indexing and Selection, Data Cleaning and Pre-processing, Data Manipulation, Group by Operations, Merging, Joining, and Concatenating Data Frames, Input/output Operations.
Unit-IV	**Simple graphics and image processing:** Simple graphics, Turtle operations, Manipulating turtle screen, Drawing two dimensional shapes, examining an object attributes, Taking a random walk, Colour and RGB scheme, Image processing: Image manipulation operations, properties of images, image module, copying, blurring and reducing image. **Graphical User Interfaces using Tkinter:** Terminal based and GUI based programs, Introduction to Tkinter, Simple GUI-Based Programs, Windows and Window Components, Input and Output with Entry Fields, Defining and Using Instance Variables, Other Useful GUI Resources.

Suggested Readings:

- Fundamentals of Python: First Programs by Kenneth Lambert, Course Technology, Cengage Learning, 2012.
- Introduction to Computer Science Using Python: A Computational Problem-Solving by Dierbach, C. Focus, John Wiley & Sons, 2012.
- Let Us Python by, Kanetkar, A., & Kanetkar, Y., BPB Publications.
- Python – The Complete Reference by Brown, M. C., McGraw Hill Education.
- Core Python Programming by Rao, R. N., Dream Tech Press.
- Python Programming: Using Problem Solving Approach by Thareja, R., Oxford University Press.
- Python Programming by Sridhar, S., Indumathi, J., & Hariharan, V. M., Pearson Education.
- Python for Data Analysis by Wes McKinney, 3rd Edition, O'Reilly Media, 2022.
- Python Data Science Handbook by Jake VanderPlas, O'Reilly Media.

Useful Video Links:

Unit No	Topics	Links
Unit-I	Variables and Input Statement	https://youtu.be/ruQb8jzkGyQ
	Data Types, Operators and Expressions	https://youtu.be/8n4MbjuDBu4
	Introduction to for loop	https://youtu.be/lvXuQ_x7EsI
	Introduction to while loop	https://youtu.be/KTvVNN7ia8o
	String Methods	https://youtu.be/p-4HU1rcG5s
	Reading and Writing to a File	https://www.youtube.com/watch?v=rYLJaAdgLhI
	Creating and reading a formatted file	https://www.youtube.com/watch?v=NBTSDtBy5bs
Unit-II	List operators	https://youtu.be/jMShssechMI
	Searching and sorting lists	https://youtu.be/4OxBvBXon5w
	Tuples	https://youtu.be/mzx74TdGYbg
	Dictionary literals, adding, and removing elements	https://youtu.be/Aj7PwBI99A4
	Recursive functions	https://youtu.be/Uo7RyqJaaRQ
Unit-III	NumPy	https://youtu.be/rjY59WLMK2o
	Pandas	https://youtu.be/6DTFIKF8QIg?feature=shared
Unit-IV	Simple graphics	https://www.youtube.com/watch?v=pxKu2pQ7Ilo
	Graphical User Interfaces using Tkinter	https://youtu.be/-GhzpvvIXlM?si=itHn2839Kkhy89B3

Course Code	**PEC-ECE-208A**				
Category	Professional Elective Course				
Course Title	**Bio-Medical Electronics**				
Scheme and Credits	L	T	P	**Credits**	**Semester- IV**
	3	0	0	3	
Course Objectives	The objectives of this course are to ● Understand human physiology and basic biomedical transducer principles. ● Learn bio-electrode configurations and bio-potential amplifier techniques. ● Measure non-electrical physiological body parameters. ● Explore medical imaging, therapeutic equipment, and safety standards.				
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	Describe the structure, function, and electrical activity of human physiological systems and the role of biomedical transducers used to measure physiological parameters
CO2	Explain the configurations and implement the applications of bio-electrodes and bio-potential amplifiers in physiological measurements.
CO3	Measure and interpret non-electrical physiological parameters using appropriate biomedical instruments and techniques.
CO4	Analyze the principles, applications, and safety considerations of medical imaging and therapeutic biomedical equipment.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units 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	**Physiology and Transducers:** Brief introduction to human physiology: Cell and its structure; Resting and Action Potential; Cardiovascular system; respiratory system; Basic components of a biomedical system. Biomedical transducers: Transducers selection criteria; Piezoelectric; ultrasonic; displacement, velocity, force, acceleration, flow, temperature, potential, dissolved ions and gases; Temperature measurements; Fiber optic temperature sensors.
Unit-II	**Electro – Physiological Measurements:** Bio-electrodes and Biopotential amplifiers for ECG, EMG, EEG, etc.: Limb electrodes; floating electrodes; pre-gelled disposable electrodes; Micro, needle and surface electrodes. ECG; EEG;EMG; ERG; Lead systems and recording methods.

Unit-III	**Non-Electrical Parameter Measurements:** Measurement of blood temperature, pressure and flow; Cardiac output ; Heart rate ;Heart sound Pulmonary function measurements ;spirometer ; Impedance plethysmography; Photo Plethysmography, Body Plethysmography.
Unit-IV	**Medical Imaging:** Ultrasonic, X-ray and nuclear imaging: Radiographic and fluoroscopic techniques; Computer tomography; MRI; Ultrasonography **Assisting And Therapeutic Equipments:** Prostheses and aids: pacemakers, defibrillators, heart-lung machine, artificial kidney, aids for the handicapped; Safety aspects: safety parameters of biomedical equipments.

Suggested Readings:

- Handbook of Biomedical Instrumentation by RS Khandpur;TMH, New Delhi, latest edition.
- A.M. Cook and J.G. Webster, eds., Therapeutic Medical Devices, Prentice-Hall,latest edition
- Introduction to Biomedical Electronics by Edward J. Perkstein; Howard Bj, USA
- Medical Electronics by Vikas Soni, Ishan publication
- Leslie Cromwell,―Biomedical Instrumentation and Measurement‖, Prentice Hall of India, New Delhi, latest edition

Useful Video Links:

Unit No	Topics	Links
Unit-I	Brief introduction to human physiology: Cell and its structure; Resting and Action Potential. Biomedical transducers: Transducers selection criteria; Piezoelectric; ultrasonic.	https://www.youtube.com/watch?v=Z1vp0bNFovU https://www.youtube.com/watch?v=nb_GXOaS94w
Unit-II	Bio-electrodes and Biopotential amplifiersfor ECG, EMG, EEG.	https://www.youtube.com/watch?v=3RcS4cDgK08 http://swayam.gov.in
Unit-III	Measurement of blood temperature, pressure and flow; Cardiac output ; Heart rate ; Heart sound. Body Plethysmography.	https://www.youtube.com/watch?v=n_6A2BL0YlA http://swayam.gov.in https://www.youtube.com/watch?v=8pmVZwGUEgU&t=50s
Unit-IV	Ultrasonic, X-ray and nuclear imaging: Radiographic and fluoroscopic techniques; Computer tomography; MRI;Ultrasonography. Pacemakers,defibrillators,heart-lung machine, artificial kidney.	https://www.youtube.com/watch?v=ZN9lPpkHiH8 https://www.youtube.com/watch?v=h2JgleSpocE http://swayam.gov.in

Course Code	**PEC-ECE-210A**				
Category	Professional Elective Course				
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. ● Solve differential equations using numerical methods and understand advanced computational techniques. ● Apply numerical methods to solve linear and nonlinear systems, and perform data fitting.				
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 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 8 parts of 1.5 marks each from all units 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:** 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, RungaKutta 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-212A**				
Category	Professional Elective Course				
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. ● Design and analyze rectifiers, inverters, choppers, and converters. ● Study different control techniques for AC and DC electric drives. ● Explore real-world applications of power electronics in systems like UPS and electric vehicles.				
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 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 8 parts of 1.5 marks each from all units 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	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 of DIAC, TRIAC, IGBT, GTO, MOSFET, UJT and their V-I characteristics. 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 (Half Bridge and Full Bridge with R, R-L Load), Single phase full wave centre tapped rectifier, Three phase full wave half-controlled and fully controlled bridge rectifier (R Load) Inverters: Principle of operation of basic inverter circuits, concepts of duty cycle, series & parallel, inverters & their applications.

Unit-III	**Choppers:** Introduction, types of choppers (Class A, Class B, Class C and Class D). Step up and step-down choppers. Cyclo-converters: Dual Converters and cyclo- converters: Introduction, types & basic working principle of dual converters and cyclo- converters & their applications.
Unit-IV	**Thyristorised Control of Electric drives DC drive control:** Half wave drives, Full wave drives, Chopper drives (Speed control of DC motor using choppers) AC drive control: Phase control, Constant V/F operation, Cyclo-converter /Inverter drives, Slip control AC drives Applications of power devices: light intensity control, speed control of universal motors, fan regulator, battery charger. Uninterrupted power supplies (UPS online, off line), SMPS Application of Power Electronics in Electrical vehicles controls. 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=lFrbdl9AsQE
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=q4YEChr8R5I

Course Code	**PEC-CSE-214A**				
Category	Program Elective Courses				
Course Title	**Computer Vision**				
Scheme and Credits	L	T	P	**Credits**	**Semester-IV**
	3	0	0	3	
Course Objectives	The objectives of this course are to ● Understand about images formation, representation, and processed using cameras, geometry, and transformations. ● Learn how to estimate and track motion in image sequences using techniques like optical flow and Kalman filters. ● Explore methods to detect shapes such as lines, circles, and ellipses using the Hough Transform and its variations. ● Understand how to reconstruct 3D scenes and objects from 2D images using depth cues and 3D projection methods.				
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	Describe the fundamentals of computer vision and image processing operations to enhance, segment the images.
CO2	Understand the analyzing and extraction of relevant features of the concerned domain problem.
CO3	Understand and apply the motion concepts and its relevance in real time applications
CO4	Apply the knowledge in solving high level vision problems like object recognition, image classification etc.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units 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	**Overview of computer vision and its applications:** Image Formation and Representation: Imaging geometry, radiometry, digitization, cameras and Projections, rigid and affine transformation **Image Processing:** Pixel transforms, color transforms, histogram processing, histogram equalization, filtering, convolution, Fourier transformation and its applications in sharpening, blurring and noise removal.
Unit-II	**Hough Transform**: Line detection – Hough Transform (HT) for line detection , foot-of normal method, line localization, line fitting, RANSAC for straight line detection, HT based circular object detection – accurate center location – speed problem – ellipse detection. **Case study:** Human Iris location, hole detection, Generalized Hough Transform (GHT) , Spatial matched filtering, GHT for ellipse detection , object location, GHT for feature collation.

Unit-III	**3D Vision:** Methods for 3D vision – projection schemes, shape from shading – photometric stereo, shape from texture, shape from focus – active range finding, **Surface Representations:** point-based representation , volumetric representations- 3D object recognition, 3D reconstruction.
Unit-IV	**Introduction to Motion:** Triangulation, bundle adjustment, translational alignment, parametric motion, spline-based motion, Optical flow, layered motion. **Motion tracking:** statistical filtering; iterated estimation; observability and linear systems; the Kalman filter. **Object recognition and shape representation:** alignment, appearance-based methods, invariants, image eigen spaces.

Suggested Readings:

- Mastering OpenCV with Practical Computer Vision Projects by D. L. Baggio etal., Packt Publishing.
- Computer & Machine Vision‖ by E. R. Davies, Fourth Edition, Academic Press.
- Programming Computer Vision with Python Tools and algorithms for analyzing images by Jan Erik Solem, O'Reilly Media.
- Feature Extraction & Image Processing for Computer Vision by Mark Nixon and Alberto S. Aquado, Third Edition, Academic Press.
- Computer Vision: Algorithms and Applications by R. Szeliski, Springer.
- Computer Vision: Models, Learning, and Inference‖ by Simon J. D. Prince, Cambridge University Press.

Useful Video Links:

Unit No	Topics	Links
Unit-I	Introduction to Computer Vision	https://www.youtube.com/watch?v=yetsJWgYh0o&list=PLwdnzlV3ogoVsma5GmBSsgJM6gHv1QoAo&index=2
	Introduction to Image Processing	https://www.youtube.com/watch?v=1I6kfkY4GyQ&list=PLwdnzlV3ogoVsma5GmBSsgJM6gHv1QoAo&index=3
Unit-II	Image Features and Edge Detection	https://www.youtube.com/watch?v=U-5x0L48LzE&list=PLwdnzlV3ogoVsma5GmBSsgJM6gHv1QoAo&index=22
	Hough Transform	https://www.youtube.com/watch?v=4fTxG-Eb37k&list=PLwdnzlV3ogoVsma5GmBSsgJM6gHv1QoAo&index=24
Unit-III	3D object recognition, 3D reconstruction	https://www.youtube.com/watch?v=yG74TklRPoo
	Image Formation in a Stereo Vision Setup	https://www.youtube.com/watch?v=IvYu0O8ZQNI
Unit-IV	Structure from Motion	https://www.youtube.com/watch?v=ffYs3i2BAig
	Object Boundary and Shape Representations	https://www.youtube.com/watch?v=sVTlQQ2jXIM&list=PLwdnzlV3ogoVsma5GmBSsgJM6gHv1QoAo&index=27

Course Code	**HSMC-01A**				
Category	Humanities and Social Science 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 • Introduce students to foundational management theories, functions, and organizational concepts to build a strong conceptual framework. • Develop understanding of individual and group behavior, motivation, communication, and leadership in organizational settings. • Equip students with practical skills to manage interpersonal processes, conflicts, and team dynamics effectively. • Foster critical analysis of organizational structures, cultures, and change mechanisms to enhance adaptability and effectiveness in organizations.				
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 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 8 parts of 1.5 marks each from all units 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 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, Aswathappa K.,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-CSE-213A**				
Category	Engineering Science Courses				
Course Title	**Python Programming Lab**				
Scheme and Credits	L	T	P	**Credits**	**Semester-IV**
	0	0	2	1	
Course Objectives	The objectives of this course are • To introduce students to the basics of Python programming including syntax, data types, control structures, and file operations. • To enable students to use Python data structures and modular programming techniques effectively. • To provide hands-on experience with data analysis using NumPy and Pandas libraries. • To develop skills in GUI programming, simple graphics, and image processing using Python.				
Assessment	25 Marks				
End Semester Examination	25 Marks				
Total	50 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 installation process, basic features and programming constructs in Python.
CO2	Apply Python programming techniques to implement algorithms for mathematical operations, searching, sorting and other real life problems.
CO3	Apply NumPy and Pandas for data manipulation, statistical operations.
CO4	Analyze and integrate Python's graphics, image processing, and GUI programming concepts to develop interactive applications.

List of Experiments

Sr. No.	Contents
1	Study the basic features and installation of Python.
2	Write a Python program to compute the G.C.D. of two numbers.
3	Write a Python program to find the square root of a number.
4	Write a Python program to find the power of a number.
5	Write a Python program to find the maximum in a list of numbers.
6	Write a Python program to implement linear search and binary search in a list.
7	Write a Python program to sort the element using selection sort, insertion sort and merge sort.
8	Write a Python program to compute first "n" prime numbers.
9	Write a Python program to find the most frequent word in a text file.
10	Write a Python program to create and perform operations on arrays using NumPy.
11	Write a Python program to apply Pandas for manipulating a dataset and performing grouped statistical operations.
12	Write a Program in Python for a random walk using turtle.
13	Create simple graphics using Turtle: draw shapes and take random walks.
14	Perform image processing: copy, blur, and reduce images using PIL or OpenCV
15	Design a GUI application using Tkinter with input, output, and buttons.

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	Arithmetic Operations	https://python-iitk.vlabs.ac.in/exp/arithmetic-operations/
2	Built-in Functions	https://python-iitk.vlabs.ac.in/exp/built-in-functions/
3	Loops	https://python-iitk.vlabs.ac.in/exp/loops/
4	Strings	https://python-iitk.vlabs.ac.in/exp/strings/
5	File Handling	https://python-iitk.vlabs.ac.in/exp/file-operators/simulation.html

Course Code	**LC-ECE-216A**				
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. ● Understand the operation and characteristics of different oscillators, regulators and timers. ● Understand the operation of the power supply.				
Assessment	25 Marks				
End Semester Examination	25 Marks				
Total	50 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 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=ru72wlF6epU
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-218A**				
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. ● Design and check different combinational and sequential logic circuits. ● Understand the working operation of adders, subtractors, multiplexers, flip-flops, and counters in digital systems. ● Learn to build and test ADC, DAC, and practical counters for various applications.				
Assessment	25 Marks				
End Semester Examination	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

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

COs	**Skills Demonstrated**
CO1	Identify and apply operational principles of logic gates used in digital systems.
CO2	Apply K-map techniques to simplify Boolean expressions and design efficient combinational and sequential circuits.
CO3	Verify the truth tables and behavior of various combinational circuits with different states and inputs.
CO4	Design and develop counters and shift registers using flip flops for various practical applications used in digital systems.

List of Experiments

Sr. No.	**Contents**
1	To study & design basic gates.
2	To study and realize logic functions with the help of universal gates.
3	To realize and minimize five & six variables using K-Map method.
4	To verify the operation of Multiplexer & De-multiplexer.
5	To perform half adder and full adder
6	To perform half subtractor and full subtractor.
7	To verify the truth table of S-R, J-K, T & D Type flip flop.
8	To design & verify the operation of 3 bit synchronous counter.
9	To design & verify the operation of synchronous UP/DOWN decade counter using JK flip
10	To design & verify operation of Asynchronous counter.
11	To design and implement a circuit to detect a count sequence.
12	To design & verify operation of ADC & DAC.

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-220A**				
Category	Professional Core Courses				
Course Title	**Microprocessors and Microcontrollers Lab**				
Scheme and Credits	L	T	P	**Credits**	**Semester- IV**
	0	0	2	1	
Course Objectives	The objectives of this course are to • Introduce students to the working models of 8085 and 8086 microprocessors. • Enable students to develop and execute assembly language programs using 8085 and 8086 microprocessors. • Provide hands-on experience in interfacing various peripherals with 8085 and 8086 systems.				
Assessment	25 Marks				
End Semester Examination	25 Marks				
Total	50 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 architecture, addressing modes and functioning of 8085 and 8086 microprocessors 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 and analyze the process of interfacing the peripherals with microprocessors for solving real world problems.
CO4	Design and implement assembly language programs to generate standard waveforms using 8086 microprocessor kits.

List of Experiments

Sr. No.	Contents
1	To study the architecture, pin configuration and functional blocks of the 8085 and 8086 microprocessors using trainer kits.
2	Write a program to add the contents of the memory location to the content of other memory location and store the result in 3rd memory location.
3	Write a program to add 16 bit number using 8086 instruction set.
4	Write a multiplication of two 16 bit numbers using 8086 instruction set.
5	Write a program for division of two 16 bit numbers using 8086 instruction set.
6	Write a program factorial of a number.
7	Write a Program to transfer a block of data with & without overlap.
8	Write a program to find the average of two numbers.
9	Write a Program to check whether data byte is odd or even
10	Write a program to find maximum number in the array of 10 numbers.
11	Write a program to find the sum of the first ‘n’ integers.
12	Write a program to generate a square wave.
13	Write a program to generate a rectangular wave.
14	Write a program to generate a triangular wave.

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 the architecture of 8086 microprocessor and 8086 microprocessor kit.	https://www.youtube.com/watch?v=_5yDeCBXrXc&list=PLNdrDld4dxeVrRU4OmzVCR6UUgyRYMquI&index=6
2	Write a Program to transfer a block of data with & without overlap.	https://www.youtube.com/watch?v=GKgaMMYut7g&list=PLNdrDld4dxeVrRU4OmzVCR6UUgyRYMquI&index=9
3	Write a program to find the average of two numbers.	https://www.youtube.com/watch?v=nOt9Wa-ClRo&list=PLNdrDld4dxeVrRU4OmzVCR6UUgyRYMquI&index=10
4	Write a program to find maximum number in the array of 10 numbers.	https://www.youtube.com/watch?v=vNRGKG8ujVc&list=PLNdrDld4dxeVrRU4OmzVCR6UUgyRYMquI&index=12
5	Write a program factorial of a number.	https://www.youtube.com/watch?v=riliLJP0Q_0&list=PLNdrDld4dxeVrRU4OmzVCR6UUgyRYMquI&index=13