SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)
(A CENTRAL UNIVERSITY)
CBCS-NEW SYLLABUS
B. TECH. SECOND YEAR (Electronics and Communication Engineering)
(W.E.F. SESSION 2021-22)

Vision and Mission of the Institute

Vision		To be a leading technological institute that imparts transformative education to create globally competent technologists, entrepreneurs, researchers and leaders for a sustainable society
Mission	1	To create an ambience of teaching learning through transformative education for future leaders with professional skills, ethics, and conduct.
	2	To identify and develop sustainable research solutions for the local and global needs.
	3	To build a bridge between the academia, industry and society to promote entrepreneurial skills and spirit

Vision and Mission of the Department

Vision		The Department endeavours for academic excellence in Electronics & Communication Engineering by imparting in depth knowledge to the students, facilitating research activities and cater to the ever-changing industrial demands, global and societal needs with leadership qualities.
Mission	1	To be the epitome of academic rigour, flexible to accommodate every student and faculty for basic, current and future technologies in Electronics and Communication Engineering with professional ethics.
	2	To develop an advanced research centre for local & global needs.
	3	To mitigate the gap between academia, industry & societal needs through entrepreneurial and leadership promotion.

Program Educational Objectives (PEOs)

The graduate of the Electronics and Communication Engineering Program will

PEO1: Have fundamental and progressive knowledge along with research initiatives in the field of Electronics & Communication Engineering.

PEO2: Be capable to contrive solutions for electronic & communication systems for real world applications which are technically achievable and economically feasible leading to academia, industry, government and social benefits.

PEO3: Have performed effectively in a multi-disciplinary environment and have self-learning & self-perceptive skills for higher studies, professional career or entrepreneurial endeavors to be confronted with a number of difficulties.

PEO4: Attain team spirit, communication skills, ethical and professional attitude for lifelong learning.

Programme Outcomes: Graduates will be able to:

PO1: Fundamentals: Apply knowledge of mathematics, science and engineering.

PO2: Problem analysis: Identify, formulate and solve real time engineering problems using first principles.

PO3: Design: Design engineering systems complying with public health, safety, cultural, societal and environmental considerations

PO4: Investigation: Investigate complex problems by analysis and interpreting the data to synthesize valid solution.

PO5: Tools: Predict and model by using creative techniques, skills and IT tools necessary for modern engineering practice.

PO6: Society: Apply the knowledge to assess societal, health, safety, legal and cultural issues for practicing engineering profession.

PO7: Environment: Understand the importance of the environment for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics, and responsibilities and norms of the engineering practice.

PO9: Teamwork: Function effectively as an individual and as a member or leader in diverse teams and multidisciplinary settings.

PO10: Communication: Communicate effectively by presentations and writing reports.

PO11: Management: Manage projects in multidisciplinary environments as member or a team leader.

PO12: Life-long learning: Engage in independent lifelong learning in the broadest context of technological change.

Programme Specific Outcomes:

PSO1: Identify, formulate and apply concepts acquired through Electronics & Communication Engineering courses to the real-world applications.

PSO2: Design and implement products using the cutting-edge software and hardware tools to attain skills for analyzing and developing subsystem/processes.

PSO3: Ability to adapt and comprehend the technology advancement in research and contemporary industry demands with demonstration of leadership qualities and betterment of organization, environment and society.

SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)
(A CENTRAL UNIVERSITY)

CBCS-NEW, EVALUATION SCHEME

PROPOSED (W.E.F. SESSION 2021-22)

B. TECH. SECOND YEAR (SEMESTER- III)

(Electronics and Communication Engineering)

S. No.	COURSE No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	IA	ESE	TOTAL	
THEORY									
1.	EC203TPC01	Electronic Devices	3	-	-	30	70	100	3
2.	EC203TPC02	Digital Logic Design	3	-	-	30	70	100	3
3.	EC203TPC03	Network Theory	3	1	-	30	70	100	4
4.	EC203TPC04	Signals and Systems	3	1	-	30	70	100	4
5.	EC203TBS05	Mathematics- III	3	1	-	30	70	100	4
6.	EC203THS02	Engineering Economics	3	-	-	30	70	100	3
		TOTAL	**18**	**3**	**-**	**180**	**420**	**600**	**21**
PRACTICALS									
1	EC203PPCO1	Electronics Devices Lab	-	-	2	30	20	50	1
2.	EC203PPC02	Digital Logic Design Lab	-	-	2	30	20	50	1
		TOTAL	**-**	**-**	**4**	**60**	**40**	**100**	**2**
		GRAND TOTAL	**18**	**3**	**4**	**240**	**460**	**700**	**23**

Total Credits: **23** Total Contact Hours**: 25** Total Marks**: 700**

L**:** LECTURE, T**:** TUTORIAL, P**:** PRACTICAL, IA**:** INTERNAL ASSESSMENT, ESE**:** END SEMESTER EXAMINATION

*INTERNAL ASSESSMENT- Two Class Test of 15 Marks each will be conducted.

SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)
(A CENTRAL UNIVERSITY)

CBCS-NEW, EVALUATION SCHEME

PROPOSED (W.E.F. SESSION 2021-22)

B. TECH. SECOND YEAR (SEMESTER- IV)

(Electronics and Communication Engineering)

S. No.	COURSE No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	IA	ESE	TOTAL	
THEORY									
1.	EC204TPCO5	Analog Circuits	3	1	-	30	70	100	4
2.	EC204TPC06	Analog Communication	3	1	-	30	70	100	4
3.	EC204TPC07	Control Systems	3	1	-	30	70	100	4
4.	EC204TES05	Data Structure with C++	3	-	-	30	70	100	3
5.	EC204TBS06	Numerical Methods	3	1	-	30	70	100	4
6.	EC204TMCO2	Environmental Sciences	2	-	-	-	-	-	-
		TOTAL	**17**	**4**	**-**	**150**	**350**	**500**	**19**
PRACTICALS									
1.	EC204PPC05	Analog Circuits Lab	-	-	2	30	20	50	1
2.	EC204PES05	Data Structure with C++ Lab	-	-	2	30	20	50	1
		TOTAL	**-**	**-**	**4**	**60**	**40**	**100**	**2**
		GRAND TOTAL	**17**	**4**	**4**	**210**	**390**	**600**	**21**

Total Credits**: 21** Total Contact Hours **: 25** Total Marks**: 600**

L**:** LECTURE, T**:** TUTORIAL, P**:** PRACTICAL, IA**:** INTERNAL ASSESSMENT, ESE**:** END SEMESTER EXAMINATION

*INTERNAL ASSESSMENT- Two Class Test of 15 Marks each will be conducted.

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC203TPC01	3	-	-	3 Hours	30	70	100	3

ELECTRONIC DEVICES

Course Objectives:

- To develop basic concept of semiconductor materials and physics.
- To introduce different methods of DC analysis and AC models of semiconductor devices.
- To develop the concept and analysis of transistor characteristics, biasing and thermal stabilization.
- To help students develop various designs of amplifiers and its applications.

UNIT-I

Semiconductor Concept: Metals, Insulators and semiconductors, Electrical properties of Ge and Si, Conductivity equation, Mobility and conductivity, Electron and holes in intrinsic and extrinsic semiconductors, Donor and acceptor Impurities, Electrons in periodic lattices, E-K diagrams, Energy bands in intrinsic and extrinsic silicon, Transport phenomena of semiconductor, Generation and recombination of carriers, Charge density in semiconductor, Hall effect, Injected minority charge carriers, Potential variation within graded semiconductor.

Junction Diode Characteristics: Properties of P-N junction, Open circuited P-N junction, V-I characteristics, Temperature dependence of V-I characteristics, Diode resistance, Current component of PN diode, Space charge capacitance, Charge control description of a diode, Diffusion capacitance, Junction diode switching times, Breakdown mechanism.

UNIT-II

Diode Circuits: Load line concepts, Graphical analysis, Clipper circuit, Clamper, Comparator, Rectifier, Full wave circuits, Filter circuits- Inductor filter, Capacitor filter, LC filter, Multiple LC filter, CLC or filter, Zener diode regulator circuit.

Other Diodes: Negative conductance in semiconductors-Tunnel diode, Photo diode, Photo voltaic effect, Solar cells, Schottky diode, Varactor diode, Avalanche diode, PIN diode, LED, LASER.

UNIT-III

Transistor Characteristics: Junction transistor, Transistor current components, Transistor as an amplifier, Transistor construction, Transistor circuit configuration (CB, CE, CC)-Analytical expression for transistor characteristics and operation, Early effect, Ebers-Moll model, re model, Transistor as a switch.

Transistor Biasing and Thermal Stabilization: The operating point, Bias stability, Stability factor-stabilization against variation in I_{co} V_{BE} and ß, Emitter bias, Collector to base bias, Voltage divider bias with emitter bias, Emitter bypass capacitor, Bias compensation.

UNIT-IV

Field Effect Transistor (FET): JFET construction, Operation, V-I characteristics, Transfer characteristics, Drain characteristics, Metal oxide semiconductor field effect transistor (MOSFET) construction, Operation and characteristics, Depletion MOSFET, Enhancement MOSFET, Complementary MOSFET, MOS capacitor, C-V characteristics, MOSFET, Small signal models of MOS transistor, LED, Photodiode and solar cell.

UNIT-V:

Timer & Regulators: PNPN and other devices, Silicon controlled rectifier, Basic rectifier operation, V-I characteristics, Gate triggering characteristics, Application, Silicon-controlled switch, Shockley diode, DIAC, TRIAC, Uni-junction transistors-Construction, Operation, V-I characteristics, Application.

Text/Reference Books:

1. J. Millman and C. C. Halkias, "Electronic Devices and Circuits", 6th ed., Tata McGraw Hill Publishing Limited, New Delhi, 2003.
2. A. Mottershead, "Electronic Devices and Circuits- An Introduction", Prentice Hall of India Private Limited, New Delhi, 2003
3. R. Boylestad and L. Nashelsky, "Electronic Device & Circuit Theory", 11th ed., Pearson, 2013.
4. B. G. Streetman and S. Banerjee, "Solid State Electronic Devices", Pearson Education, 2002 / PHI
5. S. M. Sze and K. N. Kwok, "Physics of Semiconductor Devices," 3rd ed., John Wiley & Sons, 2006.
6. T. F. Boghert, "Electronic Devices & Circuits", 6th ed., Pearson Education, 2003.

Course Outcomes:

At the end of the course, students will be able to:

CO1 Illustrate the knowledge of semiconductor physics.

CO2 Understand the characteristics of the PN junction diode, special diodes and its application in electronic circuits.

CO3 Elucidate and analyze the characteristics and performance of transistors.

CO4 Analyze the concept of load line and design biasing circuits of transistor.

CO5 Comprehend the understanding of power electronic devices for industrial application.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1					3	1		2	3		2
CO2	3	3	2	3	3	3			3	1		2	3	2	3
CO3	3	3	2	3	3	3			3	1		2	3	3	3
CO4	3	3	2	3	3	3			3	1		2	3	3	3
CO5	3	3	2	3	3	3			3	1		2	3	3	3

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC203TPC02	3	-	-	3 Hours	30	70	100	3

DIGITAL LOGIC DESIGN

Course Objectives:

- To understand number representation and conversion between different representation in digital electronic circuits.
- To analyze logic processes and implement logical operations using combinational logic circuits.
- To understand the characteristics of memory and their classification.
- To understand concepts of sequential circuits and to analyze sequential systems in
- terms of state machines.
- To understand the concept of programmable devices, PLA, PAL.

UNIT-I

CODES: Binary Codes: Introduction & usefulness, Weighted & non-weighted codes, Sequential codes, Self-complementing codes, Cyclic codes, 8-4-2-1BCD code, Excess-3 code, Grey code: Binary to grey and grey to binary code conversion, Error detecting code, Error-correcting code,7-bit hamming code, ASCII code, EBCDIC code.

Realization of Boolean Expressions: Reduction of Boolean expressions using laws, theorems, and xioms of Boolean algebra, Boolean expressions and logic diagram, Converting AND/OR/Invert logic to NAND/NOR logic, SOP and POS forms and their realization.

UNIT-II

Minimization Techniques: Binary codes: Expansion of a Boolean expression to SOP form, Expansion of a Boolean expression to POS form 2, 3 & 4 variable K-map: Mapping and minimization of SOP and POS expressions, Completely and incompletely specified function, Concept of don't care terms.

UNIT-III

Combinational Circuits: Adder & Subtractor: Half-adder, Full-adder, Half-subtractor, Full subtractor, Parallel binary adder, Look ahead carry adder, Serial adder, BCD adder, Code converter, Parity bit generator/checker, Comparator, Decoder: 3-line to 8-line decoder, 8-4-2-1 BCD to decimal decoder, BCD to 7-segment decoder, Encoder: octal to binary and decimal to BCD encoder, Multiplexer: 2-input multiplexer, 4-input multiplexer, 16-input multiplexer, Demultiplexer: 1-line to 4-line & 1-line to the 8-line demultiplexer, Multiplexer as universal logic function generator, Programmed array logic (PAL), PLA, and PLO.

UNIT-IV

Sequential Circuits: Flip-flop & timing circuits: S-R latch, Gated S-R latch, D latch, J-K flip-flop, T flip-flop, Edge-triggered S-R, D, J-K, T flip-flops, Master-slave flip-flop, Direct preset and clear inputs, Shift registers: PIPO, SIPO, PISO, SISO, Bi-directional shift registers, Universal shift

registers, Counter: Asynchronous counter: Ripple counter, Design of asynchronous counter, Effect of propagation delay in ripple counter, Synchronous counter: 4-bit synchronous up counter, 4-bit synchronous down counter, Design of synchronous counter, Ring counter, Jhonson counter, Pulse train generators using counter, Design of sequence generator.

UNIT-V

Digital-Logic Families: Introduction, Simple diode gating, and transistor inverter, Basic concepts of TTL, Open collector gates, MOS logic, CMOS logic, Dynamic MOS logic, Interfacing: TTL to CMOS, CMOS to TTL, Comparison among various logic families, Manufacturer's specification

Text/Reference Books:

1. A. A. Kumar, "Fundamentals of Digital Circuits", 2nd ed., PHI, 2009
2. H. Taub and D. Schilling, "Digital Integrated Electronics", 1st ed., TMH, 2008
3. M. M. Mano," Digital Logic and Computer Design", 1st ed., PHI, 2004
4. A. P. Malvino and D. Leach, "Digital Principles and Application", 4th ed., TMH, 1986.

Course Outcomes:

At the end of the course, students will be able to learn:

CO1 Apply the knowledge of number systems and Boolean logic used in the development of digital circuits

CO2 Analyze digital circuits using Boolean algebra and K-maps

CO3 Design and implement a variety of logical devices using combinational circuits concepts

CO4 Design and analyze sequential circuits

CO5 Analyze different circuits using different logic families

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	1			1			3	3	1	1
CO2	3	3	3	2	2	1			1			3	3	1	1
CO3	3	3	3	2	2	1			1			3	3	1	1
CO4	3	3	3	2	2	1			1			3	3	1	1
CO5	3	3	3	2	2	1			1			3	3	1	1

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC203TPC03	3	1	-	4 Hours	30	70	100	4

NETWORK THEORY

Course Objectives:

- Capable for analyzing any given electrical network.
- Identify the behaviour of the electrical network.
- Understand the significance and practical aspect of two port network.
- Understand the use of network graphs and synthesize passive filter circuits.
- Familiarize an electrical network from a given impedance/admittance function.

UNIT-I

Circuit Concept: R, L, C parameter, Relationship of field & circuit concepts, Dot convention to coupled circuits, Nodal and mesh analysis, Duality, Network theorems: Superposition, Reciprocity, Thevenin's, Norton's, Maximum power transfer, Compensation and Tallegen's theorem as applied for dependent and independent sources, Wye-delta transformation, Resonance: Series resonance and parallel resonance, Frequency- response of series and parallel circuits, Quality factor Q, Bandwidth, Conditions for maximum impedance.

UNIT-II

Time and Frequency Domain Analysis: Network equation, Initial conditions in networks, Step and impulse response, Transient analysis of DC & AC circuits, Solution of network equations.

First order differential equations: General & particular solutions, Time constant, Integrating factor, Initial conditions in networks: Why study initial conditions, Procedure for evaluating initial conditions, Initial state of a network. Second order differential equations: Internal excitation, Network excited by external energy sources, General solutions in terms of S,Q, and Wn, Laplace transforms and properties: Partial fractions expansions, Initial and final value theorem.

UNIT-III

Two Port Networks: Relationship of two port variables, Short circuit admittance parameters, Open circuit impedance parameters, Transmission parameters, Hybrid parameters, Relationship between parameter sets, Interconnection of two port networks, T and π section representation in parameter forms.

UNIT-IV

Network Graph Theory: Introduction of graph theory, Concept of network graph, Properties of tree in a graph, Formation of incidence matrix, Properties of incidence matrix, Number of tree in a graph, Cut set matrix, Loop matrix.

Passive filters: Characteristic impedance of symmetrical networks, The propagation constant, Filter fundamentals- pass and stop bands.

UNIT-V

Network Synthesis: Concept of network synthesis, Procedure of synthesis, Reactive network, Foster's canonic first and second form, Ladder network, Cauer canonic first and second form, Applicability of Foster's and Cauer form.

Text/Reference Books:

1. M.E. Van Valkenburg, "Network Analysis", 3rd ed., Prentice-Hall India, 2010
2. F. F. Kuo., "Network Analysis and Synthesis", 2nd ed., Wiley India, 2008
3. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", 8th ed., Tata McGraw-Hill, 2008
4. Sudhakar and A. Shyammohan, "Circuits and Network", 3rd ed., Tata McGraw Hill, 2006
5. C. L. Wadhwa, "Network analysis and synthesis", 2nd ed., New Age International, 2006

Course Outcomes:

At the end of the course, students will be able to:

CO1 Analyze various electrical networks using advanced theorems and techniques.

CO2 Obtain the transient and steady-state response of electrical networks.

CO3 Apply two-port network formulation for analyzing electrical networks.

CO4 Apply network graph in real-world scenario and design different types of passive filters.

CO5 Synthesize electrical network using Foster and Cauer forms.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	2			3	1		2	3	2	3
CO2	3	2	2	3	3	1			3	1		2	3	2	3
CO3	3	2	2	3	3	1			3	1		2	3	2	3
CO4	3	2	2	3	3	1			3	1		2	3	2	3
CO5	3	2	2	3	3	1			3	1		2	3	2	3

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC203TPC04	3	1	-	4 Hours	30	70	100	4

SIGNALS & SYSTEMS

Course Objectives:

- To make the students familiarize with the fundamental continuous and discrete signals and systems.
- To develop basic idea of operations performed on LTI systems in time and frequency domain.
- To introduce different transformation methods used in time and frequency domains.
- To help students develop an understanding the concept of representation of various time and frequency domains systems.
- To explore the concept of continuous to discrete conversion technique needed in communication.

UNIT-I

Signals and Systems: Definition of signal, Test signals, Operations on signals, Classification of signals, Definition of system and system classification, System properties: additivity and homogeneity, Causality, Stability, Invertibility.

UNIT-II

Linear Time Invariant (LTI) Systems: Impulse response and step response, Convolution, properties of LTI systems, Eigen functions, System representation through differential and difference equations.

UNIT-III

Continuous Time System Analysis: The Laplace transform, Region of convergence, Poles and zeros of system, Properties of Laplace transform, Inverse Laplace transform, Laplace domain analysis, Solution to differential equations and system behavior.

Discrete Time System Analysis: The Z-Transform, Region of convergence, Properties of Z-transform, Inverse Z-transform, Z-domain analysis, Solution to difference equations and system behavior.

UNIT-IV

Fourier Analysis of Continuous Time System: Fourier series representation, Fourier transform, Properties of Fourier transform, Magnitude and phase response.

Continuous to Discrete Conversion: Sampling, Sampling theorem and signal reconstruction.

Fourier Analysis of Discrete Time System: The discrete-time Fourier transform (DTFT), Properties of DTFT, LTI system representation by DTFT.

UNIT-V

Discrete Fourier transform (DFT), Properties of DFT, Parseval's theorem, Fast Fourier transform (FFT): Concept of twiddle factor, DIT and DIF radix-2 algorithm.

Text/Reference Books:

1. B. P. Lathi, "Principles of Linear Systems and Signals", Oxford University Press, 2009.
2. H. P. Hsu, “Schaum’s outline: Theory and Problem of Signal & Systems”, TMH 1995.

3. S. Ghosh, “Signals & Systems”, Pearson Education, 2006.
4. S. K. Mitra, “Signals & Systems”, Oxford University Press, 2015
5. A. V. Oppenheim, A.S. Willsky , and I.T. Young, "Signals and Systems", Prentice Hall, 1983.
6. J. Nagrath, S. N. Sharan, R. Ranjan, and S. Kumar, "Signals and Systems", TMH New Delhi, 2001.

Course Outcomes:

At the end of the course, students will able to:

CO1 Analyze and identify different types of continuous and discrete signals and systems.

CO2 Investigate and represent various responses of LTI continuous and discrete systems.

CO3 Perform different continuous and discrete time domain transformation technique.

CO4 Represent any aperiodic signal in to a combination of sinusoids.

CO5 Obtain the conversion using sampling and reconstruction of signals.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	2				3			3	3	2	
CO2	3	3	1	2	3				3			3	3	2	
CO3	3	3	2	2	3				3			3	3	2	
CO4	3	3	2	2	1				3			3	3	2	
CO5	3	3	2	1	1				3			3	3	2	

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC203TBS05	3	1	-	4 Hours	30	70	100	4

MATHEMATICS – III

Course Objectives:

- To expand the given periodic function defined in the given range in terms of sine and cosine multiple of terms as a Fourier series.
- To extremize the functional using integration technique.
- To form and solve the partial differential equation using different analytical techniques.

UNIT-I

Functions of Complex Variables-Differentiation: Limit, Derivative, Analytic function, Cauchy- Riemann equations, Harmonic functions, Finding harmonic conjugate, Elementary analytic functions (exponential, trigonometric, logarithmic) and their properties, Conformal mapping, Mobius transformation and their properties.

UNIT-II

Functions of Complex Variables-Integration: Complex integration, Cauchy´s integral theorem, and integral formula, Liouville's theorem and maximum-modulus theorem (without proof), Taylor's & Laurent's series, Singular point, Poles & resides, Residue theorem & its application to contour integration.

UNIT-III

Laplace Transform: Definition, Linearity, Shifting & scaling properties, Transform of elementary functions, Transform of derivatives & integrals, Multiplication by t & division by t, Inverse Laplace transform, Convolution theorem, Transform of periodic functions, Unit step function & dirac delta function, Initial value and final value theorems, Application to solution of ordinary differential equations.

UNIT-IV

Fourier Transform: Definition of Fourier integrals- Fourier sine & cosine integrals, Complex form of Fourier integral, Fourier sine & cosine transforms, Complex form of Fourier transform, Linearity, Shifting & scaling properties, Modulation theorem, Inverse Fourier transform, Fourier transform of derivatives.

UNIT-V

Differential Equations: First order ordinary differential equations-exact, linear and Bernoulli's equations, Equations not of first degree: equations solvable for p, Equations solvable for y, Equations solvable for x and Clairaut's type, Second order linear differential equations with constant coefficient.

Text/Reference Books:

1. H. K. Das, "Advance Engg. Mathematics", S-Chand Publication
2. B. S. Grewal, "Higher Engg. Mathematics", Khanna Publication
3. E. Kreyszig, "Advance Engg. Mathematics", J Willey & Sons
4. L. A. Pipes, "Applied Mathematics for Engineers & Physicists", TMH
5. S. L. Ross, Differential Equations, 3rd ed., Wiley India, 2009.

Course Outcomes:

At the end of the course, students will be able to:

CO1 Apply knowledge of complex variables and its application in differentiation

CO2 Apply knowledge of complex variables and its application in Integration

CO3 Perform Laplace transformation on different functions, signals and systems.

CO4 Obtain Fourier transform of different signals and its application in solving engineering Problems

CO5 Apply different types of differential equations for understanding and solving engineering Problems.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

PO												PSO		
PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
3	3	1	2	2				3			3	3		2
3	3	1	2	2				3			3	3		2
3	3	2	1	3				3			3	3		3
3	3	2	1	3				3			3	3		3
3	3	1	2	2				3			3	3		2

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC203THS02	3	-	-	3 Hours	30	70	100	3

ENGINEERING ECONOMICS

Course Objectives:

- To analyze cost/revenue data and carry out make economic analyses in thedecision-making process
- To justify or reject alternatives/projects on an economic basis.

UNIT-I

Basic concepts and definitions, Methodology of economics, Demand and supply-elasticity, Theory of the firm and market structure, Price and output determinations in different types of market.

UNIT-II

Public Sector Economics–Welfare economics, Central and commercial marks and their functions, Industrial policies, Theory of localization, Weber & surgent florence theory, Investment analysis-NPV, ROI, IRR, Payback period, SWOT analysis.

UNIT-III

Monetary and fiscal policy, Tools, Impact on the economy, Inflation, Business Cycle, Cash flow-2, 3, 4 Model.

UNIT-IV

Business Forecasting–Elementary techniques, Cost and revenue analysis, Capital budget, Break even analysis.

UNIT-V

Indian economy, Urbanization, Unemployment–poverty, Regional disparities, Unorganized sectors- Roll of plans, Reforms-post independent period.

Text/Reference Books:

1. N. M. Gregory, "Principles of Economics", Thompson Asia, 2002.
2. V. Mote, S. Paul, and G. Gupta, "Managerial Economics", Tata McGraw Hill, 2004.
3. S.K. Misra and V. K. Puri, "Indian Economy", Himalaya, 2009.
4. P. Saroj, "Textbook of Business Economics", Sunrise Publishers, 2003.
5. U. Kapila, "Indian Economy Since Independence", Academic Foundation, New Delhi
6. R. Dutt and K. P. M. Sundharam, "Indian Economy", S. Chand & Company Ltd., New Delhi.
7. R. Mathur, "Indian Economic Policy and Reform", RBSA Publisher, Jaipur.

Course Outcomes:

At the end of the course, students will able to:

CO1 Aware of the basic theoretical framework underlying the field of microeconomics, macroeconomics, Indian economy, public finance etc.

CO2 Understand the operations of money and banking and their interaction with the rest of the economy.

CO3 Realize how monetary forces operate through a multitude of channels-market, non- market,

institutions and among others.

CO4 Understand the various issues/components of the Indian economy so that they are able to comprehend and critically appraise current Indian economic problems.

CO5 Understand the major developments in the Indian economy before independence, at the time of Independence and during the post-Independence period.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		1	1	1		1			2		2	2	1		
CO2		1	1	1		1			2		2	2	1		
CO3		1	1	1		1			2		2	2	1		
CO4		1	1	1		1			2		2	2	1		
CO5		1	1	1		1			2		2	2	1		

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC203PPC01	-	-	2	2 Hours	30	20	50	1

ELECTRONICS DEVICES LAB

Course Objectives:

- To identify and test various electronic components.
- To use DSO for various measurements.
- To plot the characteristics of diode and transistor.
- To plot the characteristics of SCR, UJT, DIAC & TRIAC.

LIST OF EXPERIMENTS:

1. To verify V-I characteristics of PN junction diode.
2. To verify V-I characteristics of Si diode.
3. To verify V-I characteristics of Ge diode.
4. To verify V-I characteristics of zener diode.
5. To verify V-I characteristics of light emitting diode (LED).
6. To verify V-I characteristics of BJT in CE–mode.
7. To verify V-I characteristics of BJT in CB–mode.
8. To verify V-I characteristics of BJT in CC–mode.
9. To verify V-I characteristics of JFET.
10. To verify V-I characteristics of MOSFET.
11. To verify V-I characteristics of SCR.
12. To verify V-I characteristics of UJT.
13. To verify V-I characteristics of DIAC.
14. To verify V-I characteristics of TRIAC.

Course Outcomes:

At the end of the course, students will be able to:

CO1 Illustrate the characteristics of diode.

CO2 Implement the different configuration of BJT and analyze their characteristics.

CO3 Design JFET & MOSFET and analyze their characteristics.

CO4 Design SCR & UJT and analyze their characteristics.

CO5 Implement DIAC & TRIAC and analyze their characteristics.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	1			2			3	2	2	1
CO2	3	2	1	1	1	1			2			3	2	2	1
CO3	3	2	1	1	1	1			2			3	2	2	1
CO4	3	2	1	1	1	1			2			3	2	2	1
CO5	3	2	1	1	1	1			2			3	2	2	1

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC203PPC02	-	-	2	2 Hours	30	20	50	1

DIGITAL LOGIC DESIGN LAB

Course Objectives:

- To provide hand-on experience in designing and implementing digital/logic circuits.
- The laboratory exercises are designed to enhance students ability to design, build, and implement digital circuits and systems.
- To know the concepts of combinational circuits.
- To understand the concepts of flip flops, registers and counters

LIST OF EXPERIMENTS:

1. To study the 4-binary adder.
2. To study the verification of De-morgan theorem.
3. To study the realization of Boolean expression & law.
4. To study the half/full adder/subtractor.
5. To study the encoder/decoder.
6. To study the one input two output demultiplexer.
7. To study the BCD seven segment decoder.
8. To study the logic gate apparatus.
9. To study the decimal to excess-3 encoder.
10. To study the excess-3 to decimal decoder.
11. To study the 8:1 multiplexer & 1:8 demultiplexer.
12. To study the flip-flop trainer.
13. To study the logic gate using ICS.
14. CMOS: to study the interfacing of TTL & CMOS.
15. To study the johnson ring counter.

Course Outcomes:

At the end of the course, students will be able to:

CO1 Construct Boolean functions using logic gates.

CO2 Construct basic combinational circuits and verify their functionalities

CO3 Apply the design procedures to design basic sequential circuits.

CO4 Comprehend the basic gate ICs & digital circuits and to verify their operation

CO5 Learn & design about counters.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	1			2			3	2		1
CO2	3	2	1	1	1	1			2			3	2		1
CO3	3	2	1	1	1	1			2			3	2		1
CO4	3	2	1	1	1	1			2			3	2		1
CO5	3	2	1	1	1	1			2			3	2		1

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

B. TECH. II YEAR IV SEMESTER SCHEME

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC204TPC05	3	1	-	4 Hours	30	70	100	4

ANALOG CIRCUITS

Course Objectives:

- To introduce and verify basic principles, operation and applications of BJT and MOSFET for various functions.
- To make students understand and analyze the design and working of amplifiers/oscillators and their configurations.

UNIT-I

Low Frequency Transistor Amplifier: Graphical analysis of CE amplifier, h-parameter models for CB, CE, CC configurations and their inter relationship, Analysis and comparison of the three configurations, Linear analysis of transistor circuits, Miller's theorem, Cascading, Simplified models and calculation of CE and CC amplifiers, Cascade amplifiers, Darlington pair, Analysis of single stage FET amplifier-CS and CD configuration.

UNIT-II

High Frequency Transistor Amplifier: CE hybrid pi model, Validity and parameter variation, Current gain with resistive load, Frequency response of a single stage CE amplifier, Gain-bandwidth product, CC stage high frequencies, Multistage amplifier, Classification, Distortion in amplifiers, Step response, Pass band of cascaded stages, Response of a two-stage RC coupled amplifier at low and high frequencies, Sources of noise in transistor circuits, Noise figure.

UNIT-III

Feedback Amplifiers: Classification, Feedback concept, Ideal feedback amplifier, Properties of negative feedback amplifier topologies, Method of analysis of feedback amplifier, Voltage series feedback, Voltage series feedback pair, Current series, Current shunt, Voltage shunt feedback, Effect of feedback on amplifier bandwidth and stability.

UNIT-IV

Oscillator: Sinusoidal oscillator, Phase shift oscillator, Wien bridge oscillator, Resonant circuit oscillators: LC Collpit, LC Hartley, General form of oscillator configuration: Crystal oscillator.

UNIT-V

Large Signal/ Power Amplifier: Classification, Large signal amplifier characteristics, Class A amplifiers, Class A amplifier with direct-coupled resistive load, Transformer-coupled class A amplifier, Class A push pull amplifiers, Class B amplifiers- transformer coupled push-pull class B amplifier, Complementary symmetry push-pull class B amplifier, Class AB amplifier, Class C amplifier, Harmonic distortion, Push-pull amplifiers, Cross-over distortion.

Tuned Amplifiers: Classification of tuned amplifier, Analysis of single and double tuned amplifiers.

Text/Reference Books:

1. J. Millman and C. C. Halkias, "Integrated Electronics", 2nd edition, TMH 2001.
2. A. S. Sedra and K. C. Smith, "Microelectronic Circuits Theory and Applications", 6th ed., Oxford, 2015
3. D. Neamen, "Electronic Circuits-Analysis & Design", Cengage Learning, 2/e, 2011.
4. D. A. Bell, "Electronic Device & Circuits", 5th ed., Oxford Publication, PHI, 2008.
5. R. Boylestad and L. Nashelsky, "Electronic Device & Circuit Theory", 11th ed., Pearson, 2013.

Course Outcomes:

At the end of the course, students will be able to:

CO1. Illustrate and analyze low frequency single and multistage transistor amplifier.

CO 2. Elucidate and analyze high frequency transistor amplifier.

CO 3. Discuss the concept of feedback and construct feedback amplifier.

CO 4. Illustrate about oscillator and analyze the oscillating frequency and condition of oscillation for different oscillators.

CO 5. Explain about power amplifier and its type along with characteristics.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	2			2			2	3	1	2
CO2	3	3	2	2	1	2			2			2	3	1	2
CO3	3	3	2	2	1	2			2			2	3	1	2
CO4	3	3	2	2	1	2			2			2	3	1	2
CO5	3	3	2	2	1	2			2			2	3	1	2

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC204TPC06	3	1	-	4 Hours	30	70	100	4

ANALOG COMMUNICATIONS

Course Objectives:

- To understand modulation & demodulation techniques of AM, DSB, SSB, VSB & FM.
- To understand modulation & demodulation techniques PAM & PTM and sampling theorem.
- To develop understanding of noise figure in AM & FM receiver systems.
- To understand characteristic and function of various stages of AM, FM transmitters and receivers.

UNIT-I

Spectral Analysis: Fourier series, Response of a linear system, Normalized power in a Fourier expansion, Power spectral density, The Fourier transform, Convolution, Parseval's theorem, Power and energy spectral density, Signal transfer through a LTI network, Auto and cross correlations.

UNIT-II

Amplitude Modulation Systems: Frequency translation, A method of frequency translation, Recovery of base band signal, Amplitude modulation, Maximum allowable modulation, The square Law demodulator, Spectrum of AM signal, Modulators and balanced modulator, SSB modulation and generation, VSB, Multiplexing.

UNIT-III

Frequency Modulation System: Phase and frequency modulation and their relationship, Frequency deviation, Spectrum of FM signal, BW of FM signal, Effect of modulation on BW, Constant BW, FM phasor diagram, Spectrum of narrow band FM and wideband FM, Bandwidth required for a Gaussian modulated WBFM signal, FM generation: Armstrong and parameter variation methods of FM demodulators, Frequency multiplication, FM demodulators, Approximately compatible SSB systems, Stereophonic FM broadcasting.

UNIT-IV

Noise in Communication System: Resistor noise, Available power, Noise temperature, Noise bandwidth, Two ports noise bandwidth, Input noise temperature, Noise figure, Equivalent-noise temperature of a cascade example of receiving system, Noise performance of communication system, Noise in SSB and DSB system, Noise in AM system, Noise in angle modulation system, Threshold effect in angle modulation system, Pre-emphasis and De-emphasis.

UNIT-V

Receivers And Sampling Theorem: Tuned radio frequency receiver, Super heterodyne receiver, Radio frequency amplifier, Mixer, Local oscillator, Intermediate frequency amplifier, Automatic gain control, Receiver characteristics: sensitivity, selectivity, image frequency rejection ratio, Choice of intermediate frequency, Fidelity, Frequency modulation receiver, Amplitude limiting, Automatic frequency control, Comparison with amplitude modulation receiver, Sampling theorem, Graphical and analytical proof for band limited signals, Types of sampling, Reconstruction of signal from its samples.

Text/Reference Books:

1. S. Haykin, "Communication systems". John Wiley & Sons, 2008.
2. H. Taub and D. L. Schiling, "Principles of Communication Systems", Tata McGraw Hill Education Private Limited, 2007.
3. G. Kennedy and B. Davis, "Electronic Communication Systems" Tata McGraw-Hill Publishing Co. Ltd, 1999.
4. B. P. Lathi, "Modern Digital And Analog Communication Systems", Oxford University Press, 1998.
5. J. G. Proakis and Masoud Salehi "Fundamentals of Communication Systems", Pearson Education India, 2007.

Course Outcomes:

At the end of the course, students will be able to:

CO1 Define and state the elements of communication systems and issues related to transmission of signals through communication channels, radio wave propagation.

CO2 Explain time and frequency domain equations for all forms of amplitude modulation schemes and corresponding circuits, signals and spectra.

CO3 Formulate time and frequency domain equations for angle modulation systems and justify related circuits, signals and spectra.

CO4 Differentiate between various types of noise, and compare noise resistance, noise figure and noise temperature and discuss probability theory, random variables and random processes with related significance in communication systems.

CO5 Assemble complete analog communication system and formulate the expression of figure of merit for different schemes of modulation

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1	1								3	2	2
CO2	3	3	1	3	2								3	3	2
CO3	3	3	1	3	2								3	3	3
CO4	3	3	1	3	2								3	3	3
CO5	3	3	1	3	2								3	3	3

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC204TPC07	3	1	-	4 Hours	30	70	100	4

CONTROL SYSTEMS

Course Objectives:

- To make the student familiarize with the fundamental concepts of different control systems.
- To help students develop an understanding the concept of transfer function and representing systems by block diagram, signal flow graph.
- To develop an understanding of transient and steady state behavior of different systems.
- To introduce the concept of absolute and relative stability of control system using Root locus, Bode plot, Polar plot and Nyquist plot.
- To inculcate state variable analysis approach for modern control systems i.e. MIMO systems.

UNIT-I

Introduction to Control Systems: Open & closed-loop systems, Industrial control examples, Transfer function, Block diagram and signal flow graph analysis, Mathematical modeling: Mechanical and electrical systems, Force-voltage and force-current analogy.

UNIT-II

Time Response Analysis: Standard signals, Order and type of system, Time response and performance specifications in transient response, Steady-state analysis, Error constants proportional, Integral and derivative.

UNIT-III

Stability Concept: Absolute and relative stability, Routh Hurwitz stability criterion, Root locus method of design, Stability analysis using root locus, Lead and lag compensation using root locus technique.

UNIT-IV

Frequency Response Analysis: Frequency-domain specifications, Polar plots, Bode plot, Stability in frequency domain, Nyquist plots, Nyquist stability criterion, Compensation Techniques: Lead, Lag and Lag-lead compensation.

UNIT-V

State Variable Analysis: Concepts of state, State variable, State model, State models for MIMO systems, Diagonalization, State transition matrix (STM), Solution of state equations, Concept of controllability & observability, Introduction to nonlinear system.

Text/Reference Books:

1. M. Gopal, "Control Systems: Principles and Design", Tata Mcgraw-Hill, 1997.
2. B. Manke, "Linear Control Systems", Khanna Publication, 2022.
3. B. C. Kuo, "Automatic Control System", 6th ed., Prentice Hall, 1993.
4. K. Ogata, "Modern Control Engineering", 2nd ed., Prentice Hall, 1991.

5. I. J. Nagrath and M. Gopal, "Modern Control Engineering", 5th ed., New Delhi: New Age International, 2017.

Course Outcomes:

At the end of the course, students will be able to:

CO1 Construct block diagrams, signal flow graphs and mathematical models of systems.

CO2 Analyze transient and steady state response specifications of systems

CO3 Perform stability analysis of linear time invariant system.

CO4 Design a compensator to meet specifications in time or frequency domains.

CO5 Analyze multiple input multiple output modern control system.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1				2			2	3	1	2
CO2	3	3	2	2	2				2			2	3	1	2
CO3	3	3	2	2	2				2			2	3	1	2
CO4	3	3	2	2	2				2			2	3	1	2
CO5	3	3	2	2	2				2			2	3	1	2
	3	3	2	2	1.8				2			2	3	1	2

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC204TES05	3	-	-	3 Hours	30	70	100	3

DATA STRUCTURE USING C++

Course Objectives:

- Introduce the concept of data structures through array, stack, and queues.
- To design and implement various data structure algorithms.
- To introduce various techniques for representation of the data in the real world.
- To develop application using data structure algorithms.

UNIT-I

Introduction: Functions and parameter, Dynamic memory allocation, Recursion.

Linear Lists: Data objects and structures, Linear list data structures, Array representation, Vector representation, Singly linked lists and chains. L1, L2.

UNIT-II

Arrays And Matrics: Arrays, Matrices, Special matrices, Sparse matrices.

Stacks: The abstract data types, Array representation, Linked representation, Applications-parenthesis, Matching & towers of Hanoi L1, L2, L3.

UNIT-III

Queues: The abstract data types, Array representation, Linked representation, Applications-railroad car arrangement.

Hashing: Dictionaries, Linear representation, Hash table representation L1, L2, L3.

UNIT-IV

Binary and Other Trees: Trees, Binary trees, Properties and representation of binary trees, Common binary tree operations, Binary tree traversal the ADT binary tree, ADT binary tree and the class linked binary tree L1, L2, L3.

UNIT-V

Priority Queues: Linear lists, Heaps, Applications-heap sorting.

Search Trees: Binary search trees operations and implementation, Binary search trees with duplicates L1, L2, L3.

Text/Reference Books:

1. S. Sahni, "Data structures, Algorithms, and Applications in C++", Universities Press, 2nd ed., 2005.
2. S. Sahni, "Data structures, Algorithms, and Applications in C++", Mc. Graw Hill, 2000.
3. E. Balaguruswamy, "Object Oriented Programming with C++", TMH, 6th ed., 2013.
4. E. Balaguruswamy, "Programming in C++", TMH, 4th ed., 2010.

Course Outcomes:

At the end of the course, students will be able to:

CO1 Comprehend the concept of dynamic memory management, data types, algorithms, Big O notation.

CO2 Illustrates basic data structures such as arrays, linked lists, stacks and queues.

CO3 Describe the hash function and concepts of collision and its resolution methods

CO4 Solve problem involving graphs, trees and heaps.

CO5 Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	2	3				2			2	3	2	1
CO2	3	1	2	2	3				2			2	3	2	1
CO3	3	1	2	2	3				2			2	3	2	1
CO4	3	1	2	2	3				2			2	3	2	1
CO5	3	1	2	2	3				2			2	3	2	1

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC204TBS05	3	1	-	4 Hours	30	70	100	4

NUMERICAL METHODS

Course Objectives:

- Provide the information related to existence and uniqueness criteria applied to numerical methods.
- Providing the knowledge of convergence criteria and awareness of reasons behind the failure of numerical methods.
- Find numerical approximations to the root of equation by various methods.
- Find numerical solution to a system of linear equations by direct method and iterative method.
- Learn the numerical solution of ordinary differential equation and partial differential equation.

UNIT-I

Introduction of errors and their analysis, Types of errors, Numerical problems on error analysis, Curve fitting: method of least squares, Fitting of exponential curvesy = ae^{bs}, Fitting of the curvey = ab^{s}, Fitting of the curvey = ax^{b}, Method of moments.

UNIT-II

Numerical Solution of Algebraic and Transcendental Equations: Graphical method, Bisection method, Secant method, Regula-falsi method, Newton raphson method, Solution of a system of simultaneous linear algebraic equations, Direct methods: Gauss elimination method, Gauss jordan method, Iterative methods, Jacobi iterative method, Gauss seidel iterative method.

UNIT-III

The Calculus of Finite Differences: Finite differences, Difference formula, Operators and relation between operators, Inverse operator, Interpolation with equal intervals: Newton's forward and backward interpolation formula, Interpolation with unequal intervals: Lagrange's interpolation, Newton's differenceformula, Inverse interpolation.

UNIT-IV

Numerical Differentiation and Integration: Numerical differentiation, Newton's forward and backward difference interpolation formula, Maxima and minima of a tabulated function, Numerical Integration: Trapezoidal rule, Simpson's $(1/3)^{rd}$ and $(3/8)^{th}$ rule, Boole's rule, Weddle rule.

Difference Equations: Definition, Order and degree of a difference equation, Linear difference equations, Difference equations reducible to linear form, Simultaneous difference equations with constant coefficients.

UNIT-V

Numerical Solution Of Ordinary Differential Equation: Taylor series method, Euler's method, Modified euler method, Runge's method, Runge-kutta method, Numerical method for solution of partial differential equations, General linear partial differential equation, Laplace

equation and poisson equation.

Text/Reference Books:

1. M. K. Jain and S. R. K. Iyngar, "Numerical Methods for Scientific and Engineering Computations", New Age, 2012.
2. S. G. Rao, "Numerical Anlysis", 5th ed., New Age International Publishers, 2018.
3. B. S. Grewal, "Numerical Methods in Engineering and Science", 11th ed., Khanna Publishers, 2013.
4. H. K. Das, "Advance Engineering Methods", 21st revised ed., S. Chand & Company Ltd., 2013.
5. P. Kandasamy, K. Thilagavathy, and K. Gunavathi, " Numerical Methods", S. Chand & Company Ltd., 2nd ed., Reprint 2012.
6. S. S. Sastry, "Introduction Methods of Numerical Analysis", PHI, 4th ed., 2005.
7. E. Kreyszig, "Advanced Engineering Mathematics", 9th ed., John Wiley & Sons, 2006.

Course Outcomes:

At the end of the course, students will be able to:

CO1 Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.

CO2 Apply numerical methods to obtain approximate solutions to mathematical problems.

CO3 Derive numerical methods for various mathematical operations and tasks, such as differentiation, integration.

CO4 Analyse and evaluate the accuracy of common numerical methods.

CO5 Implement numerical methods for a variety of multidisciplinary applications and a variety of numerical algorithms using appropriate technology.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2					2			2	3		2
CO2	3	2	2	2					2			2	3		2
CO3	3	2	2	2					2			2	3		2
CO4	3	2	2	2					2			2	3		2
CO5	3	2	2	2					2			2	3		2

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC204TMC02	2	-	-	2 Hours	-	-	-	-

ENVIROMENTAL SCIENCES

Course Objectives:

- To learn the importance of ecosystems, natural resources and energy resources.
- To learn the importance of biodiversity and environmental pollution.
- To understand the environmental ethics.

UNIT-I

Introduction to environmental studies, Multidisciplinary nature of environmental studies, Scope and importance, Concept of sustainability and sustainable development.

UNIT-II

Ecosystems: structure and function of ecosystem, Energy flow in an ecosystem, Food chains. Food webs and ecological succession a) Forces: ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams lakes, rivers, oceans, estuaries).

UNIT-III

Natural resources, Renewable and non-renewable resources, Land resources and land use change, Land degradation, Soil erosion and desertification, Deforestations, Causes and impacts due to mining, Dam building on environment, Forests biodiversity and tribal populations, Water: Use and over-exploitation of surface and ground water, Floods, Droughts, Conflicts over water (international & inter-state)

UNIT-IV

Energy resources: Renewable and non-renewable energy sources, Use of alternate energy sources, Growing energy needs, Case studies, Biodiversity and conservation, Levels of biological diversity, Genetic species and ecosystem diversity, Bio geographic zones of India.

Biodiversity patterns and global biodiversity, Hot spots India as a mega-biodiversity nation, Endangered and endemic species of India, Threats to biodiversity: Habitat loss poaching of wildlife man wildlife conflicts, Biological invasions: Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity, Ecosystem and biodiversity services: Ecological, Economic, Social, Ethical, Aesthetic and informational value.

UNIT-V

Environmental pollution, Environmental pollution types, Causes, Effects and controls: Air, Water, Soil and noise pollution, Nuclear hazards and human health risks, Solid waste management, Control measures of urban and industrial waste, Pollution case studies, Environmental potencies & practices, Climate change, Global warming, Ozone layer depletion, Acid rain and impacts on human communities and agriculture, Environment laws, Environment protection Act, Air (prevention & Control of pollution) Act, Water (prevention and control of pollution) Act, Wildlife protection Act, Forest conservation Act, International agreements, Montreal and kyoto protocols

and convention on biological diversity (CBD), Nature reserves. Tribal populations and rights, Human wildlife conflicts in Indian context, Hunan communities and the environment, Human population growth, Impacts on environment, Human health and welfare, Resettlement and rehabilitation of project affected persons: Case studies, Disaster management, Floods, earthquake, Cyclones and landslides, Environmental movements, Chipko, Silent valley, Bishno is of Rajasthan, Environmental ethics, Role of Indian and other religions and cultures in environmental conservation, Environmental communication and public awareness, Case studies (e.g. CNG vehicles in Delhi), Field work, Visit to an area to document environmental assets. River/forest/flora/fauna etc., Visit to a local polluted site-urban/rural/industrial/agricultural. Study of common plants birds and basic principles of identification, Study of simple ecosystems-pond river-etc.

Text/Reference Books:

1. P. H. Gleick, "Water in Crisis Pacific Institute for Studies in Dev. Environment & Security Stockholm Env.", Institute Oxford Univ. Press, 1993.
2. R. E. Grumbine and M. K. Pandit, "Threats from India's Himalaya Dams Science", 339; 36-37, 2013.
3. R. Sengupta, "Ecology and Economics: An approach to Sustainable Development", OUP, 2003.
4. N. S. Sodhi, L. Gibson, and P. H. Raven, "Conservation Biology: Voices from the Tropics", John Wiley & Sons, 2013.

Course Outcomes:

At the end of the course, students will be able to:

CO1 Comprehend the importance of environment and sustainability.

CO2 Illustrate the concept of ecosystems and their classifications.

CO3 Comprehend the importance of natural resources and their properties

CO4 Analyze energy resources and learn the importance of biodiversity.

CO5 Realize about environmental pollution and the environmental ethics.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2	2	2		1	2	2	2			2	1		1
CO2		2	2	2		1	2	2	2			2	1		1
CO3		2	2	2		1	2	2	2			2	1		1
CO4		2	2	2		1	2	2	2			2	1		1
CO5		2	2	2		1	2	2	2			2	1		1

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC204PPC05	-	-	2	2 Hours	30	20	50	1

ANALOG CIRCUITS LAB

Course Objectives:

- To identify and test various electronic components.
- To use DSO for various measurements.
- To plot the characteristics of diode and transistor.
- To design and implement feedback amplifier circuits.
- To measure the frequency of oscillators.

LIST OF EXPERIMENTS:

1. To study the two stage direct coupled amplifier using transistor.
2. To study the h-parameters of transistor.
3. To study the transistor amplifier trainer BAE-059.
4. To study the single stage CC amplifier (Emitter- follower)
2. To study the class A amplifier.
3. To study the class B amplifier.
4. To study the class C amplifier.
5. To study the transformer coupled class A amplifier.
6. To study the negative feedback in CE amplifier.
7. To study the hartley & collpit oscillator.
8. To study the JFET as amplifier.
9. To study the RF single & double tuned amplifier.
10. To study the push-pull amplifier.
11. To study the complementery symmetry push-pull amplifier.
12. To study the RC phase-shift oscillator.
13. To study the wien bridge oscillator.

Course Outcomes:

At the end of the course, students will be able to:

CO1 Implement the direct coupled amplifier and analyze the characteristics at different frequencies.

CO2 Implement the different configuration of BJT & FET amplifier at different frequencies.

CO3 Implement different class of power amplifier with different loads and evaluate the efficiency.

CO4 Design audio frequency oscillator and evaluate the frequency of oscillation.

CO5 Design radio frequency oscillator and evaluate the frequency of oscillation.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2					3			3	2	2	1
CO2	3	3	1	2					3			3	2	2	1
CO3	3	3	1	2					3			3	2	2	1
CO4	3	3	1	2					3			3	2	2	1
CO5	3	3	1	2					3			3	2	2	1

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC204PES05	-	-	2	2 Hours	30	20	50	1

DATA STRUCTURE WITH C++ LAB

Course Objectives:

- To Learn how to implement some useful data structures?
- To understand the effect of data structures on an algorithm's complexity.
- To develop skills to design and analyze simple linear data structures.
- To strengthen the ability to identify and apply the suitable data structure for the given real world Problem.
- To Gain knowledge in practical applications of data structures.

LIST OF EXPERIMENTS:

1. Write a program for traversing operation on the linear array.
2. Write a program for insert an element on the any position in the linear array.
3. Write a program for delete an element from any position of the linear array.
4. Write a program to search an element from linear array by using the linear search technique.
5. Write a program to sort the linear array elements by using the bubble searchtechnique.
6. Write a program to sort the linear array elements by using the selection sortmethod
7. Write a program to search an element from linear array by using the binary search technique.
8. Write a program to estimate the factorial of a number by using recursivefunction.
9. Write a program to generate the n- terms of Fibonacci number by using the recursive function.
10. Write a program for push an element on the stack data structure.
11. Write a program for pop an element on the stack data structure.
12. Write a program to traverse the link list elements.
13. Write a program to transform infix expression into postfix expressionusing stack.
14. Write a program to insert and delete an item to/from link list.
15. Write a program to insert an element to the Queue data structure.
16. Write a program to delete an element from the Queue data structure.

Course Outcomes:

At the end of the course, students will be able to:

CO1 Select appropriate data structures as applied to specified problem definition.

CO2 Implement operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures.

CO3 Implement linear and non-linear data structures.

CO4 Implement appropriate sorting/searching technique for given problem.

CO5 Design advance data structure using non- linear data structure.

Course Outcomes and their mapping with Program Outcomes & Program Specific Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	2	3				2			3	2	2	2
CO2	3	2	1	2	3				2			3	2	2	2
CO3	3	2	1	2	3				2			3	2	2	2
CO4	3	2	1	2	3				2			3	2	2	2
CO5	3	2	1	2	3				2			3	2	2	2

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**