List of Courses Focus on Employability/ Entrepreneurship/ Skill Development

Department : *Electronics and Communication Engineering*

Programme Name : *B.Tech.*

Academic Year : 2021-22

List of Courses Focus on Employability/ Entrepreneurship/Skill Development

Sr. No.	Course Code	Name of the Course
01.	MA201TBS01	Mathematics-I
02.	PH201TBS02	Physics
03.	EC201TES01	Basic Electrical & Electronics Engineering
04.	IT201TES02	Introduction to Information Technologies
05.	EN201THS01	English Communication
06.	PH201PBS01	Physics Lab
07.	ME201PES01	Engineering Graphics
08.	ME201PES02	Workshop Technology & Practices
09.	EC201PES03	Basic Electrical Engineering Lab
10.	MA202TBS03	Mathematics-II
11	CY202TBS04	Chemistry
12	CE202TES03	Engineering Mechanics
13	CS202TES04	Computer Programming
14	CM202TES05	Basic Civil & Mechanical Engineering
15	CY202PBS02	Chemistry Lab
16	CE202PES04	Engineering Mechanics Lab
17	CS202PES05	Computer Programming Lab
18	EC203TPC01	Electronic Devices
19	EC203TPC02	Digital Logic Design
20	EC203TPC03	Network Theory
21	EC203TPC04	Signals and Systems
22	EC203TBS05	Mathematics-III
23	EC203THS02	Engineering Economics
24	EC203PPC01	Electronics Devices Lab
25	EC203PPC02	Digital Logic Design Lab
26	EC204TPC05	Analog Circuits

27	EC204TPC06	Analog Communication
28	EC204TPC07	Control System
29	EC204TES05	Data Structure with C++
30	EC204TBS06	Numerical Methods
31	EC204TMC02	Environmental Sciences
32	EC204PPC05	Analog Circuits Lab
33	EC204PES05	Data Structure with C++ Lab
34	EC205TPC08	LIC & its Application
35	EC205TPC09	Digital Communication
36	EC205TPC10	Digital Signal Processing
37	EC205TES06	Electromagnetic Waves
38	EC205THS03	Probability Theory & Random Process
39	EC205THS04	Effective Technical Communication
40	EC205PPC06	LIC Lab
41	EC205PPC07	Analog and Digital Communication Lab
42	EC205PPC08	Digital Signal Processing Lab
43	EC206TPC11	CMOS Digital VLSI Design
44	EC206TPC12	Data Communication & Computer Networks
45	EC206TPC13	Microprocessor & Microcontroller
46	EC206TES07	Electronic Measurements and Sensors
47	EC206TPE01	Information Theory & Coding
48	EC206TPE02	Advance Signal Processing
49	EC206TPE03	Renewable Energy Sources
50	EC206TPE04	Introduction to MEMS
51	EC206PPC09	CMOS Digital VLSI Design Lab
52	EC206PPC10	Data Communication & Computer Networks Lab
53	EC206PES06	Electronic Measurement and Sensors Lab
54	EC07TPC14	Fiber Optics Communication
55	EC07TPC15	Embedded Systems
56	EC07TPC16	Mobile Communication & Network
57	EC07TPE09	Digital Image Processing
58	EC07TPE10	Analog & Digital VLSI Design
59	EC07TPE11	Estimation and Detection Theory
60	EC07TPE12	Advanced Power Electronics
61	EC07TPE13	Microwave Theory & Techniques

62	EC07TPE14	Radar & Satellite Comm
63	EC07TPE15	Machine Learning
64	EC07PPC12	Fiber Optics Communication Lab
65	EC07PPC13	Design and Simulation Lab
66	EC07PPS01	Seminar on Industrial Training
67	EC07PPS02	Project - I
68	EC08TPC17	VLSI Fabrication Technology
69	EC08TPE16	Millimeter Wave Technology
70	EC08TPE17	Video Processing
71	EC08TPE18	Biomedical Electronics
72	EC08TPE19	Neural Network & Fuzzy logic
73	EC08TPE20	Next Gen. Comm. Technology
74	EC08TPE21	Wireless Sensor Networks
75	EC08TOE05	Intellectual Property Rights
76	EC08TOE06	Principles of Management
77	EC08TOE07	Introduction to IOT
78	EC08PPS03	Project - II
79	EC08PPS04	Comprehensive viva
80	ECPATT1	Linear Algebra
81	ECPATT2	Wireless Communication & Network
82	ECPATT3	Optoelectronic Devices
83	ECPATP1	ction to Signal Processing
84	ECPATP2	Introduction to Embedded & IOT System
85	ECPATP3	Microstrip Antenna
86	ECPATP4	Estimation & Detection Theory
87	ECPATP5	Digital Image Processing
88	ECPATP6	Network Security & Cryptography
89	ECPATP7	Modern Digital Communication
90	ECPATP8	Antenna for Modern wireless Communication
91	ECPBTT1	Advanced VLSI Fabrication
92	ECPBTT2	Millimeter Wave Technology
93	ECPBTP1	Machine Learning
94	ECPBTP2	Optical Communication System
95	ECPBTP3	Next Generation Communication Technologies
96	ECPBTP4	Advanced Digital Signal Processing

97	ECPBTP5	Computer Vision
98	ECPBTP6	Digital Communication Receiver
99	ECPBTP7	Optical Instrumentation
100	ECPBTP8	Satellite Communication
101	ECPCPT1	Dissertation Stage–I
102	ECPDPT1	Dissertation Stage–II

विभागाध्यक्ष (इलें. एव संचार अभियांत्रिकी)
H.O.D. (Elect. & Comm. Engineering)
प्रौद्योगिकी संस्थान
Institute of Technology
गु. घा. वि., बिलासपुर (छ.ग.)
G. G. V. Bilaspur (C.G.)

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC203TPC03	3	1	0	4 hours	30	70	100	4

NETWORK THEORY

Course Objectives:

The objectives of the course are to make the students:

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

Syllabus Content:

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 euations; 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.

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC203TPC04	3	1	0	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

Syllabus Content:

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.

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC203TBS05	3	1	0	4 hours	30	70	100	4

MATHEMATICS – III

Course Objectives:

Students will try to learn:

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

Syllabus Content:

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.

SUGGESTED BOOKS & REFERENCE: -

1. H K Das, "Advance Engg. Mathematics", S-Chand Publication
2. B S Grewal, "Higher Engg. Mathematics", Khanna Publication

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC203THS02	3	0	0	3 hours	30	70	100	3

ENGINEERING ECONOMICS

Course Objectives:

Students will try to learn:

1. To Analyze Cost/Revenue Data and Carry Out Make Economic Analyses in The Decision-Making Process
2. To Justify or Reject Alternatives/Projects on An Economic Basis.

Syllabus Content:

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 Books:

1. Mankiw Gregory N. (2002), Principles of Economics, Thompson Asia
2. V. Mote, S. Paul, G. Gupta (2004), Managerial Economics, Tata McGraw Hill
3. Misra, S.K. and Puri (2009), Indian Economy, Himalaya
4. Pareek Saroj (2003), Textbook of Business Economics, Sunrise Publishers

Recommended Books:

1. Kapila U. Indian economy since Independence, Academic Foundation, New Delhi
2. Misra, S. K. and Puri V. K. Indian Economy — Its Development Experience. Himalaya 3. Publishing House, Mumbai
3. Dutt R. and Sundharam K. P. M. Indian Economy. S. Chand & Company Ltd., New Delhi.
4. Mathur R. Indian Economic Policy and Reform. RBSA Publisher, Jaipur

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC204TPC05	3	1	0	4 hours	30	70	100	4

ANALOG CIRCUITS

Course Objectives:

Students will try to learn:

1. To understand the operation of the various bias circuits of low frequency transistors and Analyze and design FET based circuits.
2. To understand the operation and design of high frequency amplifier and multi stage amplifier.
3. To understand the operation and design of transformer coupled various types of power amplifier circuits.
4. To understand the effects of negative feedback on amplifier circuits.
5. To analyze the different RC and LC oscillator circuits.

Syllabus Content:

UNIT-I: **Low Frequency Transistor Amplifier:** Graphical Analysis of CE amplifier; h-parameter Models for CB, CE, CC configurations and their Interrelationship; 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,

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC204TPC06	3	1	0	4 hours	30	70	100	4

ANALOG COMMUNICATION

Course Objectives:

Students undergoing this course, are expected to

1. Understand Modulation & demodulation techniques of AM, DSB, SSB, VSB & FM
2. Understand Modulation & demodulation techniques PAM & PTM and Sampling Theorem.
3. Know Noise Figure in AM & FM receiver systems.
4. Understand Function of various stages of AM, FM transmitters
5. Know Characteristics of AM & FM receivers.

Syllabus Content:

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 THEORM:
Receivers: Introduction, 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

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC204TPC07	3	1	0	4 hours	30	70	100	4

CONTROL SYSTEMS

Course Objectives:

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

Syllabus Content:

Unit I: **Introduction to control systems:** Open & closed-loop systems, Industrial Control examples. Transfer function, Block diagram and signal flow graph analysis, Mathematical modelling: Mechanical and Electrical systems, Force-voltage and force-current analogy. **[12 Hours]**

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 systems. **[08 Hours]**

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. **[08 Hours]**

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. **[12 Hours]**

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. **[08 Hours]**

Text Books:

1. Gopal. M., "Control Systems: Principles and Design", Tata McGraw-Hill, 1997.
2. B.S. Manke, "Linear Control Systems", Khanna Publication, 2012.

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC204TES05	3	0	-	3 hours	30	70	100	3

DATA STRUCTURE USING C++

COURSE OBJECTIVE:

1. Introduce the concept of data structures through Array, Stack, and Queues.
2. To design and implement various data structure algorithms.
3. To introduce various techniques for representation of the data in the real world.
4. To develop application using data structure algorithms.

Syllabus Content

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 Books:

1. Data structures, Algorithms, and applications in C++, Sartaj Sahni, Universities Press, 2nd Edition, 2005.

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC204TBS05	3	1	0	4 hours	30	70	100	4

NUMERICAL METHODS

Course Objectives:

Students will try to learn:

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

Syllabus Content:

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^{bx}, fitting of the curvey = ab^x, 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 difference formula, 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.

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC204TMC02	2	0	0	2 hours	-	-	-	-

ENVIROMENTAL SCIENCES

Course Objectives:

1. To learn the importance of Ecosystems, Natural Resources and Energy resources
2. To learn the importance of Biodiversity and Environmental pollution
3. To understand the Environmental ethics

Course Content:

Introduction to environmental studies Multidisciplinary nature of environmental studies: scope and importance: Concept of sustainability and sustainable development. 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). 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) 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. 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 Bishnois 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.

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC205TPC08	3	1	-	4 hours	30	70	100	4

LIC & ITS APPLICATIONS

Course Objectives:

1. To develop basic concept of Differential Amplifiers & OPAMP IC 741.
2. To Analyze and perform different applications and frequency response of OPAMP.
3. To develop the concept and analysis of Active filters, Phase Lock Loop, Multiplier, Timer, Regulator.
4. To help students develop various designs of OPAMP and its applications.
5. To Analyze and perform the theoretical concepts through laboratory and simulation experiments.

Syllabus Content:

UNIT-I:

Basic Building Blocks for ICs & OPAMP: Basic Differential Amplifiers & Analysis, Introduction to OPAMP, Ideal OPAMP Characteristics, OPAMP ICs:741Pin Diagram and Pin Function, Inverting Amplifier, Non-Inverting Amplifier, Definition of OPAMP Parameters, Frequency Response of OPAMP, Open Loop & Closed Loop Configuration of OPAMP and its Comparisons, Voltage Comparator, Zero Crossing Detector, Level Detector.

UNIT-II:

Applications of OPAMP: Introduction, Adder, Substractor/Difference Amplifier, Voltage Follower, Integrator, Differentiator, Comparator IC such as LM339, Window detector, Current to Voltage and Voltage to Current Converter, Instrumentation Amplifier, Precision Half Wave Rectifier, Precision Full Wave Rectifier, Log & antilog amplifier, Schmitt Trigger, Bridge Amplifier, Peak Detectors/Peak follower, Sample- and- Hold Amplifiers, Square wave generator, Saw-tooth wave generator, Triangular wave generator, Astable multivibrator, Monostable multivibrator, Dead Zone circuit- with positive output, with negative output, Precision clipper circuit, Generalized Impedance Converter (GIC) and its application.

Frequency response of OPAMP: Open loop voltage gain as a function of frequency, Unity gain Bandwidth, Close loop frequency response, Slew Rate.

UNIT-III:

Active filters & PLL - Introduction to Filters, Merits & Demerits of active filters of over Passive Filter, Classification of filters, Response characteristics of Filter, First Order and Second Order active high pass, Low pass, Band pass and band reject Butterworth filters.

Phase Lock Loop: Operating Principle of the PLL, Linear Model of Phase Lock Loop, Lock Range and Capture Range, Application of the PLL. Voltage Controlled Oscillator(VCO).

UNIT-IV:

D/A and A/D converters & Analog Multiplier: D/A converter - Ladder, R-2R, A/D converters-Ramp, Continuous conversion, Flash ADC, Dual slope ADC, Successive Approximation, Voltage to Time converters. Timing and circuits comparisons, DAC/ADC specifications.

Analog Multiplier: Basic Analog Multiplication Techniques, Applications of Multiplier-Frequency doubling, Phase-angle difference detection, Voltage dividing action, Square root of a

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC205TPC09	3	1	-	4 hours	30	70	100	4

DIGITAL COMMUNICATION

Course Objectives:

1. To study process of sampling, quantization that are fundamental to the digital transmission of analog signals.
2. To study baseband and band pass signal transmission and reception techniques.
3. To Study concept of signaling
4. To study digital modulation methods and optimum receiver.
5. To study the noise in digital communication, optimum filter and matched filter.
6. To Study the Error control and channel coding concept.

Syllabus Content:

UNIT-I: Digital transmission of analog signal: Sampling Theorem, Quantization, Companding, PAM, PWM, PPM, PCM, Differential PCM (DPCM), Delta Modulation, Adaptive Delta Modulation, Delta Sigma Modulation, channel bandwidths of PCM, TDM, noises in PCM PWM, PPM, DM.

Noise in PCM and DM. PCM transmission: Calculation of SNR in PCM. Delta modulation transmission: signals to quantization noise ratio Calculation.

UNIT-II: Principle of digital data transmission: Line coding: PSD of various line codes, Polar signalling, On-Off signalling, Bipolar signalling, Pulse shaping: Nyquist criterion for zero ISI, Scrambling, Regenerative repeater: Eye diagram, Detection error probability for polar signal, ON-Off and bipolar signals.

UNIT-III: Digital modulation techniques: Fundamentals of BASK, BPSK and BFSK, Generation, detection, spectrum and geometrical representation of BPSK and BFSK, Fundamentals of DPSK, DEPSK and QPSK, Generation and detection of DPSK, DEPSK and QPSK, Signal space representation of QPSK. M-ary PSK. MSK Signalling Scheme.

UNIT-IV: Optimal Reception of Digital Signal: A baseband signal Receiver, Probability of Error, Optimal Receiver design, Signal Space representation and probability of Error calculation.

UNIT-V: Information Theory and Coding: Introduction, unit of information, rate of information, joint and conditional entropy, mutual information, channel capacity: Noise free channel, symmetrical channel, binary symmetrical channel, cascaded channel, Shannon's theorem, capacity of Gaussian channel, Shannon's Hartley theorem, bandwidth S/N tradeoff, coding efficiency, source coding, channel coding.

Text/Reference Books:

1. Principles of communication system by Taub & Schilling, 3 rd Ed., McGraw-Hill Education
2. Modern Digital and Analog Communication Systems by B.P. Lathi,3 rd Ed., Oxford university press.
3. Digital communications by Simon Haykin, Wiley India Private Limited,2006

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC205TPC10	3	1	-	4 hours	30	70	4

Digital Signal Processing

Course Objectives:

Objective of the course are to make Students will able:

1. To summarize and analyze the concepts of signals, systems in time and frequency domain with corresponding transformations
2. To introduce the diverse structures for realizing digital filters.
3. To develop the understanding the concept of design and implementation of digital filters.
4. To develop basic idea of multi rate filter bank design.
5. To utilise the appropriate tools for design and realization of signal processing modules

Unit–I: Basic elements of digital signal Processing

Introduction of discrete time signals and systems, Discrete Time Fourier Transform (DTFT), Discrete Fourier series (DFS), Discrete Fourier Transform (DFT), Fast Fourier Transform (FFT) using DIT and DIF algorithms, Inverse FFT using DIT and DIF algorithms, Circular convolution, Correlation, MATLAB programs based illustrations.

Unit-II: Realization of Systems

Realization of discrete time systems, Structures for Infinite Impulse Response (IIR) and Finite Impulse Response (FIR) systems, Basic realisation Block diagram and Signal flow graph, **Realization of IIR filter:** Direct forms structure, Transposed structure, Cascade structure, Parallel structure, Lattice structure, Ladder structure. **Realization of FIR filter:** Direct forms structure, Cascade structure, linear phase realization, Lattice structure.

Unit-III: FIR Filter Design

Linear phase response, Symmetric and Anti-symmetric, Design characteristics of FIR filters, Frequency response of FIR filters, Design FIR filter by Window functions: Rectangular, Triangular, Hanning, Hamming, Blackman & Kaiser, Design FIR filter by Frequency sampling method, MATLAB programs based illustrations for FIR filters.

Unit-IV: IIR Filter design

Transformation of Analog filter to digital filters by: Approximation of Derivatives, Impulse invariance method, bilinear transformation method, design of digital Butterworth and Chebyshev filter, Frequency Transformations in Analog and Digital domain, MATLAB programs based illustrations for IIR filters.

UNIT-V: Multi-rate Digital Signal Processing

Introduction of multi rate system, Sampling Rate Conversion, Decimation, Interpolation, Sampling rate alteration, Poly-phase Decomposition, Digital Filter Bank, Application of DSP: Speech and Image.

Text/Reference Books:

1. S. K. Mitra, " Digital Signal Processing: A computer based approach", McGraw Hill, 2011.

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC205TES06	3	0	-	3 hours	30	70	100	3

ELECTROMAGNETIC WAVES

1. To introduce the concepts, working principles, and laws of Electromagnetic Waves.
2. To perform analysis and characterization of uniform plane wave at different media
3. To develop the basic concept of analysis and design of Transmission line
4. To perform analysis and design of the waveguide.
5. To introduce the concept of radiation and antenna.

Syllabus Content:

UNIT-I: Maxwell's Equations: Basics of Vectors, Vector calculus, Basic laws of Electromagnetics, Maxwell's Equations, Boundary conditions at Media Interface.

UNIT-II: Uniform Plane Wave: Uniform plane wave, Propagation of wave, Wave polarization, Wave propagation in conducting medium, phase and group velocity, Power flow and Poynting vector, Surface current and power loss in a conductor, Plane Waves at a Media Interface- Plane wave in arbitrary direction, Reflection and refraction at dielectric interface, Total internal reflection, wave polarization at media interface, Reflection from a conducting boundary.

UNIT-III: Transmission Lines: Equations of Voltage and Current on TX line, Propagation constant and characteristic impedance, reflection coefficient and VSWR, Impedance Transformation on Loss- less and Low loss Transmission line, Power transfer on TX line, Smith Chart, Admittance Smith Chart, Applications of transmission lines: Impedance Matching, use of transmission line sections as circuit elements.

UNIT-IV: Waveguide: Wave propagation in parallel plane waveguide, Analysis of waveguide general approach, Rectangular waveguide, Modal propagation in rectangular waveguide, Surface currents on the waveguide walls, Field visualization, Attenuation in waveguide.

UNIT-V: Radiation: Solution for potential function, Radiation from the Hertz dipole, Power radiated by hertz dipole, Radiation Parameters of antenna, receiving antenna, Monopole and Dipole antenna

Text/Reference Books:

1. R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill India, 2005

2. E.C. Jordan & K.G. Balmain, Electromagnetic waves & Radiating Systems, Prentice Hall, India

3. Narayana Rao, N: Engineering Electromagnetics, 3rd ed., Prentice Hall, 1997.

4. David Cheng, Electromagnetics, Prentice Hall

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC205THS03	3	-	-	3hours	30	70	3

PROBABILITY THEORY AND RANDOM PROCESS

COURSE OBJECTIVES:

1. To provide mathematical background and sufficient experience so that student can read, write and understand sentences in the language of probability theory.
2. To introduce students to the basic methodology of "probabilistic thinking" and apply it to problems.
3. To understand basic concepts of Probability theory and Random Variables, how to deal with multiple Random Variables.

UNIT 1: INTRODUCTIONTO PROBABILITY:

Set theory, Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, and Independent Events, Bernoulli's trials.

UNIT II: RANDOM VARIABLES :

Definition, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Methods of defining Conditioning Event, Conditional Distribution, Conditional Density and their Properties.

Operation on One Random Variable: Expected value of a random variable, function of a random variable, moments about the origin, central moments, variance and skew, characteristic function, moment generating function, transformations of a random variable, monotonic transformations for a continuous random variable, non monotonic transformations of continuous random variable, transformations of Discrete random variable.

UNIT III: MULTIPLE RANDOM VARIABLES:

Vector Random Variables, Joint Distribution Function and its Properties, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence. Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected). Unequal Distribution, Equal Distributions. Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT IV: STOCHASTIC PROCESSES-TEMPORAL CHARACTERISTICS:

The Stochastic process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, Statistical Independence and concept of Stationarity: First-Order Stationary Processes, SecondOrder and Wide-Sense Stationarity, Nth-Order and Strict-Sense Stationarity, Time Averages andErgodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes Autocorrelation Function and Its Properties, Cross-Correlation Function and Its Properties, Covariance Functions and its properties, Gaussian Random Processes.