JAIDEV EDUCATION SOCIETY'S
J D COLLEGE OF ENGINEERING AND MANAGEMENT
KATOL ROAD, NAGPUR
Website: www.jdcoem.ac.in E-mail: info@jdcoem.ac.in
An Autonomous Institute, with NAAC "A" Grade
Department of Electronics and Telecommunication Engineering
"Rectifying Ideas, Amplifying Knowledge"
Session: 2020-21

Course Structure and Syllabus (Autonomous)

For

Third Semester B. Tech. in Electronics and Telecommunication Engineering

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE	Total	
1	BSC	ET3T001	Multivariate Calculus	2	1	0	20	20	60	100	3
2	ESC	ET3T002	Electronic Devices & Circuits-I	3	1	0	20	20	60	100	4
3	PCC	ET3T003	Analog communication system	2	1	0	20	20	60	100	3
4	PCC	ET3T004	Digital Circuits and microprocessor	2	1	0	20	20	60	100	3
5	PCC	ET3T005	Integrated circuit and application	3	1	0	20	20	60	100	4
6	PCC	ET3T006	Network synthesis and analog filter	2	1	0	20	20	60	100	3
7	ESC	ET3L002	Electronic Devices & Circuits-I lab	0	0	2	60	0	40	100	1
8	PCC	ET3L003	Analog communication system lab	0	0	2	60	0	40	100	1
9	PCC	ET3L004	Digital Circuits and microprocessor Lab	0	0	2	60	0	40	100	1
10	Internship	ET3F007	Field Training-1	0	0	0	0	0	50	50	1
11	MC	ET3T008	Innovation and Entrepreneurship Development	2	0	0	10	15	25	50	Audit
			Total	**16**	**6**	**6**	**310**	**135**	**555**	**1000**	**24**

ET3T001	Multivariate Calculus	3 Credit

Course outcomes:

Students will be able to:

1. Describe properties of Laplace transform, Convolution Theorem, Fourier integral theorem, Parseval's identity, Cauchy's integral theorem, Cauchy's residue theorem.
2. Illustrate the examples using Laplace transform, Fourier Transform, Partial differential equation, Function of Complex Variables, Matrices.
3. Apply the knowledge of Laplace transform, Z-transform, function of complex variable, Advance partial differential equation.
4. Analyze the question on Laplace transform, Fourier Transform, Partial differential equation, Function of Complex Variables
5. Create a modal using Laplace transform, Fourier Transform, Theory of probability, Function of Complex Variables, Matrices.

Course Contents:

Module-1: Matrices **[6 Hrs]**

Characteristics equation, Eigen values and Eigen vectors, Statement and Verification of Cayley Hamilton Theorem [without proof], Reduction to Diagonal form, Sylvester's theorem [without proof.]

Module-2: Laplace Transform **[5 Hrs]**

Definition – conditions for existence; Properties of Laplace transforms; Transforms of some special functions- periodic function, Heaviside-unit step function.

Module-3: Inverse Laplace Transform **[5 Hrs]**

Introductory remarks; Inverse transforms of some elementary functions; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms; Applications to find the solutions of differential equations.

Module-4: Z-Transform **[5 Hrs]**

Definition, Convergence of Z-transform and Properties, Inverse Z-transform by PartialFraction Method, Residue Method (Inversion Integral Method), Solutions of DifferenceEquations with Constant Coefficients by Z- transform.

Module-5: Theory of Probability **[6 Hrs]**

Axioms of Probability, Conditional Probability, Baye's Rule, Random variables: Discrete and Continuous random variables, Probability function and Distribution function, Joint distributions, Independent Random Variables, Conditional Distributions.

Module-6: Functions of Complex Variables **[5 Hrs]**

Analytic functions; Conjugate functions; Cauchy- Riemann equations in Cartesian and polarforms; Harmonic functions in Cartesian form, Cauchy's integral theorem; Bilinear transform Cauchy's integral formula; Residues; Cauchy's residue theorem (All theorem without proofs)

Text Books:

1. Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, NewDelhi.
2. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, NewYork.
3. A Course in Engineering Mathematics (Vol III) by Dr. B. B. Singh, Synergy Knowledgeware, Mumbai.
4. A Text Book of Applied Mathematics (Vol I & II) by P. N. Wartikar and J. N.Wartikar, Pune VidyarthiGriha Prakashan, Pune.
5. Higher Engineering Mathematics by H. K. Das and Er. RajnishVerma, S. Chand & CO.Pvt. Ltd., NewDelhi.

Reference Books:

1. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, NewDelhi.
2. A Text Book of Engineering Mathematics by Peter O' Neil, Thomson Asia PteLtd., Singapore.
3. Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, TataMcgraw-Hill Publishing Company Ltd., NewDelhi.
4. Integral Transforms and Their Engineering Applications by Dr.B.B.Singh, Synergy. Knowledgeware, Mumbai.
5. Integral Transforms by I. N. Sneddon, Tata McGraw-Hill, NewYork.
6. Advanced Mathematics for Engineers by Chandrika Prasad

ET3T002	Electronics Devices and Circuits-I	4 Credit

Prerequisites: Basic knowledge of Semiconductor Physics (FYT106 and FYT110)

Course Objectives:

1. To understand properties, characteristics and behaviour of basic solid state devices such as PN junction diode/BJT/JFET
2. To know and analyse different amplifier configurations.
3. To introduce concepts of feedback in electronic circuits
4. To design Electronic circuits using diodes and transistors

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Explain the working principle, operation and characteristics of basic solid state devices such as PN junction diode, BJT and JFET.
2. Apply the concept of biasing techniques and feedback to improve stability of circuits.
3. Categorize amplifiers and oscillators based on feedback topology.
4. Analyse different amplifier configurations and DC bias circuitry of BJT.
5. Interpret BJT circuits for small signal at low and high frequencies.
6. Design Electronic circuits using diodes and transistors.

Course Contents:

Module-1: Semiconductor Theory and PN Junction Devices **[5 Hrs]**

Energy bands in silicon, intrinsic and extrinsic silicon, Carrier transport in silicon diffusion current, drift current, mobility, and resistivity. Generation and recombination of carriers. P-N junction diode theory, Zener diode, Zener as a Voltage regulator, Tunnel diode, LED, Schottky diode, Varactor Diode operation, characteristics and applications such as Rectifiers, Filters

Module-2: Bipolar Junction Transistors **[5 Hrs]**

BJT Structure, Operation, Input and Output Characteristics in CE, CB and CC configuration, Comparison of transistor configurations,Ebers-Moll model, BJT biasing techniques, Load line concept, Thermal Runaway, Stability factor, Stabilization Techniques, Ratings and specifications of BJT from data sheet.

Module-3: Single Stage Amplifiers **[5 Hrs]**

BJT small signal model – Analysis of CE, CB, CC amplifiers, Concept of frequency response, Miller's theorem, Effect of coupling, bypass, junction and stray capacitance on frequency response of BJT amplifiers

Module-4: Power Amplifiers **[5 Hrs]**

Classes of Power amplifiers – Class A, Class B, Class AB, Class C and Class D amplifiers, Analysis of Class A, Class B, Class AB amplifiers, Distortions in amplifiers, concept of Total Harmonic Distortion, Comparison of power amplifiers

Module-5: Feedback Amplifiers and Oscillators **[5 Hrs]**

Feedback Concept, Classification of amplifiers based on feedback topology, (Voltage, Current, Transconductance and Transresistance amplifiers), Effect of negative feedback on various performance parameters of an amplifier, Analysis of one circuit for each feedback topology. Oscillators: Condition for oscillations, Phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators

Module-6: Junction Field Effect Transistors **[5 Hrs]**

JFET:-Structure, Symbol, Basic Operation, Drain and Transfer Characteristics, Biasing arrangements for JFET, Biasing against device variation, biasing for zero current drift.

Universal JFET bias curve, Ratings and specifications of JFET from data sheet.

Text Books:

1. Millman & Halkies, "Electronic Devices and Circuits", Second Edition, Tata McGraw Hill.

2. Boylestead & Nashelsky, "Electronic devices and Circuits Theory" Eighth edition, PHI

3. S. Salivahanan, N.Suresh Kumar,"Electronic devices and Circuits", Fourth Edition ,McGraw Hill Education (India) Private Ltd

4. Donald Neaman, "Electronic Circuit Analysis and Design", Third Edition, Tata McGraw Hill

Reference Books.

1. MillmanHalkies, "Integrated Electronics", Seventh edition,Tata McGraw Hill.

2. David A. Bell,"Electronic Device and Circuits", Fourth Edition, PHI.

3. Gupta.J.B, "Electron Devices and Circuits", Second Edition,S.K.Kataria& Sons,

4. Floyd,"Electronic Devices", Seventh Edition, Pearson.

5. Sedra and Smith, "Microelectronic Circuits", Oxford University Press, 2004.

6. Ben G. Streetman "Solid State Electronic Devices", Sixth Edition ,Pearson

E-Resources:

1. https://nptel.ac.in/courses/122/106/122106025/
2. https://onionesquereality.wordpress.com/.../more-video-lectures-iit-open
3. http://www.nesoacademy.org/electronics-engineering/analog-electronics/analog
4. http://www.electronics-tutorials.ws/transistor/tran_1.html
5. http://www.allaboutcircuits.com/textbook/semiconductors/chpt-1/active-versus-passivedevices/

ET3T003	Analog Communication System	3 Credit

Course Objectives:

1. To introduce the concepts of analog communication systems and to make the students understand the functions of major building blocks of communication system and noise performance.
2. To develop a clear insight into techniques involved in different types of modulation and demodulation of AM & FM signals.
3. To introduce the fundamental concepts of sampling theorem.
4. To describe the effect of noise in analog and pulse modulation systems

Course Outcomes:

At the end of this course, the students should be able to,

1. Explain signal to noise ratio, noise figure and noise temperature for single and cascaded stages in a communication system.
2. Distinguish between different types of analog modulation techniques based on bandwidth Occupied and power transmitted.
3. Analyze the performance of analog communications in the presence of noise by evaluating the figure of merit for different schemes of modulation
4. Evaluate different components of analog communication systems such as modulator, demodulator, mixer, receiver etc in time and frequency domain.
5. Design the modulators, demodulators for amplitude and frequency modulated systems.
6. Develop the ability to compare and contrast the strengths and weaknesses of various communication systems.

Course Contents:

Module-1: AM Transmission **[5 Hrs]**

Introduction Overview: Signals and their classifications, Fourier analysis of Signals and Systems. Elements of a Communication System, Need for modulation, Channel, Noise, and Band pass transmission: Complex low pass representation of narrowband signals and systems,
Equivalent low pass transmission model.

Module-2: AM Reception **[6 Hrs]**

Amplitude modulation DSB-FC, DSB-SC, SSB, VSB and ISB transmissions: mathematical Analysis-time and frequency domain analysis, modulation index, generation and detection methods, power

requirement of these systems, Comparison of AM modulation schemes, Quadrature Carrier Multiplexing(QAM), frequency division multiplexing.

Module-3: FM Transmission **[6 Hrs]**

Angle Modulation Frequency Modulation (FM),: Single Tone Frequency Modulation, Spectrum Analysis, Narrowband FM, Wideband FM, Transmission Bandwidth of FM Waves, Generation of FM waves: Direct and Indirect Methods, Demodulation of FM, Phase Locked Loops, Limiting of FM waves, comparison between AM & FM, Phase Modulation, Relation between FM and PM.

Module-4: FM Reception **[5 Hrs]**

Radio Receivers and performance in the noise Basic receiver (TRF), Super heterodyne receiver for AM and FM, performance parameters for receiver such as sensitivity, selectivity, fidelity, image frequency rejection etc., AGC technique, Sources of noise, Signal to Noise Ratios, Figure of Merit Calculations, Noise in AM, Pre emphasis and De-emphasis in FM, Comparison of Noise Performance of different modulation schemes.

Module-5: Applications of AM and FM **[4 Hrs]**

Applications of AM and FM AM Radio, Television: Video Bandwidth, Choice of Modulation, Colour Television, HDTV, FM Radio, FM Stereo Multiplexing.

Module-6: Acoustics **[5 Hrs]**

Acoustics: Introduction to acoustic transducers, microphone and loud speakers, construction, types, characteristics and applications, Block schematic of Public address system, High quality audio such as stereophonic, Dolby, surround, 3-D etc.

Text Books:

1. J. G. Proakis and M. Salehi, "Communication system engineering", 2/e, Pearson Education Asia, 2002.

2. R. E. Ziemer, W. H. Tranter, "Principles of Communications: Systems, Modulation, and Noise", 5/e, John Wiley & Sons, 2001.

3. Simon Haykins and Michael Moher,"Communication Systems", 5th Edition, John Wiley and sons, 201

4. Communication Systems - Analog and digital, Singh and Sapre, 2nd edition, 2007, TMH.

Reference Books:

1. Wayne Tomasi, "Electronic Communications Systems – Fundamentals Through advanced", 5th Edition Pearson Education, 2012

2. H. Taub and D. L. Schilling, Principles of Communication Systems, 3rd Reprint,McGraw Hill, 2006.

3. George Kennedy and Bernard Davis," Electronic Communication systems", 4thEdition, TMH, 2008

4. Modern digital and analog Communication systems, B. P. Lathi, 3rd edition, 2015, Oxford University Press.

5. Roddy and Coolen, "Electronic Communication Systems", Pearson Education.

6. Frank R. Dungan, "Electronic Communication Systems", Delmar Publishers.

ET3T004	Digital Circuits and Microprocessor	3 Credit

Course Objectives:

1. Develop a strong foundation of digital electronics.
2. Understand concepts of combinational and sequential circuits.
3. Develop and design synchronous circuits and sequential machines.
4. Understand the concepts of processors

Course Outcomes:

Students will be able to:

1. Define Logic Families and Programmable Devices and understand the architecture of logic families and combinational digital circuits and describe the basic concept and interrupts in microprocessors.
2. Classify SOP and POS forms, combinational and sequential circuits, synchronous and asynchronous circuits.
3. Apply the principles of Boolean algebra to manipulate, minimize design logic circuits using logic gates and K-map and Use HDL & appropriate EDA tool for digital logic design and simulation.
4. Analyze combinational logic circuits and sequential circuits.
5. Recommend various combinational logic circuits like code converters, multiplexers, adders in the design of complex hierarchical combinational blocks like multipliers, fast adders etc and Validate sequential logic circuits elements like latches, flip-flops for counters, registers, simple finite state machine and similar circuits.
6. Design modular combinational circuits, synchronous sequential logic circuits and interface various devices with microprocessor.

Course Contents:

Module-1: Logic Simplification **[6 Hrs]**

Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Logic Gates, combinational Logic Optimization Techniques, Canonical forms of Boolean expression. Implementations of Boolean expressions using logic gate, Introduction to logic families & their characteristics such as Fan-In, Fan-out, Propagation delay, Power dissipation, Noise Margin

Module-2: Combinational logic Design **[5 Hrs]**

Comparators, Multiplexers, Demultiplexer, Encoder, Decoder, K-Map, half and full adders, Subtractors, serial parallel adders, Barrel Shifter, ALU. VHDL constructs and codes for combinational circuits.

Module-3: Sequential circuits **[5 Hrs]**

Latches and flip-flops: SR-FF, D-FF, JK-FF, Master-Slave JK-FF & T-FF's, Excitation &Truth Table, Flip-flop conversions, Shift registers. Introduction to Synchronous Counters: Ring counter, Johnson counter.

Module-4: Synchronous machines **[5 Hrs]**

Classification of synchronous machines, Design of synchronous sequential machines using Moore & Mealy circuits: Sequence detector, State diagram and implementation.

Module-5: Fundamentals of Microprocessor **[5 Hrs]**

Basic 8085 microprocessor architecture and its functional blocks, 8085 microprocessor IC pinouts and signals.

Module-6: Programming with 8085 **[6 Hrs]**

Assembly Language Programming Basics, Addressing Modes, Instruction set of microprocessor, Instruction timing diagram. Writing, Assembling & Executing Assembly Language Programs, Memory Interfacing.

Text Books:

1. An approach to digital Design: Morris Mano, Pearson Publications.

2. Microprocessor Architecture, Programming and Applications with the 8085:Ramesh Gaonkar, Penram International Publications.

3. Engineering Approach to Digital Design: W. Fletcher, PHI Publications.

Reference Books:

1. Fundamentals of digital circuits: A. Anand Kumar, Prentice-Hall of India, 4Edition.t

2. Modern digital Electronics: R.P. Jain, Tata McGraw Hill, 4Edition.r

3. Digital Electronic Principles: Malvino, PHI, 3Edition.

ET3T005	Integrated Circuit and Applications	4 Credit

Prerequisites:

1. Concepts of Basic Electrical Engineering.
2. Fundamentals of Engineering Mathematics

Course Objectives:

1. To understand characteristics of various Analog Circuits.
2. To study and interpret the datasheet
3. To study various op-amp parameters and their significance for Op-Amp.
4. To analyze and identify linear and nonlinear applications of Op-Amp.
5. To understand functionalities of PLL.

Course Outcomes:

Students will be able to:

1. Understand and explain the basic concepts of OPAMP.
2. Demonstrate the working principle of various analog circuits.
3. Conduct experiments using analog electronic components, electronic instruments and modern tool.
4. Analyze analog circuits to evaluate various performance parameters.
5. Compare multivibrator circuits, Data converters.
6. Design and realize filters, Oscillators, linear and non-linear applications of Op-Amp.

Course Contents:

Module-1: Introduction to Operational Amplifier **[6 Hrs]**

Op-Amp Fundamentals: Block diagram of operational amplifier, Op-Amp parameters, virtual ground concept, Differential amplifiers, Interpreting datasheet. Inverting & non invertingconfigurations

Circuits with resistive feedback: Concept of feedback & their types.

Module-2: OP-Amp Linear Applications **[6 Hrs]**

Voltage follower, Summing amplifier, scaling and averaging amplifier, Instrumentation amplifier and applications, Integrator and differentiators (Practical considerations and design), current to voltage converters, voltage to current converters, Peak detector, using Op-Amp & Transistor and analog multipliers.

Module-3: OP-Amp Non Linear Applications **[6 Hrs]**

Comparators, Log and antilog amplifiers, Schmitt trigger, Clipper and Clamper, Precision Rectifier. Multivibrators: Bistable, Monostable, Astable multivibrator circuits using Op-Amp, Sample/Hold circuits.

Module-4: Signal Generator **[6 Hrs]**

Principle of Oscillators, Barkhausen's criterion, Oscillator types: RC, LC oscillators, Triangular wave generator, Saw tooth wave generators. Monolithic timer IC 555, applications of IC 555, V to F and F to V converters.

Module-5: Design of Converters and filters **[6 Hrs]**

D-A conversion techniques, A-D Conversion techniques, First and second order Low Pass filter, High Pass filter, Band Pass filter, Band Select and All pass active filters.

Module-6: Phase Locked Loops & multipliers **[6 Hrs]**

Block diagram of PLL free running frequency, lock range, capture range and Sample circuits for each block. Applications of PLL - Frequency synthesizer FM demodulator, AM demodulator, FSK demodulator, Analog multiplier, Multiplier IC.

Text Books:

1. David A. Bell, 'Op-amp & Linear ICs', Oxford, 2013.

2. D. Roy Choudhary, SheilB.Jani, 'Linear Integrated Circuits', II edition, New Age, 2003.

3. Ramakant A. Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, 2003 / PHI. 2000.

4. N. C. Goyal and Khetan 'A Monograph on Electronics Design Principals', Khanna Publications

5. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", McGraw Hill.

Reference Books:

1. Fiore, "Opamps& Linear Integrated Circuits Concepts & Applications", Cengage, 2010.

2. Floyd ,Buchla, "Fundamentals of Analog Circuits", Pearson, 2013.

3. Jacob Millman, Christos C. Halkias, "Integrated Electronics – Analog and Digital circuits system", Tata McGraw Hill, 2003.

4. Robert F. Coughlin, Fredrick F. Driscoll, 'Op-amp and Linear ICs', PHI Learning, 6th edition, 2012.

5. Tobey, Graham, Huelsman "Operational Amplifier Design and Applications" McGraw Hill.

ET3T006	Network Synthesis and Analog Filter	3 Credits

Prerequisites:

Basic knowledge of network analysis, Ohms law, Kirchoff's Current and Voltage law.

Course Objectives:

1. To review basic components of electric network.
2. To appreciate the consequences of linearity using various network theorems.
3. To analyze Analog circuits that include energy storage elements using Laplace transforms for circuit analysis.
4. To analyze and synthesize waveforms for different electrical parameters.
5. To analyze four terminal networks using two-port parameters
6. To learn about the basics of analog Filters

Course outcomes:

Students will be able to:

1. Define various terminologies and network theorems.
2. Understand the basics of Network synthesis and analog filters.
3. Apply knowledge of mathematics to solve numerical based on network simplification and it will be used to analyze the same.
4. Analyze steady state and transient response of electrical circuits
5. Characterize the transfer function for two – port networks.
6. Design various electrical circuits using network theorems.

Course Contents:

Module-1: Basics of electric circuits **[5 Hrs]**

Basics of electric circuits, circuit elements and their voltage – current relationship,classification of circuit elements, sources – their types and characteristics, concept of equivalent sources, source transformation, nodal analysis of circuits containing resistors, inductors, capacitors, transformers, and both independent and dependent sources to determine current, voltage, power, and energy. Series Circuit, Parallel Circuit, Source shifting, Principe of duality, concept of V-shift and I-shift.

Module-2: Basics of Network Analysis **[5 Hrs]**

Mutual inductance, coefficient of coupling, dot convention, dot marking in coupled coils, mesh analysis of circuits containing resistors, inductors, capacitors, transformers, and both independent and dependent sources to determine current, voltage, power, and energy.

Module-3: Network Theorems **[5 Hrs]**

Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem.

Module-4: Laplace Transform **[5 Hrs]**

Review of Laplace Transform, concept of complex frequency, transform impedance and admittance, s – domain impedance and admittance models for resistor, inductor and capacitor, series and parallel combinations of elements. Transformed network on loop and mesh basis, mesh and node equations for transformed networks, time response of electrical network with and without initial conditions by Laplace transform, Transient analysis.

Module-5: Introduction to Active Filters **[6 Hrs]**

Aspects of filter design problem, approximation problem in network theory, maximally flat low pass filter approximation (Butterworth), Chebyshev approximations.

Module-6: Synthesis of Active filters **[5 Hrs]**

Synthesis of Active filters: Low Pass, Band Pass, RC-CR Transformation, Sensitivity, Biquad Circuits.

Text Books:

1. Franklin Kuo, "Network Analysis & Synthesis", Wiley International.
2. Govind Daryanani, "Analysis and Synthesis of Filters".

Reference Books:

1. Kendall Su, "Analog Filters", Kluwer Academic Publisher, 2nd Edition, 2002.
2. John O' Malley, "Basic Circuit Analysis", Schaum's series.
3. Van Valkenberg, "Network Analysis", Pearson Education.

ET3L002	Electronics Devices and Circuits-I Lab	1 Credit

Prerequisites: Basic knowledge of Semiconductor Physics and theoretical knowledge about the practical.

Course Objectives:

1. To identify Basic electronic components and devices
2. To observe the characteristics of diodes and Transistors
3. To analyze different amplifier configurations and their Frequency response
4. To design Electronic circuits using diodes and transistors

Course Outcomes:

At the end of the laboratory work, students will demonstrate the ability to:

1. Acquire the basic concepts of different semiconductor components and understand the use of semiconductor devices in different electronic circuits.
2. Identify basic devices such as diodes, BJT and JFET from their package information by referring to manufacturer's data sheets.
3. Plot and study the characteristics of semiconductor devices.
4. Simulate Electronic circuits using SPICE.
5. Calculate different performance parameters of transistor.
6. Design, build and test the performance of various circuits.

List of Experiments:

1. To Plot the V- I characteristics of PN junction diode (Silicon), Zener diode, LED under forward and reverse bias conditions.
2. To find the i) Voltage regulation ii) Load Regulation of a Zener shunt regulator
3. To design Half wave rectifier (with and without Filter) and find ripple factor and efficiency of Half wave Rectifier
4. To plot input and output wave forms of the Full Wave Rectifier (with and without Filter) and find ripple factor and efficiency of Full wave Rectifier
5. To observe the action of a Transistor as an Electronic switch
6. To plot input and Output Characteristics of Common Base Transistor configuration
7. To plot input and Output Characteristics of Common Emitter Transistor configuration
8. To obtain Frequency Response of single stage CE Amplifier and Find performance parameters
9. To plot Drain and Transfer characteristics of Field Effect Transistor (JFET) and Find gm,rd and μ from characteristics

10. Design and simulate LC Oscillators (Compare practical and theoretical oscillation frequency)
11. Build and test RC oscillator
12. Design and simulate Power Amplifiers - Class A, Class B, Class AB
13. Design and simulate Voltage Shunt Feedback Amplifiers
14. Design and simulate Current Series Feedback Amplifiers
15. Applications of Diodes: To verify the truth table for Logic Gates (AND & OR) using Diodes

ET3L003	Analog Communication System Lab	1 Credit

Course outcomes:

Students will be able to:

1. Observe SSB detection techniques.
2. Realize various modulation technique..
3. Generate signals using Scilab.
4. Identify and design different analog modulation techniques.
5. Analyze multiplexing systems such as FDM, TDM and QAM.
6. Compare different communication systems by analysing in time and frequency domain.

List of Experiments:

1. To generate amplitude modulated wave and determine the percentage modulation.
2. To generate frequency modulated signal and determine the modulation index and bandwidth for various values of amplitude and frequency of modulating signal.
3. To generate SSB using phase method and detection of SSB signal using Synchronous detector.
4. To generate DSB using phase method and detection of DSB signal using Synchronous detector
5. To generate the pulse amplitude modulated and demodulated signals
6. To implement the pulse width modulated and demodulated signals
7. To Design & generate the pulse position modulated and demodulated signals
8. To Study Differential PULSE Code Modulation & Demodulation
9. Implement and Study the AM Superhetrodyne radio receiver
10. To construct the frequency division multiplexing and demultiplexing circuit and to verify its operation
11. To perform the AM DSB-SC signal Generation and Detection using Scilab Simulink.
12. To perform the FM signal Generation and Detection using Scilab Simulink.
13. Quadrature Amplitude Modulation and Demodulation.
14. Time Division Multiplexing and Demultiplexing.
15. Study of phase modulator.

ET3L004	Digital Circuits and Microprocessor Lab	1 Credit

Course Objectives:

1. To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
2. To prepare students to perform the analysis and design of various digital electronic circuits.
3. To study programming based on 8085 microprocessor

Course Outcomes:

Students will be able to:

1. Find and prevent various hazards and timing problems in a digital design.
2. Understand the fundamental of basic gates and their use in combinational and sequential circuits Outline the use of digital components as a switching elements.
3. Develop ability to handle arithmetic operations using assembly language programming.
4. Analyze basic arithmetic and logical circuits required in microcomputer systems.
5. Examine the structure of various number systems and its application in digital design.
6. Design various combinational and sequential circuits and develop skill to build, and troubleshoot cost effective digital circuits.

List of Experiments:

1. Verification and interpretation of truth table for AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates.
2. Construction of half / full adder using XOR and NAND gates and verification of its operation.
3. To Study & Verify Half and Full Subtractor.
4. Verify the truth table of RS, JK, T and D flip-flops using NAND & NOR gates.
5. Implementation and verification of decoder/de-multiplexer and encoder using logic gates.
6. Implementation of 4x1 multiplexer and 1x4 demultiplexer using logic gates.
7. Design and verify the 4- Bit Synchronous/ Asynchronous Counter using JK flip flop.
8. Verify Binary to Gray and Gray to Binary conversion using NAND gates only.
9. Verify the truth table of one bit and two bit comparator using logic gates.
10. Write a Program Using 8085 & Verify for:

a. Addition of Two 8-Bit Numbers.

b. Addition of Two 16-Bit Numbers. (With Carry)

11. Write a Program Using 8085 & Verify for:

a. Subtraction of Two 8-Bit Numbers. (Display of Borrow)

b. Subtraction of Two 16-Bit Numbers. (Display of Borrow)

12. Write a Program Using 8085 & Test for Typical Data:

a. Multiplication of Two 8-Bit Numbers by Bit Rotation Method

b. Division of Two 8-Bit Numbers by Repeated Subtraction Method

13. Write a Program to Move a Block of Data Using 8085 & Verify

14. Write a Program to Arrange Number in Ascending Order Using 8085 & Verify.

15. Write a Program to Check Number of 1's and 0's in Given Number Using 8085 &Verify.

ET3T008	Innovation and Entrepreneurship Development	Audit

Course Objectives

1. To understand the importance of Innovation and Idea Generation
2. To understand the concept of entrepreneurship.

Course Outcomes

At the end of the course students will be able to

1. Identify and validate of ideas.
2. Remember Patent registration of Innovation.
3. Understand roles and responsibilities of Entrepreneurship.

Module 1: Innovation **[06Hrs]**

Concept of creativity, innovation, invention, discovery. Methods for development of creativity, convergent & divergent thinking etc. Introduction to Intellectual Property Rights (IPR), Patent and laws related to patents.

Module2: Entrepreneurship **[06Hrs]**

Concept of entrepreneurship, its relations in economic developments, Eventuation of concept of entrepreneur, characteristics of an Entrepreneur, Types of entrepreneurs, Qualities of entrepreneur, Factors affecting growth of entrepreneurship

Module 3: Role of Entrepreneurial Bodies **[06Hrs]**

Theory of achievement, motivation, Medelland's. Experiment, Women entrepreneurship, Role of SSI, its advantages & limitations, policies governing small scale industries, Procedure to set up small scale industrial unit, Advantages and limitations of SSI.

Module4: Role of Entrepreneurial Support **[06 Hrs]**

Factors governing project selection, Market survey, Preparation of project report. Financial, technical & market analysis of project. Entrepreneurial support systems, Role of consultancy organization like, District Industrial Centre, State Industrial Development Corporation, Financial institution, Latest SSI schemes of DIC (to be confirmed from DIC from time to time.

Text Book

1) Entrepreneurship Development, S. S. Khanka, S. Chand Publishers.

Reference Book

1) Creativity Innovation & Entrepreneurship, Zechariah James Blanchard, Needle Rat Business Publishers.

JAIDEV EDUCATION SOCIETY'S
J D COLLEGE OF ENGINEERING AND MANAGEMENT
KATOL ROAD, NAGPUR
Website: www.jdcoem.ac.in E-mail: info@jdcoem.ac.in
An Autonomous Institute, with NAAC "A" Grade
Department of Electronics and Telecommunication Engineering
"Rectifying Ideas, Amplifying Knowledge"
Session: 2020-21

Course Structure and Syllabus (Autonomous)

For

Fourth Semester B. Tech. in Electronics and Telecommunication Engineering

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE	Total	
1	BSC	ET4T001	Partial differential equation and Numerical Methods	2	1	0	20	20	60	100	3
2	ESC	ET4T002	Basics of Python Programming	3	0	0	20	20	60	100	3
3	ESC	ET4T003	Electrical Machines and Instruments	2	1	0	20	20	60	100	3
4	ESC	ET4T004	Electronic Devices and circuits-II	2	1	0	20	20	60	100	3
5	PCC	ET4T005	Signal and system	3	0	0	20	20	60	100	3
6	PCC	ET4T006	Electromagnetic Field	3	1	0	20	20	60	100	4
7	ESC	ET4L003	Electrical Machines and Instruments lab	0	0	2	60	0	40	100	1
8	ESC	ET4L004	Electronic Devices and circuits-II	0	0	2	60	0	40	100	1
9	PCC	ET4L005	Signal and system lab	0	0	2	60	0	40	100	1
10	Internship	ET4F006	Field Training-2	0	0	0	20	0	30	50	1
11	MC	ET4T007	Universal Human Values	2	0	0	10	15	25	50	Audit
			Total	**17**	**4**	**6**	**330**	**135**	**535**	**1000**	**23**

ET4T001 Partial Differential Equation and Numerical Methods 3 Credit

Course Objectives:

1. To prepare students for successful career in industries, for Post Graduate programme and to work in research institutes.
2. To understand different numerical techniques used for solving algebraic and transcendental equations.
3. To understand numerical methods to solve a system of linear equations.
4. To understand numerical integration and differentiation techniques.

Course Outcomes:

At the end of course students will be able to

1. Understand calculation and interpretation of various errors in numerical methods and partial differential equations.
2. Familiar with finite precision computation.
3. Solve nonlinear equations in a single variable and find numerical solutions.
4. Apply Numerical analysis which has enormous application in the field of science and some fields of Engineering.
5. Analyze the numerical integration and differentiation, numerical solution of ordinary differential equation.
6. Design mathematical model for various electronic applications.

Course Contents:

Module-1: Error Analysis [6 Hrs]

Significant figures, round-off, precision and accuracy, approximate and true error, truncation error and Taylor series, machine epsilon, data uncertainties, error propagation, importance of errors in computer programming.

Module-2: Solution of Transcendental / Polynomial Equations and System of Linear Equation [6 Hrs]

Solution of Transcendental / Polynomial Equations: Finding root of polynomial equations deploying computational methods such as Bisection, Regula-falsi, Newton-Raphson, Seccant, Successive approximation. System of linear equation: Solving linear equations deploying computational methods such as Gauss elimination, Gauss Jordan, Partial pivoting, Matrixtriangularisation (LU decomposition), Cholesky, Gauss Seidel and Jacobi methods.

Module-3: Interpolation and Polynomial Approximation **[6 Hrs]**

Least square approximation, Orthogonal polynomials Chebyshev polynomials, Finite difference operator and their relations, Forward, backward, central and divided difference, Newton's forward divided difference, Backward difference interpolation, Sterling interpolation, Lagrange"s interpolation polynomials, Spline interpolation, Least square approximation.

Module-4: Numerical Integration and Differentiation **[5 Hrs]**

Numerical Integration: Methods based on interpolation such as Trapezoidal rule, Simsons 1/3and 3/8 rules. Numerical differentiation: Euler's method, Modified Euler's method, Taylor'sseries, RungeKutta 2ndand 4th order, Stability analysis of above methods.

Module-5: Advance Partial Differential equations **[6 Hrs]**

Introduction Partial differential equation, method of separation of variables, Application of partial differential equations. (Heat equation, wave equation, Laplace Equation)

Module-6: Object Oriented Programming **[6 Hrs]**

Software Evaluation, Object oriented programming paradigm, Basic concepts of object oriented programming, Benefits of OOP, Object oriented languages, Applications of OOP Beginning with C++: Structure of C++ program, creating the source file, Compiling & linking, Basic data types, User defined data types, Symbolic constants, Declaration of variables, Dynamic initialization of variables, Reference variables, Operators in C++, Scope resolution operator, Type cast operator. Functions in C++: Function prototyping, Inline functions, Function overloading, Friend and virtual functions. Classes and Objects: Specifying a class, Defining member functions, C++ program with class, Arrays within a class, Memory allocation for objects, Constructors, Multiple constructor in class, Dynamic initialization of objects, Dynamic constructor, Destructors.

Texts Books:

1. Steven C Chapra, Reymond P. Canale, "Numerical Methods for Engineers", Tata McGraw Hill Publications, 2010.

2. E. Balaguruswamy, "Numerical Methods", TataMcGraw Hill Publications, 1999.

References Books:

1. V. Rajaraman, "Fundamental of Computers", Prentice Hall of India,NewDelhi, 2003.

2. S. S. Sastri, "Introductory Methods of Numerical Methods", Prentice Hall of India, NewDelhi 3rd edition, 2003.

3. K. E. Atkinson, “An Introduction to Numerical Analysis”, Wiley,1978.

4. M.J. Maron, “Numerical Analysis: A Practical Approach”, Macmillan, New York, 1982D.Ravichandran, "Programming with C++", TMH

5. E. Balagurusamy, "Object-Oriented Programming with C++", TMH, New Delhi,2001, 2nd Edition

6. YeshwantKanetkar, "Let us C++, BPB Pub.", Delhi, 2002, 4thEdition

ET4T002	Basics of Python Programming	3 Credits

Prerequisites: The prerequisite for learning Python is basic knowledge of concepts like Variables, Loops, and Control Statements etc.

Course Objectives:

To make students aware about

1. To understand the role computation can play in solving problems.
2. To understand why Python is a useful scripting language for developers.
3. To learn how to design and program Python applications.
4. To learn how to read and write files in Python
5. To learn how to design object□oriented programs with Python classes.
6. To learn how to use exception handling in Python applications for error handling.

Course Outcomes:

Students will be able to

1. Remember variables, types, operators, data structures, arguments, object oriented programming and libraries.
2. Understand assignment, keyword, expressions, lists, modules, exceptions and standard libraries.
3. Apply variables, types, operators, data structures, arguments, object oriented programming and Libraries.
4. Analyse modern updates in python for keyword, expressions, lists, modules, exceptions, standard libraries.
5. Evaluate storage space required to program python scripts, variables, types, operators and data structures.
6. Create python code to make functional Electronics hardware.

Course Contents:

Module-1: Introduction **[6 Hrs]**

History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.

Module-2: Types, Operators and Expressions **[6 Hrs]**

Types – Integers, Strings, Booleans; Operators - Arithmetic Operators, Comparison(Relational) Operators, Assignment Operators, Logical Operators, Bit-wise Operators, Membership Operators,

Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while break, continue, pass.

Module-3: Data Structures **[6 Hrs]**

Lists, Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences, Comprehensions.

Module-4: Default Arguments **[6 Hrs]**

Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function- Global and Local Variables. Modules: Creating modules, import statement, from. Import statement, name spacing, Python packages, Introduction to PIP, Installing Packages via PIP, Using Python Packages.

Module-5: Object-Oriented Programming OOP in Python **[6Hrs]**

Classes, self-variable Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding, Error, and Exceptions: Difference between an error and Exception, Handling Exception, try except for block, Raising Exceptions, User Defined Exceptions.

Module-6: Brief Tour of the Standard Library **[6 Hrs]**

Operating System Interface – String Pattern Matching, Mathematics, Internet Access, Dates and Times, Data Compression, Multithreading, GUI Programming, Turtle Graphics Testing: Why testing is required ?, Basic concepts of testing, Unit testing in Python, Writing Test cases, Running Tests.

Text Books:

1 Python Programming: A Modern Approach, Vamsi Kurama, Pearson

2. Learning Python, Mark Lutz, Orielly

Reference Books:

1 Think Python, Allen Downey, Green Tea Press

2. Core Python Programming, W.Chun, Pearson

3. Introduction to Python, Kenneth A. Lambert, Cengage

E-Resources:

1.https://www.python.org/

2.https://swayam.gov.in/nd1_noc19_cs41/preview

3. https://www.codecademy.com/learn/learn-python

4. https://www.learnpython.org/

5. https://developers.google.com/edu/python/
6. https://www.datacamp.com/tracks/python-programming
7. https://www.udemy.com/courses/search/?q=python+programming
8. https://docs.python.org/3/tutorial/index.html
9. http://www.pythonchallenge.com/
10. https://www.tutorialspoint.com/python/index.htm

ET4T003	Electrical Machines and Instruments	3 Credit

Course Objectives:

1. Develop a basic foundation of Electrical Machines.
2. Understand the basic principle, construction &operation, of ac and dc machines and electrical Instruments.
3. Understand the performance characteristics of ac and dc machines and electrical Instruments
4. Understand the applications of ac and dc machines as well as electrical Instruments in day today life.

Course outcomes:

Students will be able to:

1. Remember basic principles & construction, of electrical instruments and ac & dc machines.
2. Understand the operation, performance and characteristics of electrical instruments and ac & dc machines.
3. To identify the different issues related to the electrical instruments, speed control and torque improvement in ac & dc machines.
4. Analyse the performance indices of electrical instruments and ac & dc machines. Dc machines during various conditions..
5. Evaluate the operation of ac and dc machines along with the testing of electrical instruments.
6. Solve the different problems related to operation, & performance indices of electrical instruments ac and dc machines.

Course Contents:

Module-1: DC Machines **[5 Hrs]**

Construction, working principle (motor & generator), EMF equation of DC Machine (motor and generator), Types and its characteristics of DC machines (motor and generator), back emf, starters of dc machine, Speed control of DC motor ,Breaking of DC motor, applications of DC machines (motor and generator).

Module-2: Synchronous Machines **[5 Hrs]**

Construction, types, armature reaction, circuit model of synchronous machine, determination of synchronous reactance, phasor diagram, power angle characteristics, parallel operation of synchronous generators, synchronous motor operation, synchronous condenser.

Module-3: Three phase Induction (Asynchronous) Motor **[5 Hrs]**

Types of induction motor, flux and mmf waves, development of circuit model, power across air gap, torque and power output, starting methods, cogging and crawling, speed control, deep bar/ double cage rotor, induction generator, efficiency .of induction motors

Module-4: Special Machines **[5 Hrs]**

Construction, working and application of steeper motor, variable reluctance motor, servo motor, FHP motor, hysteresis, repulsion, linear IM.

Module-5: Electrical Instruments **[6 Hrs]**

Classification selection of transducers strain gauges, LVDT, Temperature transducers, piezoelectric, photosensitive transducers, Hall Effect transducers, proximity devices Digital transducers need of signal conditioning and types, interfacing techniques of transducers with microprocessor and controller.

Module-6: Applications of Electrical Instruments **[5 Hrs]**

Measurement of electrical telemetry thickness vibration,, humidity, thermal conductivity and gas analysis emission computerized tomography, smoke and fire detection, burglar alarm, object counter level measurement, on /off timers, RTC, sound level meter, tachometer, VAW meter.

Text Books:

1. Electrical Machines by Ashfaqu Husain, Dhanpatrai and publication
2. Instrumentation Devices System edition C. S. Rajan, G. R. sharma.

Reference Books:

1. A course in Electrical and Electronic Measurement and Instrumentation" by A. K. Sawhney (Publisher name: Dhanpat Rai& Co.)
2. Electronics Instrumentation by H.S. Kalsi (Publisher McGraw Hill)
3. Abhijit Chakrabarti & Sudipta Debnath, "Electrical Machines", Tata McGraw-hill Publication.
4. William H Hayt, Jack E Kimmerly and Steven M. Durbin, "Engineering Circuit Analysis",Tata McGraw Hill.
5. A.E. Fitzgerald, Charles Kingsley & Jr. Stephen D. Umans, "Electrical Machinery", TataMcGraw-hill Publication 6th Edition.
6. I.J Nagarath& D.P Kothari, "Electrical Machines", Tata McGraw-hill Publication 4th Edition.
7. T. J. E. Miller, "Brushless permanent-magnet and reluctance motor drives", OxfordUniversity Press (1989).
8. B. L. Theraja, "Electrical technology" volume 2, S. Chand.

ET4T004	Electronics Devices and Circuits-II	3 Credit

Prerequisites: Basic knowledge of Semiconductor Physics

Course Objectives:

1. To introduce semiconductor devices MOSFET, it's characteristics, DC analysis, biasing and applications
2. To analyze and interpret MOSFET circuits for small signal
3. To study the different types of voltage regulators
4. To design different electronic circuits

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Explain the working principle, operation and characteristics of Semiconductor devices such as MOSFET
2. Apply Knowledge of semiconductor devices and concepts to implement various electronic circuits.
3. Analyze different amplifier configurations.
4. Evaluate the small signal model and performance parameters of the device.
5. Design different oscillator circuits for various frequencies
6. Build and test the performance of electronic circuits

Course Contents:

Module-1: MOSFET **[6 Hrs]**

Structure, Symbol, Construction of n-channel E-MOSFET, MOS Transistor operation, EMOSFET Characteristics& parameters, non-ideal voltage current characteristics viz. Finite output resistance, body effect, sub-threshold conduction, breakdown effects and temperature effects, N-MOS, P-MOS and CMOS devices

Module-2: MOSFET Biasing and its DC Analysis **[5 Hrs]**

Common source circuit, Load Line & Modes of operation, Common MOSFET configurations: DC Analysis, constant current source biasing, MOSFET as switch, diode/active resistor, Current sink and source, Current mirror

Module-3: CMOS Inverter **[5 Hrs]**

Principle of operation, dc characteristics, transient characteristics, noise margin, static loadMOS inverter, transmission gate

Module-4: Study of CMOS Logic **[6 Hrs]**

Study of Combinational logic, gates, compound gates, multiplexers, and memory elements using CMOS technology

Module-5: Oscillators **[5 Hrs]**

Barkhausen criterion, stability with feedback. Classification of oscillators, RC Oscillators: FET RC Phase Shift oscillator, Wein bridge oscillator, LC Oscillators: Hartley and Colpitts oscillators, Crystal oscillators, UJT Relaxation oscillator

Module-6: Voltage Regulators **[5 Hrs]**

Block diagram of an adjustable three terminal positive and negative regulators (317,337) typical connection diagram, current boosting, Low drop out voltage regulators, Introduction to Switch Mode Power supply (SMPS), Block diagram of SMPS, Types of SMPS. Comparison of Linear Power supply and SMPS

Text Books:

1. Neil Weste and David Harris, Addison-Wesley "CMOS VLSI Design – A Circuits and Systems Perspective", Fourth edition, Pearson

2. R.L.Boylestad & Nashlesky, "Electronic devices and Circuits Theory" Nineth Edition, Prentice Hall of India

3. Donald Neaman, "Electronic Circuit Analysis and Design", Third Edition,TataMcGraw Hill

4. Millman, Halkias, "Integrated Electronics- Analog and Digital Circuits and Systems",Second Edition , Tata McGraw Hill

Reference Books:

1. BrijeshIyer, S. L. Nalbalwar, R. Dudhe, "Electronics Devices & Circuits", SynergyKnowledgeware Mumbai, 2017. ISBN:9789383352616

2. David A. Bell,"Electronic Devices and Circuits", Fourth Edition, PHI

3. Floyd," Electronic Devices", Seventh Edition, Pearson

4. Sedra and Smith, "Microelectronic Circuits", Oxford University Press, 2004

E-Resources:

1. https://nptel.ac.in/content/storage2/courses/117101058/downloads/
2. http://www.nesoacademy.org/electronics-engineering/analog-electronics/analog
3. https://onionesquereality.wordpress.com/.../more-video-lectures-iit-open
4. http://www.electronics-tutorials.ws/transistor/tran_1.html
5. http://www.allaboutcircuits.com/textbook/semiconductors/chpt-1/active-versus-passivedevices/

ET4T005	Signal and System	3 Credit

Prerequisites:

1. Basic Idea of Transform and its mathematical descriptions (Laplace, Fourier and ZTransform)
2. Differential equations and Integrals (advanced level)
3. Ordinary differential equations
4. Series and expansions
5. Fourier analysis and complex Fourier Series/transform
6. Applications of Fourier series, Fourier Transform to circuits.

Course Objectives:

1. To develop a strong foundation of continuous and discrete time signal and system.
2. Introduce ideas for analysis of various types of continuous & discrete time system.
3. Learn fundamental concepts and transforms as relevant to time and frequency domain Signals.
4. Understand the process of sampling and interpolation in real time signal transmission.

Course Outcomes:

1. Understand different types of signals & systems.
2. Familiar with the properties of LTI (Linear Time Invariant System) system and process involved in analysis of signals before transmission.
3. Solve various complex mathematical problems for signal analysis and conversion of signals from one domain to another.
4. Apply knowledge of sampling and interpolation to sample and reconstruct signals during real time signal transmission and reception.
5. Analyze continuous and discrete systems in time and frequency domain.
6. Design Various Mathematical models to Investigate stability of the system.

Course Contents:

Module-1: Basics of signals and system **[6 Hrs]**

Introduction and Classification of signals, Definition of signal, Continuous time and discrete time signal, Classification of signals as even, odd, periodic and non-periodic, Deterministic and non-deterministic, energy and power, elementary signals used for testing, Exponential, sine, impulse, step and its properties, ramp, rectangular, triangular, signum, sinc, Operations on signals, Amplitude scaling, addition, multiplication, differentiation, integration, time scaling, time shifting and time folding, Systems Definition, Classification, linear and non-linear, time variant and invariant, causal and non-causal, static and dynamic, stable and unstable, invertible.

Module-2: Time Response Analysis **[6 Hrs]**

Continuous-Time and Discrete-Time Signals, Transformations of the Independent Variable, Continuous-Time and Discrete-Time Systems, Basic System Properties, Discrete-Time LTI (Linear Time Invariant System) Systems, the Convolution Sum, Continuous-Time LTI Systems, the Convolution Integral, Properties of Linear Time-Invariant Systems, Causal LTI Systems Described by Differential and Difference Equations.

Module-3: Fourier Series Analysis **[6 Hrs]**

The Response of LTI Systems to Complex Exponentials, Fourier Series Representation of Continuous-Time Periodic Signals, Convergence of the Fourier Series, Properties of Continuous-Time Fourier Series, Fourier Series Representation of Discrete-Time Periodic Signals, Properties of Discrete-Time Fourier Series, Fourier Series and LTI Systems, Examples of Continuous-Time Filters Described by Differential Equations, Examples of Discrete-Time Filters Described by Difference Equations.

Module-4: Fourier Transform Analysis **6 Hrs**

The Continuous-Time Fourier Transform, Representation of Aperiodic Signals, The Fourier Transform for Periodic Signals, Properties of the Continuous-Time Fourier Transform, Systems Characterized by Linear Constant-Coefficient Differential Equation, The Discrete-Time Fourier Transform, Representation of Aperiodic Signals, The Fourier Transform for Periodic Signals, Properties of the Discrete-Time Fourier Transform, Systems Characterized by Linear Constant-Coefficient Difference Equations.

Module-5: Frequency Response Analysis **[6 Hrs]**

The Magnitude-Phase Representation of the Frequency Response of LTI Systems, Concept ofFrequency Response, Group Delay, Phase Delay, Time-Domain Properties of Ideal Frequency-Selective Filters, Time- Domain and Frequency-Domain Aspects of Non ideal Filters, First-Order and Second-Order Continuous-Time Systems, Discrete-Time System, Representation of a Continuous-Time Signal by its Samples, the Sampling theorem, Reconstruction of a Signal from Its Samples Using Interpolation, Aliasing effect, Discrete-Time Processing of Continuous-Time Signals.

Module-6: Laplace and Z-Domain Analysis **[6 Hrs]**

The Laplace Transform, Region of Convergence for Laplace Transforms, Inverse Laplace Transform, Properties of the Laplace Transform, Analysis and Characterization of LTI Systems Using Laplace Transform, System Function Algebra and Block Diagram Representations, The Unilateral Laplace Transform, The z-Transform, Region of Convergence for the z-Transform, Inverse z-Transform,

Properties of z-Transform, Analysis and Characterization of LTI Systems Using z-Transforms, System Function Algebra and Block Diagram Representations, The Unilateral z-Transform.

Text Books:

1. Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia), Private Limited,

2. B. P. Lathi, "Linear Systems and Signals", OXFORD University Press.

3. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall,1983.

4. "Signals and Systems", A. NagoorKanni, 2nd Edition, McGraw Hill.

Reference Books:

1. J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems", TMH New Delhi,2001.

2. M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB",TMH, 2003.

3. Signals Systems and Transforms, 3rd Edition, 2004, C. L. Philips, J.M.Parr and EveA.Riskin ,Pearson education.

4. S.S. Soliman& M.D. Srinath, "Continuous and Discrete Signals and Systems", Prentice-Hall, 1990.

5. ShailaDinkarApte "Signals and Systems" Principles and Applications",CambridgeUniversityPress.

E-Resources:

1. NPTEL link principal of signals and system.
https://www.youtube.com/watch?v=xrVWB9VYZ64&list=PLq-Gm0yRYwTjwxaqapPsSAHzs4_nkQLVr

2. E-BOOK Signal and Systems Simon Haykin Wiley
https://www.academia.edu/38588821/Signal_and_Systems_Simon_Haykin_Wiley

3. E-BOOK B. P. Lathi, "Linear Systems and Signals",
https://india.oup.com/productPage/5591038/7421214/9780198062271

ET4T006	Electromagnetic Fields	4 Credits

Course Objectives:

Learners can be able to explore their knowledge in the area of EM Waves and its analysis.

1. To learn basic coordinate system, significance of divergence, gradient, curl and its applications to EM Waves.
2. To understand the boundary conditions for different materials /surfaces.
3. To get insight on finding solution for non-regular geometrical bodies using Finite
4. Element Method, Method of Moments, Finite Difference Time Domain.
5. To get the basics of microwave, transmission lines and antenna parameters.
6. Students get acquainted with different physical laws and theorems and provide basic platform for upcoming communication technologies.

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand characteristics and wave propagation on high frequency transmission lines
2. Carryout impedance transformation on TL
3. Use sections of transmission line sections for realizing circuit elements
4. Characterize uniform plane wave
5. Calculate reflection and transmission of waves at media interface
6. Analyze wave propagation on metallic waveguides in modal form
7. Understand principle of radiation and radiation characteristics of an antenna

Course Contents:

Module-1: Maxwell's Equations **[6 Hrs]**

Maxwell's Equations Basics of Vectors, Vector calculus, Basic laws of Electromagnetics, Maxwell's Equations, Boundary conditions at Media Interface

Module-2: Uniform Plane Wave **[6 Hrs]**

Uniform Plane Wave Uniform plane wave, Propagation of wave, Wave polarization, Poincare"s Sphere, Wave propagation in conducting medium, phase and group velocity, Power flow and Poynting vector, Surface current and power loss in a conductor.

Module-3: Transmission Lines **[6 Hrs]**

Equations of Voltage and Current on TX line, Propagation constant and characteristic impedance, and 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 transmission line sections as circuit elements.

Module-4: Plane Waves at a Media Interface **[6 Hrs]**

Plane wave in arbitrary direction, Reflection and refraction at dielectric interface, Total internal reflection, wave polarization at media interface, Reflection from a conducting boundary.

Module-5: Wave propagation **[6 Hrs]**

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

Module-6: Radiation **[6 Hrs]**

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.
5. Sadiku, "Elements of Electromagnetics", Oxford.
6. Krauss, "Electromagnetics", McGraw Hill, New York, 4th edition.
7. W. H. Hayt, "Engineering Electromagnetics", McGraw Hill, New Delhi, 1999.
8. Edminister, Schaum series, "Electromagnetics", McGraw Hill, New York, 1993, 2nd edition.
9. Sarvate, "Electromagnetism", Wiley Eastern.

ET4L003 **Electrical Machines and Instruments Lab** **1 Credit**

Course Outcomes:

Students will be able to:

1. Remember basic principles & construction, of electrical instruments and ac & dc machines.
2. Understand the operation, performance and characteristics of electrical instruments and ac & dc machines.
3. To identify the different issues related to the electrical instruments, speed control and torque improvement in ac & dc machines.
4. Analyse the performance indices of electrical instruments and ac & dc machines.
5. Evaluate the operation of ac and dc machines along with the testing of electrical instruments.
6. Solve the different problems related to operation, & performance indices of electrical instruments ac and dc machines.

List of Experiments:

1. To study the construction of field and armature of DC Machine.
2. To determine external characteristics of DC Generator
3. To perform Load test on DC shunt motor.
4. To perform speed control of DC shunt motor using armature and field control method.
5. To perform Load test on DC shunt generator.
6. .To study and perform the voltage build up in the DC shunt Generator
7. To study the internal construction of three phase induction motor.
8. To perform no Load and block rotor tests on squirrel cage induction motor
9. To study various starting methods of three phase induction motor
10. To control speed of induction motor by V/F control
11. To control speed of slip ring induction motor by rotor resistance control
12. To study the internal construction of three phase synchronous machine.
13. Determination of sequence impedance of salient pole synchronous machine
14. To perform speed control of Stepper motor
15. To study various electrical instruments with their industrial applications.

ET4L004	Electronic Circuit and Devices-II Lab	1 Credit

Prerequisites: Basic knowledge of Semiconductor Physics and theoretical knowledge of respective practical.

Course Objectives:

1. To identify Basic electronic components and devices
2. To observe the characteristics of MOSFET, CMOS Inverter, UJT
3. To analyze different amplifier configurations and their Frequency response
4. To design and Simulate Electronic circuits

Course Outcomes:

At the end of the laboratory work, students will demonstrate the ability to:

1. Acquire the basic concepts of different semiconductor components and understand theuse of semiconductor devices in different electronic circuits.
2. Plot and study the characteristics of semiconductor devices like MOSFET, UJT
3. Simulate Electronic circuits using SPICE.
4. Calculate different performance parameters of transistor.
5. Design, build, and test the performance of various circuits.

List of Experiments:

1. To Plot Drain and Transfer characteristics of N- Channel E- MOSFET
2. To design NMOS Common source amplifier
3. To obtain the frequency response of MOSFET amplifier in common source configuration with given specifications
4. To Study MOSFET as a Switch
5. To assemble and characterize MOSFET current mirrors
6. To design and plot the static (VTC) and dynamic characteristics of a digital CMOS inverter using Virtual lab
7. To design and plot the dynamic characteristics of 2-input NAND and NOR logic gates using CMOS technology using Virtual lab
8. Implement 2:1 Multiplexer using transmission gate
9. Implementation of NAND and NOR gate
10. To Design and Simulate Wein Bridge oscillator using FET
11. To Design and Simulate RC Phase shift oscillator using FET
12. To Design and Simulate Hartley Oscillator using FET

13. To Design and Simulate Colpitts Oscillator using FET
14. To Study the operation of UJT as a Relaxation Oscillator
15. To Design adjustable Voltage Regulated Power Supply using LM317

ET4L005	Signal and System Lab	1 Credit

Course Objectives:

1. Develop a strong foundation of continuous and discrete time signal and system analysis using Scilab.
2. Understand the various continuous and discrete time signals generation methods.
3. Understand the basic operations on the signals.
4. Understand the Design and analysis of linear time-invariant (LTI) systems.
5. Understand the spectral characteristics of signals using Fourier analysis.
6. Develop a strong foundation of systems using Laplace transform and Z-transform

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand basics of Scilab syntax, functions and programming.
2. Familiar With characterization of various continuous and discrete time signals.
3. Solve the Problems on basic operations on the signals.
4. Apply Knowledge of linear time-invariant (LTI) systems for computing its response.
5. Analyze the spectral characteristics of signals using various transforms.
6. Design the Mathematical model of systems using various transforms.

List of Experiments:

1. Introduction to Scilab.
2. To create user defined functions for generating Continuous and Discontinues time sinusoidal signal.
3. To create user defined functions for generating Continuous and Discontinues time delta signal and unit step signal.
4. To create user defined functions for generating Continuous and Discontinues time Exponential and RAMP Signal.
5. To create user defined functions for signal operation: signal addition, subtraction, and multiplication.
6. To create user defined functions for signal operation: time shifting, time scaling and time inversion.
7. To compute convolution of two signals and verify its properties.
8. To compute auto-correlation of two signals and verify its properties.
9. To compute cross-correlation of two signals and verify its properties.
10. To obtain the response of LTI system defined by linear constant coefficient difference equations.
11. To synthesize the periodic signal using Fourier series.

12. To analyze the spectrum of the signal using Fourier transform and verify its properties.

13. To compute and plot the impulse response and pole-zero diagram of transfer function using Laplace transform

14. To compute and plot the impulse response and pole-zero diagram of transfer function using Z-transform.

15. Program for calculating Inverse z-transform of Given function.

16. Program for calculating Inverse Laplace-transform of Given function

17. To Analyze discrete-time signals with the (discrete) Fast Fourier transform

18. To find whether the system is linear or nonlinear for the given signal.

ET4T007	Universal Human Values	Audit

Course Objective:

The objective of the course is four fold:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course Contents:

Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

Module 2: Understanding Harmony in the Human Being - Harmony in Myself!

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in 'I'
11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail

12. Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me.

Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

Module 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship

14. Understanding the meaning of Trust; Difference between intention and competence

15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship

16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals

17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

18. Understanding the harmony in the Nature

19. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self regulation in nature

20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space

21. Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

22. Natural acceptance of human values

23. Definitiveness of Ethical Human Conduct

24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

26. Case studies of typical holistic technologies, management models and production systems

27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

28. Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. to discuss the conduct as an engineer or scientist etc.

Text Books:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Books:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)