SCHEME OF EXAMINATION
B.TECH (FOUR YEAR) DEGREE COURSE
SECOND YEAR, ELECTRONICS & COMMUNICATION ENGINEERING
SCHOOL OF ENGINEERING & TECHNOLOGY, GGVV BILASPUR (CG) 495009

SEMESTER III (SECOND YEAR)
EFFECTIVE FROM SESSION 2019-20

Sr. No.	Course Code	Course Title	L	T	P	Periods/ week	Evaluation Scheme			Credit
							IA	ESE	Total	
Theory										
1	EC03TPC01	Electronic Devices	3	0	0	3	30	70	100	**3**
2	EC03TPC02	Digital System Design	3	0	0	3	30	70	100	**3**
3	EC03TPC03	Signals and Systems	3	0	0	3	30	70	100	**3**
4	EC03TPC04	Network Theory	3	0	0	3	30	70	100	**3**
5	EC03TBS05	Mathematics-III	3	1	0	4	30	70	100	**4**
6	EC03THS02	Engineering Economics	3	0	0	3	30	70	100	**3**
7	EC03TMC02	Constitution of India	2	0	0	2	0	0	0	**0**
Practical										
1	EC03PPC01	Electronics Devices Lab	0	0	3	3	30	20	50	**1**
2	EC03PPC02	Digital System Design Lab	0	0	3	3	30	20	50	**1**
									Total Credits	**21**

SEMESTER IV (SECOND YEAR)
EFFECTIVE FROM SESSION 2019-20

Sr. No.	Course Code	Course Title	L	T	P	Periods/ week	Evaluation Scheme			Credit
							IA	ESE	Total	
Theory										
1	EC04TPC05	Analog and Digital Communication	3	1	0	4	30	70	100	**4**
2	EC04TPC06	Analog Circuits	3	0	0	3	30	70	100	**3**
3	EC04TPC07	Microcontrollers	3	0	0	3	30	70	100	**3**
4	EC04TBS06	Numerical Methods	3	1	0	4	30	70	100	**4**
5	EC04TES05	Electronics Measurement & Instrumentation	3	0	0	3	30	70	100	**3**
6	EC04THS03	Effective Technical Communication	3	0	0	3	30	70	100	**3**
Practical										
1	EC04PPC03	Analog and Digital Communication Lab	0	0	2	2	30	20	50	**1**
2	EC04PPC04	Analog Circuits Lab	0	0	2	2	30	20	50	**1**
3	EC04PPC05	Microcontrollers Lab	0	0	2	2	30	20	50	**1**
									Total Credits	**23**

L : LECTURE T: TUTORIAL P: PRACTICALIA: INTERNAL ASSESSMENT ESE: END SEMESTER EXAM

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC03TPC01	3	0	0	3 hours	30	70	3

ELECTRONIC DEVICES

Course Objectives:

Students will try to learn:

1. To understand operation of semiconductor devices.
2. To understand DC analysis and AC models of semiconductor devices.
3. To apply concepts for the design of Regulators and Amplifiers
4. To verify the theoretical concepts through laboratory and simulation experiments.
5. To implement mini projects based on concept of electronics circuit concepts.

UNIT-I :Semiconductor concept: Metals, Insulators and Semiconductors, Electrical properties of Ge and Si, Conductivity Equation, Mobility and Conductivity, Electron and holes in intrinsic and extrinsic semiconductors, Donor and Acceptor Impurities,

Electrons in periodic Lattices, E-k diagrams. Energy bands in intrinsic and extrinsic silicon, Transport Phenomena of semiconductor, Generation and recombination of carriers, Charge density in Semiconductor, Hall Effect, Injected minority charge carriers, Potential variation within graded semiconductor.

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

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

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

UNIT-III :Transistor Characteristics: Junction Transistor, Transistor current components, Transistor as an amplifier, Transistor construction, Transistor circuit configuration (CB, CE, CC)**-** Analytical Expression for transistor characteristics and Operation, Early Effect, Ebers-Moll Model, β-re model, Transistor as a switch.

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

UNIT-IV: Field Effect Transistor (FET): JFET Construction, Operation, V-I characteristics, Transfer characteristics, Drain characteristics. Metal Oxide Semiconductor Field Effect Transistor (MOSFET)-Construction, Operation and characteristics, Depletion MOSFET, Enhancement MOSFET,

complementary MOSFET.MOS capacitor, C-V characteristics, MOSFET, small signal models of MOS transistor, LED, photodiode and solar cell;

UNIT-V:IC Fabrication: Integrated circuit fabrication process: oxidation, diffusion, ion implantation, photolithography, etching, chemical vapor deposition, sputtering, twin-tub CMOS process.

Text/Reference Books:

1. G. Streetman, and S. K. Banerjee, “Solid State Electronic Devices,” 7th edition,Pearson,2014.
2. D. Neamen , D. Biswas "Semiconductor Physics and Devices," McGraw-Hill Education
3. S. M. Sze and K. N. Kwok, “Physics of Semiconductor Devices,” 3rd edition, John Wiley&Sons, 2006.
4. C.T. Sah, “Fundamentals of solid state electronics,” World Scientific Publishing Co. Inc,1991.
5. Y. Tsividis and M. Colin, “Operation and Modeling of the MOS Transistor,” OxfordUniv.Press, 2011.

Course Outcomes:

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

1. Understand the principles of semiconductor Physics
2. Understand and utilize the mathematical models of semiconductor junctions and MOS transistors for circuits and systems.

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC03TPC02	3	0	0	3 hours	30	70	3

DIGITAL SYSTEM DESIGN

Course Objectives:

Students will try to learn:

1. To understand number representation and conversion between different representation in digital electronic circuits.
2. To analyze logic processes and implement logical operations using combinational logic circuits.
3. To understand characteristics of memory and their classification.
4. To understand concepts of sequential circuits and to analyze sequential systems in terms of state machines.
5. To understand concept of Programmable Devices, PLA, PAL, CPLD and FPGA and implement digital system using VHDL.
6. To implement combinational and sequential circuits using VHDL.

UNIT-I : Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De-Morgan's Theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, Binary codes, Code Conversion.

UNIT-II:MSI devices like Comparators, Multiplexers, Encoder, Decoder, Driver & Multiplexed Display, Half and Full Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Barrel Shifter and ALU.

UNIT-III : Sequential Logic Design: Building blocks like S-R, JK and Master-Slave JK FF, Edge triggered FF, Ripple and Synchronous counters, Shift registers, Finite state machines, Design of synchronous FSM, Algorothmic State Machine Charts, Designing Finite synchronous circuits like Pulse train generator, PseudoRandom Binary Sequence generator, Clock generation

UNIT-IV : Logic Families and Semiconductor Memories: TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing, Memory elements, Concept of Programmable Logic Devices like FPGA, Logic implementation using Programmable devices.

UNIT-V :VLSI Design flow: Design entry: Schematic, FSM & HDL, different modeling styles in VHDL, Data types and objects, Dataflow, Behavioral and Structural Modeling, Synthesis & Simulation , VHDL constructs and codes for combinational and sequential circuits.

Text/Reference Books:

1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.
2. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002.
3. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", PHI, 2nd edition ,2006.
4. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill, 1989
5. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition2012.

Course outcomes:

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

1. Design and analyze combinational logic circuits
2. Design & analyze modular combinational circuits with MUX/DEMUX, Decoderand Encoder.
3. Design & analyze synchronous sequential logic circuits
4. Use HDL & appropriate EDA tools for digital logic design and simulation.

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC03TPC03	3	0	0	3 hours	30	70	3

SIGNALS & SYSTEMS

Course Objectives:

Students will try to learn:

1. To introduce students the concept and theory of signals and systems needed in electronics and telecommunication engineering fields.
2. To introduce students to the basic idea of signal and system analysis and its characterization in time and frequency domain

UNIT-I: Signals and systems as seen in everyday life, and in various branches of engineering and science. Energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity additivity and homogeneity, shift-invariance, causality, stability, realizability.

UNIT-II: Linear shift-invariant (LSI) systems, impulse response and step response, convolution, input-output behavior with aperiodic convergent inputs. Characterization of causality and stability of linear shift-invariant systems. System representation through differential equations and difference equations.

UNIT-III : Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response, Fourier series representation, the Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem: The idea of signal space and orthogonal bases.

UNIT-IV : The Laplace Transform, notion of eigen functions of LSI systems, a basis of eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system behavior. The z-Transform for discrete time signals and systems- eigen functions, region of convergence, z-domain analysis.

UNIT-V: State-space analysis and multi-input, multi-output representation. The state-transition matrix and its role. The Sampling Theorem and its implications- Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on. Aliasing and it seffects. Relation between continuous and discrete time systems.

Text/Reference books:

1. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall,1983.
2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.
3. Papoulis, "Circuits and Systems: A Modern Approach", HRW, 1980.
4. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.
5. Douglas K. Lindner, "Introduction to Signals and Systems", McGraw Hill InternationalEdition: c1999.

6. Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia) Private Limited, c1998.
7. Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems", John Wiley andSons, 1995.
8. M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB",TMH, 2003.
9. J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems", TMH New Delhi,2001.
10. Ashok Ambardar,"Analog and Digital Signal Processing", 2nd Edition, Brooks/ ColePublishing Company (An international Thomson Publishing Company), 1999.

Course outcomes:

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

1. Analyze different types of signal
2. Represent continuous and discrete systems in time and frequency domain using differenttransforms
3. Investigate whether the system is stable
4. Sampling and reconstruction of a signal

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC03TPC04	3	0	0	3 hours	30	70	3

NETWORK THEORY

Course Objectives:

Students will try to learn:

1. To explain the basic concepts and laws of DC and AC electrical networks and solve them using mesh and nodal analysis techniques.
2. To introduce students with the fundamental concepts in graph theory.
3. To analyze circuits in time and frequency domain.
4. To explain concepts of driving point and transfer functions, poles and zeroes of network functions.
5. To introduce open circuit, short circuit, transmission, hybrid parameters and their interrelationship.

UNIT-I: Node and Mesh Analysis, matrix approach of network containing voltage and current sources and reactances, source transformation and duality. Network theorems: Superposition, reciprocity, Thevenin's, Norton's, Maximum power Transfer, compensation and Tallegen's theorem as applied to AC. circuits.

UNIT-II: Trigonometric and exponential Fourier series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values, Fourier transform and continuous spectra, three phase unbalanced circuit and power calculation.

UNIT-III: Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions.

UNIT-IV: Transient behavior, concept of complex frequency, Driving points and transfer functions poles and zeros of immittance function, their properties, sinusoidal response from pole-zero locations.

UNIT-V: Convolution theorem and Two four port network and interconnections, Behaviors of series and parallel resonant circuits, Introduction to band pass, low pass, high pass and band reject filters.

Text/Reference Books

1. Van, Valkenburg.; "Network analysis"; Prentice hall of India, 2000
2. Sudhakar, A., Shyammohan, S. P.; "Circuits and Network"; Tata McGraw-Hill NewDelhi, 1994
3. A William Hayt, "Engineering Circuit Analysis" 8th Edition, McGraw-Hill Education

Course Outcomes:

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

1. Understand basics electrical circuits with nodal and mesh analysis.
2. Appreciate electrical network theorems.
3. Apply Laplace Transform for steady state and transient analysis.
4. Determine different network functions.
5. Appreciate the frequency domain techniques.

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC03TBS05	3	1	0	4 hours	30	70	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 extremise the functional using integration technique.
3. To form and solve the partial differential equation using different analytical techniques.

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

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

UNIT – III : Laplace Transform: Definition, Linearity, Shifting & Scaling properties, Transform of Elementary functions, Transform of Derivatives & Integrals, Multiplication by t &division by t, Inverse Laplace transform, Convolution theorem, Transform of Periodic functions, Unit Step function & Dirac delta function, Initial value and Final value theorems, Application to solution of ordinary differential equations.

UNIT – IV : Fourier Transform: Definition of Fourier Integrals- Fourier Sine & Cosine integrals, Complex form of Fourier integral, Fourier Sine & Cosine transforms, Complex form of Fourier Transform, Linearity, Shifting & Scaling properties, Modulation theorem, Inverse Fourier transform, Fourier transform of derivatives.

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

SUGGESTED BOOKS & REFERENCE:-

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

Course Outcomes:

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

1. Apply knowledge of complex variables, Laplace transform, Fourier transform and Differential equations for understanding and solving engineering Problems

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC03THS02	3	0	0	3 hours	30	70	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.

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

Course Outcomes:

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

1. Aware of the basic theoretical framework underlying the field of Microeconomics, Macroeconomics, Indian Economy, Public Finance etc.
2. Understand the operations of money and banking and their interaction with the rest of the economy

3. Realize how monetary forces operate through a multitude of channels — market, non-market, institutions and among others.
4. Have an understanding of the various issues/components of the Indian economy so that they are able to comprehend and critically appraise current Indian economic problems.
5. Understand the major developments in the Indian economy before Independence, at the time of Independence and during the post-Independence period.

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC03TMC02	2	0	0	2 hours	0	0	0

CONSTITUTION OF INDIA

Course Objectives:

Students will try to learn:

1. To understand the need for a constitution.
2. To explain the role of constitution in a democratic society.
3. To list the key features of the constitution.
4. To appreciate the fundamental rights of the citizens of India.

UNIT – I: Introduction: Constitution – Meaning of the term, Sources and Constitutional history, Features, Citizenship, Preamble.

UNIT-II: Fundamental Rights & Duties: Fundamental Rights & Duties, Directive Principles of State Policy.

UNIT-III: Union Government: Structure of the Indian Union: Federalism, Centre-State relationship, President : Role, Power and Position, PM and Council of ministers, Cabinet & Central Secretiat, Lok Sabha, Rajya Sabha.

UNIT-IV: State Government: Governor: Role & Position, CM and Council of ministers, State Secretariat: Organisation Structure & Functions.

UNIT-V: Relation between Centre &States: Distribution of Legislative Powers, Administrative relations, Coordination between States.

Text /Reference Books:

1. V. N. Shukla; “Constitution of India”
2. J.N.Pandey; “Constitutional Law of India”
3. M. P. Jain; “Indian Constitutional Law”

Course Outcomes:

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

1. To enhance their knowledge about society and public welfare.
2. To become a responsible citizen and give an active & positive support in Indian democracy
3. Students will understand the importance of their duties towards the society and nation and be aware about their rights for their overall development

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC04TPC05	3	1	0	4 hours	30	70	4

ANALOG AND DIGITAL COMMUNICATION

Course Objectives:

Students will try to learn:

1. The fundamentals of basic communication system, types of noise affecting communication system and noise parameters.
2. Need of modulation, modulation processes and different amplitude modulation schemes
3. Different angle modulation schemes with different generation and detection methods.
4. Various radio receivers with their parameters.
5. Need of sampling and different sampling techniques.
6. Generation and detection of pulse modulation techniques and multiplexing.
7. About theoretical bounds on the rates of digital communication system and represent a digital signal using several modulation methods

UNIT-I: Review of signals and systems, Frequency domain representation of signals, Principles of Amplitude Modulation Systems- DSB, SSB and VSB modulations. Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals.

UNIT-II: Review of probability and random process. Gaussian and white noise characteristics, Noise in amplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and De- emphasis, Threshold effect in angle modulation.

UNIT-III: Pulse modulation. Sampling process. Pulse Amplitude and Pulse code modulation (PCM), Differential pulse code modulation. Delta modulation, Noise considerations in PCM, Time Division multiplexing, Digital Multiplexers.

UNIT-IV: Elements of Detection Theory, Optimum detection of signals in noise, Coherent communication with waveforms- Probability of Error evaluations. Base band Pulse Transmission- Inter symbol Interference and Nyquist criterion. Pass band Digital Modulation schemes- Phase Shift Keying, Frequency Shift Keying, Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying.

UNIT-V: Digital Modulation tradeoffs. Optimum demodulation of digital signals over band-limited channels- Maximum likelihood sequence detection (Viterbi receiver). Equalization Techniques. Synchronization and Carrier Recovery for Digital modulation.

Text/ReferenceBooks:

1. Haykin S., "Communications Systems", John Wiley and Sons, 2001.
2. Proakis J. G. and Salehi M. ;Communication Systems Engineering", Pearson Education,2002.
3. Taub H. and Schilling D.L., "Principles of Communication Systems", Tata McGraw Hill,2001.

4. Wozencraft J. M. and Jacobs I. M., ``Principles of Communication Engineering'',JohnWiley, 1965.
5. Barry J. R., Lee E. A. and Messerschmitt D. G., ``Digital Communication'', KluwerAcademic Publishers, 2004.
6. Proakis J.G., ``Digital Communications'', 4th Edition, McGraw Hill, 2000.

Course Outcomes:

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

1. Analyze and compare different analog modulation schemes for their efficiency and bandwidth
2. Analyze the behavior of a communication system in presence of noise
3. Investigate pulsed modulation system and analyze their system performance
4. Analyze different digital modulation schemes and can compute the bit error performance

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC04TPC06	3	0	0	3 hours	30	70	3

ANALOG CIRCUITS

Course Objectives:

Students will try to learn:

1. To understand the operation of the various bias circuits of MOSFET and Analyze and design MOSFET bias circuits.
2. To understand the operation and design of multistage. amplifier for a given specification.
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 to.
6. To determine the frequency of oscillation

UNIT-I: Diode Circuits, Amplifier models: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. Biasing schemes for BJT and FET amplifiers, bias stability, various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers.

UNIT-II: High frequency transistor models, frequency response of single stage and multistage amplifiers, cascode amplifier. Various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues. Feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability, gain margin and phase margin.

UNIT-III: Oscillators: Review of the basic concept, Barkhausen criterion, RC Oscillators (Phase shift, Wein Bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), Non sinusoidal oscillators, Current mirror: Basic topology and its variants, V-I Characteristics, Output resistance and minimum sustainable voltage (VON), maximum usable load.

UNIT-IV: Differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR. OP-AMP Design: design of differential amplifier for a given specification. Design of gain stages and output stages, compensation. OP-AMP applications: review of inverting and non-inverting amplifiers, integrator and differentiator, summing amplifier, Precision rectifier, Schmitt trigger and its applications. Active filters: Low pass, high pass, band pass and band stop design guidelines.

UNIT-V: Digital-to-analog converters (DAC): Weighted resistor, R-2R ladder, resistor string etc. Analog to-digital converters (ADC): Single Slope, dual slope, successive approximation, flash etc. Switched capacitor circuits: Basic concept, practical configurations, application in amplifier, integrator, ADC etc.

Text/Reference Books:

1. J.V. Wait, L.P. Huelsman and GA Korn, Introduction to Operational Amplifier theory and applications, McGraw Hill, 1992.
2. J. Millman and A. Grabel, Microelectronics, 2nd edition, McGraw Hill, 1988.
3. P. Horowitz and W. Hill, The Art of Electronics, 2nd edition, Cambridge University Press, 1989.
4. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College11Publishing, Edition IV
5. Paul R. Gray and Robert G. Meyer, Analysis and Design of Analog Integrated Circuits, John Wiley, 3rd Edition

Course Outcomes:

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

1. Understand the characteristics of diodes and transistors
2. Design and analyze various rectifier and amplifier circuits
3. Design sinusoidal and non-sinusoidal oscillators
4. Understand the functioning of OP-AMP and design OP-AMP based circuits
5. Design ADC and DAC

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC04TPC07	3	0	0	3 hours	30	70	3

MICROCONTROLLERS

Course Objectives:

Students will try to learn:

1. To develop background knowledge and core expertise of microcontroller.
2. To know the importance of different peripheral devices and their interfacing to microcontrollers.
3. To know the design aspects of microcontrollers.
4. To write assembly language programs of microcontrollers for various applications.

UNIT-I: Overview of microcomputer systems and their building blocks, types of microprocessor, Multiplexing concept of buses, buffer.

UNIT-II: Introduction to 8085, bus architecture, pin diagram, demultiplexing of buses, Instruction set of 8085.

UNIT-III: Stack, stack related instructions, concept of interrupts, Direct memory access, Memory interfacing.

UNIT-IV : Interfacing with peripherals - timer, serial I/O, parallel I/O, A/D and D/A converters; Arithmetic Coprocessors; System level interfacing design; Concepts of virtual memory, Cache memory,

UNIT-V: Advanced coprocessor Architectures- 8086, 286, 486, Pentium; Microcontrollers: 8051 systems, Introduction to RISC processors; ARM microcontrollers interface designs.

Text/Reference Books:

1. R. S. Gaonkar, Microprocessor Architecture: Programming and Applications with the 8085/8080A, Penram International Publishing, 1996
2. D A Patterson and J H Hennessy, "Computer Organization and Design The hardware and software interface. Morgan Kaufman Publishers.
3. Douglas Hall, Microprocessors Interfacing, Tata McGraw Hill, 1991.
4. Kenneth J. Ayala, The 8051 Microcontroller, Penram International Publishing, 1996.

Course Outcomes:

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

1. Do assembly language programming
2. Do interfacing design of peripherals like, I/O, A/D, D/A, timer etc.
3. Develop systems using different microcontrollers
4. Understand RSIC processors and design ARM microcontroller based systems

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC04TBS06	3	1	0	4 hours	30	70	4

NUMERICAL METHODS

Course Objectives:

Students will try to learn:

1. To understand the method of solving algebraic, transcendental equations.
2. To determine the approximate value of the derivative & definite integral for a given data using numerical techniques.

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 curves$y = ae^{bx}$, fitting of the curve$y = ab^{x}$, fitting of the curve$y = ax^{b}$.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 aTabulated function, Numerical Integration :-Trapezoidol 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.

Books Recommended:

1. JAIN & IYNGAR Numerical Methods for Scientific and Engineering Computations.
2. RAO G.S. Numerical Anlysis.
3. Grewal B S Numerical Methods In Engineering and Science.
4. Das K K Advance Engineering Methods.
5. Rajaraman V Computer Oriented Numerical Methods
6. P. Kandasamy K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
7. S. S. Sastry, Introduction methods of Numerical Analysis, PHI, 4th Edition, 2005.

8. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.

Course Outcomes:

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

1. Apply knowledge of numerical analysis for understanding, formulating and solving engineering Problems

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC04TES05	3	0	0	3 hours	30	70	3

ELECTRONICS MEASUREMENT & INSTRUMENTATION

Course Objectives:

Students will try to learn:

1. To explain basic concepts and definitions in measurement.
2. To describe the bridge configurations and their applications.
3. To elaborate discussion about the importance of signal generators and analyzers in Measurement.

UNIT – I: Measurements and Measurement system: Measurements, Significance of measurement, Methods of measurement- Direct and Indirect Method. Instruments and measurement system: Mechanical, Electrical, Electronic instruments; Classification of Instruments: Deflection and null type instruments. Analog and Digital mode of Operation, Application of measurement system, Characteristics of instrument and measurement system: static & dynamic; Elements of a Generalized Measurement System: Primary Sensing Element, Variable Conversion Element, Data presentation Element. Accuracy and precision, Significant figure, types of error, gross error, systematic error- Instrumental, Environmental, Observational Errors, Random error, Probability of error, Probable Error- of a finite number of readings, for combination of components, Limiting error.

UNIT –II: Electromechanical Indicating Instruments: Operating forces, Constructional Details, Types of Support, Torque/Weight Ratio, Control system, Damping- Air friction and Eddy current damping.
D´Arsonaval Galvanometer- construction, Torque Equation, Dynamic Behavior, Undamped, Damped, Overdamped Motion, Response of Galvanometer. Ballistic Galvanometer. PMMC- Construction, Torque Equation, Voltage/Current Measurement: Ammeter, Voltmeter, Ohmmeter, Multimeter (V.O.M.), Ratiometer, Megger. High frequency Measurement: Q-meter

UNIT – III: AC Bridge: Introduction, Sources and Detectors, General equation for bridge balance, General form of AC Bridge. Maxwell´s Bridge, Hay´s bridge, Anderson´s bridge, De-Sauty´s bridge, Schering bridge, Wien´s bridge. **Electronic Instruments:** Introduction, Advantage of Electronic voltmeter, VTVM, Differential voltmeter, Electronic voltmeter using rectifier, True RMS reading voltmeter, Calorimeter power meter.

UNIT – IV: Transducers: Classification of transducer, Primary & Secondary, Passive & Active, Analog & Digital, Potentiometer, loading effect, Strain Gauge, Thermistor, Construction of thermistor, Thermocouple, LVDT, Advantage & Disadvantage of LVDT, RVDT, Capacitive Transducer, Piezo-electric transducer, Hall-effect Transducer, Capacitive Transducer, Pressure Transducer.

UNIT – V: Display devices: Digital display method, Segmental display- 7segment & 14 segment display, dot matrix, LED, LCD, TFT, Plasma display, DLP. **Digital voltmeter (DVM):** Types of DVM, Ramp type DVM, Integrating type DVM, Potentiometer type (non-integration type). **Recorders:** Analog Recorder, Null type Recorder, Single point Recorder, Graphical strip chart, X-Y recorders, Magnetic tape recorder, FM recorder.**CRO:** Introduction, Oscilloscope block diagram, CRT, Functional block diagram of sampling, Storage, Dual trace and dual beam oscilloscope.

SUGGESTED BOOKS & REFERENCE:-

1. Modern Electronic Instrumentation and Measurement Technique, W D Cooper & A D Helfrick, PHI 2000
2. A Course in Electrical and Electronic Measurements and Instrumentation, A K Sawhney, Dhanpat Rai & Sons, 2010

Course Outcomes:

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

1. Measure low, medium & high resistances using suitable bridges.
2. Determine the value of inductor & Capacitor with the help of AC Bridges.
3. Test & Calibrate ammeter, voltmeter and wattmeter.
4. Understand the principles of various electronic instruments and transducers.
5. Measure frequency and phase in CRO.

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC04THS03	3	0	0	3 hours	30	70	3

EFFECTIVE TECHNICAL COMMUNICATION

Course Objectives:

Students will try to learn:

1. To participate actively in writing activities (individually and in collaboration)
2. To understand how to apply technical information and knowledge in practical documents
3. To practice the unique qualities of professional writing style, including sentence conciseness, readability, clarity, accuracy, honesty, avoiding wordiness or ambiguity, previewing.
4. To recognize, explain, and use the genres of technical communication: technical abstracts, data based research reports, instructional manuals, technical descriptions, and web pages
5. To recognize and develop professional format features in print, html, and multimedia modes, as well as use appropriate nonverbal cues and visual aids.

UNIT-I: Information Design and Development- Different kinds of technical documents, Information development life cycle, Organization structures, factors affecting information and document design, Strategies for organization, Information design and writing for print and for online media.

UNIT-II: Technical Writing, Grammar and Editing- Technical writing process, forms of discourse, Writing drafts and revising, Collaborative writing, creating indexes, technical writing style and language. Basics of grammar, study of advanced grammar, editing strategies to achieve appropriate technical style. Introduction to advanced technical communication, Usability, Hunan factors, Managing technical communication projects, time estimation, Single sourcing, Localization.

UNIT-III: Self Development and Assessment- Self assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, career planning, Self-esteem. Managing Time; Personal memory, Rapid reading, Taking notes; Complex problem solving; Creativity

UNIT-IV: Communication and Technical Writing- Public speaking, Group discussion, Oral; presentation, Interviews, Graphic presentation, Presentation aids, Personality Development. Writing reports, project proposals, brochures, newsletters, technical articles, manuals, official notes, business letters, memos, progress reports, minutes of meetings, event report.

UNIT-V: Ethics- Business ethics, Etiquettes in social and office settings, Email etiquettes, Telephone Etiquettes, Engineering ethics, Managing time, Role and responsibility of engineer, Work culture in jobs, Personal memory, Rapid reading, Taking notes, Complex problem solving, Creativity.

Text/Reference Books:

1. David F. Beer and David McMurrey, Guide to writing as an Engineer, John Willey, NewYork, 2004.
2. Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN0312406843)
3. Shiv Khera, You Can Win, Macmillan Books, New York, 2003.
4. Raman Sharma, Technical Communications, Oxford Publication, London, 2004.

5. Dale Jungk, Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN:07828357-4)
6. Sharma, R. and Mohan, K. Business Correspondence and Report Writing, TMH New Delhi 2002.
7. Xebec, Presentation Book, TMH New Delhi, 2000. (ISBN 0402213)

Course Outcomes:

1. At the end of the semester employability skill of students will get developed
2. Students will get improved their technical vocabulary & their accent.
3. Students will understand about technical communication strategies and personality skills.
4. Students will be able to write various technical scripts/letters.