MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

B.Tech. I Semester (Electronics Engineering/ Electronics and Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Theory Slot			Practical Slot		Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark		L	T	P	
140111/200111	ESC	Electronics Workshop	-	-	-	60	40	100	-	-	2	1

Subject Name: Electronic Workshop
Subject Code: 140111/200111

Course Objectives:

Students will be able to learn the practical aspects of the basic electronic components, instruments and PCB designing.

List of Experiment

1. Study of basic electronic components
2. Study of bread board, power supply, digital storage oscilloscope and multimeter.
3. Identification of Polarity, and cut in voltage of various electronics components.
4. Phase shift measurement using Lissajous Pattern.
5. Study of basic steps involved in PCB designing.
6. Fabrication of small electronic circuits.

Course Outcome:

After completing the course, students will be able to

CO1. Evaluate the parameters of basic electronic components.
CO2. Calculate the phase shift between two waveforms.
CO3. Fabricate small electronics circuits.

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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(11)

B.Tech. II Semester (Electronics Engineering/ Electronics and Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Theory Slot			Practical Slot		Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark		L	T	P	
140211/200211	DC	Electronics Devices	60	20	20	60	40	200	2	1	2	4

Electronics Devices (140211/200211)

Course Objective: To understand construction, principal and operation of different semiconductor devices.

Unit I: Fundamental of Electronic Devices: Elemental & Compound Semiconductor Materials , Bonding Forces and Energy Bands in Intrinsic and Extrinsic Silicon, Charge Carrier in Semiconductors , Carrier Concentration, Extrinsic Semiconductor, Hall Effect, Mechanism of Current Flow, Drift Current, Diffusion Current, Einstein Relation, Continuity Equation.

Unit II: Semiconductors Diodes: P-N Junction properties, Diode Characteristics, Equilibrium condition, biased junction, Steady state condition, P-N Junction breakdown mechanism, Capacitance of junction barrier, Diode circuit parameters, Basic circuits of Rectifier, Clippers and Clampers.

Unit III: Bipolar Junction Transistors: Construction, basic operation, current components and equations, CB, CE and CC configuration, input and output characteristics, Early effect, Region of operations: active, cut-off and saturation region.

Unit IV: Field effect transistors: Construction and characteristics of JFET, working principle of JFET.MOSFET construction and characteristics, MOSFET enhancement and depletion mode.

Unit V: Power Electronics Devices: Basic principle and working of SCR, IGBT, Uni-junction Transistor (UJT) and Thyristors. UJT: Principle of operation, characteristics.

Text Books:

1. Electronics Devices and Circuits: Boylested & Nashelsky, 11th Edition, Pearson Education India
2. Electronic devices and circuits: S. Salivahanan, 2nd Edition, Tata McGraw-Hill Education, 2011.
3. Microelectronic Circuits: Theory and Application: Sedra & Smith, 7th Edition, Oxford University Press.

Reference Books:

1. Micro Electronics: Millman, & Grabel, 2nd Edition, McGraw Hill Education
2. Integrated Electronics: Millman &Halkias, McGraw Hill Education.

Course Outcomes

After the completion of this course students will be able to:

- **CO1.** **Analyze** the properties of semiconductor materials.
- **CO2.** **Understand** construction and working of different diodes.
- **CO3.** **Analyze** the operation of Bi-polar junction transistors.
- **CO4.** **Examine** the working of Field Effect Transistors.
- **CO5.** **Analyze** the working of power electronics devices.

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B.Tech. II Semester (Electronics Engineering/ Electronics and Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Theory Slot			Practical Slot		Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark		L	T	P	
140212/200212	DC	Engineering materials	60	20	20	-	-	100	3	1	-	4

Engineering Materials (140212/200212)

Course Objective: To introduce the student with different materials and their characteristics used in manufacturing various electrical and electronics equipment.

Unit 1 Conducting materials: Classification of Engineering Materials, Crystal Structure of The Material, Crystal System, Unit Cells and Space Lattices and Defects. Conducting Material- Properties of Conductors, Characteristics of Good Conductor Material, Commonly used Conducting Materials, Conducting Materials for Overhead Lines, Types of Conductor and Applications.

Unit 2 Dielectric materials: Dielectric Strength, Factors affecting Dielectric Strength, Dielectric Loss, Dissipation Factor, Factors affecting Dielectric Loss, Permittivity & Polarization, Conduction through Dielectric. Application of Dielectric. Different Types of Capacitors and Materials used for them. Piezoelectricity & Ferro Electricity

Unit 3 Semi Conducting Material: Introduction - Semi-conductors and their properties, Different Semiconducting materials (Silicon and Germanium) used in manufacture of various Semiconductor devices (i.e p-type and n-type semiconductors), Materials used for electronic components like Resistors, Capacitors, Diodes, Transistors and Inductors etc.

Unit 4 Insulating Material: Plastics- Definition and classification, Thermosetting Materials, Thermoplastic Materials; Natural Insulating materials, properties and their applications; Gaseous Materials – Ceramics-properties and applications.

Unit 5 Magnetic Material: Introduction and classification - Ferromagnetic Materials, Permeability, BH curve, Magnetic Saturation, Hysteresis loop (including) coercive force and Residual Magnetism, Concept of Eddy Current and Hysteresis loss, Curie temperature, Magnetostriction effect, Soft Magnetic Materials, Hard Magnetic materials , Hall effect and its applications.

Text Books:

1. SK Bhattacharya, "Electrical and Electronic Engineering Materials"1st edition, Khanna Publishers, New Delhi, 2006.
2. A.J. Dekker "Electrical Engineering Materials", Reprint 1st edition, PHI, 2006.

Reference Books:

1. Sahdev, "Electrical Engineering Materials", Unique International Publications.
2. C. S. Indulkar & S. Thiruvengadam, "Electrical Engineering Materials", Reprint 1st edition, 2013, S. Chand & Com. Ltd, New Delhi -55
3. S.P. Seth, P.V. Gupta "A course in Electrical Engineering Materials", 4th Edition, 2017, Dhanpat Rai & Sons.

Course Outcome:

After successful completion of the course, student will be able to:

CO 1. Classify engineering materials.
CO 2. Analyze the characteristics of dielectric materials.
CO 3. Analyze the characteristics of semi-conducting materials.
CO 4. Identify insulating materials for special purposes.
CO 5. Classify magnetic materials with reference to their properties.

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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B.Tech. III Semester (Electronics Engineering/Electronics & Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Theory Slot			Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
140311/ 200311	DC	Electronic circuit Design	60	20	20	60	20	20	200	2	1	2	4

Electronic Circuit Design (140311/200311)

Course Objective: To understand different semiconductor circuits and grab the way to design circuits and perform measurements of circuit parameters.

Unit I: Diode Circuits: Review of P-N Junction Diodes, Power supply parameters, SMPS, Zener and Avalanche Breakdown, Zener voltage regulator, series pass regulator (with feedback) and shunt voltage regulators, Short circuit protection.

Unit II: Introduction to BJT Biasing and Stability: Review of BJTs, Transistor biasing and bias stabilization, the operating point, stability factor, analysis of fixed base bias, Voltage divider bias, collector to base bias, Emitter resistance bias circuit and Bias compensation techniques.

Unit III: BJT as an Amplifier:Low frequency BJT amplifiers, equivalent circuit of BJT using h parameter for CB, CE, CC configurations, calculation of transistor parameter for CB, CE, CC using h parameters. High frequency BJT amplifier: Hybrid-pi (π) common emitter transistor model, hybrid – π conductance and capacitance, gain-bandwidth product.

Unit IV: Feedback amplifiers: Introduction to Feedback Amplifiers & their design parameters, comparison of different feedback amplifier configuration viz (gain, input impedance, output impedance, current gain, voltage gain), cascading of BJT amplifier, Darlington Pair.

Unit V: Oscillators and Tuned Amplifiers: Barkhausen criterion, Sinusoidal oscillators, L-C (Hartley-Colpitts) oscillators, RC phase shift, resonant oscillator, Wien Bridge and crystal oscillators, Clapp oscillator, Tuned amplifier design using BJTs.

Text Books:

1. Microelectronic Circuits:Theory and Application: Sedra& Smith,7th Edition, Oxford University Press.
2. Electronics Devices and Circuits: Boylested&Nashelsky,11th Edition, Pearson Education India

Reference Books:

3. Electrical Engineering material: A.J Dekker, 1st Edition, Prentice Hall of India.
4. Micro Electronics: Millman, &Grabel,2nd Edition, McGraw Hill Education
5. Integrated Electronics: Millman&Halkias,McGraw Hill Education.

Course Outcomes

After the completion of this course students will be able to:

- CO 1. **Design** different diode circuits.
- CO 2. **Design** the biasing circuits for BJTs.
- CO 3. **Examine** the working of BJT amplifiers.
- CO 4. **Analyze** the different parameters of feedback amplifiers.
- **CO 5.** **Design** the Oscillator and Tuned amplifier circuits.

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B.Tech. III Semester (Electronics Engineering)

2020 III

Subject Code	Category Code	Subject Name	Theory Slot			Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
140312/ 200312	DC	Network Theory	60	20	20	60	20	20	200	2	1	2	4

Network Theory (140312/ 200312)

Course objective: To understand phasor diagrams of three phase circuits, Study of network theorem, transients analysis, graph theory of network, analysis of two port networks.

Unit-I Introduction to Circuit Elements, Characterization of Resistors, Capacitors & Inductors in Terms of their linearity & time dependence features, Characteristics of Independent & Dependent Sources, KCL & KVL for circuits with dependent & independent sources, Dot convention for coupled inductor and their characteristics, co-efficient of coupling.

Unit-II Network theorems - superposition, Thevenin, Norton, Millman, Reciprocity and Maximum Power Transfer theorems, problem with controlled sources, Network topology, concept of network graph, Tree, Tree branch and link, Incident matrix, cut set and tie set matrices.

Unit-III Transient analysis- Transients in RL, RC and RLC circuits, initial conditions, time constants, Steady state analysis – concept of phasor and vector, impedance and admittance, Node and mesh analysis of RL, RC and RLC networks with sinusoidal and driving sources, Resonance and Q-factor.

Unit-IV Transform Domain Analysis of Networks: The Laplace transform, Properties of Laplace transform,solution of differential equation using Laplace Transform, Initial and final value theorem. Waveform synthesis & Laplace Transform of various waveform function.

Unit-V Two Port Network: Concept of Ports, Network functions of one port & two ports, Calculation of network functions for one port and two port, Pole & zeros of network of different kinds, Two port parameters – Z, Y, hybrid and chain Parameters, Relationship between two port network parameters.

Text Books:

1. Network Analysis: M.E. Van Valkenberg, 3rd Edition, Prentice Hall of India.
2. Network and Systems: D. Roy Chaudhary,**2nd Edition,**New Academic Science Ltd.

Reference Books:

3. Introduction to Modern Network Synthesis: M.E. Van Valkenberg, Prentice Hall of India.
4. Network Analysis & Synthesis: F. Kuo, 2nd Edition, Wiley & Sons.
5. Network Analysis & Synthesis: Ravish R Singh, 1st Edition, McGraw Hill Education.

Course Outcomes

After the completion of this course students will be able to:

- **CO1. Analyze** the circuits using Kirchoff's law and Network simplification theorem.
- **CO2. Solve** circuits using Tree, Node, Branch, cut-set and Tie set methods.
- **CO3. Evaluate** transient response and steady state response.
- **CO4. Examine** RL, RC and RLC circuits (DC and AC) using Mesh and Nodal analysis techniques.
- **CO5. Apply** the Laplace transform to linear circuits and systems
- **CO6. Determine** ABCD, Z,Y and h parameter of an electrical circuits.

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B.Tech. III Semester (Electronics Engineering)

Subject Code	Category Code	Subject Name	Theory Slot			Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
140313/ 200313	DC	Signals & Systems	60	20	20	-	-	-	100	3	-	-	3

Signals & Systems (140313/ 200313)

Course objective: Coverage of continuous and discrete-time signals and systems, their properties and representations and methods that is necessary for the analysis of continuous and discrete-time signals and systems.

Unit-1 Introduction: Mathematical Description of Continuous & Discrete– Time Signals Definition, Classification of signals, Complex Exponential and Sinusoidal Function; Unit Step, Signum, Unit Ramp, Unit Impulse, Periodic Impulse or Impulse Train, Rectangle, Triangle, Sinc and Gaussian pulse functions, Even and Odd Functions, Periodic and non periodic Functions, Signal Energy and Power, Scaling and Shifting, Amplitude Scaling, Time Shifting, Differential and Integration.

Unit 2 Fourier series and Fourier transform: Fourier Transform: Exponential Fourier series, and Trigonometric Fourier series, properties of Fourier series, Introduction to Fourier transform, Fourier Transforms of elementary functions. Properties of Fourier Transform.

Unit 3: Z transforms: Introduction to Z-transform, relation between Laplace and Z-transform, relation between Fourier transform and Z-transform, ROC, properties of ROC, Properties of Z-transform, Inverse Z-transform, Unilateral Z-transform.

Unit-4 Properties of Continuous and Discrete Time Systems: System Modeling, System Properties, Homogeneity, Time Invariance, Additivity, Linearity & Superposition, Stability, Incremental Linearity, Causality, Memory, Static, Nonlinearity, Inevitability, continuous & discrete LTI system.

Unit-5 Continuous and Discrete system analysis: The Convolution Integral, and Convolution Sum, Impulse Response, Convolution & Properties, System Interconnections, Stability and Impulse Response, Response of Systems to Standard Systems, Realization of Differential Equations, Analysis of discrete time LTI system using Z-transform, Analysis of continuous time LTI system using Laplace transform.

Text Books:

1. Digital Signals and Systems, 2nd Edition: Simon Haykin, Barry Van Veen, 2nd Edition, Wiley India Pvt. Ltd.
2. Signals and Systems: Hwei. P. Hsu, Schaum's outlines, 2 nd Edition, Tata Mcgraw Hill Education.

Reference Books:

1. Fundamentals of Signals & Systems: Michael J Roberts, 2 nd Edition, Mc Graw Hill Education.
2. Signal and Systems: Alan V. Oppenheim, Alan S. Willsky and S. Hamid Nawab, 2 nd Edition, Pearson Education India.

Course Outcomes

After the completion of this course students will be able to:

CO1. Describe mathematically the basic continuous-time and discrete along with their transformations.
CO2. Determine the spectral characteristics of continuous-time and discrete time signals using Fourier transform.
CO3. Develop the z-transform for analysis of discrete time signals and systems
CO4. Analyze the properties of continuous-time and discrete time signals.
CO5. Calculate the convolution and response of continuous-time and discrete time systems with respect to input.

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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2020 III

B.Tech. III Semester (Electronics Engineering)

Subject Code	Category Code	Subject Name	Theory Slot			Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Mark	Mid Sem Mark	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
140314/ 200314	DC	Electronics Measurement & Instrumentation	60	20	20	-	-	-	100	3	-	-	3

Electronics Measurement and Instrumentation (140314/200314)

Course objective: To introduce students the use of various electrical/electronic instruments, their construction, applications, principle of operation, standards and units of measurements.

UNIT– I : Accuracy and precision, Sensitivity, Linearity, Resolution, Hysteresis, Loading effect, Measurement systems, Classification of Instruments, Limiting error, Gross error, Systematic error, random error, statistical treatment of data, Q-meter.

UNIT–II: A.C. Bridges: Measurement of self inductance, measurement of incremental inductance, Measurement of capacitance, measurement of mutual inductance using different types of bridges. Transducers: Classification of transducers, Strain gauge, thermistor, thermocouple, LVDT, Capacitive transducers, Piezoelectric transducers.

UNIT-III: Digital Instruments: Digital volt meters.-Ramp techniques, dual slope, integrating type, resolution and sensitivity of digital meters, digital multi-meters, digital frequency meter, universal counter, Classification of Displays, Display devices: Light Emitting diodes (LED) and Liquid Crystal Display(LCD).

UNIT-IV: CRO : Introduction to CRO, dual beam CRO, dual trace CRO, measurement of frequencies by Lissajous method, measurement of capacitance and inductance, Applications of CRO, Special purpose CROs- Multi input, Dual trace, Dual beam, Sampling, Storage (Analog and Digital) Oscilloscope.

Unit V: Digital-to-analog conversion (DAC) - Variable resistive type, R-2R ladder Type, Binary ladder, weighted converter using op-amp and transistor, Practical DAC. Analogto digital Conversion (ADC)- Ramp Technique, Dual Slope Integrating Type, Integrating Type (voltage to frequency), Successive Approximations.

Text Books:

1. Electronics Instrumentation: H.S. Kalsi,3rd Edition, McGraw-Hill Education.
2. A Course in Electrical & Electronics Measurement and Instrumentation: A.K. Sawhney, DhanpatRai & Co.

Reference Books:

1. Electronic Instrumentation and measurement techniques: Cooper &Helfrick,3rdEditon, Prentice Hall of India.

Course Outcomes

After the completion of this course students will be able to:

- **CO1.** **Discuss** various performance characteristics of an instrument
- **CO2.** **Explain** the working principle and applications of bridges and transducers
- **CO3.** **Analyze** the working principle of various digital instruments and display devices.
- **CO4.** **Measure** different parameters using various CROs.
- **CO5.** **Design** of A/D and D/A converter.

ANNEXURE-VII

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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B.Tech. IV Semester (Electronics Engineering)

Subject Code	Category Code	Subject Name	Theory Slot			Practical Slot		Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark		L	T	P	
100003	BSC	Mathematics-III	70	20	10	-	-	100	3	2	-	4

Mathematics-III (100003)

Course Objective: To familiarize with Complex variable, To know about the formulation of L.P.P. & Its solution, To explore the knowledge of numerical techniques

Unit I: Complex Variable, Analytic functions, Cauchy-Riemann equations, Harmonic functions, Milne-Thomson method to find conjugate function, Transformations: Conformal, magnification and rotation, inversion and reflection, bilinear transformation.

Unit II: Complex integration, integration of regular function, Cauchy's theorem, Cauchy's integral formula, Taylor's and Laurent's series, Cauchy's residue theorem, evaluation of integrals by residue theorem.

Unit III: Introduction of OR, LPP formulation, Graphical method, Simplex method, Big- M method, Duality of LPP, Transportation and Assignment problems.

Unit IV: Solution of algebraic and transcendental equations by Bisection, Regula-Falsi and Newton-Raphson method, Solution of linear system of equations by Gauss elimination, Gauss-Seidal, and Gauss Jacobi, Interpolation: finite differences, difference operators, Newton's interpolation formulae, Newton's divided difference formula, Lagrange's interpolation formula

Unit V: Numerical differentiation up to second order , Numerical integration by Trapezoidal, Simpson's 1/3, Simpson's 3/8 Weddle's rule. Numerical solution of differential equations: Euler's method, Taylor's series, Picard's method, Runge- Kutta method of fourth order.

Reference Books:

1. M. K. Jain, R. K. Jain and S. R. K. Iyengar: Numerical Methods for Scientific & Engineering, New Age International Pvt Ltd Publisher, 6th Edition (2014).
2. R. K. Jain, S. R. K. Iyengar: Advance Engg. Mathematics, Narosa Pub. House Pvt. Ltd, 5th Edition (2016).
3. B. S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Edition (2015).
4. B.V. Ramanna: Higher Engineering Mathematics, McGraw Hill Education, 1st Edition (2017).
5. H. A. Taha: Operations Research an Introduction, Pearson, 9th Edition 2014.
6. S. D. Sharma: Operation Research, Kedar Nath Ram Nath, 2003.

Course Outcomes

After completing this course, the students will be able to:

- **CO1.** **Acquire** the knowledge of Complex Variable.
- **CO2.** **Solve** the problems of Complex Variable.
- **CO3.** **Find** the optimal solution using various methods of Linear Programming Problem.
- **CO4.** **Apply** different numerical methods in problem solving
- **CO5.** **Evaluate** Ordinary Differential Equation by Numerical methods

ANNEXURE-VII

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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B.Tech. IV Semester (Electronics Engineering/ Electronics & Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Theory Slot			Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
140411/ 200411	DC	Digital Circuits & Systems	60	20	20	60	20	20	200	3	-	2	4

Digital Circuits & Systems (140411/200411)

NEW SYLLABUS

Course Objective: To understand the concept of digital systems, design&analyze the combinational and sequential logic circuits.

Unit I: Boolean algebra and switching functions: Minimization of Boolean functions, Canonical & standard form, concept of prime implicant etc. Karnaugh's map method, Quine-McCluskey's method, Universal gates, NAND/NOR realization of Boolean functions.

Unit II: Combinational Logic circuits: Half adder, Half subtractor, Full adder, Full subtratctor circuits. Serial and parallel adder, BCD adders, look-ahead carry generator, Code Converters, Decoders, Encoders, Multiplexers & demultiplexers.

Unit III: Sequential Circuits: Latches, Flip-flops - SR, JK, D, T, and Master-Slave,Race around condition Characteristic table and equation, Excitation table, Edge triggering, Level Triggering, Realization of one flip flop using other flip flops.

Unit IV: Registers and Counters: Asynchronous Ripple or serial counter, Asynchronous Up/Down counter, Synchronous counters, Synchronous Up/Downcounters, Design of Synchronous counters: State diagram, State table, State minimization, State assignment, Excitation table and Maps Circuit, Implementation: Modulo-n-counter, Registers:Shift registers, Universal shift registers, Shift register counters, Ring counter, Sequence generators, Johnson Counter.

Unit V: Logic Families: Diode and transistor as a switch, FET as a switch, specifications for Logic Families, RTL, DCTL, IIL, DTL, all types of TTL circuits, ECL, HTL and PMOS, NMOS & CMOS logic, Comparison of various logic families.

Text Books:

4. Digital Design: M. Mano,4th Edition, Prentice Hall of India.
5. Logic & Computer Design Fundamental: M.Mano, 5th Edition, Pearson Education India.
6. Digital Circuits and Design: S. Salivahanan,5th Edition, Oxford University Press.

Reference Books:

4. Digital Electronics: W.H. Gothman, Prentice Hall of India.
5. Digital System Principles & Applications: R.J. Tocci,11th Edition, Pearson Education India.
6. Pulse, Digital & Switching Waveforms: Millman&Taub,McGraw Hill Education.

Course Outcomes

After the completion of this course students will be able to:

CO1. Implement the Boolean expression using basic and universal logic gates.
CO2. Design different combinational logic circuits
CO3. Design various latches and flip-flops
CO4. Design various shift registers and counters using flip-flops.
CO5. Analyze different types of logic families, semiconductor memories, & multivibrators.

B.Tech. IV Semester (Electronics Engineering/ Electronics & Telecommunication Engineering)

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Subject Code	Category Code	Subject Name	Theory Slot			Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
140412/ 200412	DC	Analog Integrated circuits	60	20	20	60	20	20	200	2	1	2	4

Analog Integrated Circuits (140412/200412)

Course objective: Students will be able to learn the concepts of power, multistage and operational amplifiers. Further, they will learn to design multivibrators using IC 555 and active filter design using Opamp.

Unit I Power Amplifiers: Introduction, amplifier classification, Analysis and design of Class A, Class B, Class AB, class C amplifiers, Amplifier Distortion, Power Transistor Heat Sinking, Class C, harmonic distortion, push pull amplifiers.

Unit II Multistage Amplifiers: classification of amplifiers, distortion in amplifiers, frequency response of an amplifier, step response of an amplifier, types of coupling, low frequency response of an RC coupled stages, effect of an emitter bypass capacitor on low frequency response, two Stage RC coupled Amplifier.

Unit III Multivibrator Design using 555 IC:The 555 IC Circuit, 555 IC block diagram, Using the 555 IC as Astable and Monostable Multivibrator Circuits and its applications: Phase Locked Loops (PLL), Phase Detectors.

Unit IV: Operational Amplifier: Differential amplifier and analysis, Introduction of op-amp, Block diagram, characteristics and equivalent circuits of an op-amp, Power supply configurations for op-amp, thermal drift, Effect of variation in power supply voltage, common-mode rejection ratio (CMRR), Slew rate and its Effect, Gain bandwidth product, frequency limitations and compensations. OP AMP Application circuits such as: Inverting and non-inverting amplifier configurations, Summing amplifier, Integrators and differentiators, Schmitt Trigger, Logarithmic and anti-logarithmic amplifier etc.

Unit V Active Filter Design: Characteristics of filters, Classification of filters, Magnitude and frequency response, Butterworth 1st and 2nd order Low pass, High pass and band pass filters, Chebyshev filter characteristics, Band reject filters, Notch filter; all pass filters, self-tuned filters.

Text Books:

1. Electronics Devices and Circuits: Boylested& Nashelsky,11thEdition, Pearson Education India
2. Op-Amp and Linear Integrated Circuit: R.A.Gayakwad, 4th Edition, Prentice Hall of India.

Reference Books:

1. Integrated Electronics: Millman&Halkias, 2ndEdition,McGraw Hill Education
2. Electronics Devices and Circuits: Shalivanan, 2nd Edition, Tata Mcgraw Hill Education.
3. Microelectronic Circuits- Theory and Application: Sedra& Smith,7th Edition, Oxford Press.

Course Outcomes

After the completion of this course students will be able to:

- **CO1. Compare** the efficiency of various power amplifiers.
- **CO2. Analyze** the parameters of multistage amplifiers.
- **CO3. Design** Multivibrator circuits using IC 555.
- **CO4. Design** the electronic circuits using Operational amplifier.
- **CO5. Implement** the active filters based on given specifications.

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Subject Code	Category Code	Subject Name	Theory Slot			Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Mark	Mid Sem Mark	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
140413/ 200413	DC	Analog Communication	60	20	20	60	20	20	200	2	1	2	4

Analog Communication (140413/200413)

NEW SYLLABUS

Course objective: To understand the concept of multiplexing, various types of modulation, design and analysis of transceiver for AM, FM application, probability theory and probability function, noise.

Unit I Amplitude Modulation: Introduction to multiplexing, types of multiplexing, need of modulation, Amplitude modulation, single side band and double side band suppressed carrier and vestigial side band, modulation techniques their generation, detection and spectral analysis, square law modulators, switching modulator, envelope and square law detector, balanced modulator, Power calculation for AM, DSB-SC & SSB-SC.

Unit II Angle Modulation: Relationship between Frequency and phase modulation, frequency and phase deviation, types of FM, comparison between NBFM & AM signal., Carson's rule, spectrum of FM signal, Constant bandwidth of FM, comparison of narrow band and wide band FM, generation and detection of FM.

Unit III AM & FM transmitter and receiver: Tuned radio receiver, limitation of TRF, Super heterodyne receiver, concept of IF frequency, image signal rejection, selectivity, sensitivity and fidelity, Noise in AM, FM, Block diagram of FM transmitter& receiver.

Unit IV Probability, and random variables: Cumulative distribution function, probability density function, average and variance of random variables, Various types of elementary Discrete and continuous PDF function and calculation of statistical averages, moment generating and characteristic function, Gaussian and Rayleigh probability density function.

Unit V Noise Analysis: Various sources of noise, types of noise with their characteristics, Mathematical representation of noise figure, Noise bandwidth, Noise temperature and noise figure of amplifiers in cascades, Figure of merit of modulation techniques, comparison of modulation scheme for noise.

Text Books:

1. Communication System: Simon Haykins,4th Edition, Wiley &Sons.
2. Communication Systems - B. P. Lathi, BSPPublication

Reference Books:

1. Communication System: George Kennedy, 5th Edition, Tata McGraw-HillEducation.
2. Modern Digital & Analog Communication System: B.P. Lathi ,4th Edition, Oxford UniversityPress;
3. Principles of Communication System: Taub and Schilling,3rd Edition, McGraw-HillEducation.

Course Outcomes

After the completion of this course students will be able to:

CO1. **Analyze** the amplitude modulation, theirgeneration & detection methods.
CO2. **Explain** the generation and detection techniques for angle modulated signal.
CO3. **Explain** the working of transmitter andreceiver.
CO4. **Evaluate** the statistical parameters for generalPDF/CDF.
CO5. **Evaluate** the effects of noise on modulationtechniques.

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

B.Tech. IV Semester (Electronics Engineering/ Electronics & Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Theory Slot			Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
140414/ 200414	DC	Communication Networks	60	20	20	-	-	-	100	2	1	-	3

Communication Networks (140414/200414)

Course objective: To make the students capable of analyzing electrical network and how to synthesize an electrical network from a given impedance/admittance function.

Unit I Basic Parameters of Networks: Characteristic impedance, iterative impedance, Propagation constant, analysis of symmetrical T, π, Lattice and Bridged-T networks, image impedance, attenuators and their design.

Unit II-Network Synthesis: Positive real function, LC, RL, RC and RLC network synthesis, Foster and Cauer form realization , Minimum positive real function, Brune's method, Bott-Duffin method, Insertion Loss Synthesis, and Coefficient matching technique.

Unit III- Passive Filters: Constant K prototype Filters: Low pass, high pass, band pass and band elimination filters, m-derived filters, composite filters, frequency transformation.

Unit IV-.Transmission Line: Voltage and current on a transmission line; characteristic impedance and propagation constant of a transmission line, Lossless & Distortion less line, reflection on a line, Standing wave ratio, and Transient analysis of terminated transmission line.

Unit V- Lines at radio frequency: Dispersion less line, Input impedance of open circuit and short circuit line, power and impedance measurement, $\lambda/8$, $\lambda/4$, $\lambda/2$ lines, Smith chart and application, Single stub and double stub matching.

Text Books:

1. Introduction to Modern Network Synthesis: Van Valkenberg, 1st Edition, John Wiley & Sons.
2. Communication Network and Transmission Lines by Bakshi & Bakshi, Technical Publication

Reference Books:

3. Principles of Active Network Synthesis and Design: G. Daryanani, 1st Edition, John Wiley & Sons.
4. Network Analysis and Synthesis - F.F. Kuo, 2nd Edition, John Wiley & Sons.
5. Networks, Lines, & Fields: J.D. Ryder, 2nd Edition, Prentice Hall of India.
6. Elements of Electromagnetics: Mathew N. O.Sadiku, 3rd Edition, Oxford Publication Press.

Course Outcomes

After the completion of this course students will be able to:

- **CO1. Design** the symmetrical and asymmetrical attenuators.
- **CO2. Synthesize** the network for a given positive and minimum positive real function.
- **CO3. Design** passive filters for the given specifications.
- **CO4. Analyze** the characteristics of various transmission lines.
- **CO5. Calculate** the impedance and SWR graphically /analytically.

B.Tech. VI Semester (Electronics Engineering)

Subject Code	Category Code	Subject Name	Theory Slot			Practical Slot		Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark		L	T	P	
140511/ 200511	DC	Microprocessor & Interfacing	70	20	10	30	20	150	2	1	2	4

Microprocessor and Interfacing (140511/200511)

Course objectives: To introduce the basic concepts of microprocessor and to develop assembly language programming skills along with the introduction of microprocessor applications.

Unit I: Introduction to Microprocessor

Introduction to microprocessors and microcomputers, Study of 8 bit Microprocessor, 8085 pin configuration, Internal Architecture and operations, Interrupts and interrupt service routine.

Unit II: 8085 Assembly language Programming

8085 instruction set, 8085 assembly language programming, Addressing modes, Counters and time Delays, Instruction cycle, machine cycle, T-states, timing diagram for 8085 instructions.

Unit III: Peripheral devices and their interfacing

Introduction to memory interfacing and interfacings chips: Programmable input/output ports 8255, Programmable interval timer 8253, Programmable interrupt controller 8259, DMA controller 8257.

Unit IV: Architecture and Programming of 16-Bit Microprocessor

8086 Block diagram and architecture, pin configuration of 8086, Execution Unit (EU) and Bus Interface Unit(BIU), Minimum mode & Maximum mode Operation, Memory segmentation. Instruction set and addressing modes of 8086, Introduction to 8086 assembly language programming.

Unit V: 8051 Microcontroller

Introduction to microcontrollers and embedded systems, 8051 architecture, pin description, an overview of 8051 instruction set, use of microcontrollers in real time embedded system design.

Text Book:

1. Ramesh. S. Gaonkar, Microprocessor architecture Programming and Application with 8085 - Penram International Publishing, 4th Edition.
2. B. Ram, "Fundamentals of Microprocessors and Microcomputer" DhanpatRai, 5th Edition.

Reference Books:

1. Douglas V Hall., "Microprocessor and Interfacing" Tata Mcgraw Hill
2. A.K. Ray and K. M. Bhurchandi , "Advance Microprocessor and Peripheral", Tata Mcgraw Hill

Course Outcomes

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

- **CO1.** Explain the architecture and organization of 8085 microprocessors.
- **CO2.** Develop assembly language programming skill for 8085.
- **CO3.** Design memory and I/O interfacing circuits using 8255, 8253/8254, 8257/8237 and 8259A with 8085 microprocessor
- **CO4.** Illustrate 8086 microprocessor architecture and programming skills.
- **CO5.** Discuss 8051 microcontroller architecture ant its application in Embedded systems.

B.Tech. V Semester (Electronics Engineering)

Subject Code	Category Code	Subject Name	Theory Slot			Practical Slot		Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark		L	T	P	
140512/ 200512	DC	Linear Control Theory	70	20	10	-	-	100	2	1	-	3

Linear Control Theory (140512/200512)

Course Objectives: learning of control system theory and its implementation in practical systems using electronic devices.

UNIT I: Introduction to Control Systems: Basic control system terminology, Open loop and Closed loop system, Feedback control, Different modeling of physical systems, Linear approximation of physical systems. Transfer function of linear systems, Block diagram algebra and Signal flow graphs, Effects of negative feedback.

UNIT II: **Time Domain Analysis:** Test input signals, First order systems, Second order systems, Effects of addition of poles and zeros to open and closed loop transfer functions, Steady state error, Constant and error coefficients for type 0, 1, and 2 systems.

UNIT III: Stability Analysis: Concept of stability of linear systems, Relation between the closed loop poles and stability, Relative stability, Absolute stability, Routh Hurwitz criteria and its applications, Root locus plot.

UNIT IV: Frequency Domain Analysis: Performance specifications in frequency domain, Co-relation between frequency domain and time domain, Polar plots and Bode plots of transfer function, Nyquist stability criterion, Assessment of relative stability.

Unit V: Introduction to Controllers: Introduction to Proportional, Integral, and Derivative controller, PD controller, PI controller, PID controller, Design of various controllers and their limitations.

Text Books:

1. Control System Engineering- I. J. Nagrath & M. Gopal, New Age International.
2. Modern Control Engineering –K. Ogata, Prentice Hall.
3. Control System- A. Anand Kumar, PHI
4. Control System Engineering – B.S. Manke, Khanna publications.

Reference Books:

1. Automatic Control System— B. C. Kuo,Wiley.
2. Control System Engineering- Norman Nise, John Wiley & Sons.

Course Outcomes:

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

- **CO1. Determine** the transfer function of linear control system.
- **CO2. Evaluate** the time domain response of control system for different standard inputs.
- **CO3. Compute** the steady state error for type 0,1,2 systems.
- **CO4. Analyze** the stability of control system using time and frequency domain methods.
- **CO5. Design** proportional, integral, and derivative controller, PD, PI, PID controllers.

B.Tech. V Semester (Electronics Engineering)

Subject Code	Category Code	Subject Name	Theory Slot			Practical Slot		Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark		L	T	P	
140513/ 200513	DC	Digital Communication	70	20	10	30	20	150	2	1	2	4

Digital Communication (140513/200513)

Course Objectives: The main objective of this course is to understand the basic concepts of digital modulations, signal-space analysis and digital transmission techniques.

Unit I Sampling: Sampling theorem for Low pass and Band pass signals, Ideal sampling, Natural sampling and Flat top sampling, Crosstalk, Aliasing, Time division multiplexing, PAM, PWM and PPM their generation and detection.

Unit II Digital Modulation Systems: Pulse Code Modulation, Quantization, Quantization noise, Companding, Inter symbol interference, Eye pattern, Delta modulation, Adaptive delta modulation and DPCM. Encoding techniques: On-Off signaling, Polar signaling, RZ signaling, Bipolar signaling, AMI, Manchester code, Differential encoding their advantage and disadvantages.

Unit III Band Pass Data Transmission: ASK, Binary phase shift keying (BPSK), QPSK, DPSK, Coherent and Non coherent BFSK, Minimum shift keying, QAM, Concept of M-ary PSK and M-ary FSK, Spectral properties of QPSK and MSK.

UNIT IV Detection Techniques: Matched filter and Correlator detector, Gram Schmidt orthogonalization procedure and Concept of signal space for the computation of probability of error, Calculation of error probability for BPSK, QPSK, QAM and coherent BFSK, Comparison of different modulation techniques.

Unit V Information Theory and Coding: Concept of information theory, Entropy and Information rate, Channel capacity, Shannon's theorem, Shannon Hartley theorem , BW and signal to noise ratio trade off, Sources encoding, Extension of zero memory source.
Error correcting codes: Properties of linear block codes, Encoding and Decoding of linear block codes and cyclic codes, Burst error correcting codes, Concept of convolution codes.

Text Books:

1. Singh, R.P. &Sapre, S.D, "Communication Systems: Analog & Digital", Tata McGraw-Hill, 5th reprint, 2000.
2. John G. Proakis, "Digital Communication", McGraw Hill Inc, 5th Edition, 2008.

Reference Books:

1. Simon Haykin, "Communication Systems", John Wiley & Sons, 4th Edition, 2000.
2. Taub& Schilling, "Principle of Communication Systems", 2nd Edition, 2003.

Course Outcomes:

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

CO1. **Explain** the process of sampling and pulse modulation.
CO2. **Analyze** digital modulation systems and line coding schemes.
CO3. **Describe** the different band pass data transmission techniques with spectral analysis.
CO4. **Determine** the base band pulse transmission techniques and error probability.
CO5. **Illustrate** the concepts of information theory and source coding.
CO6. **Apply** error correcting codes in digital communication.

B.Tech. VI Semester (Electronics Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency in Subject course	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini proj		L	T	P	
	MC	Artificial Intelligence & Machine Learning	50	10	20	20	60	20	20	200	3	-	2	4

Artificial Intelligence & Machine Learning

Course Objectives: To provide the fundamental knowledge of Artificial Intelligence, Neural Network and Machine Learning, to present the basic representation and reasoning paradigms used in AI & ML, to understand the working of techniques used in AI & ML.

Unit – I Introducing Artificial Intelligence: Definition, Goals of AI, Task of AI, Computation, Psychology and Cognitive Science. Perception, Understanding, and Action. Artificial intelligence vs machine learning vs deep learning and other related fields. Applications of Artificial intelligence and Machine Learning in the real world.

Unit – II Problem, Problem Space and Search: Production System, Blind Search: BFS & DFS, Heuristic Search, Hill Climbing, Best First Search
Introduction to Neural Networks: History, Biological Neuron, Artificial Neural Network, Neural Network Architectures, Classification, & Clustering

Unit – III Introduction to Machine Learning: Traditional Programming vs Machine learning. Key Elements of Machine Learning: Representation, process (Data Collection, Data Preparation, Model selection, Model Training, Model Evaluation and Prediction), Evaluation and Optimization. Types of Learning: Supervised, Unsupervised and reinforcement learning. Regression vs classification problems.

Unit – IV:Supervised Machine Learning: Linear regression:implementation, applications & performance parameters. Decision tree classifier, terminology, classification vs regression trees, tree creation with Gini index and information gain, IDE3 algorithms, applications and performance parameters. Random forest classifier. Case study on regression and classification for solving real world problems.

Unit – V:Unsupervised Machine Learning: Introduction, types: Partitioning, density based, DBSCAN, distribution model-based, hierarchical, Agglomerative and Divisive, Common Distance measures, K-means clustering algorithm. Case study on clustering for solving real world problems.

Text Books/Reference Books:

1. Artificial Intelligence: A Modern Approach by Stuart J. Russell and Peter Norvig, Prentice Hall.
2. Artificial Intelligence: Elaine Rich, Kevin Knight, Mc-Graw Hill.
3. Introduction to AI & Expert System: Dan W. Patterson, PHI.
4. Pattern Recognition and Machine Learning, Christopher M. Bishop
5. Introduction to Machine Learning using Python: Sarah Guido
6. Machine Learning in Action: Peter Harrington

Course Outcomes:
After successful completion of the course, students will be able to:
CO1. Define basic concepts of Artificial Intelligence & Machine Learning.
CO2. Illustrate various techniques for search and processing..
CO3. Identify various types of machine learning problems and techniques.
CO4. Analysis various techniques in Artificial Intelligence, ANN & Machine Learning.
CO5. Apply AI and ML techniques to solve real world problems.
CO6. Build AI enabled intelligent systems for solving real world problems.

B.Tech. VI Semester (Electronics Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency in Subject course	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini proj		L	T	P	
140602/200601	DC	Digital Signal Processing	50	10	20	20	60	20	20	200	3	-	2	4

Digital Signal Processing (140602/200601)

Course Objectives: understanding of the fundamental concepts of digital signal processing, designing of digital filters, and brief knowledge about the Multirate digital signal processing.

Unit I Review of Transform Domain Techniques: Review of discrete time signals and systems, Properties and applications of discrete time Fourier transform, Review of Z transform, Analysis of minimum phase, maximum phase and inverse system.

Unit II Discrete Fourier Transform (DFT): Introduction and properties of DFT, Computation of circular convolution using DFT, Decimation in time FFT algorithm, Decimation of frequency FFT algorithm with radix-2, and radix-4.

Unit III Digital Filters (Part-I): Characteristics of practical frequency selective filters, Various **s**ignal flow graph structure of IIR filters. **IIR Filter design:** Overview of Butterworth, Chebyshev and Elliptic approximations, Design of discrete time IIR filters using Impulse invariant, and Bilinear transformation methods, Spectral transformation of IIR filters.

Unit IV Digital Filters Part-II: Introduction and Signal flow graph structure of FIR Filter.

FIR Filter design: Symmetric, and Asymmetric FIR filters, Design of linear phase FIR filters using windows, and Frequency sampling method, Design of Optimum Equiripple linear phase FIR filters, Design of FIR differentiators.

Unit V Multirate Digital Signal Processing: Introduction, Decimation and Interpolation, Sampling rate conversion by a Rational factor.

Implementation of Sampling rate Conversion: Sampling rate conversion with Cascaded integrator, Comb filters,Polyphase structures for decimation, and interpolation filters, Application of multirate signal processing.

Text Books:

7. John. G. Proakis, “Digital Signal Processing”, 4th Edition, Pearson Education.
8. Oppenheim and Schafer, “Digital Signal Processing”, 2nd Edition, PHI Learning.

Reference Books:

1. Johnny R. Johnson, “Introduction to Digital Signal Processing”, 1st Edition, PHI Learning.
2. Rabiner and Gold, “Theory and Application of Digital Signal Processing”,3rd Edition, PHI Learning.
3. Ingle and Proakis, ”Digital Signal Processing- A MATLAB based Approach”, 3rd Edition, Thompson, Cengage Learning.

Course Outcomes:

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

CO3. Analyze discrete time system using transform methods.
CO4. Compute DFT using FFT algorithms.
CO5. Design IIR Filters.
CO6. Design FIR Filters.
CO5. Apply the concept of multi-rate signal processing in practical applications.

B.Tech. VI Semester (Electronics Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency in Subject course	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini proj		L	T	P	
200603/140603	DC	VLSI Design	50	10	20	20	60	20	20	200	3	-	2	4

VLSI Design (140603/200603)

Course objectives: To understand the fundamental properties of digital CMOS logic circuits using basic MOSFET equations and to develop skills for various logic circuits using CMOS design.

Unit I MOS Transistor: The Metal Oxide Semiconductor (MOS) Structure, The MOS System under External Bias, Structure and Operation of MOS Transistor (MOSFET), MOSFET Current-Voltage Characteristics, MOSFET Scaling and Small-Geometry Effects, MOSFET Capacitances.

Unit II MOS Inverters Static Characteristics: Introduction, Voltage Transfer Characteristic (VTC), Noise Immunity and Noise margins, Resistive-Load Inverter, Inverters with n-Type MOSFET Load and CMOS Inverter, DC Characteristics of CMOS Inverter, Calculation of VIL, VIH, VOL, VOH and Vth, Design of CMOS Inverters, Supply Voltage Scaling in CMOS Inverters, Power and Area considerations.

Unit III MOS Inverters Dynamic Characteristics: Switching Characteristics and Interconnect Effects, Switching Characteristics of CMOS Inverter- Delay-Time Definitions, CMOS Propagation Delay, Calculation of Delay times, Power Dissipation-Switching, Short-Circuit and Leakage Components of Energy and Power, Power-Delay Product.

Unit IV CMOS Logic Structures and Layout Design: Combinational MOS logic circuits- CMOS Logic circuits (NAND, NOR and Complex Logic Gates, Multiplexers etc.), CMOS Transmission Gates (Pass Gates). CMOS n-Well Process, layout design rules, layout design of CMOS Inverter, designing of stick diagram.

Unit V Semiconductor Memories and Low-Power CMOS Logic Circuits: Semiconductor memories: non-volatile and volatile memory devices, flash memories, SRAM cell design, 1T DRAM cell design, dynamic CMOS logic circuits, domino logic CMOS circuits.

Text Books

1. Sung-Mo Kang & Yusuf Leblebici, "CMOS Digital Integrated Circuits – Analysis and Design", 3rd Edition, Tata McGraw-Hill, New Delhi, 2003.
2. Jan M. Rabaey, Anantha Chandrakasan and Borivoje Nikolic, "Digital Integrated Circuits: a design perspective", 2nd Edition, Pearson Education, 2003.

Reference Books

1. David A. Hodges, Horace G. Jackson, Resve A. Saleh, "Analysis and Design of Digital Integrated Circuits: In Deep Submicron Technology", McGraw, 2003.
2. David A. Johns and Ken Martin, "Analog Integrated Circuit Design" John Wiley and Sons Inc., 1997.
3. Neil Weste and David Harris, "CMOS VLSI Design: A Circuits and Systems Perspective", 4th Edition, Addison-Wesley, 2010
4. John P.Uyemura, "CMOS Logic Circuit Design", Springer International Edition.2005.Logic Circuit Design", Springer International Edition.2005.

Course Outcome:

After completion of the course the students will be able to:

CO1. **Analyze** the working of CMOS Transistors in different Modes of Operation.
CO2. **Derive** the Static Characteristics of Resistive Load, N-Type MOSFET Load CMOS Inverters.
CO3. **Evaluate** the Propagation Delay and Power Dissipation of a CMOS Inverter.
CO4. **Design** a CMOS Logic Circuit and Layout Design for a Given Boolean Function.
CO5. **Analyze** the Design and Operation of Various Semiconductor Memories.

B.Tech. VI Semester (Electronics Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency in Subject course	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini proj		L	T	P	
100008	MAC	Intellectual Property Rights	50	10	20	20	-	-	-	100	2	-	-	2

Intellectual Property Rights (100008)

Course Objectives: To acquaint the learners with the basic concepts of Intellectual Property Rights. To develop expertise in the learners in IPR related issues and sensitize the learners with emerging issues in IPR and the rationale for the protection of IPR.

UNIT – I: Introduction: Introduction to IPRs, Basic concepts and need for Intellectual Property – Meaning and practical aspects of Patents, Copyrights, Geographical Indications, IPR in India and Abroad. Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT – II: Intellectual Property Rights: The IPR tool kit, Patents, the patenting process, Patent cooperation treaties: International Treaties and conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

UNIT – III: Intellectual Property Protections: IPR of Living Species, protecting inventions in biotechnology, protections of traditional knowledge, biopiracy and documenting traditional knowledge, Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection. Case studies: The basmati rice issue, revocations of turmeric patent, revocation of patent.

UNIT – IV: Exercising and Enforcing of Intellectual Property Rights: Rights of an IPR owner, licensing agreements, criteria for patent infringement. Case studies of patent infringement, IPR – a contract, unfair competitions and control, provisions in TRIPs.

UNIT- V: Role of Patents in Product Development & amp: Commercialization, Recent changes in IPR laws impacting patents and copy rights, intellectual cooperation in the science and allied industry. Patentable and non-patentable research. Case studies

Reference Books:

1. P.B. Ganguli, Intellectual Property Rights: Unleashing the Knowledge Economy. Tata Mc Graw Hill, 2001.
2. Steve Smith, The Quality Revolution.1st ed., Jaico Publishing House, 2002.
3. Kompal Bansal and Praishit Bansal. Fundamentals of IPR for Engineers, 1st Edition, BS Publications, 2012.
4. Prabhuddha Ganguli. Intellectual Property Rights. 1st Edition, TMH, 2012.

Course Outcomes: At the end of this course, the student will be able to

CO1. Imbibe the knowledge of Intellectual Property and its protection through various laws

CO2. Apply the knowledge of IPR for professional development

CO3. Develop a platform for protection and compliance of Intellectual Property Rights & knowledge

CO4. Create awareness amidst academia and industry of IPR and Copyright compliance

CO5. Deliver the purpose and function of IPR and patenting.