MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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

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		L	T	P	
100001	BSC-4	Mathematics-II	70	20	10	-	-	100	3	1	-	4

Mathematics-II (100001)

Course Objective

To perceive the transform techniques in engineering problems
To expose the concept of ordinary and partial differential equations
To understand vector calculus and its applications
To explore the statistical abilities

Unit 1: Fourier series and half range Fourier series, Harmonic analysis, Laplace transform and their basic properties, Convolution Theorem, Applications of Laplace transform to solve the ordinary differential equations.

Unit 2: Second order differential equations with variable coefficients, Methods: one integral is known, Removable of first derivative, changing of independent variable and variation of parameters, Solution of Differential equation by series method.

Unit 3: Linear and Non-Linear Partial differential equations of first and second order with constant coefficients, Separation of variable method, Application in solution of wave and heat conduction equations (one-dimensional).

Unit 4: Vector calculus: Vector differentiation, Divergence, Gradient and Curl, Directional derivative, Solenoidal and Irrotational vectors, Vector Integration, Gauss divergence theorem and Stoke's theorem.

Unit 5: Concept of Probability and its distributions, probability density functions, probability mass functions, first and second moments about origin and about mean, Binomial, Poisson and Normal distributions and their properties, Bivariate distribution, variance and Covariance, curve fitting correlation & regression.

Recommended Books:

1. E. Kreyszig: Advance Engineering Mathematics, John Wiley & Sons, 10th Edition (2011).
2. R. K. Jain, S. R. K. Iyengar: Advance Engineering Mathematics, Narosa Publishing House Pvt. Ltd., 5th Edition (2016).
3. B. S. Grewal: Higher Engineering Mathematics, Khanna Publisher, 43rd Edition (2015).
4. H. K. Dass: Advance Engineering Mathematics, S. Chand Publisher (2018).
5. B.V. Ramanna: Higher Engineering Mathematics, McGraw Hill Education, 1st Edition (2017).

Course Outcome

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

CO1. Identify the concepts of Fourier series and Laplace Transform
CO2. Describe Ordinary Differential Equation of Higher Order
CO3. Solve the Partial Differential equations and its application
CO4. Illustrate the problems of Vector calculus
CO5. Analyze the probability theory and its distribution

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200301/ 140301	DC	Electronics-I	70	20	10	30	20	150	2	1	2	4

Electronics-I (200301/140301)

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

Unit I: Electrical Engineering materials; Crystal structure & defects, Ceramic materials-structures, composites, processing and uses; Insulating laminates for electronics- structures, properties and uses; Magnetic materials- basics, classification, ferrites, Ferro/Para-magnetic materials and components; Superconductivity, uses.

Unit IISemiconductors& Diode Circuits: Extrinsic semiconductor, Hall effect, mechanism of current flow, drift current, diffusion current, Einstein relation, continuity equation, capacitance of junction barrier, Diode circuit parameters, Designing of Rectifier, Clippers and Clampers. Power supply parameters, SMPS, Zener and Avalanche Breakdown, Zener voltage regulator, transistor series pass regulator (with feedback) and shunt voltage regulators, Short circuit protection.

Unit III: Bipolar Junction Transistors: CB, CE, CC configurations and their characteristics, Low frequency transistor amplifiers, Equivalent circuit of BJT using h parameter for CB, CE, CC configurations, calculation of transistor parameter for CB, CE, CC using h parameters, Transistor biasing and bias stabilization, the operating point, stability factor, analysis of fixed base bias, collector to base bias, Emitter resistance bias circuit, Bias compensation techniques.

Unit IV: Field effect Transistors: Construction and characteristics of JFET, JFET biasing circuit MOSFET construction and characteristics, small signal model. MOSFET enhancement and depletion mode, Common source amplifier.Application of FET as a voltage variable resistor (VVR).

Unit V: Amplifier & Oscillator: 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, Barkhausen criterion, Sinusoidal oscillators, L-C (Hartley-Colpitts) oscillators, RC phase shift, resonant oscillator, Wien Bridge and crystal oscillators, Clapp oscillator.

Text Books:

1. Engineering Material Book: S. P. Seth
2. Microelectronic Circuits:Theory and Application: Sedra& Smith,7th Edition, Oxford University Press.
3. Electronics Devices and Circuits: Boylested&Nashelsky,11th Edition,Pearson Education India

Reference Books:

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

Course Outcomes

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

CO1. **Analyze** the characteristics of various engineering materials.

CO2. **Design** different diode and BJT circuits.
CO3. **Analyze** the response of various BJT configurations.
CO4. **Examine** the working of transistor biasing circuits.
CO5. **Analyze** different FET based circuits.
CO6. **Construct** various feedback circuits.

List of Experiments

Subject Name: ELECTRONICS – I
Subject Code: 200301/140301

1. Implementation of Half wave rectifier circuit on bread board and observation of output on CRO.
2. Implementation of Full wave rectifier circuit on bread board and observation of output on CRO.
3. Implementation of Clipper, & Clamper circuit on bread board and observation of output on CRO.
4. Implementation of PN Junction circuit on bread board and observation of output on CRO.
5. To verify V-I Characteristics of Zener Diode.
6. To verify V-I Characteristics of BJT in CB, CE, CC Configuration.
7. To verify the V-I Characteristics of FET.
8. To verify the V-I Characteristics of enhancement/ depletion mode MOSFET.
9. To Design LC Oscillator.
10. To Design RC Oscillator

Course Outcomes:

After completing the lab, students will be able to:

CO1. **Implement** the basic rectifier, clipper and clamper circuits.
CO2. **Design** the transistors and amplifiers circuits.
CO3. **Troubleshoot** the already fabricated circuit individually or in a team.
CO4. **Design** amplifier and oscillator circuits.
CO5. **Develop** the ability of working in team/group and learn professional ethics.
CO6. **Measure** various parameter using instruments such as Multimeter, function generator and CRO.

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200302/ 140302	DC	Digital Circuits & Systems	70	20	10	30	20	150	3	-	2	4

Digital Circuits & Systems (200302/140302)

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, Halfsubtractor, Full adder, Full subtratctor circuits. Serieal 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, Characteristic table and equation, Application table, Edge triggering, Level Triggering, Realization of one flip flopusing other flip flops, Multivibrators**:**Monostable, Astable, Bistable (transistorized).

Unit IVRegisters and Counters: Asynchronous Ripple or serial counter, Asynchronous Up/Down counter, Synchronous counters, Synchronous Up/Downcounters, Programmable counters, 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, Shift counters, Sequence generators.

Unit V- Logic Families: RTL, DTL, all types of TTL circuits, ECL, HTL and PMOS, NMOS & CMOS logic etc. Comparison of various logic families, ROM organization- PROM, EPROM, EEPROM, EAPROM, RAM organization- Static RAM, Dynamic RAM.

Text Books:

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

Reference Books:

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

Course Outcomes

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

- **CO1. Simplify** the Boolean expression using minimization techniques
- **CO2. Implement** the Boolean expression using basic and universal logic gates.
- **CO3. Design** different combinational logic circuits

CO4. **Design** various latches and flip-flops
CO5. **Design** various shift registers and counters using flip-flops
CO6. **Analyze** different types of logic families, semiconductor memories, &multivibrators.

List of Experiments

Subject Name: DIGITAL CIRCUITS AND SYSTEMS
Subject Code: 200302/140302

1. To convert given binary numbers to gray codes.
2. To Implement logic gates – NAND,AND,NOR,EX-OR,EX-NOR.
3. To construct the basic gates using universal gates.
4. To verify the truth table of half adder and full adder.
5. To verify the truth table of half and full subtractor.
6. To verify De-Morgan's Theorem.
7. To Design D-latch flip flop.
8. To Design R-S flip flop.
9. To Design J-K flip flop.
10. To examine parity generator/checker circuit.
11. To verify the truth table of one bit and four bit comparators using logic Gates and IC 7485.
12. To design ripple counter using J-K Flip Flop.
13. To design shift registers.

Course Outcomes:
After completing the lab, students will be able to:

CO1. **Verify** the operation of basic logic gates and DE Morgan's theorem using standard combinational logic.
CO2. **Construct** the basic gates by using universal gates.
CO3. **Develop** half adder and full adder circuits using their truth table.
CO4. **Develop** the D, RS and JK flip-flops and verify their operation.
CO5. **Design** Counters and Registers.

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			End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark		L	T	P	
200303/ 140303	DC	Network Theory	70	20	10	30	20	150	3	-	2	4

Network Theory (200303/140303)

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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List of Experiments

Subject Name: NETWORK THEORY
Subject Code: 200303/140303

1. Verification of Thevenin's Theorem.
2. Verification of Norton's Theorem.
3. Verification of Superposition Theorem.
4. Verification of Millman's Theorem.
5. Verification of Reciprocity Theorem.
6. Verification of Maximum Power Transfer Theorem.
7. Verification of the condition for resonance in:
   (a) Series RLC circuit.
   (b) Parallel RLC circuit.
8. Design & Verification of loop & nodal Circuits on Bread Board.

Course Outcome:

After completing the lab, students will be able to:

CO1. Evaluate the performance of different network theorems.
CO2. Develop the equivalent circuit for different network theorems.
CO3. Perform maximum power transfer to a load for series and parallel resonant circuit.
CO4. Illustrate the two port network parameters.
CO5. Demonstrate steady state response and transient response.

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			End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark		L	T	P	
200304/ 140304	DC	Signals and Systems	70	20	10	-	-	100	3	1	0	4

Signals & Systems (200304/140304)

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

Unit I 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, Dirichlet Function, Even and Odd Functions, Periodic and non periodic Functions, Signal Energy and Power, Scaling and Shifting, Amplitude Scaling, Time Shifting, Differential and Integration.

Unit II Fourier series& 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: Linearity, Shifting, Change of scale, Modulation etc. Fourier Transform of Derivatives, Parsevals theorem, convolution, auto-correlation and cross-correlation.

Unit III Z transforms: Review of Laplace transform, 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 IV Properties of Continuous and Discrete Time Systems: System Modelling, System Properties, Homogeneity, Time Invariance, Additivity, Linearity & Superposition, Stability, Incremental Linearity, Causality, Memory, Static Nonlinearity, Inevitability, Eigen functions of LTI Systems, continuous & discrete LTI system.

Unit V 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, transmission of signals through a LTI system, Analysis of discrete time LTI system using Z-transform, Analysis of continuous time LTI system using Laplace transform.

Text Books:

1. Digital Signal Processing- Principles, Algorithms & Application: Proakis & Manolaxis, 4th Edition, Pearson Education India.
2. Signals and Systems: Hwei. P. Hsu, Schaum's outlines, 2nd Edition, Tata Mcgraw Hill Education.

Reference Books:

1. Fundamentals of Signals & Systems: Michael J Roberts,2nd Edition, McGraw Hill Education.
2. Signal and Systems: Oppenheim AV, Willisky AS and Nawab SH, 2nd Edition,Pearson Education India.

Course Outcomes

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

- **CO1. Explain** different basic signals and their mathematical description.
- **CO2. Analyze** the spectral characteristics of continuous-time and discrete time signals.
- **CO3. Analyze** the properties of continuous-time and discrete time signals.
- **CO4. Analyze** the properties of LTI continuous-time and discrete time systems using transform.
- **CO5. Calculate** the convolution and response of continuous-time and discrete time systems with respect to input.
- **CO6. Design** block diagram of LTI system corresponding to given differential/ difference equation.

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			End Sem Marks	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark		L	T	P	
200305/ 140305	DLC	Introduction to MATLAB	-	-	-	30	20	50	-	-	2	1

Introduction to MATLAB (200305/140305)

List of Practical

1. Study of MATLAB.
2. Perform the MATRIX Manipulation using MATLAB Command window.
3. Develop a Computer program code in MATLAB to:
    a. Plot the various analog function (Sine, Cosine, Tan etc), also label the x-axis, y-axis, and provide the title of the figure.
    b. Plot the various discrete function (Sine, Cosine, Tan etc), also label the x-axis, y-axis, and provide the title of the figure.
    c. Plot more than one analog function in a single window using SUBPLOT command.
    d. Plot more than one discrete function in a single window using SUBPLOT command.
    e. Plot Amplitude modulated signal along with the baseband Signal.
    f. Plot SSB modulated signal along with the baseband Signal.
    g. Plot Frequency modulated signal along with the baseband Signal.
    h. Plot Phase modulated signal along with the baseband Signal.
    i. Perform Various Digital Modulation Scheme.
    j. Plot root-locus for corresponding given function.
    k. Plot Bode Plot for corresponding given function.
    l. Plot Bode Plot for corresponding given function.
    m. Plot Nyquist Plot for corresponding given function.
4. Develop a Computer Program code in MATLAB for calculator in Graphical User Interface mode.

Course Outcomes:
After the completion of this lab, students will be able to:

CO1. **Work** with MATLAB.
CO2. **Create** a flow chart of problem, and decision.
CO3. **Create** a source code for any given problem.
CO4. **Evaluate** and spot the error in the code.
CO5. **Optimize** the code.

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100002	MC	Biology for Engineers	70	20	10	-	-	100	3	-	-	3

Biology for Engineers (100002)

Course Objectives: This course is designed to convey the essential concepts of biology and apply the same for developing technology and solving problems of core engineering in future

Unit I: **Importance of Biology for Engineers**, **Classification of living organisms** on the basis of Cellularity, Ultrastructure, Carbon utilization, Darwinian evolution.

Unit II: **Human Physiology**: Structure and function of brain, basics of artificial intelligence, Mechanism of blood circulation, Mechanism of digestion

Unit III: **Introduction to Biomolecules**: Definition and important functions of carbohydrates, lipids, proteins, nucleic acids (DNA, RNA), and Hormone. Concept of Bio-sensor.
Metabolic Disorder: Causes and prevention of diabetics and hypertension

Unit IV: **Basics of Microbiology**: Basic structure of Bacteria, Virus. Sterilization, Growth kinetics, types of vaccines, Multiple drug resistance. Economic importance of microbes, Relevance of Algae in Bio-fuel production
Microbial Diseases: Causes and prevention of Cancer, AIDS.

Unit V: **Basics of Molecular Biology and Genetics:** Basic concept of Genes and chromosome, Central Dogma of Molecular Biology, Mendel's laws of inheritance, Pedigree Analysis, Concept of genetic Algorithm.

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

- **CO1. Classify** living organisms on the basis of different properties and their Evolutionary significance.
- **CO2. Explain** mechanism of various physiological processes of human.
- **CO3. Explain** functions and industrial application of various bio-molecules and their metabolic disorder
- **CO4. Explain** the basics and Industrial applications of Microbiology and microbial diseases.
- **CO5. Describe** basic concepts of genetics and their applications.

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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	2	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

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200401/ 140401	DC	Electronics-II	70	20	10	30	20	150	2	1	2	4

Electronics-II (200401/140401)

Course objective: Students will be able to learn the concepts of feedback amplifier, design of oscillators and multistage amplifiers.

Unit I Tuned amplifier: General behavior of tuned amplifier, Single tuned and doubled tuned amplifier, Advantages and disadvantages of tuned amplifiers, Q factor of a circuit and coil, series and parallel resonant circuit, variation of impedance with frequency, Bandwidth of series and parallel resonant circuit.

Unit II 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 III Multistage Amplifiers: classification of amplifiers, distortion in amplifiers, frequency response of an amplifier, step response of an amplifier, the RC coupled amplifier, low frequency response of an RC coupled stages, effect of an emitter bypass capacitor on low frequency response.

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, Inverting and non-inverting amplifier configurations, Summing amplifier, Integrators and differentiators, Schmitt Trigger, Sample and hold Circuit.

Unit V Application of Operational Amplifier:, Amplifier and Oscillator, Filter designing using Op-amp: 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,11th Edition,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, 2nd Edition,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 University Press.

Course Outcomes

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

CO1. **Analyze** the characteristics of an amplifier.

CO2. **Design** the tuned amplifier with the given parameters.
CO3. **Compare** various power amplifiers.
CO4. **Design** the multistage amplifiers.
CO5. **Design** the various electronics circuits using Operational amplifier.
CO6. **Design** the active filters based on given specifications.

List of Experiments

Subject Name: ELECTRONICS –II
Subject Code: 200401/140401

1. Design of the circuit using IC 741 Op-Amp:
    a. Summer, & Subtractor
    b. Differentiator,& Integrator.
    c. Inverting & Non-inverting amplifier.
    d. Voltage,& Current follower.
    e. Comparator, &Schmitt Trigger
2. To design the multistage amplifier.
3. To design the Tuned amplifier with given specification.
4. To design the RC coupled amplifier.

Course Outcomes:

After completing the lab, students will be able to:

CO1. **Design** various applications using Op-Amp.
CO2. **Troubleshoot** the already fabricated circuit individually or in a team.
CO3. **Design** various amplifier circuits.

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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	
200402/ 140402	DC	Analog Communication	70	20	10	30	20	150	2	1	2	4

Analog Communication (200402/140402)

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.

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

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, AGC, AVC, AFC.

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, Error function and complementary error functions.

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, BSP Publication

Reference Books:

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

Course Outcomes

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

- **CO1.** **Apply** the concept of multiplexing and modulation in communication engineering.
- **CO2.** **Analyze** the amplitude modulation and angle modulation with their waveforms
- **CO3.** **Explain** the generation and detection for various modulation techniques**.**
- **CO4.** **Explain** the working of transmitter and receiver.
- **CO5.** **Evaluate** the statistical parameters for general PDF/CDF.
- **CO6.** **Evaluate** the effects of noise on different modulation techniques.

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List of Experiments

Subject Name: ANALOG COMMUNICATION
Subject Code: 200402/140402

1. To generate amplitude modulated wave and determine the percentage modulation.
2. To generate amplitude demodulated wave and determine the percentage modulation.
3. To generate AM-Double Side Band Suppressed Carrier (DSB-SC) signal
4. To generate SSB-SC -Double Side Band Suppressed Carrier (DSB-SC) signal
5. To generate frequency modulated wave and determine the percentage modulation
6. To generate Phase modulated wave and determine the percentage demodulation
7. To analyze the spectrum of AM signal using Spectrum analyzer
8. Verify the generation and detection of AM Signal using MATLAB
9. Verify the generation and detection of DSB-SC Signal using MATLAB
10. Verify the generation and detection SSB-SC signal using MATLAB
11. To perform Time Division Multiplexing & De-Multiplexing using MATLAB.
12. To perform Frequency Division Multiplexing & De-Multiplexing using MATLAB.
13. Verify the generation and detection of FM Signal using MATLAB.
14. Verify spectral characteristics of AM & FM using Simulink

Course Outcome:

After completing the lab, students will be able to:

- **CO1.** **Differentiate** different modulation and demodulation techniques.
- **CO2.** **Calculate** the modulation index for given modulated wave.
- **CO3.** **Analyze** the frequency spectrum of different modulated signal.
- **CO4.** **Generate** AM, DSB, SSB and FM signals.
- **CO5.** **Compare** time division and frequency division multiplexing.

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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	
200403/ 140403	DC	Communication Network	70	20	10	-	-	100	3	1	-	4

Communication Network (200403/140403)

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, λ/8, λ/4, λ/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. Compute** the various parameters of different passive networks.
- **CO2. Design** the symmetrical and asymmetrical attenuators.
- **CO3. Synthesize** the network for a given positive and minimum positive real function.
- **CO4. Design** passive filters for the given specifications.
- **CO5. Analyze** the characteristics of various transmission lines.
- **CO6. Calculate** the impedance and SWR graphically /analytically.

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B.Tech. IV Semester (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		L	T	P	
200404	DC	Stochastic processes in communication	70	20	10	-	-	100	3	1	-	4

Stochastic Processes in Communication (200404)

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 THE RANDOM VARIABLE : Introduction, Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Conditional Density, Properties.

Unit – II OPERATION ON ONE RANDOM VARIABLE: EXPECTATIONS : Introduction,Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Nonmonotonic Transformations of Continuous Random Variable.

Unit – III MULTIPLE RANDOM VARIABLES : Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem: Unequal Distribution, Equal Distributions. OPERATIONS ON MULTIPLE RANDOM VARIABLES: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variables case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

Unit – IV RANDOM PROCESSES: TEMPORAL CHARACTERISTICS: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, Concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second- Order and Wide-Sense Stationarity, Nth-order and Strict-Sense Stationarity, Time Averages and Ergodicity, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process., RANDOM PROCESSES : SPECTRAL CHARACTERISTICS: The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function.

Unit – V LINEAR SYSTEMS WITH RANDOM INPUTS : Random Signal Response of Linear Systems: System Response, Convolution, Mean and Mean-squared Value of System Response, Autocorrelation Function of Response, Cross-Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectra of Input and Output, Band pass, Band-Limited and Narrowband Processes, Properties, Modeling of Noise Sources: Resistive (Thermal) Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Average Noise Figure, Average Noise Figure of cascaded networks.

Reference Books:

1. Probability Theory and Stochastic Processes B. Prabhakara Rao, Oxford University Press.
2. Probability and Random Processes with Applications to Signal Processing, Henry Stark and John W. Woods, Pearson Education, 3rd Edition.
3. Probabilistic Methods of Signal & System Analysis, George R. Cooper, Clave D. McGillem, Oxford, 3rd Edition, 1999.
4. Statistical Theory of Communication, S.P.Eugene Xavier, New Age Publications, 2003.
5. Signals, Systems & Communications, B.P. Lathi, B.S. Publications, 2003.

Course Outcomes

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

CO1. **Analyze** the different probability distribution functions.

CO2. **Calculate** Statistical parameters.

CO3. **Perform** transformation of random variables.

CO4. **Analyze** joint distribution of continuous and discrete random variables.

CO5. **Classify** strict sense stationary and wide sense stationary random processes

CO6. **Analyze** the behavior of LTI system with random processes.

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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	
100004	MC	Cyber Security	70	20	10	-	-	100	2	1	-	3

Cyber Security (100004)

Unit I Introduction: Overview of Cyber Security, cyber crime, Cyber warfare, cyber Terrorism, Cyber espionage, Cyber Vandalism(Hacking), Cyber Stalking, Internet Frauds and Software piracy.

Unit II Basics of Internet and Networking: Wired and Wireless networks, Internetworking Devices, Topologies, Web browsers, Web server, OSI Model, IP addressing, Firewall, E-Commerce, DNS, NAT, VPN, HTTP and HTTPS.

Unit III Cryptography and Network Security: Security Principles, Attacks , Cryptography, Steganography, Cryptanalysis, Symmetric Key and Public Key Cryptography, Digital Signature, Intrusion detection System, Secure Socket Layer(SSL), and Secure Electronic Transaction.

Unit IV Cyber Security Threats and Vulnerablities: Hacker, Types of Hacker- white, Gray and black, **Macilious Software:** Virus, Worm, Trojan Horse, Backdoors and Spywares, Sniffers, Denial of Service attack and Phishing.

Unit V Cyber Crime Investigation and Legal issues: Intellectual Property, Privacy issues, IT Act 2000, Basics of Cyber Crime Investigation- Cyber Forensics, Electronic Evidences and its types

Reference Books:

1. Cryptography and network security by Atul Kahate
2. Network Forensics, Tracking Hackers through Cyber Space by Sherri Davidoff
3. Cryptography and network security by William Stallings

Courses Outcomes:

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

- **CO1. Tell** the basic terminologies of cyber security.
- **CO2. Explain** the basic concepts of Networking and Internet.
- **CO3. Apply** various methods used to protect the data in the internet environment in real world situations.
- **CO4. Discover** the concepts of IP security and architecture.
- **CO5. Compare** various types of cyber security threats/vulnerabilities.
- **CO6. Develop** the understanding of cyber crime investigation and IT Act 2000

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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	
200405/ 140405	DLC	PCB Design Lab	-	-	-	30	20	50	-	-	6	3

HARDWARE LAB (PCB Design Lab) (200405/140405)

LIST OF PRACTICALS

1. Study of Electronic Components.
2. Study of Instruments and Equipments.
3. Introduction to PCB Design software.
4. Introduction to soldering practice.
5. Design and Simulation of Regulated Power Supply circuit on PCB.
6. Design and Simulation of Half wave Rectifier circuit on PCB.
7. Design and Simulation of Full wave Rectifier circuit on PCB.
8. Design and Simulation of Low Pass Filter circuit on PCB.
9. Design and Simulation of High Pass Filter circuit on PCB.
10. Design and Simulation of Band Pass Filter circuit on PCB.

Course Outcomes:

After the completion of this lab, students will be able to:

CO1. **Simulate** Circuit Diagram on Software.

CO2. **Verify** the functionality of simulated circuit.

CO3. **Fabricate** the PCB.

CO4. **Verify** the circuit functionality with Multimeter, CRO etc.

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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	
200502/ 140502	DC	Electromagnetic Theory	70	20	10	-	-	100	3	1	-	4

Electromagnetic Theory (200502/140502)

Course objectives: To develop an understanding of fundamental concepts of electromagnetic fields with an emphasis on wave propagation and to create ability to relate basic electromagnetic concepts to the performance of devices, circuits, and systems.

Unit I Electrostatics: Coulomb's Law, Electric field intensity, Electric flux and flux density, Gauss law, Boundary relations, Concept of divergence, Curl, Scalar and vector potential, Divergence theorem, Stokes theorem, Electric field in dielectric and conductor, Continuity equation, Poisson's and Laplace's equations.

Unit II Magnetostatics: Lorentz force, Magnetic field intensity (H) – Biot–Savart's Law– Ampere's Circuit Law – H due to straight conductors, Circular loop, Infinite sheet of current, Magnetic flux density (B) –in free space and conductor, Magnetic materials – Magnetization.

Unit III Electrodynamic Fields: Magnetic field in multiple media – Boundary conditions, Scalar and vector potential, Poisson's equation, Magnetic force, force between current carrying wires, Magnetic circuits – Faraday's law, Displacement current – Maxwell's equations (differential and integral form) –for steady, time varying and time harmonic fields.

Unit IV Electromagnetic Wave Equation: General wave equation, Uniform plane wave in free space, Perfect dielectric, Lossy dielectric and conducting medium, Skin depth, Poynting vector and Poynting theorem.

Unit V Polarization and Reflection of Wave: Wave Polarization- linear-elliptic-circular**,** Reflection of uniform plane waves, Normal incidence and Oblique incidence, Brewster angle, Total internal reflection.

Text Books:

1. Elements of Engineering Electromagnetic Third Edition- N.N. Rao- Prentice Hall, India.
2. Elements of Electromagnetic, Second Edition- Matthew N.O. Sadiku- Saunders coll Publishing.

Reference Books:

1. Fields & Waves in Communication Electronics - S.Ramo, J.R. Whinnery& T. Van Duzer- John Wiley & Sons.
2. Electromagnetic - J.D. Kraus-McGraw Hill.
3. Electromagnetic Waves & Radiating Systems - E.C. Jordan & K.G. Balmain- Prentice Hall.

Course Outcomes

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

CO1. Solve the problems associated with static electromagnetic fields in different engineering situation.
CO2. Describe static and dynamic electric and magnetic field.
CO3. Apply boundary conditions for electric and magnetic fields at the interface of two different media.
CO4. Solve diverse engineering problems with the help of Maxwell equations.
CO5. Analyze the behavior of plane waves in different media
CO6. Examine the phenomenon of wave propagation and reflection in different media.

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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	
200503/ 140601	DC	Microprocessor & Interfacing	70	20	10	30	20	150	2	1	2	4

Microprocessor and Interfacing (200503/140601)

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: History and evolution of microprocessor and their classification, Introduction to microprocessors and microcomputers, Study of 8 bit Microprocessor, 8085 pin configuration, Internal Architecture and operations, Interrupts, 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 various interfacings chips like: Programmable input/output ports 8155/8255, Programmable interval timer 8253/8254, keyboard/display controller 8279, Programmable communication interface 8251 USART, 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: Microcontrollers & Embedded Systems: Introduction to microcontrollers and embedded systems, 8051 architecture, Pin description, I/O configuration, Interrupts, Addressing modes, 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** the Interfacing circuitry of memory and I/O devices using interfacing chips/PICs with 8085.
- **CO4. Discuss** the architecture and organization of 8086 microprocessors.
- **CO5. Describe** the instruction set and architecture of 8051 microcontroller.

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B.Tech. VI Semester (Electronics Engineering)

Subject Name: Microprocessor and Interfacing
Subject Code: 200503/140601

L	T	P	C
-	-	2	1

Course Objectives
This course gives the ability to the students to learn the assembly language programming of 8085, 8086 microprocessor and 8051 microcontroller and their interfacing with different peripherals.

List of Experiments

1. Write an assembly language program to perform different arithmetic operations of 8 bit numbers using 8085 microprocessor.
2. Write an assembly language program to find whether the number is even or odd using 8085 microprocessor.
3. Interface Stepper Motor to the 8085 microprocessor system and write an 8085 assembly language program to control the Stepper Motor.
4. Write an assembly language program to generate standard waveforms using DAC and display waveforms on CRO with 8085 microprocessor.
5. Write an assembly language program to obtain 2's complement of a given number using 8086 microprocessor.
6. Write an assembly language program to perform arithmetic operations of two BCD numbers using 8086 microprocessor.
7. Write an assembly language program to interfacing 8253 Timer with 8086 microprocessor for different modes.
8. Write an assembly language program to interface ADC card with 8051 microcontroller and display the digital value onthe LCD.

Value added Experiments:

9. Write an assembly language program to interfacing temperature measurement card with 8086 microprocessor and display the temperature on LCD.
10. Write an assembly language program to interface 7 segment display with 8051 Microcontroller.

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

CO1. **Develop** the assembly languageprograms for the different arithmetic and logical operations using 8085, 8086 microprocessor and 8051 microcontroller.

CO2. **Design** interfacing circuits for different I/O devices using PPIs with 8085, 8086 microprocessors and 8051 microcontroller.

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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	
200504/ 140504	DC	Linear Control Theory	70	20	10	30	20	150	2	1	2	4

Linear Control Theory (200504/140504)

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.

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B.Tech. V Semester (Electronics Engineering)

L	T	P	C
-	-	2	1

Subject Name: Linear Control Theory Lab
Subject Code: 200504/140504

Course Objectives

This course gives students the knowledge on application of machines and electronics devices with control systems. Students will also come to know about the various feedback systems used in the control systems.

List of Experiments

1. Control the Angular Position of a Load using the Synchronous (Motor) Transmitter & Receiver.
2. Control the Luminosity of a Bulb using the Magnetic Amplifier Kit.
3. Plot the Graph between Speed (rpm) and Voltage of DC Motor.
4. Obtain the Characteristics of Stepper Motor.
5. Demonstrate the Input-Output Relationship of AC - Servo Motor.
6. Obtain the Time Response of a Simulated Linear System and to Correlate with Theoretical Result.
7. Evaluate the Performance of P, PI, PD and PID Controllers.
8. Simulation of 2^{nd} order Linear Time-Invariant Control Systems using MATLAB.

Course Outcomes:

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

CO1. **Analyze** the performance of synchronous transmitter and receiver.

CO2. **Use** magnetic amplifier in different configuration.

CO3. **Verify** the characteristics of a D.C. motor, stepper motor and A.C. servo motor.

CO4. **Examine** the performance of P, PI, PD and PID controllers.

CO5. **Simulate** linear control systems using MATLAB.

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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	
200505/ 140505	DC	Digital Communication	70	20	10	30	20	150	2	1	2	4

Digital Communication (200505/140505)

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.

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L	T	P	C
-	-	2	1

Subject Name: Digital Communication Lab
Subject Code: 200505/140505

Course Objectives

The main objective of course is to impart hardware knowledge of various pulse and digital modulation techniques. Students will also learn the implementation using MATLAB software.

List of Experiments

1. To perform sampling and reconstruction.
2. To identify the various encoding schemes for a given data stream.
3. To analyze pulse amplitude modulation.
4. To analyze pulse width modulation.
5. To generate amplitude shift key signal.
6. To generate amplitude shift key signal using MATLAB.
7. To generate phase shift key signal using MATLAB software.
8. To generate frequency shift key signal using MATLAB.
9. To generate quadrature phase shifted key signal using MATLAB.

Course Outcome:

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

CO1. **Understand** sampling theorem.

CO2. **Perform** lines coding technique.

CO3. **Construct** different pulse modulation technique.

CO4. **Implement** different digital modulation technique

CO5. **Evaluate** the performance of the digital communication system using MATLAB.

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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		L	T	P	
100006	MC	Indian Constitution & Traditional Knowledge	70	20	10	30	20	150	3	-	-	3

Indian Constitution & Traditional Knowledge (100006)

Course Objectives:

- The course aims to provide students with the continuous, comprehensive and cumulative understanding of Indian Knowledge Tradition (Philosophy, Language, Art) and its modern interpretation and analysis.
- It intends to connect the students' modern advanced knowledge system with the roots of Indian Knowledge Tradition for their development and better understanding of the essentials of thought process, intellection and inference.
- To impart the knowledge of the Yogic Science and an insight into Sanskrit Literature which will promote interest among students in discerning the significance of health and wisdom with an Indian perspective.
- The objective of the syllabus is to familiarize students with the essential features and basic principles of the constitution of India.
- It will acquaint them with the concept of government, its organs and various types.
- It will provide students with a comprehensive and clear understanding of the basic fundamental rights and duties.

Unit I Introduction to Basic Structure of Indian Knowledge System, Homogeneity of modern science and Indian Knowledge Tradition, Yoga: Promoting positive health and personality, Case Studies.

Unit II Indian Philosophy or Darshanas: Jainism, Buddhism, Yoga, Śaiva and Vedanta, Indian Linguistic Tradition: Panini's Ashtadhyayi, Indian Art: Mauryan art, Buddhist art, Gupta art, Muslim Art & Culture Contemporary art, Case Studies

Unit III Introduction to Political Science: Nature and scope of political science, Definition, elements and theories of origin of State (Social Contract and Evolutionary), Meaning and features of Civil Society, Indian Political Thought: Raja Ram Mohan Roy, Swami Vivekanand, Gandhi, Ambedkar

Unit IV Concept of Government and Its Organs: Government: Definition and its characteristics, Types and meaning of Legislature: Composition, Function and Role of the Parliament (Lok Sabha and Rajya Sabha), The Powers, Position and Role of the President, Prime Minister and the Cabinet, The Powers, Position and Role of the Governor and the Chief Minister; Composition and the role of Supreme Court, Judicial Review and Judicial Activism.

Unit V Salient features of Indian Constitution Preamble, Conventions, Sovereignty of the Constitution and the Rule of Law, Parliamentary Democracy, Federalism, Secularism and Socialism, Fundamental Rights, Directive Principles of State Policies and Fundamental Duties, Election Commission and Electoral Reforms.

1. Reference Books:

1. O.P. Gauba, Political Theory, Macmillan, (latest edition).
2. D.D. Basu, Introduction to the Constitution of India, (Latest Edition).
3. N.G. Jayal & Pratap Bhanu Mehta, The Oxford Companion of Politics in India, 2000.
4. W.H. Morris-Jones, The Government and Politics of India.
5. Swami Jitamanand, Holistic Science and Vedam, Bhartiya Vidyabhawan
6. V. Shivramakrishnan (Ed.), Cultural Heritage of India, Bhartiya Vidyabhawan, Mumbai Fifth Edition,
7. 2014.
8. Yoga sutra of Patanjali, Ramakrishnan Mission, Kolkata.
9. Panini Shiksha, Motilal Banarsidas
10. VN Jh, Language, Thought and Reality
11. Krishna Chaitanya. Arts of India, Abhinav Publications, 1987.
12. SC Chaterjee and DM Datta, An Introduction to Indian Philosophy, university of Calcutta, 1984
13. A L Basham, The Wonder That was India

Course Outcomes:

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

CO1. **Know** the rich Indian traditions and the Indian constitution.
CO2. **Appraise** the utility and significance of tradition and its applicability in present times.
CO3. **Employ** the knowledge of the constitutional norms as laid in the constitution and abide by the practices stated therein.
CO4. **Create** a better society and living standards for themselves as well as for others.
CO5. **Recognize** the basic concepts of ethics and morality pertaining to Indian culture and tradition.
CO6. **Connect** traditional Indian philosophy with their everyday conduct and practices.

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Departmental Lab Core

L	T	P	C
-	-	2	1

Subject Name: Minor Project-I
Subject Code: 200506/140506

Course objectives

This course gives the basic introduction of electronics hardware system and provides hands-on training with familiarization, identification, testing, assembling, dismantling, fabrication and repairing such system by making use of the various tools and instruments available in the electronics workshop.

List of Exercise/ Experiments

1. Familiarization/Identification of electronics component with specification (Functionally, type, size, colour coding, package, symbol, cost etc. [Active, Passive, Electrical, Electronic, Electronic-Mechanical, Wires, Cables, Connectors, Fuses, Switches, Relays, Crystals, Displays, Fasteners, Heat sink etc.]
2. Drawing of electronic circuit diagrams using symbols, Interpret data sheets of discrete components and IC's, Estimation and costing.
3. Familiarization/application of testing instruments and commonly used tools. (Multimeter, function generator, power supply, CRO etc.) (soldering iron, De-soldering pump, Pliers, Cutters, Wire strippers, Screw drivers, Tweezers, Crimping tool, Hot air soldering and de-soldering station etc.)
4. Testing of electronic component (Resistor, Capacitor, Diode, Transistor, UJT and JFET using multimeter.)
5. Inter-connecting methods and soldering practices.[Bread board, Wrapping, Crimping, Soldering – types-selections of materials and safety precautions, Soldering practice in connectors and general purpose PCB, Crimping.]
6. Printed circuit board (PCB) [Types, Single sided, Double sided, Processing methods, Design and fabrication of a single sided PCB for a simple circuit with manual etching (Ferric chloride) and drilling.]

Course Outcomes

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

CO1. **Identify** electronics components and their testing.

CO2. **Operate** measuring instruments (such as multi-meter) and electronics equipments likes CRO, dual-power tracking power supply &function generator.

CO3. **Design** the electronics circuits on bread-board.

CO4. **Perform** soldering and de-soldering of the circuit components properly.

CO5. **Troubleshoot** a not working electronic circuit and to rectify it.

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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		L	T	P	
200601/ 140602	DC	Digital Signal Processing	70	20	10	-	-	100	2	1	2	4

Digital Signal Processing (200601/140602)

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 andSignal 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:

1. John. G. Proakis, "Digital Signal Processing", 4th Edition, Pearson Education.
2. 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:

CO1. **Analyze** discrete time system using transform methods.
CO2. **Compute** DFT using FFT algorithms.
CO3. **Design** IIR Filters.
CO4. **Design** FIR Filters.
CO5. **Apply** the concept of multi-rate signal processing in practical applications.

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B.Tech. VI Semester (Electronics and Telecommunication Engineering)

Subject Name: Digital Signal Processing Lab
Subject Code: 200601

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-	-	2	1

Course Objectives

The objective of the course is to practically implement the convolution, correlation, DFT, IDFT and to design FIR & IIR filter.

1. To generate the following signals:-Unit Impulse Signal, Unit Step Signal, Unit Ramp Signal, Exponential Growing and Decaying Signal, Sine Signal And Cosine Signal.
2. Verification of sampling theorem.
3. To perform the Discrete Fourier Transform (DFT) and Inverse Discrete Fourier Transform(IDFT)
4. To perform the Linear Convolution of given sequences using DFT and IDFT.
5. To perform the Circular Convolution of given sequences.
6. To perform the Linear Convolution using Circular Convolution.
7. To perform autocorrelation of a given sequence and verify of its Properties.
8. To perform the computation of N-point DFT of a given sequence also to plot magnitude and phase spectrum.
9. To analyze the spectral parameters of the given window functions.

Value Added Experiments

10. To design the low pass and high pass FIR filters using the given window functions.
11. To design the band pass and band stop FIR filters using the window functions
12. To design IIR Butterworth filter corresponding to given order and specifications.

Course Outcomes

After studying this course the students would be able to-

- **CO1.** **Generate** discrete/digital signals using MATLAB
- **CO2.** **Calculate** and Plot convolution of two given DT signal.
- **CO3.** **Plot** frequency response of a given system and verify the properties of LTI system.
- **CO4.** **Implement** FFT of given sequence and identify the reduction of computations using FFT.
- **CO5.** **Design** FIR and IIR filters.

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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		L	T	P	
200602/ 140503	DC	Data Communication	70	20	10	30	20	150	4	-	-	4

Data Communication (200602/140503)

Course objectives: To provide an introduction to fundamental computer network architecture concepts and their applications.

Unit I Introduction to Switching Techniques: Circuit switching, Message switching, Packet switching, Protocols, Layered network architecture and architecture OSI & TCP/IP reference model, Physical layer transmission medium, RS 232 C, Modem, Topologies.

Unit II Data Link Layer: Framing BSC, HDLC. ARQ: Stop and wait, Sliding window, Efficiency, Error detection and Error correction, Hamming codes, Parity checks – CRC, Checksum, HARQ.

Unit III MAC Layer: MAC sub layer – LAN protocols, ALOHA, Slotted and pure ALOHA, CSMA, CSMA/CD, Token bus, Token Ring, TDMA, CDMA, FDMA, Ethernet, Bridge, Router, Gateway, Switch.

Unit IV Network Layer: Routing – Data gram and Virtual Circuit, Distance vector and Link state Routing, Dijkstra's Algorithms, Congestion Control: Leaky bucket algorithm, Slow start, ATM model and ATM traffic management – AAL, X.25, IP layer, IP addressing.

Unit V Transport Layer: Connection oriented transport protocol mechanism, TCP, Transport flow regulation, UDP Segmentation & Reassemble, Session and Transport Interaction, Synchronization, Session protocols, FTP, Remote login.

Text Books:

1. Data Communication & Networking – B.A. Forouzan, Tata Mc-Graw Hill
2. Data and Computer Communication – W. Stallings, Pearson

Reference Books:

1. LANs – Keiser,Tata Mc-Graw Hill
2. Internetworking with TCP/IP – VOL-I – D.E. Comer, PHI
3. ISDN and Broad band ISDN with Frame Relay & ATM – W. Stalling, Pearson

Course Outcome:

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

CO1. **Examine** the concept of different layers in data communication networks.
CO2. **Analyze** the error and flow control in communication network.
CO3. **Explain** the concepts of MAC layer.
CO4. **Identify** the different types of routing used in IP.
CO5. **Classify** the transport mechanism in TCP/UDP.
CO6. **Explore** the different application protocol used in internetworking.

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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		L	T	P	
200611/ 140611	DE-1	Optical Communication	70	20	10	-	-	100	4	-	-	4

Optical Communication (200611/140611)

Course objectives: This course gives information to the students about the basics of signal propagation through optical fibers, fiber fabrication, fiber losses, device components of optical fiber communication and optical networks.

Unit I Overview of Optical Fiber Communications: Optical laws and definitions, Optical fiber modes and configurations, Mode theory, Step Index and Graded Index (GI) fibers ,Single mode and Multimode, Derivation for numerical aperture, V number and modes supported by step index fiber, Mode field diameter, Modes supported by GI fibers.

Unit II Fabrication and Coupling of Optical Fiber: Fiber materials: Glass fiber, Active glass fiber, Plastic optical fiber, Fiber fabrication techniques: Outside vapour phase oxidation, Vapour phase axial deposition, Modified chemical vapour deposition, Plasma activated chemical vapour deposition, Fiber splicing techniques, Optical fiber connectors and couplers.

Unit III Optical Sources and Detectors: Introduction to optical sources, LED'S, LASER diodes, Model reflection noise, Power launching and Coupling, Population inversion, Photo-detectors, PIN, Avalanche detector, Response time, Avalanche multiplication noise.

Unit IV Signal Degradation in Optical Fibers: Signal degradation in optical fibers, Attenuation losses, Signal distortion in optical wave guides, Material dispersion, Wave guide dispersion, Chromatic dispersion, Inter-modal distortion, Pulse broadening in Graded index fibers, Mode coupling.

Unit V Optical Communication and Networks: Coherent optical fiber communication, Modulation techniques for Homodyne and Heterodyne systems, Rise time budget and link power budget, eye pattern, optical network elements and topologies, SONET / SDH.

Reference Books:

1. Optical Fiber Communication – By G. Keiser , Tata McGraw-Hill Education
2. Optical Fiber Communication- By John M. Senior, Prentice Hall

Course Outcomes:

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

- **CO1. Explain** the basic elements of optical fiber transmission.
- **CO2. Discuss** fiber fabrication, splicing and optical connectors.
- **CO3. Describe** the working of optical sources and optical detectors.
- **CO4. Calculate** the channel impairments like losses and dispersion.
- **CO5. Discuss** Coherent optical transmission system and optical networks.

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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		L	T	P	
200612/ 140612	DE-1	Antenna & wave Propagation	70	20	10	-	-	100	4	-	-	4

ANTENNA AND WAVE PROPAGATION (200612/140612)

Course objectives: To develop the students' basic understanding of antenna operation and develop the students' ability to calculate and interpret basic antenna performance parameters.

Unit I Introduction to antenna: Definition of antenna parameters – Radiation Density, Radiation Intensity, Gain, Directivity, Radiation Resistance, Band width, Beam width, Input Impedance, Effective Height, Effective aperture, Network theorems applied to antenna, Self and mutual impedance of antenna.

Unit II Radiation Fields of Wire Antennas: Radiation from current element, Short dipole, Quarter wave Monopole and Half wave Dipole, Loop antenna, Helical antenna.

Unit III Antenna Arrays
Antenna arrays of point sources, Two element array, End fire and Broad side arrays,Principle of Pattern multiplication, Uniform linear arrays of N-elements, Linear arrays with non-uniform amplitude distribution (Binomial distribution and Chebyshev optimum distribution). Arrays of two-driven half wave length elements (Broad side and end fire case).

Unit III Aperture and special Antennas: Radiation from rectangular apertures, Horn antenna, Reflector antenna, Babinet's principles and complimentary antennas, Slot antennas, Log periodic antenna, Yagiuda antenna, Travelling wave antenna, Image antenna.

Unit V Propagation of radio wave: Modes of propagation , Structure of atmosphere , Ground wave propagation , Tropospheric propagation , Duct propagation, Flat earth and Curved earth concept, Sky wave propagation – Virtual height, Critical frequency , Maximum usable frequency – Skip distance, Fading , Multi hop propagation.

Reference Books:

1. Antenna theory- J.D. Kraus, 4th edition, Tata Mc-Graw Hill
2. Electromagnetic Fields & Radiating System - Jordan &Balmain, 2nd edition, PHI
3. Antennas(for all applications)-Kraus, Marshfka, khan, Tata Mc-Graw Hill
4. Antenna Wave Propagation-K D Prashad,New Delhi : SatyaPrakashan

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

CO1. **Evaluate** various parameters of the antenna.
CO2. **Analyze** the design parameters and radiation mechanism of wire antennas.
CO3. **Design** antenna array for the given radiation characteristics.
CO4. **Analyze** the design parameters and radiation characteristics of Aperture and special antennas.
CO5. **Describe** effects of earth and its atmosphere on radio wave propagation.

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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		L	T	P	
200613/ 140613	DE-1	Telecom Switching and Networks	70	20	10	-	-	100	4	-	-	4

Telecommunication Switching and Networks (200613/140613)

Course Objectives: To introduce fundamentals functions of a telecom switching office, namely, digital multiplexing, digital switching and digital subscriber access and to introduce a mathematical model for the analysis of telecommunication traffic.

Unit I Introduction: Evolution of Telecommunications, Simple Telephone Communication, Manual switching system, Strowger Switching System, Crossbar Switching System, major telecommunication Networks (PSTN, ISDN, WLAN, Ad Hoc Network).

Unit II Switching: Circuit Switching, Store and Forward Switching, Electronic Space Division Switching, Stored Program Control, Centralized SPC, Distributed SPC, Enhanced Services, Two stage networks, three stage network n-stage networks. Time multiplexed Space Switching, Time Multiplexed time switching, combination Switching, Three stage combination switching, n-stage combination switching.

Unit III Traffic Engineering: Network Traffic load and parameters, Grade of service and blocking probability, Modeling Switching Systems, Incoming Traffic and Service Time Characterization, Blocking Models and Loss Estimates, Delay systems

Unit IV Telephone Networks: Subscriber Loop Systems, Switching Hierarchy and Routing, Transmission Plan, Transmission Systems, Numbering Plan, Charging Plan, Signaling Techniques, In channel signaling, common channel signaling, Cellular mobile telephony.

Unit V Data networks: Data transmission in PSTNs, Modems, ISO-OSI/TCP-IP Reference Model, Satellite based data networks, Data network standards (ISDN, DSL / ADSL, Token Ring, Token BUS , Bluetooth , WLAN, ZigBee, SONET / SDH).

Text Book :

1. ThiagarajanVishwanathan, "Telecommunication Switching Systems and Networks"; PHI Publications.

Reference Books:

1. J. E. Flood, "Telecommunications Switching, Traffic and Networks", Pearson Education.
2. John C. Bellamy, "Digital Telephony", Third Edition; Wiley Publications

Course Outcomes

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

- **CO1. Describe** fundamentals of telecommunication systems and associated technologies
- **CO2. Design** multi stage switching structures involving time and space switching stages
- **CO3. Analyze** and evaluate the fundamental telecommunication traffic models.
- **CO4. Examine** the working of Telephone Networks.
- **CO5. Demonstrate** broad knowledge of fundamental principles and technical standards underlying Data Networks.

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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		L	T	P	
900104	OC-1	Intelligent Control	70	20	10	-	-	100	2	1	0	3

Intelligent Control (900104)

Course Objectives: The main objective of this course is to develop the basic understanding of an Intelligent control i.e. control system with optimization and prediction using Artificial Neural Network to the students.

Unit I Adaptive Control: Introduction, Close loop and open loop adaptive control. Self-tuning controller, Parameter estimation using least square and recursive least square techniques, Gain Scheduling, Model Reference Adaptive Control, Self Tuning Regulators, Adaptive Smith predictor control, Auto tuning and self tuning smith predictor.

Unit II Artificial Neural Network (ANN) Based Control: Introduction to ANN, Different activation functions, Different architectures and different learning methods, Back Propagation and Radial Basis Function networks.

Unit III Modeling of Control System: Representation and identification, Modeling the plant, Control structures – supervised control, Model reference control, Internal model control, Predictive control, Indirect and direct adaptive controller design using neural network.

Unit IV Fuzzy Logic Based Control: Fuzzy Controllers: Preliminaries – Mamdani and Sugeno inference methods, Fuzzy sets in commercial products – basic construction of fuzzy controller – fuzzy PI, PD and PID control, Analysis of static properties of fuzzy controller, Analysis of dynamic properties of fuzzy controller , Simulation studies and case studies , Stability issues in fuzzy control.

Unit V Hybrid Control: Introduction to Genetic Algorithm (GA), Neuro-Fuzzy and Fuzzy-GA based hybrid system design.

Text Books:

1. Astrom **.**K, Adaptive Control, Second Edition, Pearson Education Asia Pvt. Ltd, 2002.
2. Shivanandan**,** Introduction to Artificial Neural Network with MATLAB 6.0.1, Third Edition, Mcgraw Hill India Ltd, 2015.

Reference Books:

1. Klir G.J and Folger T.A, Fuzzy sets, Uncertainty and Information, Prentice Hall of India, New Delhi 1994.
2. Bose and Liang, Artificial Neural Networks, Tata Mcgraw Hill, 1996.
3. Kosco B, Neural Networks and Fuzzy Systems: A Dynamic Approach to Machine Intelligence, Prentice Hall of India, New Delhi, 1992.
4. Chang C. Hong, Tong H. Lee and Weng K. Ho, Adaptive Control, ISA press, Research Triangle Park, 1993.

Course Outcomes:

After successful completion of this course; students will be able to:

CO1. **Explain** the fundamental principle behind adaptive control.

CO2. **Estimate** various parameter of control system using artificial neural network.

CO3. **Apply** the concept of artificial neural network to the field of control.

CO4. **Optimize** the throughput of the system using optimization methods like Genetic algorithm.

CO5. **Design** fuzzy logic based control system.

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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		L	T	P	
900105	OC-2	Embedded System	70	20	10	-	-	100	2	1	0	3

Embedded System (900105)

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

Unit I Introduction: Embedded system architecture, classification, challenges and design issues, fundamentals of embedded processor and microcontrollers, Von Neumann/Harvard architectures, CISC vs. RISC, microcontrollers types and their selection, Overview of the 8051 family, architecture, pin description, Flags, Register Banks, Internal Memory Organization, I/O configuration, Special Function Registers, addressing modes.

Unit II Assembly programming and instruction of 8051: An Overview of 8051 instruction set, Introduction to 8051 assembly programming, Assembling and running an 8051 program, Data types and Assembler directives, Arithmetic, logic instructions and programs, Jump, loop and call instructions, IO port programming.

Unit III 8051 Timer, Serial port, interrupt Programming: Basics of Timers/Counters, Programming 8051 timers/Counter, basics of serial communication, 8051 connection to RS232, 8051 serial port programming, basics of 8051 Interrupts, 8051 interrupts programming: Timer interrupts, external hardware interrupts and serial communication interrupt, 8051 Interrupt priority.

Unit IV Interfacing real world devices with 8051 microcontroller: Memory address decoding, 8051 interfacing with memory, 8051 interface with 8255 PPI and various interfacings like: LCD and Matrix Keyboard interfacing with 8051 microcontroller, ADC, DAC and Temperature Sensor interfacing with 8051 microcontroller, Stepper motor interfacing.

Unit V Interfacing real world devices with Arduino : Overview of Arduino, Configuration, Interfacing, Board layout, Atmega328 specifications, Interfacing of Arduino with LED, Switches, Light dependent resistor (LDR), PWM, 16*2 LCD, Serial, L293D for motor interfacing, ADC.

Text Book:

1. Muhammad Ali Mazidi, Janice GillispieMazidi, Rolin D. Mckinlay, "The 8051 Microcontroller and Embedded Systems using Assembly and C" Pearson Education India, 2nd Edition

Reference Books:

1. Kenneth Ayal, "The 8051 Microcontroller", Architecture, Programming and Applications.
2. SubrataGhoshal, "Embedded Systems and Robots, Projects using the 8051Microcontroller".

Course Outcomes

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

CO1. **Explain** the architecture of embedded system and 8051.

CO2. **Develop** assembly language programming skills for 8051.

CO3. **Analyze** the concept of Timers/Counters, Serial communication and interrupt handling processes of 8051 microcontroller.

CO4. **Interface**memory and I/O deviceswith 8051microcontroller.

CO5. **Interface**Arduino with LED, Switches, Light dependent resistor (LDR), PWM, 16*2 LCD, Serial, L293D for motor interfacing, ADC.

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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	
100007	MC	Disaster Management	70	20	10	-	-	100	3	-	-	3

Disaster Management (100007)

Course objectives:

- To understand basic concepts in Disaster Management
- To understand Definitions and Terminologies used in Disaster Management
- To understand Types and Categories of Disasters
- To understand the Challenges posed by Disaster
- To understand Impact of Disasters key skills

Unit I Introduction to disaster management, concepts and definitions: disaster, vulnerability, risk severity, frequency and details, capacity impact, prevention, mitigation.

Unit II Disasters – Disasters classification, demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends, hazard and vulnerability profile of India.

Unit III Disaster Impacts – Disaster impact (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues, impact of natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides etc.), impact of manmade disasters (industrial pollution, artificial flooding in urban areas, urban disasters, transportation accidents etc.).

Unit IV Disaster Risk Reduction (DRR) - Disaster management cycle- its phases; prevention, mitigation, preparedness, relief and recovery; structural and non- structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response. Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders: Policies and legislation for disaster management. DRR programmes in India and the activities of National Disaster Management Authority.

Unit V Disasters, Environment and Development – Factors affecting vulnerability such as impact of development projects and environmental modifications (including of dams, land use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Text Books:

1. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
2. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation
3. Srivastava H.H. & Gupta G.D., Management of Natural Disasters in developing countries, Daya Publishers Delhi, 2006.

Reference Books:

1. http://ndma.gov.in (Home page of National Disaster Management Authority)
2. http://www.ndmindia.nic.in / (National Disaster Management in India)
3. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
4. National Disaster Management Policy, 2009, GOI.
5. Inter Agency Standing Committee (IASC) (Feb. 2007), IASC Guidelines on Mental Health and Psychosocial Support in Emergency Setting. Geneva: IASC

Course Outcomes:

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

- **CO1.** **Identify** disaster prevention and mitigation approaches.
- **CO2.** **Classify** global and national disasters, their trends and profiles.
- **CO3.** **Determine** the impacts of various disasters.
- **CO4.** **Apply** Disaster Risk Reduction in management.
- **CO5.** **Infer** the linkage between disasters, environment and development.

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
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B.Tech. VI Semester (Electronics)

Departmental Lab Core-6

L	T	P	C
-	-	4	2

Subject Name: Minor Project-II
Subject Code: 200606/140606

Course objective

Main aim of the course is to enable students to design & fabricate their own innovative hardware project.

List of Exercise/ Experiments

1. Hardware project should consist of circuit design, PCB fabrication assembling & testing of digital or analog application circuit.
2. Students are required to use standard software available for drawing circuit schematic, simulating the design and PCB (single/double sided) layout of circuit.
3. Project should consist of details of work carried out including layout, circuit, datasheets, list of component cost.

Course outcome
After successful completion of the lab, students will be able to:

CO1. **Design** the project.

CO2. **Impart** skills in fault finding and troubleshooting.

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B.Tech. VII 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	
200711/ 140711	DE-III	Satellite & Radar Communication	70	20	10	-	-	100	3	-	-	3

Satellite & Radar Communication (200711/140711)

Course objective: The main objective of the course is to provide a comprehensive and state of the art knowledge in the area of satellite communication and radar Systems.

Unit I Introduction: Introduction to Satellite Communication, Origin and History of Satellite Communication, Current State of Satellite Communication, Orbital Aspect of Satellite Communication , Orbital Mechanism, Equation of Orbit, Locating Satellite in Orbit , Orbital Elements ,Orbital Perturbation , Frequency Allocations and Applications.

Unit II Space Craft Sub System and Earth Station: Altitude and Orbit Control System , Telemetry Tracking and Commend Power System, Communication Sub System, Earth Station Design , Antenna Tracking, LNA, HPA,RF, Multiplexing Factor Affecting Orbit Utilization, Tracking, Equipment for Earth Station.

Unit III Satellite Link Design: Satellite Link Design, System Noise Temperature and G/T Ratio, Downlink Design, Domestic Satellite System, Uplink Design, Earth Path Propagation Effect, Losses in Link Design.

Unit IV Introduction to RADAR: Principles OfRADAR, Radar Frequencies, Pulse RADAR, RADAR Range Equation, RADAR Application, RADAR Cross Section of Targets RADAR Indicator, Noise Figure of Receiver, Mixer Duplexer, Line Pulsar.

Unit V Operational RADAR : MTI RADAR, Delay Line Canceller, Digital Signal Processing, Limitation of MTI RADAR, CW RADAR, FM CW RADAR.

Text Book:

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.
2. RADAR System –Skolnik, 4th Edition, Tata McGraw-Hill, 2006.

References Books:

3. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G. Suyderhoud, 2nd Edition, Pearson Publications, 2003.
4. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Ed, 2007.
5. Satellite Communications – Dennis Roddy, McGraw Hill, 2nd Edition, 1996.

Course Outcomes

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

CO1. **Explain**Basic Concepts and Terminologies of Satellite Communication

CO2. **Design** the Earth Station and Space Craft System

CO3. **Calculate**the Link Power Budget Including Propagation Effects in Satellite.

CO4. **Evaluate**the Various Performance Factors Related to the RADAR

CO5. **Explain**Target Detection and Tracking using Radar Systems.

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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		L	T	P	
200712/ 140712	DE-III	VLSI Design	70	20	10	-	-	100	3	-	-	3

VLSI Design (200712/140712)

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.

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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		L	T	P	
200713/ 140713	DE-III	Microwave Engineering	70	20	10	-	-	100	3	-	-	3

Microwave Engineering (200713/140713)

Course objectives: The goal of this course is to introduce students to the concepts and principles of the advanced microwave engineering, theory and design of passive and active microwave components, and microwave circuits.

Unit I Waveguides: Review of Maxwell's equation, Rectangular Waveguides, Characteristics of TE and TM wave in Rectangular Wave Guides, Dominant mode in Rectangular Waveguide, Cylindrical Waveguides, Waveguide Excitation.

Unit II Microwave components & their S-parameters Analysis: Microwave Resonator, Microwave Network representations. Scattering Matrix, S-Matrix for two, three & four port Networks such as E-plane Tee, H-plane Tee, Magic Tee, Directional Coupler, Tuning Screw, Quarter Wave Transformer, Matched Load, Isolator, Circulator.

Unit III Microwave Tubes : Transit Time Effect, Tubes for very high frequency, Limitation of Conventional Tubes, Reflex Klystron, Two Cavity Klystron, Magnetron, Travelling Wave Tube.

Unit IV Microwave Solid State Devices: Pin diode, Tunnel diode, Gunn Effect devices, Varactor diode, IMPATT diode, Circuit applications of above devices.

Unit V Microwave Measurement and Introduction to Planer Transmission lines: Measurement of VSWR, Impedance, Frequency, Dielectric Constant Power, Attenuation and Phase Shift, Planar Transmission lines, Introduction to Micro Strip Lines, Slotlines, Coplanar lines.

Text books:

1. Microwave Devices and Circuits, Samuel Y. Liao, Prentice Hall, 3rd edition, 2003.
2. Microwave engineering-David M. Pozar, 4th ed., John Wiley & Sons, Inc., 2004.

Reference Books:

1. Introduction to Microwaves -Wheeler G.J., Literary Licensing, LLC, 2012
2. Microwave circuits & passive devices- Sisodia and Raghuvanshi, New age International, 1st edition, 1987.
3. Microwave and Radar Engineering. Kulkarni, 5th edition, Dipan, 2016.

Course Outcomes

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

- **CO1. Analyze** Rectangular and Circular Waveguides.
- **CO2. Calculate** S- parameters of Microwave components.
- **CO3. Describe** the working characteristics and applications of Microwave Tubes.
- **CO4. Explain** the working characteristics and applications of Microwave Diodes.
- **CO5. Measure** VSWR, Impedance, Frequency, Dielectric Constant Power, Attenuation and phase shift and planar transmission lines.

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B.Tech. VII 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	
900206	OC-2	Satellite Systems	70	20	10	-	-	100	2	1	-	3

Satellite Systems (900206)

Course objective: The main objective of the course is to provide a comprehensive knowledge in the area of satellite system. The course emphasis is on the study of orbital mechanics, launching techniques, working of Indian Regional Navigation Satellite System.

Unit I Introduction: Introduction of Satellite Communication, Origin and History of Satellite Communication, Current State of Satellite Communication, Orbital Aspect of Satellite Communication , Orbital Mechanism , Equation of Orbit, Locating Satellite in Orbit , Orbital Elements , Orbital Perturbation.

Unit II Space Craft Sub System and Earth Station: , Altitude and Orbit Control System, Telemetry Tracking and Commend Power System, Communication Sub System, Earth Station Design, Antenna Tracking, LNA, HPA,RF, Multiplexing Factor Affecting Orbit Utilization, Tracking, Equipment for Earth Station, Frequency Allocation in Satellite Communication.

Unit III Indian Satellite Launch Vehicle: SLV (Satellite Launch Vehicle), ASLV (Augmented Satellite Launch Vehicle),PSLV(Polar Satellite Launch Vehicle), GSLV (Geosynchronous Satellite Launch Vehicle), GSLV Mk III, Sounding Rockets.

Unit IV Satellite Link Design: Satellite Link Design, System Noise Temperature andG/T Ratio, Downlink Design, Domestic Satellite System, Uplink Design

Unit V Indian Regional Navigation Satellite System: IRNSS System Overview, IRNSS Signal Characteristics, IRNSS Data Structure, Sub Frame Structure.

TEXT BOOK:

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.
2. https://www.isro.gov.in/update/06-nov-2015/book-indian-space-programme-released-second-anniversary-of-mars-orbiter

REFERENCES BOOKS:

3. Satellite Communications – Dennis Roddy, McGraw Hill, 2nd Edition, 1996.
4. IRNSS SIS ICD for standard positioning service, version 1.1, August 2017, ISRO Satellite Centre Indian Space Research Organization Bangalore

Course Outcomes

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

CO1. **Explain** basic concepts and terminologies ofSatellite Communication.

CO2. **Design** the Earth station and Space Craft System.

CO3. **Explain** the Indian Satellite Launchers.

CO4. **Calculate** the Link power budget including Propagation effects in Satellite.

CO5. **Examine** the Indian Regional Navigation Satellite System.

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B.Tech. VII 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	
900207	OC-2	Consumer Electronics	70	20	10	-	-	100	2	1	-	3

Consumer Electronics (900207)

Course objectives: Objective of this course is to make the students understand the technology behind consumer electronics appliances. The units in the course are designed to impart the concepts of Audio Video systems, Television and other domestic appliances like Microwave ovens and air-conditioning system.

Unit I Introduction To Audio Systems: Microphone, Carbon, Crystal and Moving Coil Microphone. Loudspeakers: Permanent Magnet Loudspeaker and its Construction, Introduction to Woofers and it's Operation, Audio System, Anatomy of Hi-Fi System.

Unit II Television System: Elements of Television System, Scanning Process, Persistence of Vision and Flicker, Vertical and Horizontal Resolution. Introduction to LCD and Plasma Display. Introduction to LED TV Technology.

Unit III Landline and Mobile Telephony: Telecommunication Systems, Modulation Techniques: Analog and Digital Methods, Radio System Characteristics, Telephone Receiver and Handset.

Unit IV Cellular and Mobile Communication: Cellular Communications, Transmitting Receiving Antenna, Digital Cellular Phone Block Diagram, Types of Mobile Phones, Cellular Systems.

Unit V Domestic Appliances: Microwave Oven: Microwaves, Transit Time, Magnetrons, Wave Guides, Microwave Oven Block Diagram. Air Conditioning System: Components of Air Conditioning System, All-Water Air Conditioning System, All-Air Air Conditioning System.

Text Book:

1. S. P. Bali, "Consumer Electronics" Pearson Education India, 2nd Edition.

Reference Books:

1. Electronic communication systems by Roy Blake, Thomson Delmar, Cengage Learning, inc; 2nd edition edition, 2011
2. Colour Television by R.R.Gulati, New Age international; Second edition, 2007
3. How Electronic Things Work.& What to Do When They Don't -Robert L. Goodman, TMH, 1998
4. Digital Satellite Television Handbook By Mark E. Long, Newnes; Pap/Cdr edition, 1999.

Course Outcome:

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

CO1. **Describe** various types ofAudio Systems.
CO2. **State** the working principle ofTelevision System.
CO3. **Analyze** the operation of a Landline Telephone System.
CO4. **Explain** the working ofCellular and MobileSystem.
CO5. **Explain** the working of various Consumer Electronic appliances.

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B.Tech. VII 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	
900208	OC-3	MEMS & Mechatronics	70	20	10	-	-	100	3	-	-	3

MEMS and Mechatronics (900208)

Course Objectives: To understand basics of MEMS and basic architecture of the mechatronics system; design and characteristics of different sensors, mechanical and electrical actuators and their selection for design of mechatronic systems

UNIT I Introduction to MEMS: Basics of MEMS (Micro-Electro Mechanical Systems), Need of Miniaturization, Micro fabrication, Micromachining, Material for MEMS, Types of MEMS: RF-MEMS, Bio-MEMS, etc, Various Applications.

UNIT II Introduction to Mechatronics Systems: Basic Building Blocks of Mechatronic Systems. Mechatronics Key Elements, Mechatronics in Home, office and Industry Automation, Scope of Mechatronics, Advantages of Mechatronics, Pre-Requisites for Mechatronics.

UNIT III Sensors: Performance Characteristics of Sensors and Transducers, Position and Speed Measurement; Proximity Sensor, Potentiometer, LVDT, Digital Optical Encoder, Stress and Strain Measurement; Strain Gages, force Measurement With Load Cells, Temperature Measurement; Thermometer, Thermocouple, Vibration and Acceleration Measurement, Pressure and Flow Measurement.

UNIT IV Actuators and Control Unit: Electromagnetic Principles, Solenoids and Relays, Electric Motors, DC Motors, Stepper Motors, Hydraulic and Pneumatic Actuators, Microactuators, Piezoelectric Actuators, Selection Criteria for Sensors and Actuators, Interfacing of Sensors and Actuators, Control Unit; Microcontroller, PLC.

UNIT V Various Example of Mechatronics System: Manipulator/ Robotic Arm, Quad copter, Mobile Robots, Hexapod Robots, Humanoid and Biped Robots.

Text Books:

1. Introduction to Mechatronics and Measurement Systems, Alciatore and Histand Tata McGraw-Hill, 3rd edition, 2007.
2. Mechatronics, Kenji Uchino and Jayne R. Giniewicz, CRC Press, 2nd edition, 2019.

Reference Books:

1. Applied Mechatronics- A. Smaili and F. Mrad, OXFORD university press, 2007.
2. Mechatronics System Design, Shetty and Kolk CENGAGE Learning, India Edition, 2nd edition, 2010.
3. Mechatronics, Necsulescu, Pearson education, 1st edition, 2002

Course Outcome:

After completion of this course students will be able to:

CO1. **Describe** MEMS, their types and applications.

CO2. **Analyze** the Mechatronics system.

CO3. **Analyze** the performance characteristics of Sensors and Actuators.

CO4. **Interface** Sensors and Actuators using control unit such as Microcontroller and PLC.

CO5. **Construct** the prototype of manual Robotic Arm.

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B.Tech. VII 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	
900209	OC-3	Multimedia Communication	70	20	10	-	-	100	3	-	-	3

Multimedia Communication (900209)

Course Objective: To Understand the Multimedia Communications Systems, Applications and its Principles **.**

Unit I Basics of Analog And Digital Video: Color Video Formation and Specification, Analog TV System, Video Raster, Digital Video Formats, 2D Motion Estimation: Optical Flow Equation.

Unit II Multimedia Information Representation: Introduction to Compression Techniques, Text and Image Compression, Standards for Multimedia Communications..

Unit III Basic Compression Techniques: Information Bound for Lossless and Lossy Source Coding: Shannon Source Coding Theorem, Binary Encoding(Huffman Coding and Arithmetic Coding).

Unit IV Video Compression Standards: H.261 and H.263, MPEG1, MPEG2, MPEG4, MPEG7.

Unit V Error Control : Error Control in Video Communications. Video Transport over the Internet and Wireless.Networks.

Textbook:

1. Y. Wang, J. Ostermann, and Y.Q.Zhang, "Video Processing and Communications," 1st ed., Prentice Hall, 2002. ISBN: 0130175471.

Reference Book:

1. Iain E G Richardson, "H.264 and MPEG-4 Video Compression," John Wiley & Sons,September 2003, ISBN 0-470-84837-5.

Course Outcomes:

CO1. **Understand** the basics of Analog and Digital Video: Video representation and transmission.
CO2. **Analyze** Analog and Digital Video Signals and Systems.
CO3. **Know** the fundamental video processing techniques.
CO4. **Acquire** the basic skill of designing video compression and familiarizing with Video Compression standards.
CO5. **Know** the basic techniques in designing video transmission systems: error control and rate control.

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B.Tech. VII 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	
100008	MC	Intellectual property rights	70	20	10	-	-	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 neem 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.
5. R Radha Krishnan & S Balasubramanian. Intellectual Property Rights. 1st Edition, Excel Books, 2012.
6. M Ashok Kumar & Mohd. Iqbal Ali. Intellectual Property Rights. 2nd Edition, Serial Publications, 2011.
7. VinodV. Scople, Managing Intellectual Property. Prentice Hall of India PvtLtd, 2012.
8. Deborah E. Bouchoux. Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets. Cengage Learning, 3rd ed. Edition, 2012.
9. Prabuddha Ganguli. Intellectual Property Rights: Unleashing the Knowledge Economy. McGraw Hill Education, 2011. Edited by Derek Bosworth and Elizabeth Webster.
10. The Management of Intellectual Property. Edward Elgar Publishing Ltd.,2013.
11. B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.
12. Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
13. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House.

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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.

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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		L	T	P	
200705/ 140705	DLC	VLSI Design Lab	-	-	-	50	50	100	-	-	4	2

VLSI Design Lab (200705/140705)

Lab Objectives

To learn the fundamental principles of CMOS VLSI circuit design using SYMICA EDA CAD tool.

List of Experiments:

Digital CMOS logic circuit design using SYMICA CAD tool:

1. Design and simulate basic CMOS logic Gates: AND, OR, NOT.
2. Design and simulate CMOS logic universal gates: NAND and NOR.
3. Design and simulate CMOS logic 2:1 MUX.
4. Design and simulate CMOS logic 2 x 4 Decoder.
5. Design and simulate CMOS logic Half-Adder and Full Adder.
6. Design and simulate CMOS logic RS, JK and D flip-flops.

Gate level design using SYMICA CAD tool:

1. Design and simulate a Verilog program for the following combinational designs:
   a) 2 to 4 decoder
   b) 8 to 1 multiplexer
   c) 4 bit binary to gray converter
2. Design and simulate a Verilog code to describe the functions of a full adder using three modeling styles.
3. Design and simulate a model for 32 bit ALU.

Course Outcomes

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

CO1. Demonstrate a clear understanding in hardware design language Verilog and SPICE.
CO2. Model a combinational circuit using hardware description language Verilog and SPICE Netlist.
CO3. Model a sequential circuit using hardware description language Verilog and SPICE Netlist.
CO4. Model a computational circuit using hardware description language Verilog and SPICE Netlist.
CO5. Simulate and validate the functionality of the CMOS VLSI circuits using CAD tools.

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)
B.Tech. VII 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	
200707/ 140707	DLC	Simulation and Fabrication Lab	-	-	-	25	25	50	-	-	2	1

Simulation and Fabrication Lab (200707/140707)

Lab Objective:

The lab comprises of two modules each of which student need to finish passing this course. These 02 modules are named as

(i) Communication Systems
(ii) Antenna Design

Tools Required:
Network Simulator, QualNet, CST Design Studio

List of Experiments

Communication Module:

1. Program in NS(network simulator)/QualNet to implement different topology
2. Program in NS(network simulator)/QualNet for connecting multiple routers and nodes and building a hybrid topology
3. Program in NS(network simulator)/QualNet to implement FTP using TCP bulk transfer
4. Program in NS(network simulator)/QualNet for connecting multiple routers and nodes and building a hybrid topology and then calculating network performance
5. To analyse network traces using Wireshark software.

Antenna Module

1. Design and Simulation of Microstrip Antenna Using CST Tool.
2. Design and Simulation of Microstrip Transmission Line Using CST Tool.
3. Design and Simulation of Waveguide Using CST Tool.
4. Design and Simulation of Half Wave Dipole Antenna Using CST Tool.
5. Study and overview of CST simulation tool.

Course Outcomes:

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

CO1. **Write** a program in Network Simulator for various topologies.
CO2. **Design** a network using NS2 or QualNet.
CO3. **Design** an antenna of given specification.