- **M.Sc. Applied Physics (3rd and 4th Semester courses) (for Stream-I: Electronics)**

SEMESTER-III					SEMESTER-IV				
Sl no	**Subject Code**	**Subject**	**Contact Hours per week (L+T+P)**	**Credits**	**Sl no**	**Subject Code**	**Subject**	**Contact Hours per week (L+T+P)**	**Credits**
1	MSPH5101	Digital Communication	3+1+0	4	1	MSPH5201	Nano-Electronic Devices	3+1+0	4
	MSPH5102	Electronics Devices and Systems	3+1+0	4	2	MSPH5202	Satellite And Optical Communication	3+1+0	4
3	MSPH5103	Embedded System	3+1+0	4	3	MSPH5203	VLSI Design	3+1+0	4
4	MSPH5104	Microwave , Antenna And Wave Propagation	3+1+0	4	4	MSPL5201	Advanced Simulation Laboratory	0+0+3	2
5	MSPH5105	Research Methodology	2+0+0	2	5	MSSM5201	Seminar	As per requirement	2
6	MSPL5101	Embedded System Lab	0+0+3	2	6	MSPJ5201	Project-II	As per requirement	8
7	MSPL5102	Analog and Digital Communication Lab	0+0+3	2					
8	MSPJ5101	Minor Project /Dissertation	As per requirement	2					
TOTAL CREDITS				24	**TOTAL CREDITS**				24

3RD Semester MSc Course Structure and Syllabus.

SUBJECTS:

SL NO	SUBJECTS	CREDIT
1	DIGITAL COMMUNICATION	4
2	ELECTRONICS DEVICES AND SYSTEMS	4
3	EMBEDDED SYSTEM	4
4	**MICROWAVE, ANTENNA AND WAVE PROPAGATION**	4
5	RESEARCH METHODOLOGY	2
6	EMBEDDED SYSTEM LAB	2
7	**ANALOG AND** DIGITAL COMMUNICATION LAB	2
8	MINOR PROJECT	2

DIGITAL COMMUNICATION

Module - I **(12 Hours)**

Sampling Theorem, Signal Reconstruction from uniform samples, Practical issues in signal sampling and reconstruction, Maximum Information Rate,

Digital Representation of Analog Signal –

Quantization of Signals, Quantization error, PCM, PCM System, Commanding, Certain issues in Digital transmission: Line coding, scrambling, Differential PCM: Linear predicted design, Delta Modulation, Adaptive Delta Modulation

Module - II **(12 hours)**

Digital Modulation Technique:

Timedivision Multiplexing, Frequency Division Multiplexing, Data Communications Circuits, Codes and Modems. Basic concepts of signal processing and digitalfilters.

Generation, Transmission, Reception, Spectrum and Geometrical Representation in the Signal Space of BPSK, DPSK, QPSK, QASK, M-ary PSK, BFSK, M-ary FSK, and Minimum Shifting Keying (MSK), Random signals and noise, Noise temperature and noise figure.

Module - III **(12 hours)**

Principle of Digital Data Transmission:

Digital Communication Systems – Line Coding: PSD of various line codes, polar signaling,Bipolar, On Off signaling ,signaling constructing a DC Null in PSD by pulse shaping, Pulse shaping – ISI and effect, Nyquist first criterion for zero ISI; Scrambling, Digital receiver

and regenerative repeaters; Equalizers, Timing extraction, Eye Diagram Optimum receiver for both base band and pass band.

Discrete Messages and information content:

The Concept of amount of Information, Average Information, Entropy; Information rate,Shanon-Fano coding, Shannon's Theorem-Channel Capacity, Bandwidth – S/N Trade off.

Text Books:

1. Taub's Principles of Communication Systems by H Taub. D. L. Schilling and G Saha, 3rd Edition 2008, TMH Education Pvt Ltd, New Delhi,
2. Communication system by R.P.Singh and S.D.Sapre
3. Modern Digital and Analogue Communication Systems by B.P.Lathi and Z Ding, 4th Edition 2010, Oxford University Press, New Delhi,

Reference Books:

1. Digital Communication by Amitabha Bhattacharya, TMH Publishing Company Ltd, 2006
2. Communication Systems by SimanHaykin, 4th Edition, John Wiley & Sons, Inc
3. Digital and Analogue Communication System, Leon W, Couch-II, 6th Edition, Pearson

ELECTRONICS DEVICES AND SYSTEMS

Module-1 (12 Hours)

Semiconductordiodes, characteristics and equivalent circuits of BJT, JFET, MOSFET, IC fabricationcrystalgrowth, epitaxy, oxidation, lithography, doping, etching, isolation methods,metalization, bonding, Thin film active and passive devices.

Rectifiers, Voltage regulated ICs and regulated power supply, Biasing of Bipolar junction transistors and JFET. Single stage amplifiers, Multistage amplifiers, Feedback inamplifiers, oscillators, function generators, multivibrators, Operational Amplifiers (OP AMP) – characteristics and Applications, Computational Applications, Integrator,Differentiator, Wave shaping circuits, F to V and V to F converters. Active filters, Schmitt trigger, Phase locked loop.

Module-2 (12 Hours)

Logic families, flip – flops, Gates, Boolean algebra and minimization techniques, Multivibrators and clockcircuits, Counters – Ring, Ripple. Synchronous, Asynchronous, Up and down shift registers, multiplexers anddemultiplexers, Arithmetic circuits, Memories, A/D and D/A converters.

Characteristics of solid state power devices – SCR, Triac, UJT, Triggering circuits, converters, choppers, inverters, converters. ACregulators,speed control of a.c. andd.c. motors.Stepper and synchronous motors; Three phase controlled rectifier; Switch mode power supply; Uninterrupted power supply.

Module-3 (12 Hours)

Open – loop and closeloopcontrol system. Error amplifier, on – off controller, Proportional (P), ProportionalIntegral(PI), Proportional – Derivative (PD), PIDcontrollers, Dynamic Behaviour of control systems servomechanism characteristics parameters of control

systemsAccuracy,Sensitivity, Disturbances,Transient response, Stability, RouthHurwitzcriterion, Bode plots, Nyquist criterion.

BOOKS:

1.Op-Amps And Linear Integrated Circuits, 4/E (English) 4th Edition, By RamakantaGayakward
2.Network Theory –A K Chakraborty –DhanpatRai Publication.
3.Electronic Devices and Circuit Theory By - Robert L. Boylestad and Lewis Nashelsky,8th Edition Pearson Publication.
4.Modern Control Engineering by K. Ogata, 5th edition PHI.

EMBEDDED SYSTEM

Module -1 **(12 Hours)**

Introduction to Embedded system, General Purpose Computing System Vs Embedded System, Harvard Vs Von-Neumann Architecture, RISC Vs CISC, Little Endian Vs Big Endian, classification & applications of Embedded System, Introduction to 8085 Microprocessor ,Architecture, Addressing modes, 8085 instruction set, 8085 interrupts, Programming concept, Memory and I/O interfacing, Interfacing 8255, 8253, 8257, 8251 with 8085 Microprocessors.

Module-2 **(12 Hours)**

Introduction of High – level Programming Language, Introduction of data in C. Operators and its precedence, Various data types in C, Storage classes in C, Decision making and forming loop in program, Handling character, strings, Arrays in C, Structure and union, User defined function, Pointers in C, Advanced pointer. Pointer to structures, pointer to functions, file handling in C,

Introduction to object oriented Programming and C++.

Module-3 **(12 Hours)**

Introduction Of 8051 Microcontroller, Pin Diagram, Memory Organization, Registers of 8051, Embedded C Programming concepts, Interfacing of Led,Seven Segment,LCD, Keypad, Motors With 8051.

MICROWAVE, ANTENNA AND WAVE PROPAGATION

MODULE -1 **(12 Hours)**

Transmission lines: The Lumped -Element Circuit model for a Transmission line. Wave propagation. Field Analysis of two wire & Co-ax Transmission Lines. Terminated transmission line. Reflection coefficient, scattering matrix, Transmission line problems ,Single Stub and Double Stub matching ,problems using Smith Chart.
Rectangular waveguide: Maxwell's equations, Time varying fields, Poynting vector, Wave equation and its solutionDesign & analysis to support various modes. Field solution for TE and TM modes Propagation of wave in ionosphere

Module-2 **(12 Hours)**

Microwave components-T,Magic – T, Tuner. Circulator isolator,Direction couplers, Sources Reflex Klystron, Principle of operation of Magnetron, Solid State Microwave devices; Basic Theory of Gunn, GaAs FET, Crystal Defectorand PIN diode for detection of microwaves

Fundamental parameters of Antenna: Introduction , Principle of Radiation-Field & power pattern, Radiation Pattern – Isotropic, Directional and Omni directional patterns, principal patterns; Radiation Patterns lobes , Field regions, radian and Steradian. Radiation Power Density, Radiation Intensity, Beamwidth – FNBW & HPBW, Directivity, Antenna Efficiency, Gain, Beam efficiency, Polarization – Linear, Circular and Elliptical Polarization, Antenna impedance ,Antenna temperature, Noise Figure and Noise Temperature, effective height & area of Antenna

Module-3 **(12 Hours)**

Infinitesimal Dipole , half wavelength Dipole and Loop Antenna – Current distribution, Radiated Fields, Power density and Radiation resistance, Field regions, Directivity. Earth as perfect conductor –Image theory, vertical and horizontal electric dipole; Ground effects –vertical and horizontal electric dipole, earth curvature.

Horn Antenna, Log periodic antenna and helical antenna, Reflector antenna, smart antenna:– Operation & Design . Micro strip Antenna:– Characteristics, types, Feeding methods, Quality factor, bandwidth and efficiency, Design procedure.

Antenna Arrays: linear arrays of two element & N elements, Broadside & End fire array, array factor

Text Books:

1. Microwave Engineering by D. M. Pozor, 2nd Edition, John Willy & Sons.
2. Antenna Theory – Analysis and Design By C Balanis, 2ndEdition, John Willey & Sons.
3. Antenna by J.D. Kraus, 2ndEdition, TATA McGraw Hill.
4. Radio Wave Propagation and Antennas, an Introduction –John Griffiths, PHI International

DIGITAL COMMUNICATION
SYLLABUS

Module - I **(12 Hours)**

Sampling Theorem, Signal Reconstruction from uniform samples, Practical issues in signal sampling and reconstruction, Maximum Information Rate, Non-ideal practical sampling analysis, Some applications of sampling theorem

(Ref Text Book 2: Chapter 6.1)

Digital Representation of Analog Signal –

Quantization of Signals, Quantization error, PCM, Electrical representation of binary digits, PCM System, Companding, Certain issues in Digital transmission: Line coding, scrambling, T1Digital System, Multiplexing T1 lines – The T2, T3 and T4 lines, Differential PCM: Linear predicted design, Delta Modulation, Adaptive Delta Modulation

(Ref Text Book 1: Chapter 5.4, 5.5 and 5.6)

Module - II **(12 Hours)**

Digital Modulation Technique:

Generation, Transmission, Reception, Spectrum and Geometrical Representation in the Signal Space of BPSK, DPSK, QPSK, QASK, M-ary PSK, BFSK, M-ary FSK, and Minimum Shifting Keying (MSK),*(Ref Text Book 1: Chapter 6)*

Principle of Digital Data Transmission:

Digital Communication Systems – Source, Line coder, Multiplexer, Regenerative repeater; Line Coding: PSD of various line codes, polar signaling, constructing a DC Null in PSD by pulse shaping, On Off signaling, Bipolar signaling; Pulse shaping – ISI and effect, Nyquist first criterion for zero ISI; Scrambling, Digital receiver and regenerative repeaters; Equalizers, Timing extraction, Detection error, Eye Diagram.

(Ref Text Book 2: Chapter 7.1, 7.2, 7.3.1, 7.3.2, 7.4, 7.5, 7.6)

Module - III **(12 hours)**

A base band signal Receiver, Peak signal to RMS noise output voltage ratio, probability of error, optimum threshold, optimum receiver for both base band and pass band: calculation of optimum filter transfer function, optimum filter realization using Matched filter.

(Ref Text Book 1: Chapter 11.1 – 11.3)

Discrete Messages and information content:

The Concept of amount of Information, Average Information, Entropy; Information rate, source coding to increase average information per bit; Shanon-Fano coding, Shanon'sTheoerm- Channel Capacity, Capacity of Gaussian channel, Bandwidth – S/N Trade off, Use of Orthogonal Signals to attain Shannon's limit, Matched Filter Reception, calculation of error probability, Efficiency of orthogonal Signal transmission.

(Ref Text Book 1: Chapter 13.1 – 13.4)

Text Books:

1. Taub's Principles of Communication Systems by H Taub. D. L. Schilling and G Saha, 3rd Edition 2008, TMH Education Pvt Ltd, New Delhi,
2. Modern Digital and Analogue Communication Systems by B.P.Lathi and Z Ding, 4th Edition 2010, Oxford University Press, New Delhi,

Reference Books:

1. Principles of Communication Systems by Taub& Schilling, 2nd Edition, Tata McGraw Hill
2. Digital Communication by Amitabha Bhattacharya, TMH Publishing Company Ltd, 2006
3. Communication Systems by SimanHaykin, 4th Edition, John Wiley & Sons, Inc
4. Digital and Analogue Communication System, Leon W, Couch-II, 6th Edition, Pearson

EMBEDDED SYSTEM LAB

List of General Experiments:

1. Write a 8051 c program to send a value 00-FF h to port 0.
2. Write a 8051 c program to send hex values for ASCII characters of 0,1,2,3,4,5,A,B,C,D To port 2.
3. Write a 8051 c program to toggle all the bits of port 2 200 times.
4. Write a 8051 c program to toggle all the pins of Port 1 continuously with a 10 ms delay.
5. Write a 8051 c program to get a byte of data from Port 1 and then send it to Port 3.
6. Write a 8051 c program to get a byte of data from Port 0. If it is less than 100, send it to Port 1, otherwise send it to port 2.

List of Interfacing Experiments:

7. Interfacing Of Seven Segment With 8051
8. Interfacing Of LCD With 8051
9. Interfacing Of Switch With 8051
10. Interfacing Of Keypad With 8051
11. Interfacing Of Motors With 8051

List of small projects Projects:

12. Metro Train Prototype with 8051
13. Visitor counter with 8051 using LCD
14. Logic Gate with 8051
15. Password Based Door Locking System with 8051

ANALOG AND DIGITAL COMMUNICATION LAB:

1. Analyze and plot the spectrum of following signals with aid of spectrum analyzer: Sine wave, square wave, triangle wave, saw-tooth wave of frequencies 150Khz, 200Khz ,1 MHz onwards.
2. Study and design of AM (DSB with carrier) modulator and demodulator. Calculation of the modulation index (m) and plot the signals **for m>1,m=1 & m<1.**
3. Generation and demodulation of DSB-SC, SSB Signal. SSB generation and demodulation using integrated circuits
4. Generation and study of Sampling and Quantization of Sinusoidal signal and Signal Reconstruction.
5. Obtain the characteristics & Study pulse modulation schemes PAM, PWM and PPM.
6. Study the functioning of PCM, Implement Delta modulator and demodulator.
7. Obtain the characteristics of the Amplitude Shift Keying (ASK) ,Phase Shift Keying (PSK) Modulator and demodulate
8. Obtain the characteristics of the Frequency Shift Keying (FSK) Modulator and demodulator.
9. Study the functioning of Time division multiplexer.
10. Experimentally compare different forms of BPSK, QPSK, and OQPSK,
11. Measurement of Refractive Index profile, Numerical Aperture attenuation and dispersion in a multimode optical fiber.

4TH SEMESTER

SL NO	SUBJECTS	CREDIT
1	NANO-ELECTRONIC DEVICES	4
2	SATELLITE AND OPTICAL COMMUNICATION	4
3	VLSI DESIGN	4
4	ADVANCED SIMULATION LABORATORY	2
5	SEMINAR	2
6	PROJECT-II	6

Nano-Electronic Devices

MODULE – I (12 hours)

Introduction to Nanoelectronics:

The "top-down" approach, The "bottom-up" approach,Nanoelectronis and nanotechnology potential.

Classical Particles, Classical Waves and Classical Quantum Particles:

Comparison of Classical and quantum systems, Origin of quantum mechanics, Light as a wave and light as a particle, Electrons as particles and electron as waves, Wave packets and uncertainty.

Quantum Mechanics of Electrons:

General postulates of quantum mechanics, Time independent Schrodinger's equation, Analogies between quantum mechanics and classical Electromagnetics, Probabilistic current density, Multiple particle systems, Spin and angular momentum.

Free and Confined Electrons:

Free electrons, The free electron gas theory of metals,Electronsconfined to a bounded region of space and quantum numbers, Fermi level and chemical potential, Partially confined electrons – Finite potential wells, Electrons confined to atoms – The hydrogen atom and the periodic table, Quantum dots wires and wells.

MODULE – II (12 hours)

Electrons Subject to a Periodic Potential – Band Theory of Solids:

Crystalline materials, Electrons in a periodic potential, Kronig-Penney model of band structure, Band theory of solid – Doping in Semiconductors, Interacting systems model, The effect of an electric field on energy bands, Band structures of some semiconductors, Electronic bond transitions – interaction of electromagnetic energy and materials, Graphene and carbon nanotubes.

Tunnel Junctions and Applications of Tunneling:

Tunneling through a potential barrier, Potential energy profiles for material interfaces, Applications of tunneling – Field emission, Gateoxide tunneling and hot electron effects in MOSFETs, Scanning tunneling microscope, Double barrier tunneling and the resonant tunneling diode.

Coulomb Blockade and the Single-Electron Transistor:

Coulomb blockade–Coulomb blockade in a nanocapacitor, Tunnel junctions, Tunnel junction excited by a current source, Coulomb blockade in a quantum dot circuit, The single electron transistor, Other SET and FET structures – Carbon nanotube transistor, Semiconductor nanowire FETs and SETs, Molecular SETs and molecular electronics.

MODULE – III (12 hours)

Particle Statistics and Density of States:

Density of states in lower dimensions, Density of states in a semiconductor, Classical and quantum statistics – Carrier concentration in materials,The importance of the Fermi electrons, Equilibrium carrier concentration and the Fermi level insemiconductor.

Models of Semiconductor Quantum Wells, Quantum Wires and Quantum Dots:

Semiconductorheterostructures and quantum wells, Quantum wires and nanowires, Quantum dots and nanoparticles, Fabrication techniques for nanostructures – Lithography, Nanoimprint lithography, Split-gate technology, Self-assembly.

Text Books:

1. George W. Hanson, ***Fundamentals of Nanoelectronics***, Pearson Education, 2009, ISBN: 978-81-317-2679-2.

Recommended Reading:

1. Vladimir V. Mitin, Viatcheslav A. Kochelap and Michael A. Stroscio, ***Introduction to Nanoelectronics***Science, Nanotechnology, Engineering, and Applications, Cambridge University Press, 2008, ISBN: 978-0-521-88172-2

2. M. Kuno, ***Introduction to Nanoscience and Nanotechnology: A Workbook***, http://nd.edu/~mkuno/Class_downloads/Chem647_nano_text.pdf
3. G.L. Hornyak, H.F. Tibbals, JoydeepDutta, and J.J. Moore,***Introduction to Nanoscience& Nanotechnology***, CRC Press, 2008 **ISBN:** 9781420047790 **ISBN 10:** 1420047795.
4. Jeremy Ramsden, ***Essentials of Nanotechnology***, BOOKBOON.com, ISBN 978-87-7681-418

SATELLITE AND OPTICAL COMMUNICATION

Module-I (12 hours)

Orbital Mechanics: Determination of Orbital Parameters, look angle of a geostationary Satellite from Earth. Launches and Launch Vehicle.Placing Satellite into Geo-stationary Orbit.Satellite Subsystems: A brief Description of AOCS, TTC & M and Power System.Description of Communication System –Transponders. Satellite Antennas: Basic Antennas Types and Relationship; Global Beam Antenna, Satellite Antennas in Practice. Equipment Reliability & Space qualification.Redundancy.

Multiple Access :

Comprehensive study on FDMA, TDMA and CDMA. Satellite Link Design **:**Basic Transmission Theory , System Noise Temperature and G/T Ratio; G/T Ratio for Earth Station. Design of Down Link. Up link Design.Satellite Communication Link Design Procedure. System Design Example –Ku Band Propagation Effects and Their Impact on Satellite: Earth Links: Attenuation, Depolarization, Ionospheric&Troposhric effects. Prediction of Rain Attenuation.

Module-II (12 Hours)

Optical Communication System:

Major Elements of an optical fiber communication link.Optical fiber attenuation as a function of wavelength. Optical fiber: Refractive index profile of step Index and Graded Index Fibers. light ray propagation through Optical fiber. Total Internal Reflection. Numerical Aperture, Modal Concept. V number.Electromagnetic Theory of wave Propagation through step index fiber Mode Theory for Circular waveguide.Wave Equator Step Index fiber. Modes in step index fiber. Power flow in step index fiber.Graded index fiber structure. Mono mode fiber Fiber Materials: Fiber Fabrication : Double –Crucible Method. Cabling of Optical Fibers. Signal Degradation in Optical Fiber:

Attenuation: Factors contributing to losses. Signal Distortion –Inter-and Intra Modal, Chromatic, Wave
guide and Polarization Dispersions.

Module –III (12 Hours)

Optical Sources : LED, Typical GaAlAs p-n junction double heterostructure, Typical Spectral pattern, Modulation of an LED. LASER diodes: Principle of Operation. Typical Constructional features Radiation Pattern. Modulation of Laser diode , Typical Manufactures' specifications of LED & LASER. Power Lunching &Coupling : Source to fiber power launching , Coupling Power Calculation. Lensing Scheme for improvement of coupling.Fiber-to-fiber Connectors Connector loss. Techniques of Splicing .Splicing loss.

Photo Detectors : PIN and APD Photo detectors, Responsivity and Bandwidth of diodes. Noise in PDs. Equivalent Circuits.SNR.

Optical Receiver :

Receiver Configuration Sensitivity and Bandwidth of Receiver Bit Error Rate.Trans Impendence Preamplifier.

TEXT BOOKS:

1)Satellite Communication by T. Pratt, C. Bostian and J. Allnutt. 2nd Edition ,Joihn Wiley Co. Selected Portion from Chapters 2,3,4,6,8,9 and 11.

2) Digital Communication with Satellite and Fiberoptic Application, HarlodKolimbins, PHI

3) Optical Fiber Communications by G. Keiser. 3rd Edition McGraw Hill Book Co.

4) Fiber Optic Communications Technology by D. K. Mynbaev& Lowell L. Scheiner –Pearson Education.

REFERENCE BOOKS:

1. Optical fibers and Fiber Optic communication systems by Subir Kumar Sarkar , Publication : S. Chand & Co.
2. Fiber Optic communications By Joseph C. Palais 4th Edition , Pearson Publication Asia.
3. Satellite Communication by Robert M. Gagliardi, CBS Publishers

VLSI DESIGN

Module – I **(12 Hours)**

Introduction:

Historical Perspective, VLSI Design Methodologies, VLSI Design Flow, Design Hierarchy, Concept of Regularity, Modularity and Locality, VLSI Design Styles,Computer-Aided Design Technology.

Fabrication of MOSFETs:

Introduction, Fabrication Processes Flow – Basic Concepts, The CMOS n-Well Process, Layout Design Rules, Stick Diagrams, Full-Customs Mask Layout Design.

MOS Transistor:

The Metal Oxide Semiconductor (MOS) Structure, The MOS System under External Bias, Structure and Operation of MOS Transistor (MOSFET), MOSFETCurrent-Voltage Characteristics, MOSFET Scaling and Small-Geometry Effects, MOSFET Capacitance.

(Chapter 1 to 3 of Text Book 1 and for Stick Diagram Text Book 2)

Module – II **(12 Hours)**

MOS Inverters – Static Characteristics:

Introduction, Resistive-Load Inverters, Inverters with n-Type MOSFET Load, CMOS Inverter.

MOS Inverters – Switching Characteristics and Interconnect Effects:

Introduction, Delay-Time Definitions, Calculation of Delay-Times, Inverter Design with Delay Constraints, Estimation of Interconnect Parasitics, Calculation of Interconnect Delay, Switching Power Dissipation of CMOS Inverters.

Combinational MOS Logic Circuits:

Introduction, MOS Logic Circuits with Depletion nMOS Loads, CMOS Logic Circuits, Complex Logic Circuits, CMOS Transmission Gates (Pass Gates).

(Chapter 5 to 7 of Text Book 1)

Module – III **(12 Hours)**

Sequential MOS Logic Circuits:

Introduction, Behaviour of Bistable Elements, SR LatchCircuits, Clocked Latch and Flip-Flop Circuits, CMOS D-Latch and Edge-Triggered Flip-Flop.

Dynamic Logic Circuits:

Introduction, Basic Principles of Pass Transistor Circuits, Voltage Bootstrapping, Synchronous Dynamic Circuit Techniques, Dynamic CMOS Circuit Techniques, High Performance Dynamic CMOS Circuits.

Semiconductor Memories:

Introduction, Dynamic Random Access Memory (DRAM), Static Random Access Memory (SRAM), Non-volatile Memory, Flash Memory.

Text Books:

1. Sung-Mo Kang and Yusuf Leblebici, CMOS Digital Integrated Circuits: Analysis and Design, 3rd Edn., Tata McGraw-Hill Publishing Company Limited, 2003.
2. K. Eshraghian and N.H.E. Weste, Principles of CMOS VLSI Design – a Systems Perspective, 2nd Edn., Addison Wesley, 1993. 71

REFERENCE BOOKS:

1. Jan M. Rabaey, AnanthaChandrakasan, BorivojeNikolic, Digital Integrated Circuits – A Design Perspective**,** 2nd Edn., PHI.
2. Wayne Wolf, Modern VLSI Design System – on – Chip Design, 3rd Edn., PHI
3. Debaprasad Das, VLSI Design, Oxford University Press, New Delhi, 2010.
4. John P. Uyemura, *CMOS Logic Circuit Design*, Springer (Kluwer Academic Publishers), 2001.
5. Ken Martin, Digital Integrated Circuit Design, Oxford University Press, 2000.

ADVANCED SIMULATION LABORATORY [0-0-3]

(minimum 10 experiments)

1. **Introduction to Lab VIEW:-**

Introduce LabVIEW basics that are relevant for developing experiments and exercises related to communication systems.

2. **Amplitude Modulation:-**Review the basic concepts of amplitude modulation and demodulation. Demonstrate and analyze the behavior of various amplitude modulation and demodulation schemes.

3. **Frequency Modulation:-**Review the basic concepts of frequency modulation and demodulation. Build and analyze the behavior of an FM modulator and demodulator. Perform demodulation of an FM signal from a circuit and study the effect of additive noise on the demodulated output.

5. **Sampling and Quantization:-**Understand the basic concepts of sampling and quantization. Demonstrate and analyze the process of sampling with emphasis on the sampling conditions that enable regeneration of an original signal. Demonstrate and analyze uniform and non-uniform quantization algorithms taking into account the pros and cons of each approach.

6. **Pulse Coded Modulation (PCM):-** Understand the basic concepts of pulse-code modulation (PCM). Demonstrate and analyze the behavior of uniform and non-uniform PCM systems. Demonstrate and analyze the A-law and the μ –law companders. Demonstrate and analyze encoding schemes for PCM systems.

7. **Digital Modulation:-**Understand the basic concepts of MPSK and MQAM digital modulation techniques. Demonstrate and analyze MPSK and MQAM modulation techniques. Evaluate the performance of MPSK and MQAM modulation techniques.

8. **Digital Modulation:-**Understand the basic concepts of MFSK and MSK digital modulation techniques. Demonstrate and analyze MFSK, MSK, and GMSK modulation techniques. Evaluate the performance of MFSK, MSK, and GMSK modulation techniques.

9. **Demodulation and Performance:-**Understand the basic concepts of demodulation of digitally modulated signals. Demonstrate and analyze MPSK, MQAM and MFSK demodulators. Evaluate the BER performance of MPSK, MQAM, and MFSK modulation schemes. Analyze basic properties of channel coding for communication systems.

10. **PAM over Inter-Symbol Interference (ISI) Channels:-**Understand the basic concepts of PAM modulation over inter-symbol interference channels. Demonstrate and analyze PAM modulation over linear Gaussian channels. Understand the effect of pulse shaping filters on inter-symbol interference.

11. PAM over Inter-Symbol Interference (ISI) Channels:-Understand the building blocks of the receiver structure for PAM over ISI channels. Demonstrate and analyze demodulation using matched filters. Investigate various equalization techniques to combat ISI**.**

12. Digital Communication System Setup **.**

13. Simulating different Communication Channels**.**

14. Analog Communication System Setup **.**