MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI

M.Sc ELECTRONICS

CBCS (2017-2018 onwards)

General Objective:

Electronics has been the most fast developing branch of Science / Technology. Its development over the last few decades has bought about a vast change in the field of communication, and thus made life more comfortable and enjoyable. You can find Electronics as an integral part of all that you use nowadays.

There are good number of Engineers who contribute their skills in Electronics. This course will help the less privileged one who missed the chance of being an Engineer to study electronics, and try to make some contribution in the field of Electronics.The syllabus has been set in par with the Engineering syllabus for the benefit of students.

Eligibility for Admisssion

Applicants seeking admission to M.Sc degree course In Electronics must have passed the Bachelor's degree in any of the following disciplines.

(i) B.Sc Electronics and Communication
(ii) B.Sc Electronics
(iii) B.Sc Physics
(iv) B.Sc Chemistry with Physics or Electronics as allied subject
(v) B.Sc Mathematics with Physics or Electronics as allied subject
(vi) B.Sc Geology with Physics or Electronics as allied subject
(vii) B.Sc Computer Science
(viii) B.Sc Information Technology
(ix) B.C.A

Medium of instruction and Examination

Medium of instruction and examination shall be **ENGLISH.**

MANONMANIAM SUNDARANAR UNIVERSITY
TIRUNELVELI
PG COURSES – AFFILIATED COLLEGES
Course Structure for M.Sc . Electronics
(Choice Based Credit System)
(with effect from the academic year 2017- 2018 onwards)

Sem (1)	Sub. No (2)	Subject Status (3)	Subject Title (4)	Contact Hrs / Week (5)	Credits (6)
I	1	Core – 1	Solid State Electronic Devices	6	4
	2	Core – 2	Applied Mathematics	6	4
	3	Core – 3	Signals and Systems	5	4
	4	Core – 4	Network Theory	5	4
	5	Core – 5 Practical - 1	Analog electronic design lab	4	2
	6	Core – 6 Practical - 2	Analog circuit simulation lab	4	2
II	7	Core – 7	Digital Signal Processing	5	4
	8	Core - 8	Embedded Systems	5	4
	9	Core – 9	Advanced Microprocessors	4	4
	10	Core – 10	Communication Theory	4	4
	11	Core – 11	Field Work	4+	3
	12	Core – 12 Practical – 3	Digital Electronic design lab	4	2
	13	Core – 13 Practical - 4	Digital Circuits Simulation Lab	4	2

Sem (1)	Sub. No (2)	Subject Status (3)	Subject Title (4)	Contact Hrs / Week (5)	Credits (6)
III	14	Core – 14	Electromagnetic Theory	6	4
	15	Core - 15	Nano Electronics	6	4
	16	Core – 16	Digital Design Using VHDL	5	4
	17	Core – 17	Research Methodology	5	4
	18	Core – 18 Practical - 5	DSP Matlab Lab	4	2
	19	Core – 19 Practical – 6	DSP Processor Lab	4	2
IV	20	Core – 20	Advanced Medical Electronics	4	4
	21	Core - 21	Micro Electronic Mechanical Systems	4	4
	22	Core – 22	Advanced Microcontrollers	4	4
	23	Core – 23 Practical - 7	Embedded systems laboratory using8051	4	2
	24	Core – 24 Practical - 8	Embedded laboratory usingPIC and RTOS	4	2
	25	Elective - 1	Elective / Field Work / Study Tour 1.Electronic testing 2.Opto electronic devices	3+	3
	26	Core – 25	Project	7+	8

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SOLID STATE ELECTRONIC DEVICES

UNIT I

CRYSTAL PROPERTIES AND GROWTH OF SEMICONDUCTORS

Semiconductor materials - Periodic Structures - Crystal Lattices - Cubic lattices – Planes and Directions - Diamond lattice - Bulk Crystal Growth - Starting Materials - Growth of Single Crystal lngots - Wafers - Doping - Epitaxial Growth - Lattice Matching in Epitaxial Growth - Vapor - Phase Epitaxy - Atoms and Electrons - Introduction to Physical Models - Experimental Observations - Photoelectric Effect - Atomic spectra - Bohr model - Quantum Mechanics - Probability and Uncertainty Principle - Schrodinger Wave Equation - Potential Well Equation - Potential well Problem - Tunneling.

UNIT II

ENERGY BANDS AND CHARGE CARRIERS

Energy bands in Solids, Energy Bands in Metals, Semiconductors, and Insulators - Direct and Indirect Semiconductors - Variation of Energy Bands with Alloy Composition - Charge Carriers in Semiconductors - Electrons and Holes - Electrons and Holes in Quantum Wells - Carrier Concentrations - Fermi Level - Electron and Hole Concentrations at Equilibrium - Temperature Dependence of Carrier Concentrations - Compensation and Space Charge Neutrality - Drift of Carrier in Electric and Magnetic Fields conductivity and Mobility - Drift and Resistance - Effects of Temperature and Doping on Mobility - High field effects - Hall Effect - invariance of Fermi level at Equilibrium - Fabrication of p-n junctions, Metal semiconductor junctions.

UNIT III

METAL OXIDE SEMICONDUCTOR FET

GaAS MESFET - High Electron Mobility Transistor - Short channel Effects – Metal Insulator Semiconductor FET - Basic Operation and Fabrication - Effects of Real Surfaces - Threshold Voltage - MOS capacitance Measurements - current – Voltage Characteristics of MOS Gate Oxides - MOS Field Effect Transistor - Output Characteristics - Transfer characteristics - Short channel MOSFET V-I characteristics - Control of Threshold Voltage - Substrate Bias Effects - Sub threshold characteristics - Equivalent Circuit for MOSFET - MOSFET Scaling and Hot Electron Effects - Drain - Induced Barrier Lowering - short channel and Narrow Width Effect - Gate Induced Drain Leakage.

UNIT IV

OPTO ELECTRONIC DEVICES

Photodiodes - Current and Voltage in illuminated Junction - Solar Cells - Photo detectors - Noise and Bandwidth of Photo detectors - Light Emitting Diodes - Light Emitting Materials - Fiber Optic Communications Multilayer Heterojunctions for LEDs - Lasers - Semiconductor lasers - Population Inversion at a Junction Emission Spectra for p-n junction - Basic Semiconductor lasers - Materials for Semiconductor lasers.

UNIT V

HIGH FREQUENCY AND HIGH POWER DEVICES

Tunnel Diodes, IMPATT Diode, operation of TRAPATT and BARITT Diodes, Gunn Diode - transferred - electron mechanism, formation and drift of space charge domains, p-n-p-n Diode, Semiconductor Controlled Rectifier, Insulated Gate Bipolar Transistor.

TEXT BOOK

1. Ben. G. Streetman & Sanjan Banerjee, Solid State Electronic Devices, 5th Edition, PHI, 2003.

REFERENCES

1. Donald A. Neaman, Semiconductor Physics and Devices, 3rd Edition, TMH, 2002.
2. Yannis Tsividis, Operation & Mode line of MOS Transistor, 2nd Edition, Oxford University Press, 1999.
3. Nandita Das Gupta & Aamitava Das Gupta, Semiconductor Devices Modeling a Technology, PHI, 2004.
4. D.K. Bhattacharya & Rajinish Sharma, Solid State Electronic Devices, Oxford University Press, 2007.

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APPLIED MATHEMATICS

UNIT I

MATRIX

Elementary transformation – finding inverse and rank using elementary transformation – solution of linear equations using elementary transformations – eigenvalues and eigenvectors – application of Cayley Hamiltion theorem – Diagonalization – Reduction of quadratic form into sum of squares using orthogonal transformation – nature of quadratic form.

UNIT II

PARTIAL DIFFERENTIATION

Partial differentiation – chair rules – Eulers theorem for homogeneous functions – Taylors series for function of two variables – maxima and minima of function of two variables (proof of results not expected.)

UNIT III

MULTIPLE INTEGRALS

Double integrals in cartesian and polar co-ordinates – application in finding area and volume using double integrals – change of variables using Jacobian – triple integrals in cartesian, cylindrical and spherical co-ordinates – volume using triple integrals – simple problems.

UNIT IV

LAPLACE TRANSFORMS

Laplace transforms – Laplace transform of derivatives and integrals – shifting theorem – differentiation and integration of transforms – inverse transforms – application of convolution property – solution of linear differential equations with constant coefficients using Laplace transform – Laplace transform of unit step function, impulse function and periodic function

UNIT V

FOURIER SERIES

Dirichelt conditions – Fourier series with period π and 2π – Half range sine and cosine series – simple problems – rms value.

REFERENCES

1. Advanced Engg. Mathematics — Erwin Kreyszig
2. Higher Engg. Mathematics — Grewal B.S.
3. Engg. Mathematics — N.P.Bali
4. Laplace and Fourier Transforms — Goyal and Gupta
5. Advanced Mathematics for Engineers — E.S.Sokolinokoff
6. Methods of Applied Mathematics — F.B.Hilderbrand

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SIGNALS AND SYSTEMS

UNIT I

DYNAMIC REPRESENTATION OF SYSTEMS

Systems Attributes- Causality - linearity- Stability- time-invariance. Special Signals- Complex exponentials- Singularity functions (impulse and step functions). Linear Time-Invariant Systems: Differential equation representation- convolution Integral. Discrete form of special functions. Discrete convolution and its properties. Realization of LTI system (differential and difference equations).

UNIT II

FOURIER ANALYSIS

Fourier Analysis of Continuous Time Signals and Systems - Fourier Series- Fourier Transform and properties- Parseval's theorem- Frequency response of LTI systems. Sampling Theorem.

UNIT III

FOURIER ANALYSIS OF DISCRETE TIME SIGNALS

Fourier analysis of discrete time signals & Systems - Discrete-Time Fourier series- Discrete-Time Fourier Transform (including DFT) and properties. Frequency response of discrete time LTI systems.

UNIT IV

LAPLACE TRANSFORM

Laplace Transform and its inverse: Definition- existence conditions- Region of Convergence and properties- Application of Laplace transform for the analysis of continuous time LTI system (stability etc.) Significance of poles & zeros- Z-Transform - Z-Transform and its inverse: Definition- existence- Region of convergence and properties- Application of Z-Transform for the analysis of Discrete time LTI systems- Significance of poles and zeros.

UNIT V

RANDOM SIGNALS

Introduction to probability. Bayes Theorem- concept of random variable- probability density and distribution functions- function of a random variable. Moments- Independence of a random variable. Introduction to random process. Auto and cross correlation. wide-sense stationarity- power spectral density White noise- Random processes through LTI systems.

REFERENCES

1. Signals and Systems: Oppenheim Alan- V- Willsky Alan. S- Pearson Edn.
2. Communication Systems: Haykin Simon- John Wiley.
3. Signals and Systems: I J Nagrarth- Tata Mc Graw Hill.
4. Signals and Systems: Farooq Husain- Umesh pub.
5. Adaptive signal processing: W Bernad- Pearson Edn.

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NETWORK THEORY

UNIT I

SOURCE TRANSFORMATION

Mesh and Node voltage Analysis – Coupled circuits – Dot conventions – Analysis of coupled circuits.

UNIT II

NETWORK THEOREMS

Super position theorem- Reciprocity theorem - Thevenin's theorem- Norton's theorem- Millman's theorem- Maximum power transfer theorem- Tellegen's theorem-Graph of a network -Trees- co-trees -Incident matrix- cut- set matrix-tie-set matrix-Analysis of networks- equilibrium equations.

UNIT III

FOURIER ANALYSIS

Fourier analysis and Laplace transform - Fourier analysis of periodic signals-Trignometric and exponential forms- Non periodic signals and Fourier transforms-Frequency spectrum of periodic waveforms - Laplace Transform- Review of theorems-Laplace transform of important signal waveforms - Periodic functions-Initial value and final value Theorems- DC&AC transients- Solution of network problems using Laplace transform.

UNIT IV

TWO-PORT NETWORKS AND FILTERS

Voltage and Current ratios of two - port networks -Admittance- impedance-hybrid and transmission parameters of two port networks. Passive filters as two port networks- Characteristics of ideal filters-Image impedance- Constant K low pass-High pass and Band pass filters-m-derived filters-Composite filters.

UNIT V

NETWORK SYNTHESIS

Realizability concept – Hurwitz property – positive realness – properties of positive real function – Synthesis of R, L, RC and LC driving point functions – Foster and Cauer forms.

REFERENCES

1. Network analysis -M.E Van Valkenburg, PHI
2. Circuits and Networks – analysis & synthesis – A. Sudhakar & S P ShyamMohan
3. Network and Systems -D Roy Chaudhary
4. Network analysis and synthesis-Franklin F Kuo – John Wiley & Sons
5. Engineering Circuit Analysis-W H Hayt & Jack Kennerly – Mc-Graw Hill

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ANALOG ELECTRONIC DESIGN LAB

List of experiments

All Experiments to be carried out compulsorily

1. Power amplifiers: Design of class A and class AB push pull stage – verification of power output.
2. IC power amplifier.Design
3. Design of a Single Stage CE amplifier of given gain.
4. Feedback amplifier, design of two stage RC coupled amplifier.
5. Tuned Class C Amplifier.
6. Oscillators: Design of RC phase shift, Hartley & Colpitts oscillators.
7. Design of Mono-stable and bi-stable multi-vibrators using Transistors..
8. Design of bootstrap sweep generator.
9. SCR, Triac firing circuits. Design
10. Integrator,Differentiator,Clipper,Clamper
11. Design and analysis of (a) Half wave rectifier and (b) Full wave rectifier.
12. Design and analysis of (a) C- filter and (b) Zener regulator on the output of FWR.
13. Study of the I-V Characteristics of UJT and design relaxation oscillator..
14. Study of the output and transfer I-V characteristics of common source JFET.
15. Study of Fixed Bias and Voltage divider bias configuration for CE transistor.

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ANALOG CIRCUIT SIMULATION LAB

All experiments have to be conducted compulsorily (Use Pspice or similar Package for simulation)

1. Differential Amplifier
2. R.C Coupled amplifier-study with bias,load and input signal variation.
3. RC Phase shift Oscillator, variation of output with load and supply.
4. Hartley oscillator, variation of output with load and supply.
5. Colpitts oscillator, variation of output with load and supply.
6. Design a Wein`s Bridge oscillator of given frequency.
7. Design the inverting and non-inverting amplifier using an Op-Amp of given gain
8. Adder, Subtractor, using OP-Amp.
9. Design and Verification of op-amp as integrator and differentiator
10. Design the 1storder active low pass and high pass filters of given cutoff frequency
11. Active Filters Butterworth 2^{nd} order High pass, Low pass (Magnitude and Phase Response)
12. Astable,Monostable,BistableMultivibrator-Transistor bias
13. Full wave,Half wave,Bridge rectifier circuit.
14. Series voltage regulator, variation of line voltage and load.
15. To verify the Thevenin and Norton Theorems.
16. Design and analyze the series and parallel LCR circuits

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DIGITAL SIGNAL PROCESSING

UNIT I

REVIEW OF SIGNALS AND SYSTEMS

Introduction - advantages and limitations of Digital Signal Processing. Infinite Impulse Response (IIR) Filters - Signal Flowgraph- Basic Network structure for IIR filter- Direct- Cascade- Parallel Forms. Design of IIR Digital filters from analog filters- Butterworth design- Chebyshev design- design based on numerical solutions of differential equations- Impulse Invariant Transformation.

UNIT II

FINITE IMPULSE RESPONSE (FIR) FILTERS

Linear phase FIR filters- Frequency response of linear phase FIR filters - Location of the zeros of linear phase FIR filters. Realization of FIR- cascade - lattice design-Fourier Series method- using windows-rectangular- triangular or Barlett windows- Hanning- Hamming- Blackman- Kaiser windows.

UNIT III

DISCRETE FOURIER TRANSFORM

Properties-Circular convolution- Linear Convolution using DFT- relation between Z- Transform and DFT- Fast Fourier Transform; decimation – in time and Frequency - FFT algorithms – General Computation using Radix 2 algorithm.

UNIT IV

FINITE WORD LENGTH EFFECTS IN DIGITAL FILTERS

Introduction- Number Representation - Fixed Point- Sign-Magnitude - One's-complement- Two's - complement forms -Addition of two fixed point numbers- Multiplication in Fixed Point arithmetic - Floating point numbers- Block floating point numbers- quantization - truncation- rounding - effects due to truncation and rounding- Input quantization error - Product quantization error - Co-efficient quantization error- zero-input limit cycle Oscillations - Overflow limit cycle Oscillations - Scaling- Quantization in Floating Point realization IIR digital filters - Finite Word Length Effects in FIR Digital Filters- Quantization effects in the Computation of the DFT- quantization errors in FFT algorithms.

UNIT V

APPLICATIONS OF DIGITAL SIGNAL PROCESSING

Speech Processing- speech analysis- speech coding- sub band coding- channel vecoder- homomorphic vocoder- digital processing of audio signals- Radar signal processing- DSP based measurements systems. Equi ripple FIR design- PCM DSP chips- a general study.

REFERENCES

1. Digital signal processing: Ifechor- Pearson edn.
2. Desecrate time signal processing: Oppenhiem- Pearson edn.
3. Digital signal processing: Oppenhiem and Sheffer- PHI
4. Introduction to Digital signal processing: Johny R Johnson
5. Digital signal processing: Proakis and Manolakis.
6. Digital signal processing: P Ramesh Babu- Scitech Pub

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EMBEDDED SYSTEMS

UNIT I

OVERVIEW OF EMBEDDED SYSTEM

Embedded System, Categories of Embedded System, Requirements of Embedded Systems, Challenges and Issues in Embedded Software Development, Applications of Embedded Systems in Consumer Electronics, Control System, Biomedical Systems, Handheld computers, Communication devices.

UNIT II

EMBEDDED HARDWARE & SOFTWARE DEVELOPMENT ENVIRONMENT

Hardware Architecture, Micro-Controller Architecture, Communication Interface Standards, Embedded System Development Process, Embedded Operating systems, Types of Embedded Operating systems.

UNIT III

EMBEDDED COMMUNICATION SYSTEM

Serial Communication, PC-to-PC Communication, Serial Communication with the 8051 Family of Micro-controllers, Protocol Converter, Voice-over-IP, Embedded Applications over Mobile Network example MP3 Sound Player.

UNIT IV

REAL TIME & DATABASE APPLICATIONS

Real-Time Embedded Software Development, Sending a Message over a Serial Link, Simulation of a Process Control System, Controlling an Appliance from the RTLinux System, Embedded Database Applications using examples like Salary Survey, Energy Meter Readings.

UNIT V

JAVA APPLICATIONS & FUTURE TRENDS IN EMBEDDED SYSTEMS:

Networked Java-Enabled Information Appliances, Embedded Process Control System, Mobile Java Applications, Appliance Control using Jini, System on a Chip (SOC), Smart Cards and the Cashless Society, Security in Embedded Systems.

TEXT BOOK

1. Programming for Embedded Systems- Dreamtech Software Team, Wiley Dreamtech

REFERENCE

1.Fundamentals of Embedded Software where C and Assembly Meet – Daniel W Lewis.

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ADVANCED MICROPROCESSORS

UNIT I

CISC PRINCIPLES

Classic CISC microprocessors, Intel x86 Family: Architecture - register set – Data formats - Addressing modes - Instruction set - Assembler directives – Interrupts Segmentation, Paging, Real and Virtual mode execution – Protection mechanism, Task management 80186, 286, 386 and 486 architectures.

UNIT II

PENTIUM PROCESSORS

Introduction to Pentium microprocessor – Special Pentium Registers – Pentium Memory Management – New Pentium instructions – Introduction to Pentium Pro and its special features – Architecture of Pentium-II, Pentium-III and Pentium4 microprocessors.

UNIT III

RISC PRINCIPLES

RISC Vs CISC – RISC properties and evaluation – On chip register File Vs Cache evaluation – Study of a typical RISC processor – The PowerPC – Architecture & special features – Power PC 601 – IBM RS/6000, Sun SPARC Family – Architecture – Super SPARC.

UNIT IV

RISC PROCESSOR

MIPS Rx000 family – Architecture – Special features – MIPS R4000 and R4400 – Motorola 88000 Family – Architecture – MC 88110 – MC 88100 and MC 88200.

UNIT V

SPECIAL PURPOSE PROCESSORS

EPIC Architecture – ASIPs – Network Processors – DSPs – Graphics / Image Processors.

TEXT BOOK

1. Daniel Tabak, “Advanced Microprocessors”, Tata McGraw-Hill, 1995, 2nd Edition.
2. The 80x86 family John Uffenbeck

REFERENCES

1. www.intel.com/products/server/processors/server/itanium2 (Unit V:EPIC)
2. www.hpl.hp.com/techreports/1999/HPL-1999-111.html (Unit V: Network Processor)
3. www.intel.com/design/network/products/npfamily (Unit V: Network Processor)
4. www.national.com/appinfo/imaging/processors.html(Unit V: Image Processor)
5. Barry B.Brey, "The Intel Microprocessors, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, PentiumPro Processor, PentiumII, PentiumIII,
6. PentiumIV, Architecture, Programming & Interfacing", 6th Edition, Pearson Education/PHI, 2002

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COMMUNICATION THEORY

UNIT I

INTRODUCTION

communication systems – Modulation - need for modulation- bandwidth- Amplitude modulation - theory- mathematical representation- frequency spectrum - USB & LSB- power relation- Frequency modulation - theory- mathematical representation- frequency spectrum- Phase modulation- comparison of AM- FM- PM.

UNIT II

RADIO TRANSMITTERS

AM transmitter - block diagram - Solid state modulators - circuit explanation- FM transmitter - reactance modulator- varactor diode modulator- Amstrong modulator.

UNIT III

RADIO RECEIVERS

Tuned radio frequency receiver- superheterodyne receiver - block schematic- selectivity- sensitivity- importance of IF - image frequency rejection - AM receivers - schematic explanation - RF amplifiers - circuit explanation - Mixer circuits - IF amplifiers - circuit explanation- simple diode detector - Automatic gain control circuit - simple and delayed AGC - FM receivers - block schematic explanation - amplitude limiting - FM demodulators: slope detectors- phase discriminator- ratio detectors.

UNIT IV

SIDE BAND COMMUNICATION

Single side band transmission - suppression of carrier - balanced modulator - filtering of unwanted sideband - SSB receivers - block schematic explanation - pilot carrier receiver - suppressed carrier receiver - Vestigial side band transmission - transmitter and receiver responses - advantages of VSB in television.

UNIT V

TELEPHONE SYSTEMS

Telephone subscribers loop circuit - subscribers line interface circuit - Pulse and tone signaling - Frequency assignments - Electronic telephone - block schematic of a telephone set- block schematic of single line analog SLIC board - two wire repeaters - Electronic private automatic branching exchange - basic block schematic- Power line communication: block schematic explanation- Facsimile - FAX transmitter and receiver.

REFERENCES

1. Electronic communication Systems: Wayne Tomasi- Pearson Edn.
2. Electronic communication: Roody and Coolen- PHI.
3. Electronic Communication systems: George Kennedy- Mc Graw Hill.
4. Electronic and radio engineering: A P Mathur.
5. Telephony and Carrier current engineering: P N Das.

Modern communication Systems: Couch- PHI

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Mini project

Students are adviced to select topics of their own interest in hardware and develop their hardware skills by designing a circuit of their own.Periodical assesment to be done to evaluate their skills.

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DIGITAL ELECTRONIC DESIGN LAB

All experiments have to be conducted compulsorily

1. TTL & CMOS characteristics (7400, CD4001)
2. Interfacing of TTL & electromagnetic relay using transistor, opto coupler (4N33) & Darlington arrays (ULN2803).
3. Logic family interconnection (TTL to CMOS & CMOS to TTL)
4. Design and testing of ripple & synchronous counters using JK flip flops (7473, 7476)
5. Counters using shift registers (Ring counter & Johnson counter).
6. Study of counter ICs (7490, 74190).
7. Design of astable & mono-stable multi-vibrators using gates.
8. Design of mono-shots using dedicated ICs (74123).
9. Logic design using multiplexers (74150).
10. Logic design using decoders (74138).
11. Design of 7 segment display circuits-static/dynamic (7447, FND542).
12. 4 bit binary adder and adder-subtractor using Full adder IC.
13. To design a seven segment decoder.
14. To build Flip-Flop (RS, Clocked RS, D-type and JK) circuits using NAND gates.
15. To build JK Master-slave flip-flop using Flip-Flop ICs.
16. To make a Shift Register (serial-in and serial-out) using D-type/JK Flip-Flop ICs.

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DIGITAL CIRCUIT SIMULATION LAB

All experiments have to be conducted compulsorily

1. Binary Adder and Subtractor.
2. Code Convertors
3. Master Slave JK Flip- Flop.
4. Multiplexer and Demultiplexer.
5. Encoders and Decoders
6. Modular N-counter.
7. Up counter.
8. Down Counter
9. Ring counter
10. Ripple counter
11. Synchronous counter
12. Asynchrounous Counters
13. Shift registers SISO,SIPO,PISO and PIPO
14. PRBS Generator.
15. Parity generator/checker.

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ELECTROMAGNETIC THEORY

UNIT I

REVIEW OF VECTOR ANALYSIS

Cartesian, Cylindrical and Spherical co-ordinates systems- Co-ordinate transformations. Static electric field: Coulomb's Law of point charges- Electric flux- Gauss's Law- Electrical scalar potential- different types of potential distribution- Potential gradient- Boundary conditions Capacitance: Capacitance of isolated sphere- capacitance between two concentric sphere shells- capacitance between coaxial cylinders- capacitance between parallel wires. Vector fields: Divergence and curl- Divergence theorem- Stokes theorem.

UNIT II

MAGNETIC FIELD

Steady current and current density in a conductor- Biot-Savarts Law- Ampere's Law- Helmholtz theorems- Faraday's law of electromagnetic induction- Solenoid, toroid, inductance of transmission line- Mutual inductance energy stored in magnetic fields- Magnetic dipole- Electric and Magnetic boundary conditions- vector magnetic potential.

UNIT III

MAXWELL'S EQUATIONS AND TRAVELLING WAVES

Conduction current and displacement current- Maxwell's equations- Plane waves- Poynting theorem and Poynting vector- Plane electromagnetic waves- Solution for free space condition- Uniform plane wave-wave equation for conducting medium- Wave polarization- Poisson's and Laplace equations.

UNIT IV

GUIDED WAVES

Guided waves between parallel planes- transverse electric and transverse magnetic waves and its characteristics- Rectangular wave guides- modes of propagation.

UNIT V

TRANSMISSION LINES

Transmission line equations- transmission line parameters- Skin effect- VSWR- Characteristic impedance- Stub matching- Smith chart - Phase velocity and group velocity.

REFERENCES

1. Engineering Electromagnetics: W. H. Hayt, Mc Graw Hill Publications.
2. Electromagnetics: J. D. Kraus, Mc Graw Hill Publications.
3. Engineering electromagnetics: E. C. Jordan.
4. Field & Wave Electromagnetic: Cheng, Pearson Education.
5. Electromagnetics: Edminister, Schaum series, 2 Edn.
6. Electromagnetic Theory: B. Premlet.
7. Electromagnetic Theory: Sadiku, Oxford University Press.

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NANO ELECTRONICS

UNIT I

INTRODUCTION TO NANOTECHNOLOGY

Background to nanotechnology: Types of nanotechnology and nanomachines – periodic table – atomic structure – molecules and phases – energy – molecular and atomic size – surface and dimensional space – top down and bottom up; Molecular Nanotechnology: Electron microscope – scanning electron microscope – atomic force microscope – scanning tunnelling microscope – nanomanipulator – nanotweezers – atom manipulation – nanodots – self assembly – dip pen nanolithography. Nanomaterials: preparation – plasma arcing – chemical vapor deposition – sol-gels – electrodeposition – ball milling – applications of nanomaterials;

UNIT II

FUNDAMENTALS OF NANOELECTRONICS

Fundamentals of logic devices:- Requirements – dynamic properties – threshold gates; physical limits to computations; concepts of logic devices:- classifications – two terminal devices – field effect devices – coulomb blockade devices – spintronics – quantum cellular automata – quantum computing – DNA computer; performance of information processing systems;- basic binary operations, measure of performance processing capability of biological neurons – performance estimation for the human brain. Ultimate computation:- power dissipation limit – dissipation in reversible computation – the ultimate computer.

UNIT III

SILICON MOSFETs & QUANTUM TRANSPORT DEVICES

Silicon MOSFETS - Novel materials and alternate concepts:- fundamentals of MOSFET Devices- scaling rules – silicon-dioxide based gate dielectrics – metal gates – junctions& contacts – advanced MOSFET concepts. Quantum transport devices based on resonant tunneling:- Electron tunneling – resonant tunneling diodes – resonant tunneling devices; Single electron devices for logic applications:- Single electron devices – applications of single electron devices to logic circuits.

UNIT IV

CARBON NANOTUBES

Carbon Nanotube: Fullerenes - types of nanotubes – formation of nanotubes – assemblies – purification of carbon nanotubes – electronic propertics – synthesis of carbon nanotubes – carbon nanotube interconnects – carbon nanotube FETs – Nanotube for memory applications – prospects of carbon nanotube nanoelectronics.

UNIT V

MOLECULAR ELECTRONICS

Electrodes & contacts – functions – molecular electronic devices – first test systems – simulation and circuit design – fabrication; Future applications: MEMS – robots – random access memory – mass storage devices.

TEXTBOOK

1. Michael Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons and Burkhard Raguse, Nanotechnology: Basic Science and Emerging Technologies, Chapman & Hall / CRC, 2002
2. T. Pradeep, NANO: The Essentials – Understanding Nanoscience and Nanotechnology, TMH, 2007
3. Rainer Waser (Ed.), Nanoelectronics and Information Technology: Advanced Electronic Materials and Novel Devices, Wiley-VCH, 2003

MSU / 2017-18 / PG –Colleges / M.Sc. (Electronics) / Semester –III / Ppr.no.16 / Core- 16

DIGITAL DESIGN USING VHDL

UNIT – I

INTRODUCTION & BASIC LANGUAGES

Introduction to HDLs: Difference between HDL and other software languages – Different HDLs in vogue. Overview of digital system design using HDL Basic VHDL Language Elements: Identifiers, Data objects, scalar and composite data types, Operators

UNIT – II

BEHAVIORAL MODELING

Behavioral Modeling with examples: Entity declaration, Architecture body, Process statement and sequential statements. Inertial and transport delay models, creating signal waveforms, signal drivers, effect of transport and inertial delays on signal drivers.

UNIT – III

DATA FLOW AND STRUCTURAL MODELING

Data Flow Modeling with examples: Concurrent signal assignment statement, Concurrent versus sequential signal assignment, Delta delays, Multiple drivers, Conditional signal assignment statement, selected signal assignment statement, concurrent assertion statement. Structural Modeling with examples: Component declaration, Component instantiation and examples, direct instantiation of component.

UNIT – IV

SUBPROGRAMS AND PACKAGES

Subprograms and Overloading: Functions and procedures with simple examples - Subprogram overloading, Operator overloadingPackages and Libraries: Package declaration, package body, design file, design libraries, order of analysis, implicit visibility, explicit visibility, library clause and use clause. Advanced Features: Entity statements, Generate statements, Attributes, Aggregate targets, ports and their behavior.

UNIT – V

SIMULATION AND HARDWARE MODELING

Model Simulation: Simulation – Writing a Test Bench for a Half and a Full adder. Hardware Modeling Examples: Modeling entity interfaces, Modeling simple elements, Different styles of modeling, Modeling regular structures, Modeling delays, Modeling conditional operations, Modeling a clock divider and a pulse counter.

REFERENCE BOOKS

1. A VHDL Primer - By J.Bhasker ., 3rd edition - PHI, New Delhi, 2007
2. Circuit design with VHDL by Volnei . Pedroni – PHI, New Delhi, 2007
3. Digital Systems Design using VHDL by Charles H.Roth Jr.- PWS Pub.,1998
4. Introductory VHDL : From Simulation to Synthesis – by Sudhakar Yalamanchili.- Pearson Education Asia., 2001
5. VHDL Programming by Example – By Douglas L.Perry.- 4th Ed - TMH., 2002
6. Fundamentals of Digital Logic with VHDL Design – by Stephen Brown & Zvonko Vranesic - TMH. 2002
7. VHDL – Analysis & Modeling of Digital Systems – By Zainalabedin Navabi- 2nd Ed - TMH, 1998
8. The Designer's Guide to VHDL - By Peter J. Ashenden -2nd Ed., 1st Indian Reprint- Harcourt India Pvt. Ltd., 2001

MSU / 2017-18 / PG –Colleges / M.Sc. (Electronics) / Semester –III / Ppr.no.17 / Core- 17

RESEARCH METHODOLOGY

UNIT I

Research methodology: An Introduction Objectives of Research, Types of Research, Research Methods and Methodology, Defining a Research Problem, Techniques involved in Defining a Problem. Research Design Need for Research Design, Features of Good Design, Different Research Designs, Basic Principles of Experimental Designs.

UNIT II

Sampling Design, Steps in Sampling Design, Types of Sampling Design, Sampling Fundamentals, Estimation, Sample size Determination, Random sampling. Measurement and Scaling Techniques Measurement in Research, Measurement Scales, Sources in Error, Techniques of Developing Measurement Tools, Scaling, Meaning of Scale, Scale Construction Techniques.

UNIT III

Methods of Data Collection and Analysis Collection of Primary and Secondary Data, Selection of appropriate method Data Processing Operations, Elements of Analysis, Statistics in Research, Measures of Dispersion, Measures of Skewness, Regression Analysis, Correlation.

UNIT IV

Techniques of Hypotheses, Parametric or Standard Tests Basic concepts, Tests for Hypotheses I and II, Important parameters limitations of the tests of Hypotheses. Chisquare Test, Comparing Variance, As a nonparametric Test, Conversion of Chi to Phi, Caution inusing Chisquare test.

UNIT V

Analysis of Variance and Covariance ANOVA, One way ANOVA, Two Way ANOVA, ANOCOVA Assumptions in ANOCOVA, Multivariate Analysis Technique Classification of Multivariate Analysis, factor Analysis, Rtype Q Type factor Analysis, Path Analysis.

MSU / 2017-18 / PG –Colleges / M.Sc. (Electronics) / Semester –III / Ppr.no.17 / Core- 17

REFERENCE BOOKS

1. “Research Methodology”, C.R. Kothari, Wiley Eastern.
2. “Formulation of Hypothesis”, Willkinson K.P, L Bhandarkar, Hymalaya Publication, Bombay.
3. “Research in Education”, John W Best and V. Kahn, PHI Publication.
4. “Research Methodology A step by step guide for beginners”, Ranjit Kumar, Pearson Education
5. “Management Research MethodologyIntegration of principles, methods and Techniques”, K.N. Krishna swami and others, Pearson Education.

MSU / 2017-18 / PG –Colleges / M.Sc. (Electronics) / Semester –III / Ppr.no.18 / Practical- 5

DSP-MATLAB LABORATORY

LIST OF EXPERIMENTS USING MATLAB/SCILAB

All experiments have to be conducted compulsorily

1. Verification of Sampling theorem.
2. Impulse response of a given system
3. Linear convolution of two given sequences.
4. Circular convolution of two given sequences
5. Autocorrelation of a given sequence and verification of its properties.
6. Cross correlation of given sequences and verification of its properties.
7. Solving a given difference equation.
8. Computation of N point DFT of a given sequence and to plot magnitude and phase spectrum.
9. Linear convolution of two sequences using DFT and IDFT.
10. Circular convolution of two given sequences using DFT and IDFT
11. Design and implementation of FIR filter to meet given specifications.
12. Design and implementation of IIR filter to meet given specifications.
13. Implementation of FFT of a given sequence.
14. Generation of DTMF signals.
15. Implementation of Decimation Process.
16. Implementation of Interpolation Process.

MSU / 2017-18 / PG –Colleges / M.Sc. (Electronics) / Semester –III / Ppr.no.19 / Practical- 6

DSP-PROCESSOR LABORATORY

LIST OF EXPERIMENTS USING DSP PROCESSOR

All experiments have to be conducted compulsorily

1. Linear convolution of two given sequences.
2. Circular convolution of two given sequences.
3. Computation of N- Point DFT of a given sequence
4. Realization of an FIR filter (any type) to meet given specifications .The input can be a signal from function generator / speech signal.
5. Realization of an IIR filter to meet given specifications.
6. Audio applications such as to plot time and frequency (Spectrum) display of Microphone output plus a cosine using DSP. Read a wav file and match with their respective spectrograms
7. Noise: Add noise above 3kHz and then remove; Interference suppression using 400 Hz tone.
8. Implementation of N point FFT algorithm.
9. Impulse response of first order and second order system
10. Waveform Generation.
11. Correlation of two discrete signals.
12. Sum of two sinusoidal signals
13. Frequency response of analogLP/HP filters
14. Computation of Power Density spectrum of a sequence
15. Computation of the FFT of given 1-D signal.
16. Frequency responses of anti imaging and anti aliasing filters.

REFERENCE BOOKS

1. Sanjeet Mitra, Digital signal processing using MATLAB, TMH, 2001
2. J.G.Proakis & Ingale, Digital signal processing using MATLAB,.MGH, 2000
3. B.Venkataramani and Bhaskar, Digital signal processors, TMH,2002

MSU / 2017-18 / PG –Colleges / M.Sc. (Electronics) / Semester –IV / Ppr.no.20 / Core- 20

ADVANCED MEDICAL ELECTRONICS

UNIT I

Biomedical instruments- parameters- Man-instrument system- components- physiological systems of human body- cardiovascular system- The heart- Respiratory system- blood purification- The Kidney- Nervous system- Bioelectric potentials- Resting and Action potentials- propagation- bio-potential electrodes- Transducers- ECG-EEG-EMG.

UNIT II

Biomedical measurements:ECG measurement- electrodes and leads- ECG recorder- different recorders. Blood pressure measurements- indirect measurement- sphygmomanometer- direct measurement techniques. Respiratory measurements- Lung volume and capacities- Spirometer- Gas exchange measurements. Clinical measurements: Blood cells- tests on blood cells- chemical tests- colorimeter- spectro photometer- continuous flow analyzer.

UNIT III

Ultrasonic measurements: Characteristics of Ultrasound- Attenuation- Doppler effect- basic modes of transmission- pulsed, continuous, pulsed Doppler- Ultrasonic imaging- Block schematic of A mode, B mode, M mode instruments- Electronic scanners: Linear and Phased array- Applications of Ultrasound: Gynecology and obstetrics- blood flow measurements- cardiac imaging- echocardiography- echoencephalography.

UNIT IV

X ray imaging and measurements: x ray generation- x ray machine- C arm machine- image intensifiers- x ray films- photographic imaging- Fluoroscopy- computed tomography- CAT scan: block schematic- Gantry- detectors.

UNIT V

Bio-telemetry: components in telemetry system- transmitter-receiver- pulse modulators- implantable units- applications. Intensive care unit: Planning and location of different instruments- Bedside monitors- Prosthetic instruments- artificial heart- pump oxygenators- hemodialysis- artificial kidney- different dialysers. Electrical safety: Physiological effects of electric current- let go current- shock hazards- need of grounding- isolation of patients- isolated power distribution system.

REFERENCES

1. Introduction to biomedical technology: Joseph J Carr, Pearson Edn.
2. Biomedical Instrumentation & Measurements: Leslie Cromwell, PHI.
3. Biomedical Instrumentation: John G Webster, Houghton Mifflin Company.
4. Handbook to biomedical instrumentation: R S Khandpur, Tata Mc Graw Hill Pub.

MSU / 2017-18 / PG –Colleges / M.Sc. (Electronics) / Semester –IV / Ppr.no.21 / Core- 21

MICRO ELECTRO MECHANICAL SYSTEMS

UNIT I

INTRODUCTION

Intrinsic Characteristics of MEMS – Energy Domains and Transducers- Sensors and Actuators – Introduction to Microfabrication - Silicon based MEMS processes – New Materials – Review of Electrical and Mechanical concepts in MEMS – Semiconductor devices – Stress and strain analysis – Flexural beam bending- Torsional deflection.

UNIT II

SENSORS AND ACTUATORS-I

Electrostatic sensors – Parallel plate capacitors – Applications – Interdigitated Finger capacitor – Comb drive devices – Thermal Sensing and Actuation – Thermal expansionThermal couples – Thermal resistors – Applications – Magnetic Actuators – Micromagnetic components – Case studies of MEMS in magnetic actuators.

UNIT III

SENSORS AND ACTUATORS-II

Piezoresistive sensors – Piezoresistive sensor materials - Stress analysis of mechanical elements – Applications to Inertia, Pressure, Tactile and Flow sensors – Piezoelectric sensors and actuators – piezoelectric effects – piezoelectric materials – Applications to Inertia , Acoustic, Tactile and Flow sensors.

UNIT IV

MICRO MACHINING

Silicon Anisotropic Etching – Anisotrophic Wet Etching – Dry Etching of Silicon – Plasma Etching – Deep Reaction Ion Etching (DRIE) – Isotropic Wet Etching – Gas Phase Etchants – Case studies - Basic surface micromachining processes – Structural and Sacrificial Materials – Acceleration of sacrificial Etch – Striction and Antistriction methods Assembly of 3D MEMS – Foundry process.

UNIT V

POLYMER AND OPTICAL MEMS

Polymers in MEMS– Polimide - SU-8 - Liquid Crystal Polymer (LCP) – PDMS – PMMA –Parylene – Fluorocarbon - Application to Acceleration, Pressure, Flow and Tactile sensors- Optical MEMS – Lenses and Mirrors – Actuators for Active Optical MEMS.

TEXT BOOKS

1. Chang Liu, ‘Foundations of MEMS’, Pearson Education Inc., 2006.

REFERENCES

1. Nadim Maluf, " An introduction to Micro electro mechanical system design", Artech House, 2000.
2. Mohamed Gad-el-Hak, editor, " The MEMS Handbook", CRC press Baco Raton, 2000
3. Tai Ran Hsu, "MEMS & Micro systems Design and Manufacture" Tata McGraw Hill, New Delhi, 2002.
4. Julian w. Gardner, Vijay k. varadan, Osama O.Awadelkarim,micro sensors mems And smart devices, John Wiley & son LTD,2002
5. James J.Allen, micro electro mechanical system design, CRC Press published in 2005

MSU / 2017-18 / PG –Colleges / M.Sc. (Electronics) / Semester –IV / Ppr.no.22 / Core- 22

ADVANCED MICRO-CONTROLLERS

UNIT I

LOW PIN COUNT CONTROLLERS

Atmel AVR family – ATTiny15L controller - architecture – pin descriptions – features – addressing modes – I/O space – reset and interrupt handling – reset sources - Tunable internal oscillator.

UNIT II

TIMERS

Watch dog timer – EEPROM – preventing data corruption – Analog comparator – A/D converter – conversion timing – ADC noise reduction – PortB – alternate functions – memory programming – fuse bits – high voltage serial programming – algorithm.

UNIT III

NATIONAL SEMICONDUCTOR

COP8 family - COP8CBR9 processor – features – electrical characteristics – pin descriptions – memory organization –EEPROM - security – brownout reset – in system programming – boot ROM. Idle timer – Timer1, Timer2, Timer3 -operating modes – PWM mode – event capture mode

UNIT IV

POWER SAVING MODES

Dual clock operation – Multi input wake up – USART – framing formats – baud rate generation – A/D conversion – operating modes – prescaler – Interrupts – interrupt vector table – Watch dog – service window – Micro-wire interface – waveforms.

UNIT V

MICROCHIP

PIC16 family – PIC16F873 processor – features – architecture – memory organization - register file map – I/O ports – PORTA - PORTB – PORTC – Data EEPROM and flash program memory – Asynchronous serial port – SPI mode – I2C mode.

REFERENCES

1. Design with PIC micro-controllers: John B Peatman, Pearson Education.
2. DS101374: National Semiconductor reference manual.
3. National semiconductor web site – www.national.com
4. 1187D: Atmel semiconductor reference manual.
5. Atmel semiconductor web site – www.atmel.com
6. DS30292B: Microchip reference manual.
7. Microchip semiconductor web site – www.microchip.com

MSU / 2017-18 / PG –Colleges / M.Sc. (Electronics) / Semester –IV / Ppr.no.23 / Practical-7

EMBEDDED SYSTEMS LABORATORY USING 8051

8051 BASED EMBEDDED SYSTEMS

All experiments have to be conducted compulsorily

1. Arithmetic and Logic programs
2. Square wave generation using ports
3. Matrix Key Board interfacing
4. LED Interfacing
5. Seven segment display interfacing
6. Solid state relay interfacing using interrupts
7. Traffic light control system
8. ADC interface
9. DAC interface
10. Stepper motor interface
11. Timer/Counter operation
12. Serial port interfacing using RS232C
13. Digital clock
14. LCD interface
15. Object counter
16. Water level controller
17. Flow measurement
18. Temperature measurement

MSU / 2017-18 / PG –Colleges / M.Sc. (Electronics) / Semester –IV / Ppr.no.24 / Practical-8

EMBEDDED SYSTEMS LABORATORY USING PIC AND RTOS

PIC 16F87X BASED EMBEDDED SYSTEMS & RTOS

All experiments have to be conducted compulsorily

1. Arithmetic and Logical programs
2. Square wave generation using ports
3. Matrix Key Board & LED interfacing
4. Single digit timer using seven segment displays
5. DC motor driving via H Bridge
6. DAC interface
7. ADC INTERFACE
8. LCD interface
9. Stepper motor control
10. PWM generation
11. Compare and capture operation program
12. Serial communication using RS232C
13. PIC to PIC communication using I2 C bus

PROGRAMMING WITH RTOS

14. Semaphore & flag related functions
15. Queue & Mailbox related functions
16. Memory related functions
17. Embedded system for an adaptive cruise control system in a car
18. Embedded system for a smart card.

REFERENCE

1. Mohamammad Ali Mazidi & Mazidi ‘ 8051 Microcontroller and Embedded Systems’, Pearson Education
2. Mohammad Ali Mazidi, Rolind Mckinley and Danny Causey, ‘PIC Microcontroller and Embedded Systems’ Pearson Education
3. Jan Axelson ‘Embedded Ethernet and Internet Complete’, Penram publications
4. Kraig Mitzner, ‘Complete PCB Design using ORCAD Capture and Layout’, Elsevier
5. Woon-Seng Gan, Sen M. Kuo, ‘Embedded Signal Processing with the Micro Signal Architecture’, John Wiley & Sons, Inc., Hoboken, New Jersey 2007
6. U. Meyer-Baese ‘Digital Signal Processing using Field Programmable Gate Arrays’, Springer
7. Dogan Ibrahim, ‘Advanced PIC microcontroller projects in C’, Elsevier 2008

MSU / 2017-18 / PG –Colleges / M.Sc. (Electronics) / Semester –IV / Ppr.no.25 / Elective -1 (a)

1.ELECTRONIC TESTING

UNIT I

INTRODUCTION

Test process and automatic test equipment, test economics and product quality, fault modeling

UNIT II

DIGITAL TESTING

Logic and fault simulation, testability measures, combinational and sequential circuit test generation.

UNIT III

ANALOG TESTING

Memory Test, DSP Based Analog and Mixed Signal Test, Model based analog and mixed signal test, delay test, IIDQ test.

UNIT IV

DESIGN FOR TESTABILITY

Built-in self-test, Scan chain design, Random Logic BIST, Memory BIST, Boundary scan test standard, Analog test bus, Functional Microprocessor Test, Fault Dictionary, Diagnostic Tree, Testable System Design, Core Based Design and Test Wrapper Design, Test design for SOCs

UNIT V

LOADED BOARD TESTING

Unpowered short circuit tests, unpowered analog tests, Powered in-circuit analog, digital and mixed signal tests, optical and X-ray inspection procedures, functional block level design of in-circuit test equipment

TEXT BOOK: 1. Michael L. Bushnell and Vishwani D. Agarwal, “Essentials of Electronic Testing for Digital, Memory & Mixed-Signal VLSI Circuits”, Springer, 2006.

REFERENCE: 1. Dimitris Gizopouilos , “Advances in Electronic Testing” , Springer 2006.

MSU / 2017-18 / PG –Colleges / M.Sc. (Electronics) / Semester –IV / Ppr.no.25 / Elective -1 (b)

OPTO ELECTRONIC DEVICES

UNIT I

ELEMENTS OF LIGHT AND SOLID STATE PHYSICS

Wave nature of light, Polarization, Interference, Diffraction, Light Source, review of Quantum Mechanical concept, Review of Solid State Physics, Review of Semiconductor Physics and Semiconductor Junction Device.

UNIT II

DISPLAY DEVICES AND LASERS

Introduction, Photo Luminescence, Cathode Luminescence, Electro Luminescence, Injection Luminescence, Injection Luminescence, LED, Plasma Display, Liquid Crystal Displays, Numeric Displays, Laser Emission, Absorption, Radiation, Population Inversion, Optical Feedback, Threshold condition, Laser Modes, Classes of Lasers,Mode Locking, laser applications.

UNIT III

OPTICAL DETECTION DEVICES

Photo detector, Thermal detector, Photo Devices, Photo Conductors, Photo diodes ,Detector Performance.

UNIT IV

OPTOELECTRONIC MODULATOR

Introduction, Analog and Digital Modulation, Electro-optic modulators, Magneto Optic Devices, Acoustoptic devices, Optical, Switching and Logic Devices.

UNIT V

OPTOELECTRONIC INTEGRATED CIRCUITS

Introduction, hybrid and Monolithic Integration, Application of Opto Electronic Integrated Circuits, Integrated transmitters and Receivers, Guided wave devices.

TEXTBOOKS: 1. Pallab Bhattacharya “Semiconductor Opto Electronic Devices”, Prentice Hall of India Pvt., Ltd., New Delhi, 2006. 2. Jasprit Singh, “Opto Electronics – As Introduction to Materials and Devices”, Mc Graw-Hill International Edition, 1998

REFERENCES: 1. S C Gupta, Opto Electronic Devices and Systems, Prentice Hal of India, 2005. 2. J. Wilson and J.Haukes, “Opto Electronics – An Introduction”, Prentice Hall, 1995

MSU / 2017-18 / PG –Colleges / M.Sc. (Electronics) / Semester –IV / Ppr.no.26 / Project

PROJECT WORK

The objective of the project work is to motivate the students for doing research and to inculcate in them the self confidence to work independently. each student should do an individual project and they can freely choose their own topic of experimental nature. the project should be of investigative type not a hobby project one.

Students are encouraged to take the project work as a challenge so that their project will boost up their industrial career.

Periodic Seminars should be conducted to assess the students. The students should present the progress of the project to their respective guides and get the required assistance from them

At the completion of the project .The student will submit Project Report in the form of Dissertation which will be examined by the examiners.

The examination shall consist of i) evaluation of the dissertation and ii) comprehensive viva-voce