Course Structure for M.Sc. Electronics & Communication

(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	Advanced Microprocessors	5	4
	5	Core – 5 Practical - 1	Analog electronic design lab	4	2
	6	Core – 6 Practical - 2	Digital electronic design lab	4	2
			Subtotal	**30**	**20**
II	7	Core – 7	Electromagnetic Field Theory	5	4
	8	Core - 8	Digital Communication	5	4
	9	Core – 9	Microcontrollers	4	4
	10	Core – 10	Embedded System and RTOS	4	4
	11	Core – 11	Field Work	4+	3
	12	Core – 12 Practical – 3	DSP Matlab Lab	4	2
	13	Core – 13 Practical - 4	Microcontrollers Lab	4	2
			Subtotal	**30**	**23**

Sem (1)	Sub. No (2)	Subject Status (3)	Subject Title (4)	Contact Hrs / Week (5)	Credits (6)
III	14	Core – 14	Advanced Power electronics	6	4
	15	Core - 15	Data Communication	6	4
	16	Core – 16	Optical Communication	5	4
	17	Core – 17	Research Methodology	5	4
	18	Core – 18 Practical - 5	Advanced Communication Lab	4	2
	19	Core – 19 Practical – 6	Embedded system and RTOS	4	2
			Subtotal	**30**	**20**
IV	20	Core – 20	Microwave Electronics	4	4
	21	Core - 21	Mobile and Satellite communications	4	4
	22	Core – 22	Navigation systems	4	4
	23	Core – 23 Practical - 7	Fibre optics and Microwave lab	4	2
	24	Core – 24 Practical - 8	Power electronics lab	4	2
	25	Elective - 1	Elective / Field Work / Study Tour 1. Nano Electronics 2. Digital Design Using VHDL	3+	3
	26	Core – 25	Project	7+	8
		Subtotal		**30**	**27**
Total				**120**	**90**

Model Question paper pattern

Section A

Questions 1-10

10 questions – 2 each from every unit

Objective type of questions with no choice

Marks 10X1=10

Section B

Questions 11-15

5 questions – 1 each from every unit

Short answer questions of either / or type

Marks 5x5=25

Section C

Questions 16-20

5 questions – 1 each from every unit

Essay-type questions of either / or type

Marks 5x8=40

Max Marks 75

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI

M.Sc ELECTRONICS AND COMMUNICATION

CBCS (2017-2018 onwards)

SEMESTER I

I Semester-Core-1 theory

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.

I Semester-Core-2 theory

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

I Semester-Core-3 theory

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.

I Semester-Core-4 theory

ADVANCED MICROPROCESSORS

UNIT I

80186, 80286, 80386 AND 80486 MICROPROCESSORS

80186 Architecture, Enhancements of 80186 – 80286 Architecture – Real and Virtual Addressing Modes – 80386 Architecture – Special Registers – Memory Management – Memory Paging Mechanism – 80486 Architecture – Enhancements – Cache Memory Techniques – Exception Handling – Comparison of Microprocessors (8086 – 80186 – 80286 – 80386 – 80486).

UNIT II

PENTIUM MICROPROCESSORS

Pentium Microprocessor Architecture – Special Pentium Registers – Pentium Memory Management – New Pentium Instructions – Pentium Pro Microprocessor Architecture – Special features – Pentium II Microprocessor Architecture – Pentium III Microprocessor Architecture – Pentium III Architecture – Pentium IV Architecture – Comparison of Pentium Processors.

UNIT III

RISC PROCESSORS I

PowerPC620 – Instruction fetching – Branch Prediction – Fetching – Speculation, Instruction dispatching – dispatch stalls – Instruction Execution – Issue stalls- Execution Parallelism – Instruction completion – Basics of P6 micro architecture – Pipelining – ourof- order core pipeline – Memory subsystem.

UNIT IV

RISC PROCESSORS II (SUPERSCALAR PROCESSORS)

Intel i960 – Intel IA32- MIPS R8000 – MIPS R10000 – Motorola 88110 – Ultra SPARC processor- SPARC version 8 – SPARC version 9.

UNIT V

PC HARDWARE OVERVIEW

Functional Units & Interconnection, New Generation Mother Boards 286 to Pentium 4 Bus Interface- ISA- EISA- VESA- PCI- PCIX. Peripheral Inter faces and Controller, Memory and I/O Port Addresses.

TEXT BOOKS

1. B.B.Brey The Intel Microprocessor 8086/8088 /80186/80188, 80286, 80386, 80486 PENTIUM, PENTIUM Pro, PII, PIII & IV Archietecture, Programming & Interfacing, Pearson Education , 2004.
2. John Paul Shen, Mikko H.Lipasti, "Modern Processor Design", Tata Mcgraw Hill, 2006.

REFERENCES

1. Douglas V.Hall, "Microprocessors and Interfacing", Tata McGraw Hill, II Edition 2006
2. Mohamed Rafiquzzaman, "Microprocessors and Microcomputer Based System Design", II Edition, CRC Press, 2007.

I Semester-Core-5 Practical1

ANALOG ELECTRONIC DESIGN LAB

List of experiments

At least **TEN** 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.

I Semester Core-6 Practical-2

DIGITAL ELECTRONIC DESIGN LAB

At least **TEN** Experiments to be carried out 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.

SEMESTER II

II Semester-Core-7 theory

ELECTROMAGNETIC FIELD THEORY

UNIT 1

ELECTROSTATICS AND MAGNETOSTATICS

Electrostatic field - Divergence and curl of electrostatic fields - Electric potential - Laplace equation - Method of images - Multipole expansion - Lorentz force law - Biot-Savart law - Divergence and curl of $\boldsymbol{B}$ - Magnetic vector potential.

UNIT II

ELECTROSTATIC AND MAGNETOSTATIC FIELDS IN MATTER

Polarization - Field of polarized object - Electric displacement - Linear dielectrics - Magnetization - Field of magnetized object - Auxiliary field $\boldsymbol{H}$ - Linear and non-linear media.

UNITIII

MAXWELL'S EQUATIONS AND ELECTROMAGNETIC WAVES

Correspondence of field equations and circuit equations – Applications of circuit and field theory – Series Circuit – Maxwell's equations – Generalisation of circuit equations – Maxwell's equations in free space and for harmonically varying fields – Continuity equations – Poynting theorem – Uniform plane wave – Concept of intrinsic impedance of free space – Boundary conditions

UNIT IV

UNIFORM PLANE WAVE

Uniform plane wave propagation in good conductor, in poor conductor, in lossy dielectric – Plane wave propagation in metallic film coating - Plastic substrate and application to thin film technology - Oscillating electric dipole – Power radiated by current element - Radiation resistance.

UNIT V

GUIDED WAVES AND WAVE GUIDES:

Guided waves: Transverse electric (TE) waves - Transverse magnetic (TM) waves - Transverse electromagnetic (TEM) waves - Velocity of propagation - Attenuation in parallel-plane guides - Wave impedances.Wave Guides: Rectangular guides (RGs) - TM waves and TE waves in RGs - Impossibility of TEM wave in wave guides - TM and TE waves in circular guides - Wave impedances and characteristic impedances - Dielectric slab wave guide.

TEXT BOOKS

1. D. J. Griffiths, 2002, Introduction to Electrodynamics, 3rd Ed., Prentice-Hall of India, New Delhi.
2. E. C. Jordan and K. G. Balmain, 1995, Electromagnetic Waves & Radiating Systems, 2nd Ed., Prentice-Hall of India, New Delhi.
3. John D. Kraus, 1992, Electromagnetics, 4th Ed., McGraw Hill International.
4. V.V. Sarawate, 1993, Electromagnetic Fields and Waves, Wiley Easter Limited.

REFERENCES

1. D. Jackson, 1993, Classical Electrodynamics, 2nd Ed., Wiley Eastern, New Delhi.
2. B. Laud, 1995, Electromagnetics, 2nd Ed., New Age International, New Delhi.

3. Lorrain and D. R. Corson, 1986, Electromagnetic Fields and Waves, 2nd Ed., CBS, New Delhi.
4. R. Reitz, F. J. Milford and R. W. Christy, 1988, Foundation of Electromagnetic Theory, 3rd Ed., Narosa, New Delhi.
5. Samuel and Y. Liao, 1994, Microwave Devices and Circuits, 3rd Ed., Prentice Hall of India.

II Semester-Core-8 theory

DIGITAL COMMUNICATION

UNIT I

PULSE MODULATION

Sampling process –PAM- other forms of pulse modulation –Bandwidth – Noise trade off –Quantization – PCM- Noise considerations in PCM Systems-TDM-Digital Multiplexers-Virtues, Limitation and modification of PCM-Delta modulation –Linear prediction –differential pulse code modulation – Adaptive Delta Modulation.

UNIT II

BASEBAND PULSE TRANSMISSION

Matched Filter- Error Rate due to noise –Intersymbol Interference- Nyquist's criterion for Distortionless Base band Binary Transmission- Correlative level coding – Baseb and M-ary PAM transmission –Adaptive Equalization –Eye patterns

UNIT III

PASSBAND DATA TRANSMISSION

Introduction – Pass band Transmission model- Generation, Detection, Signal space diagram, bit error probability and Power spectra of BPSK, QPSK, FSK and MSK schemes –Differential phase shift keying – Comparison of Digital modulation systems using a single carrier – Carrier and symbol synchronization.

UNIT IV

ERROR CONTROL CODING

Discrete memoryless channels – Linear block codes - Cyclic codes - Convolutional codes – Maximum likelihood decoding of convolutional codes-Viterbi Algorithm, Trellis coded Modulation, Turbo codes.

UNIT V

SPREAD SPECTRUM MODULATION

Pseudo- noise sequences –a notion of spread spectrum – Direct sequence spread spectrum with coherent binary phase shift keying – Signal space Dimensionality and processing gain –Probability of error – Frequency –hop spread spectrum –Maximum length and Gold codes.

TEXT BOOKS

1. Simon Haykins, "Communication Systems" John Wiley, 4th Edition, 2001

REFERENCES

1. Sam K.Shanmugam "Analog & Digital Communication" John Wiley.
2. John G.Proakis, "Digital Communication" McGraw Hill 3rd Edition, 1995
3. Taub & Schilling , "Principles of Digital Communication " Tata McGraw-Hill" 28th reprint, 2003
4. Bernard Sklar , Digital communications Pearson education 2007

II Semester-Core-9 theory

MICROCONTROLLERS

UNIT I

8 BIT MICROCONTROLLERS

Introduction to 8051 Micro-controller, Architecture, Memory organization, Special function registers, Port Operation, Memory Interfacing, I/O Interfacing, Programming 8051 resources, interrupts, Programmer's model of 8051, Programming 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.

TEXTBOOKS

1. Krishna Kant, "MICROPROCESSORS AND MICROCONTROLLERS Architecture, programming and system design using 8085, 8086, 8051 and 8096". PHI 2007.
2. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.MCKinlay The 8051 Microcontroller and Embedded Systems, Second Edition, Pearson Education 2008.
3. Kenneth J. Ayala, "The 8086 Microprocessor: Programming & Interfacing The PC", Delmar Publishers, 2007.
4. A K Ray, K M Bhurchandi, Advanced Microprocessors and Peripherals, TMH, 2007.

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

II Semester-Core-10 theory

EMBEDDED SYSTEM AND RTOS

UNIT I

INTRODUCTION TO EMBEDDED SYSTEMS

Embedded systems - Application of Embedded Systems - processors in the system - Other Hardware units - software embedded to a system - Exemplar embedded system - Embedded system – on - chip (SOC) and in VLSI circuit.

UNIT II

DEVICES AND BUSES FOR DEVICE NETWORK

I/O Device - timer and counting devices – serial communication using I2C, CAN and USB. Parallel communication using PCI, PCIX and advanced parallel High Speed Buses.

UNIT III

DEVICE DRIVERS FOR DEVICE AND INTERRUPT SERVING MECHANISM

Device drives-parallel port devices drive in a system, serial port Device Drivers in a system, Drivers for internal programmable timing Devices – Interrupt servicing Mechanism – Context and the periods for context switching, Deadline and Interrupt Latency.

UNIT IV

EMBEDDED SOFTWARE DELOPMENT USING IDE

Introduction to Integrated development environment (IDE) – programming concepts and embedded programming in Assembly and C – creating a New project – Adding Files to a project – Building a project – Debugging and simulating the application – Getting Embedded software into the Target system.

UNIT V

REAL TIME OPERATING SYSTEM (RTOS)

Introduction to basic concepts of RTOS, Basics of real time& embedded system operating systems, RTOS-Interrupt handling, task scheduling; embedded system design issues in system development process-Action plan, use of target system,emulator,use of software tools.

TEXT BOOKS

1. Rajkamal, “Embedded System-Architecture, Programming, Design” Tata Mc Graw Hill 2006.
2. Daniel W.Lewis, “Fundamentals of Embedded Software” Prentice Hall of India, 2004.

REFERENCES

1 David E Simon," An Embedded Software Primer" person Education Asia, 2006.
2. Frank Vahid, Embedded System Design – A Unified hardware & Software Introduction John Wiley, 2002.
3. SriramV.Iyer,Pankaj Gupte,Embedded Real Time Systems Programming"Tata Mc Graw Hill, 2004.
4. Steve Heath," Embedded System Design"II edition, Elsevier, 2003.
5. Arnold Berger," Embedded System Design: An Introduction to processes, Tools, and Techniques", CMP Books, 2001.
6. Wayne Wolf, "Computers as components" Morgan Kaufmann Publishers, 2005.
7. Douglas V Hall, "Microprocessors and Interfacing: Programming and Hardware", Tata McGraw – Hill, Second Edition, 2001.

II Semester Core-11 Field Work / Mini Project

Students are advised to select topics of their own interest in hardware and develop their hardware skills by designing a circuit of their own. Periodic assessment has to be done to evaluate their skills.

II Semester-Core-12 Practical-3

DSP-MATLAB LABORATORY

LIST OF EXPERIMENTS USING MATLAB/SCILAB

At least **TEN** Experiments to be carried out 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.

II Semester-Core-13 Practical 4

8051 MICROCONTROLLER LAB

8051 BASED EMBEDDED SYSTEMS

At least **TEN** Experiments to be carried out 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

SEMESTER III

III Semester-Core-14 theory

ADVANCED POWER ELECTRONICS

UNIT I

DC-DC CONVERTER TOPOLOGIES:

Buck and boost converters - continuous and discontinuous current modes - buck-boost, C'uk converter - operation – control of dc-dc converters –PWM method - Full-bridge with bipolar and unipolar switching – output voltage equations.

UNIT II

SMPS TOPOLOGIES:

Basic block schematic of SMPS – isolated dc-dc topologies – forward and flyback – principles – (circuit and operation only). Push-pull topology – half bridge Basics of SMPS control methods – voltage-mode and current-mode control (block diagrams and description only).

UNIT III

RESONANT CONVERTERS:

Advantages of resonant converters over PWM converters – Classification - series and parallel resonant converters – half-bridge operation – discontinuous and continuous current modes (basic modes only, no analysis required) Principles of Zero voltage and Zero current switching (ZVS and ZCS switches only – no analysis required) comparison with hard switching, switching locus diagrams, working principle

UNIT IV

PWM INVERTERS:

Need for PWM techniques – various PWM techniques – principle of sinusoidal PWM – bipolar and unipolar PWM - modulation index – application to single phase bridges - disadvantages of SPWM – brief introduction to other PWM methods – current-mode control schemes (tolerance band control and fixed frequency control – description with block diagram only)

UNIT V

APPLICATIONS:

Power factor correction – Actual power factor – Displacement factor and distortion factor – principles of input line current shaping using boost rectifiers. UPS – Different topologies–block Schematics. Electronic ballast – block schematics. High frequency inductor and transformers: Design principles, definitions, comparison with conventional design and problems

REFERENCES:

1. Power Electronics: Converters, Applications and Design – Mohan, Undeland and Robbins, John Wiley and Sons, 2nd ed.
2. Power Electronic Systems: Theory and Design – Jai P. Agrawal , Pearson Education Asia, LPE
3. Modern Power Electronics – P.C Sen, Wheeler Publ.
4. Rashid M.H. "Power electronics-Circuits, Devices, Applications", 3rd Edition, Prentice Hall India, 2008.
5. Bose B.K., Power electronics and A.C Drives, Prentice Hail 1986.
6. Muhammad Rashid. "Digital power electronics and applications" first edition, 2005, Elsevier.

III Semester-Core-15 theory

DATA COMMUNICATION

UNIT I

Digital Transmission fundamentals: Definition of information. Digital Representation of Information, Block-Oriented information, Stream information. Why digital communication, comparison of Analog and digital transmission, Basic Properties of Digital transmission Systems; Digital Representation of Analog Signals: Bandwidth of Analog Signals, sampling of an Analog signal, digital Transmission of Analog Signals. Characteristics of communications channels: frequency domain characterization. Time Domain characterization. Fundamental limits in digital Transmission, The Nyquist signaling rate, The Shannon channel capacity.

UNIT II

Line coding Modems and digital modulation: binary phase Modulation QAM and Signal constellations, telephone modem standards, properties of media and Digital transmission systems: twisted pair, coaxial cable, optical fiber, radio transmission, Infrared light. Error detection and correction: Error Detection, Two-dimensional parity Checks, Internet checksum, polynomial codes, Standardized polynomial codes, Error detecting capability of a polynomial code.

UNIT III

Circuit switching networks: Multiplexing: FDM, TDM, WDM, SONET, SONET multiplexing, SONET frame structure. Transport networks: SONET networks, optical Transport networks, circuit switches, space division switches, Time division switches, the telephone network, transmission facilities, end to end digital services.

UNIT IV

Communication Networks and Services: Evolution of Network architecture and Services: Telegraph Networks and Message Switching, Telephone Networks and Circuit Switching, The Internet, Computer Networks and Packet Switching.

UNIT V

Medium access control protocols and LAN: The Medium Access Control Protocols, Multiple Access Communications, Random Access: ALOHA, Slotted ALOHA, CSMA, CAMA-CD, Scheduling Approaches to Medium Access Control: Reservation Systems, Polling, Token-Passing Rings; Channelization, FDMA, TDMA, CDMA. High speed Digital Access & connecting Devices. DSL: DSL Technology, cable modems, connecting devices: Repeaters, Hubs, Bridges, Two-layer switch, router and three layer switches.

TEXT BOOKS

1. Alberto Leon- Garcia and India Widjaja, Communication Networks Fundamental And Key Architectures, Tata McGraw-Hill 2nd edition.
2. Behrouz A. Forouzan; Data Communications and Networking, Tata McGraw-Hill, 3rd Edition.

REFERENCE BOOKS

1. William Stallings, Data and Computer Communication, Fifth Edition, Pearson Education/ Prentice Hall India.
2. William A. Shay, Understanding Data Communications and Networks, 2nd Edition, Thomson.
3. Codbole, data Communications and Networks, Tata McGraw-Hill 2002.

4. Micael A Gallo & William M. Handcock, Computer Communications and Networking Technologies, 2003 Edition, Thomson

III Semester-Core-16 theory

OPTICAL COMMUNICATION

UNIT I

INTRODUCTION TO OPTICAL FIBERS

Evolution of fiber optic system- Element of an Optical Fiber Transmission link- Ray Optics-Optical Fiber Modes and Configurations –Mode theory of Circular Wave guides- Overview of Modes-Key Modal concepts- Linearly Polarized Modes – Single Mode Fibers-Graded Index fiber structure.

UNIT II

SIGNAL DEGRADATION OPTICAL FIBERS

Attenuation – Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides-Information Capacity determination –Group Delay-Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers-Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in GI fibers-Mode Coupling –Design Optimization of SM fibers-RI profile and cut-off wavelength.

UNIT III

FIBER OPTICAL SOURCES AND COUPLING

Direct and indirect Band gap materials-LED structures –Light source materials –Quantum efficiency and LED power, Modulation of a LED, lasers Diodes-Modes and Threshold condition –Rate equations – External Quantum efficiency –Resonant frequencies –Laser Diodes, Temperature effects, Introduction to Quantum laser, Fiber amplifiers- Power Launching and coupling, Lencing schemes, Fibre –to- Fibre joints, Fibre splicing.

UNIT IV

FIBER OPTICAL RECEIVERS

PIN and APD diodes –Photo detector noise, SNR, Detector Response time, Avalanche Multiplication Noise –Comparison of Photo detectors –Fundamental Receiver Operation – preamplifiers, Error Sources – Receiver Configuration – Probability of Error – Quantum Limit.

UNIT V

DIGITAL TRANSMISSION SYSTEM

Point-to-Point links System considerations –Link Power budget –Rise - time budget –Noise Effects on System Performance-Operational Principles of WDM, Solitons-Erbium-doped Amplifiers. Basic on concepts of SONET/SDH Network.

TEXT BOOK

1. Gerd Keiser, "Optical Fiber Communication" McGraw –Hill International, Singapore, 3rd ed.,2000

REFERENCES

1. J.Senior, "Optical Communication, Principles and Practice", Prentice Hall of India, 1994
2. J.Gower, "Optical Communication System", Prentice Hall of India, 2001.

III Semester-Core-17 theory

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.

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.

III Semester-Core-18 Practical-5

ADVANCED COMMUNICATION LAB

At least **TEN** Experiments to be carried out compulsorily

ADVANCED COMMUNICATION

1. Verification of sampling theorem
2. Pulse position modulation
3. Pulse amplitude modulation and demodulation
4. Pulse width modulation
5. Amplitude shift keying modulation and demodulation
6. Frequency shift keying modulation and demodulation
7. Phase shift keying modulation and demodulation
8. Mixer
9. Automatic gain control
10. P.C.M system using codec
11. Delta Modulation, Adaptive Delta Modulation
12. PLLand Frequency synthesizer

13. Frequency multiplier
14. P.R.B.S. Generator

Matlab Experiments

15. Digital Modulation and Demodulation ASK,PSK,QPSK,FSK
16.Generation of Signals
17.Sampling and Effect of aliasing
18.Error Control Coding.

III Semester Core-19 Practical-6

EMBEDDED SYSTEM AND RTOS LAB

PIC 16F87X BASED EMBEDDED SYSTEMS & RTOS

At least **TEN** Experiments to be carried out 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

SEMESTER IV

IV Semester-Core20 theory

MICROWAVE ELECTRONICS

UNIT l:

Introduction, definition of microwave, characteristic features, application of microwave Generation of microwave by vacuum tube - limitation of conventional tubes klystron amplifier-reflex klystron oscillator, magnetrons-traveling wave tubes

UNIT II:

Generation of microwave by solid state devices, bipolar transistor field effect transistors, gunn oscillator, avalanche diode, oscillator, IMPATT & TRPATT mode of operation parametric amplifiers.

UNIT III:

Microwave integrated circuit design, introduction, hybrid microwave integrated circuits (HMIC), monolithic microwave integrated circuit (MMIC), MIC materials, substrate material, conductor material, dielectric materials, resistive films, types of mics, microwave monolithic integrated circuits (MMIC'S).

UNIT IV:

Waveguide and waveguide component, concept of waveguide, advantage of hollow wave guide, reflection from a metal surface, field pattern obtained by oblique

reflection, higher order modes, waveguide dimensions, impedance matching elements, waveguide short circuit, tees and magic tee, phase shiftless, attenuators, matched terminators, waveguide slotted section, f'1N diodes, P1N diode switches

UNIT V:

Microwave measurement techniques, standing wave measurements, impedance measurement, cavity resonator, cavity a. frequency measurements and calibration techniques, dielectric measurements.

TEXT BOOKS

l .Microwave Devices and circuits - S. Y. Liao, PH I
2. Introduction to microwave theory and experiments L.A. Lance TMH
3. Radio frequency and microwave measurements- M.M.Radmanesh Pearson Education
4. Microwave and Radar Engineering M.Kulkarni – Umesh Publications

IV Semester-Core21 theory

MOBILE AND SATELLITE COMMUNICATION

UNIT- I

CELLULAR CONCEPT AND SYSTEM FUNDAMENTALS

Evolution of mobile communications, mobile radio systems-Examples, trends in cellular radio and personal communications.: Frequency reuse, channel assignment, hand off, Interference and system capacity, tracking and grade of service, Improving Coverage and capacity in Cellular systems. Free space propagation model, reflection, diffraction, scattering, link budget design, Outdoor Propagation models, Indoor propagation models,

UNIT II

MODULATION CODING AND MULTIPLE ACCESS TECHNIQUES

Modulation Techniques: Minimum Shift Keying, Gauss ion MSK, M-ary QAM, M-ary FSK, Orthogonal Frequency Division Multiplexing, Performance of Digital Modulation in Slow-Flat Fading Channels and Frequency Selective Mobile Channels ,Coding: Vocoders, Linear Predictive Coders, Selection of Speech Coders for Mobile Communication, GSM Codec, RS codes for CDPD. Multiple Access Techniques: FDMA, TDMA, CDMA, SDMA, Capacity of Cellular CDMA and SDMA.

UNIT III

SATELLITE SYSTEMS

Orbits: Introduction, Kepler laws, definitions, orbital element, apogee and perigee heights, orbit perturbations, limits of visibility, earth eclipse of satellite, sun transit outage Propagation impairments and space link: Introduction, atmospheric loss, ionospheric effects, rain attenuation, and other impairments. Space link: Introduction, EIRP, transmission losses, system noise, CNR, uplink, down link, effects of rain, Combined CNR.

UNIT IV

SATELLITE ACCESS

Space Segment: Introduction, power supply units, altitude control, station keeping, thermal control, TT&C, transponders, antenna subsystem.Earth Segment: Introduction, receive only home TV system, out door unit, indoor unit, Tx – Rx earth station. Satellite access: satellite access, single access, pre-assigned FDMA, SCPC (spade system), TDMA, pre-assigned TDMA, demand assigned TDMA, down link analysis, comparison of uplink power requirements for TDMA & FDMA

UNIT V

SATELLITE SERVICES

DBS, Introduction, orbital spacing, power ratio, frequency and polarization, transponder capacity, bit rates for digital TV,HDTV, satellite mobile services, VSAT, RadarSat, GPS, orb communication and iridium.

TEXT BOOK

1. T.S.Rappaport, "Wireless Communications: Principles and Practice, Second Edition, Pearson Education/ Prentice Hall of India, Third Indian Reprint 2003.
2 Dennis Roddy, Satellite Communications, 4th Edition, McGraw-Hill International edition, 2006

REFERENCES

1. R. Blake, " Wireless Communication Technology", Thomson Delmar, 2003.
2. W.C.Y.Lee, "Mobile Communications Engineering: Theory and applications, Second Edition,McGraw-Hill International, 1998.
3. Stephen G. Wilson, " Digital Modulation and Coding", Pearson Education, 2003.
4. Timothy Pratt, Charles Bostian and Jeremy Allnutt, Satellite Communications, 2nd Edition, John Wiley & Sons, 2003
5.W.L. Pitchand, H.L. Suyderhoud, R.A. Nelson, Satellite Communication Systems engineering, 2nd Ed., Pearson Education., 2007

IV Semester-Core22 theory

NAVIGATION SYSTEMS

UNIT I

Four basic methods of navigation. Radio direction finding-loop antenna-loop input circuits. Aural-null direction finder, Goniometer Errors. Adcock direction finders, Direction finding at very high frequencies, Automatic direction finders, Radio compass, VHF phase comparison, Automatic direction finder, Commutated aerial direction finder, Range and accuracy of direction finders

UNIT II

Hyperbolic systems of navigation-LORAN A equipment ,range and precision, LORAN C Decca navigation systems, Decca receivers, range and accuracy- Omega system, DME system transmission, Airborne interrogator, Beacons ,TACAN system

UNIT III

Aids to approach and landing-Instrument landing system, Localizer, Glide-Slope system-receiving equipments-Site effects-Marker beacons ,Ground controlled approach systems-surveillance radar-Precision approach radar-Microwave landing system (MLS) Antenna system for MLS

UNIT IV

Doppler navigation-Doppler effect-Beam configuration-Doppler frequency equations, Track stabilization-Doppler spectrum-Components of the Doppler navigation system-Doppler Radar equipment-Continuous wave Doppler Radar, FMCW Doppler Radar Frequency Trackers, Doppler range Equation, Inertial navigation-Principles of operation-Navigation over the earth-Components of inertial navigation system, Accelerometers-Gyros and stabilized platforms-Earth-Coordinate mechanization strapped down systems-accuracy of inertial Navigation systems.

UNIT V

Satellite Navigation system-The transit system, Navstar Global Positioning System (GPS) -Basic principles of operation-Signal structure-Data message-velocity determination Accuracy of position determination-Differential navigation-Navstar Receivers Integration of GPS with inertial Navigation systems, GPS transmitters-Russian Glonass system

TEXT BOOKS

1 .Elements of Electronic Navigation N.S Nagaraja II Edn TMH
2.Global Positioning Systems, Inertial Navigation and Integration Mohinder Grewal II Edn Wiley and sons.

REFERENCE BOOKS

1 .Basic Coastal Navigation-An introduction to piloting- Frank.J.Larkin-Sheridan press
2.Duttons Navigation and Piloting - Elbert .S. Maloney, Naval Institute press I Edn
3.Marine navigation – Piloting, Celestial and Electronic Navigation - Richard Hobbs, II Edn

IV Semester-Core23- Practical-7

FIBRE OPTICS AND MICROWAVE LAB

At least **TEN** Experiments to be carried out compulsorily

Experiments pertaining to Fiber optics, Optical Communication and Fiber optic sensors:

1. Numerical aperture determination for fibers and Attenuation Measurement in Fibers.
2. Mode Characteristics of Fibers – SM Fibers.
3. Coupling Fibers to Semi-Conductor Sources – Connectors & Splices.
4. Fiber optic communication links. Digital and Analog
5. L.E.D & Photo Diode Characteristics.
6. Intensity modulation of LASER output through an Optical fiber.
7. Measurement of data rate for digital optical link.
8. Measurement of losses for analog optical link.

Microwave experiments

1. Reflex klystron Repeller mode characteristics
2. Characteristics of Gunn diode Oscillator
3. VSWR Measurements
4. Impedance measurement using Microwave test bench
5. Determination of guide wavelength, frequency
6. Radiation Pattern of Horns, Paraboloids.
7. Measurement of coupling and directivity of a directional coupler
8. Measurement of isolation and power division of E&H plane TEEs
9. Circulator Characteristics.
10. Scattering parameters of Magic Tee.

IV Semester-Core24- Practical-8

POWER ELECTRONICS LAB

At least **TEN** Experiments to be carried out compulsorily

1. R, RC and UJT firing circuits for the control of SCRS.
2. Design and implementation of Ramp-Comparator and digital firing scheme for simple SCR circuits.
3. Automatic lighting control with SCRs and optoelectronic components.
4. AC phase control using SCR and Triac.
5. Speed control of DC motor using choppers and converters.
6. Generation and study the PWM control signal for Single phase dc to ac inverter.
7. Study and use of the single phase half controlled & fully controlled AC to DC Converter and effect of firing angle control on load voltage & wave Forms.
8. Study and use of back to back connected SCR/ triac Controlled AC Voltage controller and its wave forms with Variation of firing angle.
9. Study & use chopper circuit for the control of DC Voltage using (1) Pulse width control (2) Frequency Control.
10. Study of Single Phase inverter and its wave form.
11. Study of Three Phase firing circuit with synchronisation, and testing with three phase AC to DC bridge converter. Testing of wave forms of digital firing modules.
12. Study and Testing of a Three Phase bridge inverter with different types of loads.
13. Study of Thyristor based DC to DC converter(Chopper).
14. Study of industrial type flyback DC to DC converter with isolated and regulated output voltage.
15. Study of Thyristor based DC drive with closed loop speed control.
16. Study of ZVS and ZCSbuck converter.

Select any one

Elective-1

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

Elective - 2

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

Core-25 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.

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