PT. RAVISHANKAR SHUKLA UNIVERSITY, RAIPUR

Scheme of Examination
M.Sc. (Electronics)
(Semester System)

EFFECTIVE FROM JULY 2016

M.Sc. Electronics is a four semester course spread over the period of two years. Every semester course consists of four theory courses and two laboratory courses ,each theory course carrying weight-age of 100 marks (4 credits) and lab course of 100 marks (2 Credits). However, in the final semester, there will be one project in lieu of one practical.

The School of Electronics, Pt Ravishankar Shukla University, Raipur offers this course on its campus. It is designed to offer in depth knowledge of the subject starting from its basic concepts to the state of art technologies in use today. Students are also provided extensive laboratory training on the course content and the current requirements of industries and R and D. In the final semester every student has to undertake a project. Advanced papers are offered to the students in the areas of Communications, Photonics, Digital Signal Processing, Embedded Systems, and Power Electronics and Neural network. In addition the course caters to the requirements of providing complete exposure to NET/SET syllabus for Electronics formed by the U.G.C.

The following shall be the scheme of examination for the course:

Semester – I

Theory	Marks			Credits
	Theory	Internal	Total	
Paper I (Code EL 101) Analog Integrated Electronics and Physics of Electronic Materials	80	20	100	4
Paper II (Code EL 102) Digital Design and Applications	80	20	100	4
Paper III (Code EL 105) Signals, Mathematical and Computational Methods in Electronics	80	20	100	4
Paper IV(Code EL 104). Optical , Quantum and Organic Electronics	80	20	100	4

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Practical	Experiment	Viva	Internal	Max	Credits
1. Lab course "A" Analog Electronics Lab	60	20	20	100	2
2. Lab course "B" Digital electronics Lab	100	60	20	100	2
Total				600	20

Total Marks for Semester I=600 & Credit = 20

Semester – II

Theory	Marks			Credits
	Theory	Internal	Total	
Paper I (Code EL 201) Network Analysis and Synthesis	80	20	100	4
Paper II (Code EL 202) Microprocessor and C++ Programming	80	20	100	4
Paper III (Code EL 203) Analog and Digital Communication Systems	80	20	100	4
Paper IV (Code EL 204). Electromagnetic Plane wave, Transmission lines and Microwave Devices	80	20	100	4

Practical	Experiment	Viva	Internal	Max	Credits
1. Lab course "C" Analog and Digital Communication Lab	60	20	20	100	2
2. Lab course "D" –8085 Microprocessor Programming, Study Cards and Interfacing Lab	60	20	20	100	2
Total				600	20

Total Marks for Semester II=600 & Credits=20

Revised and Approved by Board of Studies in Electronics on 7th November 2015

Semester – III

Theory	Marks			Credits
	Theory	Internal	Total	
Paper I (Code EL 301) Advanced Microprocessor and Interfacing	80	20	100	4
Paper II (Code EL 302) Data Communication, Mobile and Wireless Communication	80	20	100	4
Paper III (Code EL 303) Instrumentation and Measurement Or Optional Paper III(Code EL 303)Photonics	80	20	100	4
Paper IV (Code EL 304). Power Electronics, Information Theory and Coding	80	20	100	4

Practical	Experiment	Viva	Internal	Max	Credits
1. Lab course "E" - Optical Electronics, Transducer and Instrumentation Lab	60	20	20	100	2
2. Lab course "F" – 8086 Microprocessor Programming, Interfacing and "C++" Programming Lab	60	20	20	100	2
Total				600	20

Total Marks for Semester III = 600 & Credits=20

Revised and Approved by Board of Studies in Electronics on 7th November 2015

Semester IV

Theory	Marks			Credits
	Theory	Internal	Total	
Paper I (Code EL 401) Digital Signal Processing	80	20	100	4
Paper II (Code EL 402) Optical and Satellite Communication	80	20	100	4
Paper III (Code EL 403) Automatic Control System and Artificial Neural Network	80	20	100	4
Paper IV (Code EL 404). Embedded System and Microcontroller	80	20	100	4

Practical	Experiment	Viva	Internal	Max	Credits
1. Lab course "G" - Optical Communication and 8051 Programming Lab	60	20	20	100	2
2. Project & Seminar	80	20	-	100	2
Total				600	20

Total Marks for Semester IV = 600 & Credits=20

Revised and Approved by Board of Studies in Electronics on 7th November 2015

PT. RAVISHANKAR SHUKLA UNIVERSITY, RAIPUR

SYLLABUS PRESCRIBED FOR THE EXAMINATION OF

M. Sc. Electronics

July - Dec 2016

Semester – I

Paper 1 - Analog Integrated Electronics and Physics of Electronic Materials

Max. Marks: 80, Min. Marks: 16
Student should be allowed to use Programmable Scientific Calculator in Examination hall

Unit I – Physics of Electronic Materials

Crystal structures, classification of crystals, lattices, reciprocal lattice, Miller indices, amorphous materials. Lattice Vibration and Phonons, Bloch theorem, Phonons, Nearly Free electron theory. Dielectric properties, electronic polarisability, Clausius Mossotti relation, dielectric Constant static and frequency dependent

Semiconductors: Direct and indirect band gap methods to determine the Forbidden gap, mobility and conductivity, intrinsic and extrinsic semiconductor, Impurities, carrier concentration, electrical properties of Ge and Si, experimental methods to study the electrical parameters, Drift and Diffusion, Hall effect, electrons and phonons in semiconductors.

Unit II –Transistor analysis at low frequencies

Review - Transistor Characteristic viz CE, CB and CC configuration of BJT, Principle of operation and characteristic of JFET and MOSFET,

Transistor at low frequency - Graphical analysis of CE configuration, Transistor hybrid Model, h- Parameters and their variations, analysis of a transistor amplifier circuit using h-parameter, Emitter follower, comparison of transistor amplifier configurations, Miller's Theorem and its dual, cascading transistor amplifiers, Simplified hybrid model – CE and CC configuration, common emitter amplifier with an emitter resistance.

Transistor biasing and stabilization

Unit III – Multistage and Feedback Amplifiers Analysis

Transistor at high frequencies, Hybrid – pi model, gain bandwidth product.

Multistage Amplifiers Analysis - Introduction, frequency response of an amplifier, band pass of cascaded stages, Coupling scheme - RC coupled, transformer coupled and direct coupled amplifiers, low frequency response of RC coupled stage, effect of emitter bypass capacitor on low frequency response, high frequency response of two cascaded CE transistor stages.

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Feedback Amplifiers – Basic concept, types of feedback method of analysis of a feedback amplifier.

Unit IV – Operational Amplifier, Characteristics and Applications

Basic operational amplifier and its characteristics, characteristics of ideal and practical operation amplifier, parameters of operational amplifier, measurement of operational amplifier parameters, frequency response of operational amplifier,
Linear and Nonlinear Circuits analysis using operational amplifier - Inverting and Non inverting Amplifiers, Differentiator, Integrator, Voltage to current converter, Instrumentation amplifier, Sine wave Oscillator, Low pass and band – pass filters, Comparator, Multivibrator and Schmitt trigger, Triangular wave generator, Log and Antilog amplifiers

Unit V - Integrated Circuit Fabrication and Characteristics

Integrated circuit technology - SSI, MSI, LSI, VLSI, basic monolithic integrated circuits, planner process, epitaxial growth, masking and etching, diffusion of impurities, bipolar transistor fabrication, fabrication of FET,CMOS technology, monolithic diodes, integrated registers, integrated capacitors and inductors, monolithic circuit layout, metal semiconductor contact, packaging and characteristic of integrated circuit components.

TEXT BOOKS

1. Integrated electronics – Analog and digital circuits and systems Jacob Millman, Cristos, C. Halkias, Tata Macgraw□Hill
2. Electronic Devices and Circuit Theory, 9th ed. Boylestad & Nashelsky PHI
3. Microelectronics - Jacob Millman, Arvin Grabel, Tata Macgraw□Hill
4. Physics of Semiconductor Devices: Shur PHI
5. A Textbook of Applied Electronics (M.E.) Sedha R S, S. Chand Pub.
6. Physics of Semiconductor Devices: Sze
7. Ramakant A.Gayakwad, 'OP-AMP and Linear IC's', Prentice Hall
8. Principal of Electronic Material & Dev: S O Kasap

Paper 2 - Digital Design and Applications

Max. Marks: 80, Min. Marks: 16
Student should be allowed to use Programmable Scientific Calculator in Examination hall

Unit I - Basic Logic Circuit

Introduction of basic gates, universal gates, number systems and codes, Boolean algebra, switching characteristics of semiconductor devices, logic gate characteristics - speed of operation, power dissipation , figure of merit, fan in, fan out, noise margin. Logic families -

RTL, DTL, TTL, ECL interfacing, ECL and TTL, MOS logic - MOSFET NAND and NOR gates, CMOS inverters, CMOS - NAND and NOR gates, interfacing CMOS and TTL, inter facing CMOS and ECL, comparison of logic families.

Unit II - Combinational Logic Design

Simplification of Boolean algebra using K□map, minterm and maxterm, design of binary adder, subtractor , digital comparator, parity generator/checkers, priority encoder, BCD to 7 - segments decoder, multiplexer , multiplexer tree, demultiplexer and demultiplexer tree.

Unit III - Sequential Circuit Design

Excitation table of flip flops – S - R, J-K, Master-Slave – JK, D and T flip-flops, clocked flip flop design – conversion of one form of flip flop to another type.

Analysis of clocked sequential circuits - State equation, state table, state diagram, state input equations, analysis with - flip flops, JK flip flops and T flip flops.

State reduction and assignment, design procedure – synthesis using D flip flops, JK Flip flops and T flip flops.

Unit IV - Registers, Counters and A/D, D/A converters

Registers - Shift registers, application of shift registers, serial to parallel converter, parallel to serial converter.

Counters - Ring counter, modulo□n□counter, synchronous counter –ripple counter (binary, BCD) and up-down counter, asynchronous counters - ripple counter (binary , BCD) and up-down counter. Other counters – counter with unused states, ring counter, Johnson counter.

A/D, D/A Converters – D/A weighted register type, R/2R ladder type, D/A converter specifications, A/D converters - successive approximation type, parallel comparator, dual slop ADC using voltage to frequency conversion and frequency to time conversion.

Unit V - Semiconductor Memories

Memory organization and operation , write operation, read operation , expanding memory size and word capacity , classification and characterization of memory, sequential memory ROM, dynamic ROM, RAM cell, content addressable memory (CAM), PLA, CCD, PAL.

TEXT BOOKS

1. Digital Design - M. Moris Mano, PHI Publication.
2. Modern Digital Electronics - R.P. Jain, Tata Mcgraw.
3. Digital Principal and Application - Malvino Leach, Tata Macgraw Hill .
4. Digital Systems: Principles and Applications, 10th ed. Tocci, Widmer & Moss PHI

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07

PAPER 3 – Signals, Mathematical and Computational Methods in Electronics

Max. Marks: 80, Min. Marks: 16
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UNIT I - Signal Analysis

Introduction – Classification of signals and systems, some ideal signals, energy signal,

Power signals, energy and power spectral densities.
Fourier Series, Complex Fourier Spectrum, The Fourier Transform, Continuous Spectrum, Fourier Transform involving Impulse Function, Properties of Fourier Transform, Fourier Transform of Periodic Functions, Convolution, Sampling Theorem.

UNIT II – Linear Systems and State Variables Techniques

Introduction, System Function (Transfer Function), Distortion less Transmission, Paley-Wiener criterion, Correlation, Autocorrelation

State Variables Techniques - State variable concepts, form of the state equations, time domain and frequency domain solution of state equations, state transition matrix, state equations for networks, state equations from transfer functions.

UNIT- III- Probability and Random Signal Theory

Introduction, set theory, Introduction to Probability, Conditional Probability Statistical Impedance, Baye's Theorem, Random variables, Discrete and Continuous Random Variables, Joint Distributions, Characteristics of Random Variables, Binomial, Poisson and normal Distributions, Uniform and other Distributions, Random and Markov Processes.

UNIT IV - Mathematical Methods

Laplace Transform – Definition, transform of elementary function, properties of Laplace transform, convolution theorem, application to differential equation, simultaneous Linear equations with constant coefficients, unit step and unit impulse function

Special Function - Bessel equations, recurrence formula, expansion for Jo and J1, values of J1/2, generating function for Jn(x), equation reducible to Bessel equation

UNIT V – Computational Methods

Numerical Differentiation and Integration

Finite Differences, Derivatives using Forward, Backward and Central Difference Formulae, Newton-Cote's Quadrature formula, Trapezoidal rule, Simpson's rules, Weddle's rule.

Numerical methods for Solution of Ordinary Differential Equation-Picards Method ,Taylor Series Method , Eulers and Modified Eulers methods, Runge and Runge Kutta Methods , Predictor and Corrector Method.

Revised and Approved by Board of Studies in Electronics on 7th November 2015

TEXT BOOKS

1. Communication System- Analog and Digital - R.P.Singh & S.D. Sapre TMH.
2. Signal and System - Nagrath, Sharan and Ranjan. Mcgraw hill Publishing
3. Signal and Systems - Rodger E. Ziemer. Continuous and Discrete 2nd ed.Maxwell Macmillan Int. Edition,
4. Higher Engineering Mathematics - B.S. Grewal, Khanna Publications
5. Numerical Methods - Kandaswami,Thilagavathi and Gunavathi, S.Chand & Co.
6. An introduction to Numerical methods: A MATLAB approach by Abde/Wahab Kharab, Ronald B Guenther

Paper 4-Optical, Quantum and Organic Electronics

Max. Marks: 80, Min. Marks: 16
Student should be allowed to use Programmable Scientific Calculator in Examination hall

Unit I - Quantum Electronics

Coherent light sources, basic principle of lasers, laser pumping, stimulated emission, light amplification, threshold condition, Einstein's coefficient, laser rate equations for two, three and four level laser systems, variation of power around threshold, rectangular cavity, open plane resonator, mode locking and Q-switching of lasers.

Unit II - Applications of Quantum Electronics

Types of Lasers - Ruby Laser, He-Ne laser, Ar-ion laser, Co_2 laser, dye laser and semiconductor laser

Laser Applications - Laser in manufacturing, laser cutting of material, laser marking, laser transmitter, measurement of distance through Laser

Unit III - Optical Display Devices

Optical Display Devices - LED- Basic principle of operation, radiative recombination process, the spectrum of recombination process, the internal quantum efficiency, double hetrostructure, response time of LED, carrier configuration and modulation bandwidth, edge emitting LED, LED design. Liquid Crystal Display - construction, basic principle of emission, Plasma Display- construction, basic principle of emission

Unit IV - Photo Detectors and Organic Electronics

Photodiodes- General Principles, quantum efficiency, silicon P-N photodiodes, hetrojuncton photodiodes, schottkey barrier diode, P-I-N photodiodes, avalanche photodiodes, and phototransistors.

Introduction to Organic Electronics, Organic versus Inorganic solids, Molecular materials, Organic Semiconductors, Electronic states in conjugated molecules, Conjugated polymers

Unit V - Electro-Optical Devices

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09

Electro-Optic Effect - Kerr effect, Pockels effect, Farady effect, Electro-Optic Modulator- Electro-optic phase modulator, electro-optic amplitude modulator, kerr modulator
Acousto-Optic Effect - Raman-Nath and Bragg Diffraction, Raman-Nath acoustooptic Modulator, bragg modulator, acousto-optic modulator.
Magneto-Optic Effect - Faradays effect, magneto-optic modulator

TEXT BOOKS

1. Optical Electronics - Ghatak Thyagarajan, University Press
2. Optical Communication System - John Gower, PHI Publication.
3. **Optoelectronics Devices & Systems - S.C. Gupta, PHI Publication**
4. Optoelectronics - An Introduction - J.Wilson and J.F.B. Hawkes, PHI Publication.
5. Semiconductor Optoelectronic Devices, 2nd ed. **Bhattacharya PHI**
6. Pope and Swenburg, Electronic Processes in organic crystals and polymers, 2 nd Ed., Oxford
7. Organic molecular crystals, E.A. Sininsh EA and V. Capek.

PT. RAVISHANKAR SHUKLA UNIVERSITY, RAIPUR
SYLLABUS PRESCRIBED FOR THE EXAMINATION OF
M. Sc. Electronics
Jan-June 2017
Semester-2

Paper 1-Network Analysis and Synthesis

Max. Marks: 80, Min. Marks: 16
1. Student should be allowed to use Programmable Scientific Calculator in Examination hall
2. Special graph paper viz. Polar graph & Semi log graph papers should be provided to the students in the examination hall.

Unit I - Mesh and Node Analysis and Network Theorems
Mesh and Node Analysis - Kirchhoff's laws , Star and Delta conversion, source transformation, mesh and node analysis of electric circuits, response of the network by differential equation and Laplace transform method ,initial conditions in the network.
Network Theorems - Thevenin's theorem, Norton's Theorem, Superposition, Millman theorem, Maximum power transfer theorem, and Reciprocity theorem, Tellegen theorem and Substitutions theorem .

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Unit II – Coupled Circuit, Waveform Synthesis and Graph Theory

Coupled Circuit – Dot convention and magnetic coupling

Waveform Synthesis – Standard signals, unit step function, ramp function, impulse function, initial and final value of f(t) from F(s), the convolution integral.

Graph Theory - Concept of a network graph, twigs and links, trees, co trees ,formation of incidence matrix ,cut-set matrix, tie-set matrix and loop currents, analysis of networks ,network equilibrium equation ,duality, network transformation

Unit III - Network Function and Frequency Response Plots

Network Function - Network function for one port and two port, the calculation of network functions - ladder networks and general networks, pole and zero of network functions, restrictions on pole and zero locations for driving point functions ,restrictions on pole zero locations ,time domain behavior from the pole and zero plot, stability of active networks.

Frequency Response Plots- Magnitude and Phase plots, Root Loci, Bode Diagrams, Nyquist- Stability Criterion

Unit IV -Two Port Network Analysis

Relationship of two port variable , Z-parameters, Y- parameters, Hybrid parameters, ABCD parameters, conditions of reciprocity and symmetry, inter-relationship between parameter of two port network, different types of interconnections of two port networks.

Unit V- Network Synthesis

Concept, Procedure of Synthesis, Reactive Networks, Properties of Expressions of Driving point Admittances of L-C Networks, Pole-Zero Interpretations in L-C Networks. L-C Networks Synthesis-Foster's Canonic Form (First and Second Foster form), Significance of Elements in the Foster form, Cauer Canonic form of Reactive Networks-First and Second form of Cauer Networks, Applicability of Foster and Cauer forms, R-L & R-C Network Synthesis by Foster form, Identification of foster form , Identification of Admittance, R- L& R-C Network Synthesis by Cauer form, Identification of Immittance Function in Cauer form, Determination of end elements in Foster and Cauer R-L & R-C Networks.

TEXT BOOKS

1. Networks and System - D. Roy Choudhary, New Age International
2. Network Analysis: M.E. Van Valkenburg.PHI
3. Circuit theory (analysis and synthesis) - A. Chakrabarti, Dhanpat Rai and co.
2. Network Synthesis: M.E. Van Valkenburg.PHI

Revised and Approved by Board of Studies in Electronics on 7th November 2015

Paper 2 - Microprocessor and C++ Programming

Max. Marks: 80, Min. Marks: 16

1. Student should be allowed to use Non Programmable Scientific Calculator in Examination hall

Unit I - Micro-Computer System & 8085 Microprocessor Architecture

Microcomputer System & its operation- Overview of a basic Microcomputer structure and operation, Ideal microprocessor, Microprocessor evolution and types, Microprocessor initiated operation & Bus organization, internal data operation & registers, peripheral initiated operation.

Memory- Memory organization, memory map, memory & instruction fetch, types of memory. Interfacing Devices - Tri-state devices, buffer, decoder, encoder, latch.

Microprocessor Architecture - Introduction to 8085 Microprocessor, pin diagram & its function, bus timing, demultiplexing of address & data Bus, generation of control signals, microprocessor architecture of 8085, decoding & execution of an instruction, memory interfacing, timing diagram of memory, read & write cycle.

Unit II - Instruction Set & Programming of 8085, Stack & Subroutines

Instruction classification, instruction format, addressing modes, basic instructions and simple programming ,Additional Instructions - DAA, DAD, LHLD.SHLD, PCHL, STC, XCHG, XTHL and programming, Code Conversion - BCD to Binary, Binary to BCD, Binary to ASCII, ASCII to Binary.

Stack & Subroutines - Concept of stack, PUSH/POP instruction, illustrative example, Concept of subroutines, call & return instruction, conditional call & return instruction, advanced subroutines concept.

Unit III - Counters, Time Delay, Interrupts & Interrupt Controller

Counters and Time Delay -Time delay using one register, Time delay using a register pair, flow chart & program for a hexadecimal counter and modulo 10 counter, delay calculations.

Interrupts - Interrupts of Intel 8085, hardware and software interrupts, vectored/non vectored interrupts, maskable/non- maskable interrupts, Interrupts priority concept, DI,EI, RIM, SIM instructions, pending interrupts.

Programmable Interrupt Controller - Architecture of 8259, initialization command words (ICW's), operational command words (OCW's), 8259 interrupts mode, simple initialization program for 8259.

Unit IV - Data Transfer & Peripheral Interfacing Devices

Format of data transfer, modes of data transfer, microprocessor controlled data transfer, peripheral control data transfer, peripheral I/O instruction, serial I/O lines, SOD and SID.

Programmable Peripheral Interfacing Devices - Programmable keyboard / display interface – 8279, Programmable peripheral interface – 8255, Programmable interval timer – 8253, Programmable Interrupt controller – 8259, Synchronous data communication device – 8251, DMA Controller 8257, RS 232 interface.

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Unit V- "Object Oriented Programming

Principles and Basic concepts, OOPs languages, Application of OOPs, Simple programming in C++, Tokens, expressions and control structures - Tokens, keyword, identifiers and constants, declaration of variables, operators in C++, manipulators, control structure. Functions in C++ - main function, function references, return references, default arguments and constant arguments. Classes and Objects- C structures revisited, specifying class, C++ program with classes, arrays within Classes, memory allocation of objects, arrays of objects, returning objects, pointer to members, local classes.

TEXT BOOKS

1. Microprocessor Architecture Programming - Ramesh S. Gaonkar & Application with 8085/8080 Penram Int. Pub2
2. 0000 to 8085: Introduction to Microprocessors for Engineers and Scientists, 2nd ed. Ghosh & Sridhar PHI
3. Fundamentals of Microcomputer & Microprocessor r - B.Ram, Dhanpat Roy Pub.
4. Object Oriented Programming E - Balaguruswamy with C++ Second Edition
5. PROGRAMMING IN C++ P.B.MAHAPATRA, S Chand & Co

Paper 3- Analog and Digital Communication Systems

Max. Marks: 80, Min. Marks: 16

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Unit I Radiation and Propagation of Waves - Electromagnetic Radiation –Effect of environment, Propagation of waves –Ground Wave and Sky-wave Propagation – The ionosphere – Space waves – Tropospheric scatter propagation – Extraterrestrial communications

Introduction to Communication Systems -Block diagram of communication system – Transmitter, Receiver, Modulation, Bandwidth requirements

Noise - Source of Noise, External Noise –Atmospheric Noise, Extra Terrestrial Noise, Industrial Noise, Internal Noise-Shot Noise, Resister or Johnson Noise ,Calculation of noise in Linear Systems, Noise Bandwidth, Power, Noise Temperature, Noise in Two Port Networks, Noise Figure, Cascaded stages, Measurement of Noise Figure, Signal in presence of Noise, Narrowband Noise.

Unit II – Amplitude Modulation System

Amplitude Modulation - Frequency spectrum of AM wave, Representation of AM wave, Power relation in AM wave, Single side band techniques – Suppression of carrier, suppression of side bands, vestigial side band,

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Transmitters - Classification of radio transmitter, AM radio transmitter, Generation of AM -Transistor as AM Generator, balanced modulator, filter method, phase shift method, third method.

Receivers – Classification of radio receiver, basic function of AM receiver, tuned radio frequency receiver, super heterodyne receiver, AM demodulation – RC demodulator, square law demodulator. Noise in Amplitude Modulated Systems, Comparison of various AM systems,

Unit III – Angle Modulation System

Angle Modulation – Frequency modulation, analysis of FM waveform, frequency spectrum, Bessel function, Narrowband FM and Wide Band FM, Phase modulation

FM Modulators and Transmitters - Method of frequency modulation – Direct method – reactance modulator (FET and varactor diode method), Indirect Method, pre-emphasis and de-emphasis

FM Demodulators and Receivers – Super heterodyne FM receiver – block diagram, amplitude limiter, FM demodulator –phase discriminator, ratio detector, PLL demodulator. Comparison of AM, FM and PM, , frequency division multiplexing(FDM).

Unit IV - Pulse Modulation System

Pulse Amplitude Modulation - Natural Sampling, flat top sampling, equalization signal recovery to holding, PAM modulator and demodulator. Pulse time modulation (PTM)-Generation of PTM signals, PTM modulator and Demodulator, time division multiplexing (TDM).

Pulse Code Modulation- Quantization of signals, quantization error, pulse code modulation (PCM), companding, Bandwidth of PCM System, Noise in PCM System, Differential pulse code modulation, Delta modulation, Adaptive Delta modulation.

Digital Modulation Techniques - Introduction, Binary Phase Shift Keying (BPSK), Differential Phase Shift Keying (DPSK), Quadrature Phase Shift Keying (QPSK), Quadrature Amplitude Shift Keying (QASK) and Binary Frequency Shift Keying (BFSK).

Unit V – Monochrome and Colour Television

Elements of a TV System - Concept of Picture and sound transmission and reception, Flicker, Composite Video Signal, signal transmission and Channel bandwidth, Monochrome picture tube, Television Camera tube - Vidicon and CCD. Monochrome TV transmitter and receiver (Block Diagram), Essentials of Colour TV - Three Colour theory, Luminance, Hue and saturation, Triniton Colour Picture tube, Block diagram of Colour TV transmitter and receiver, PAL Colour TV System. CCTV, HDTV, CATV and DTH, Concepts of Home Theatre

TEXT BOOKS

1. Principles of Communication Systems - Taub & Schilling, TMH
2. Principles of Communication Systems - George Kennedy, TMH
3, Communication System- Analog and Digital - R.P.Singh & S.D. Sapre TMH
4. Radio Engineering - G. K. Mithal G.K. Pub.
5. Monochrome and Colour Television - R.L. Gulati, New Age International, Wiley Eastern Ltd. New Delhi.

Revised and Approved by Board of Studies in Electronics on 7th November 2015

7/11/15

8. Advanced Electronic Communication Systems: Tomasi PHI
9. Television Engineering – A.M. Dhake, TMH
10. Electronic communication, Roddy and Coolen, PHI, New Delhi,

Paper 4 - Electromagnetic Plane Wave, Transmission Lines and Microwave Devices

Max. Marks: 80, Min. Marks: 16
1. Student should be allowed to use Non Programmable Scientific Calculator in Examination hall

UNIT I - Electromagnetic Plane Wave

Electromagnetic Plane Wave - Electron motion in electric field , electron motion in magnetic field , electron motion in electromagnetic field, electric and magnetic wave equations, Maxwell equation, Poynting theorem, uniform plane wave and reflection, uniform plane wave propagation in free space and lossless dielectric, plane wave propagation in lossy media, Ionospheric propagation.

UNIT II - Transmission Lines and Antennas

Transmission Line - Basic equation , reflection and transmission coefficient , standing wave and standing wave ratio , line impedance and admittance, Determination of characteristics impedance, Fundamental of Smith Chart, Impedance Matching: Single and Double Stub Matching, microwave Coaxial Connectors.

Antennas – The Radiation mechanism, Current and Voltage distribution, Antennas gain, Antenna resistance, Bandwidth, Beam width and Polarization, effects of Antenna height, Dipole arrays, Folded dipole. Microwave Antennas - Parabolic reflector, Horn and Lens antenna, Special purpose antennas - Yagi, Log periodic and Loop antennas

UNIT III – Microwave Waveguides and Components

Waveguides - Rectangular Wave guide – TE and TM modes , power transmission, excitation in rectangular wave guide , circular wave guides – TE,TM and TEM mode,

Microwave Components - Waveguide Tee - E-plane tee, H-plane tee, Hybrid tee, scattering parameters (s-matrix), circulators, isolators , directional couplers.

UNIT IV – Microwave Sources and Measurements

Microwave Sources - Reflex Klystron - principle of operation of velocity modulation, power output and efficiency, electronic admittance, Cylindrical Magnetron – principle of operation, equation of electron motions, cyclotron angular frequency , power output and efficiency.

Microwave measurement techniques, - Microwave bench, precautions, power measurement, bolometric method, attenuation, VSWR, impedance, frequency and Q of the cavity, standing wave measurements, impedance measurement, cavity resonator, dielectric measurements.

Revised and Approved by Board of Studies in Electronics on 7th November 2015

UNIT V - Microwave Semiconducting and Avalanche Transit -Time Devices
Microwave Semiconducting Devices

Microwave Transistor – Microwave Bipolar Transistor – principle and amplification phenomenon, power frequency limitation, Microwave Tunnel Diode – principle and characteristics of microwave tunnel diodes, JFET operation and characteristics. 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 MIC'S, microwave monolithic integrated circuits (MMIC'S).

Transferred Electron Devices – Gunn Effect Diodes, GaAs diode Ridley Watkins Hilsum (RWH) theory – Differential negative resistance

Avalanche Transit -Time Devices - Read Diode - Avalanche multiplication, carrier current and external current, output power and quality factor. IMPATT Diodes and TRAPATT Diodes- Principles of operation, power output and efficiency

TEXT BOOKS

1. Microwave Devices and Circuits – Samuel Y. Liao, PHI Pub

2. Microwave Engineering – Annapurna Das, Sisir K. Das, Tata Mc Graw Hill.
3. Microwave and Radar Engineering - M. Kulkarni, Umesh Publication
4. Electronic Communication Systems - George Kennedy, 3rd Edition TMH
5. Introduction to electrodynamics by David J. Griffithe , PHI
6. Elements of engineering electromagnetics by Narayaaa Rao, PHI

PT. RAVISHANKAR SHUKLA UNIVERSITY, RAIPUR

SYLLABUS PRESCRIBED FOR THE EXAMINATION OF

M. Sc. Electronics

July-Dec 2017

Semester-3

Paper - 1 Advanced Microprocessor and Interfacing

Max. Marks: 80, Min. Marks: 16

1. Student should be allowed to use Non Programmable Scientific Calculator in Examination hall

Unit – I Architecture & Instruction set for 8086: Architecture and pin configuration of 8086, Instruction Format; Addressing modes, Data Transfer Instruction; Arithmetic Instructions; Branching and Looping Instructions, NOP and Halt, Flag Manipulation Instructions; Logical, Shift and Rotate Instruction. Byte and String Manipulation: String Instructions; REP Prefix, Table Translation, Number Format conversions. Assembler, Directives and Operators; Assembly Process; Translation of assembler Instructions, Programming of microprocessor 8086

Revised and Approved by Board of Studies in Electronics on 7th November 2015

Unit – II System Bus Structure

Basic 8086/8088 system bus architecture, Minimum mode Configuration, Maximum mode configuration; memory interfacing with 8086/8088 in minimum and maximum mode; System Bus Timings, Bus Standards, Interrupts of microprocessor 8086

Unit – III Architecture of Interfacing Devices

Programmable interrupt controller (PIC) 8259, Programmable DMA Controller (8257). (Architecture and Functioning only) 8-bit ADC and DAC, Programming for Interfacing of 8253/8254, 8251, 8279, ADC and DAC with 8086.

Unit – IV Architecture of 32 bit Microprocessors

Intel 80386 Architecture –Special 80386 Registers –Memory management – interrupts and exceptions – management of tasks –Real, protected and virtual 8086 mode-Introduction to 80486 microprocessor – Architecture ; Comparison with 80386 processor

The IBM PC Motherboard and Drives - Motherboard Components, System Resources, ROM BIOS Services

Drives - Principles of Magnetic Storage, Floppy Disk Drive, Hard Disk Drive, IDE Interface, SCSI Interface, CD-ROM Drive, BIOS Disk Drive Services.

Unit-V High End High Performance Processors

Instructions level Parallelism and Superscalar processors, Advanced Design features, Pentium IV, Power PC, Concept of Pentium Dual Core and Core 2 Duo processors. Mobile Phone Processors IA 64 Architecture - General organization, Predication, Speculation and Software pipelining, Itanium organization, TRIPS (Tera-op, Reliable, Intelligently adaptive Processing System),Future trends in high performance processors.

TEXT BOOKS

1. Microcomputer System-The 8086/8088 Family,Architecture,Programming & Design - Y. U. Cheng Liu & A.Gibson, PHI.
2. Microprocessor & Interfacing - Doughlas V.Hall,Tata McgrawHill.
3. The Intel Microprocessor - Barry&Barry,PHL
4. Advance microprocessors and peripheral - Roy and Bhurchandi, PHI
5. Computer Organisation & Architecture - William Stallings,Pearson
6. The Intel Microprocessors 8086/8088, 80186/80187, 80286, 80386. 80486.
7. Pentium Processors - Architecture, Programming and interfacing, PHI, B.B. Brey

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Paper 2-Data Communication, Mobile and Wireless Communication

Max. Marks: 80, Min. Marks: 16
1. Student should be allowed to use Non Programmable Scientific Calculator in Examination hall

Unit I- Data Communication

Data Signal, Signaling & Data Transmission Media, Communication Mode-Half Duplex/Full Duplex, Data Communication System-Synchronous/Asynchronous Transmission, Serial/Parallel Data, Switching & Multiplexing-Circuit Switching, Message Switching, Packet Switching, Network Topology-Bus/Star/Ring/Mesh Topology, LAN, OSI Reference Model, Network Protocol(TCP/IP).

Unit II- Introduction to Mobile and Wireless Devices

Mobile and wireless devices, history, applications wireless transmission, frequencies for radio transmission, regulations, signals, antennas, signal propagation, multiplexing, modulation, wireless LANs and wireless WANs, spread spectrum, FHSS and DSSS spread spectrum technology, cellular systems, medium access control, specialized MAC.

Unit III- Telecommunications and Broadcast Systems

GSM, mobile services, system architecture, GSM subsystems, GSM communication frame, localization and calling, handover, security, new data services, satellite systems applications, GEO, LEO. MEO, routing, localization, broadcast systems, cyclic repletion of data.

Unit IV- Wireless Networks and others 3G Technologies

Wireless LAN, infrared v/s radio transmission, infrastructure and adhoc networks, IEEE 802.11, architecture (details of protocol not required), DFWMAC schemes, MAC frames, MAC management, roaming, HIPERLAN (just basics, frame and protocol details not required), Bluetooth, applications, physical layer, modes MAC layer, packet format, networking security, link management, brief discussions (frame details and protocols not required) on GPRS, DECT, TETRA, UMTS, IMT-2000, CDPD.

Unit V- Mobile Network and Transport Layers

Mobile network layer, requirements, entities, IP packet delivery, agent advertisement and discovery, registration, encapsulation and tunneling, optimization, messages, reverse tunneling, IPv6, DHCP, Mobile IP, DHCP, ad-hoc networks, mobile transport layer, traditional TCP, indirect TCP, snooping TCP, mobile TCP, fast transmit/fast recovery, transmission/time out freezing, selective retransmission, transaction oriented TCP.

TEXT BOOKS

1. Data Communication & Networking - Behrouz A Foruzon.

Revised and Approved by Board of Studies in Electronics on 7th November 2015

Kolkata 7/11/15

2. Wireless communications and networking" William Stallings, PHI
3. Data and Computer Communications – By William Stalling., 7th Ed., PHI
4. Mobile communications"-by Johan schiller, PEA, 2nd ED
5. Mobile and personal communications systems and services" Rajpandya, PHI
6. Computer Networks - Tanenbaum, PHI.
7 Data Communications and Distributed Networks, 3rd ed. Black PHI
8 Computer Networks: Protocols, Standards and Interfaces, 2nd ed. Black PHI

Paper –3 Instrumentation and Measurement

Max. Marks: 80, Min. Marks: 16
1. Student should be allowed to use Non Programmable Scientific Calculator in Examination hall

Unit I-Concept of Measurement

Basic concept of Measurement, Performance & Static Characteristics, Error in Measurement, Types of Errors-Gross, Systematic & Random, Dynamic Characteristics, Zero Order, First Order,& Second Order System, Real Time Element, Specification & Testing of Dynamic Response.

Unit II- Transducers

Fundamental Concept & Transducers Classification Resistance, Capacitance, inductance, Piezoelectric, Thermoelectric, Hall effect, Techogenerator, Optical & Digital Transducers, Measurement of Displacement, Velocity, Acceleration, Force, Torque, Strain, Speed & Sound, Temperature, Pressure, Flow, Humidity, Thickness.

Unit III- Instrumentation Electronics

Instrumentation Amplifiers, Basic Characteristics, D.C. Amplifiers, Isolation Amplifiers, Feedback Transducers system, feedback Fundamentals, Inverse Transducers, Temperature Balance System.

Signal Processing Circuits-Phase Sensitive Detection, Absolute Value Circuit, Peak Detector, Sample & Hold Circuit, RMS Converter, Logarithmic Amplifier, Frequency to Voltage & Voltage to Frequency Converter, waveform Generators, Lock in Amplifiers, SMPS, UPS.

Unit IV-Measuring Instruments

Measuring Instruments- Measurement of R, L, C Bridge, Voltage, Current, Energy, Frequency/Time, Block diagram, working principle and procedure of operation of Digital Voltmeter, Digital Multimeters, Digital Frequency Meter, Q-Meter, Digital Storage Oscilloscope

Electrometer, Spectrum analyzers, Impedance analyzer, Network analyzers, Logic analyzer, Semiconductor parameter analyzer

Unit V-Biomedical Electronic Instrumentation and Measurements

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Introduction to biomedical instrumentation, sources of bioelectric potentials, electrodes-electrode theory, biopotential electrodes, biochemical transducers, cardiovascular measurements- electrocardiography, measurement of blood pressure, blood flow and heart sound, plethysmography, the elements of intensive care monitoring; calibration and reparability of patient monitoring equipment, pace makers.

TEXT BOOKS

1. Instrumentation Devices & Circuit System -Rangan,Sharma& Mani,
2. Transducers& Instrumentation -D.V.S.Murthi.PHI
3. Biomedical instrumentation and measurements – Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer
4. Electronic Instrumentation - H. S. Kalsi, 2nd Edition, tata Mcgraw Hill
5. Electronic Instrumentation and Measurements Bell PHI

Or
Optional Paper 3 - Photonics

Max. Marks: 80, Min. Marks: 16
Student should be allowed to use Programmable Scientific Calculator in Examination hall

Unit I- Optical Radiation

Theory of Light, Light as Electromagnetic wave, Polarization of Light, Principle of superposition, Interference, Diffraction, Scattering, Photon nature of light, Light wave in homogeneous medium, Plane Electromagnetic Wave, Maxwell's Wave equation and Diverging Waves.

Unit II - Radiometry & Photometry

Photometry and radiometry-'quantities and units, colourimetry- chromaticity coordinates UCS diagrams, colour temperature, visual basis of colourimetry, Human eye and color deficiency, color vision model,Radiant Power & Radiant Energy, Units of Light,Units related to transmitter and receiver, Lambert Law, Fresnal's Equations, Amplitude, Reflection and Transmission Coefficient,

Unit III - Photovoltaic Devices

Introduction, Solar Energy Spectrum,Photovoltaic Device Principles,p-n junction Photovoltaic I-V Characteristics, Solar Cell parameters, Series resistance & equivalent circuit, Homojunction Solar Cells, Heterojunction Solar Cells, Thin Film Solar Cells, Material requirements

Unit IV- Non Linear Optical processes

Introduction, Second Harmonic Generation, propagation of EMW through second order nonlinear media, experimental technique in study second order non linearitySelf

7/11/15

Focussing and Defocussing, Optical Parametric Interactions, parametric oscillations, Four Wave Mixing, Multiphoton Absorption.

Unit V -Advances in Photonics

Raman Scattering, Photrefractive effect, Optogalvanic effect, Photothermal Deflection effect, Photorefraction in diffusing medium, Squeezed state, Optical Solitons, Optical Bistability, Optical interconnect, Photonic switches, Optical Computers, Ultrafast phenomena

TEXT BOOKS

1. Optical Electronics - Ghatak Thyagarajan, University Press
2. Optoelectronics An Introduction: Wilson & Hawkes PHI
3. Optoelectronics & Photonics S.O.Kasap, Pearso
4. Optoelectronics Devices & Systems - S.C. Gupta, PHI Publication

Paper 4- Power Electronics, Information Theory and Coding

Max. Marks: 80, Min. Marks: 16

1. Student should be allowed to use Non Programmable Scientific Calculator in Examination Hall

Unit I- Thyristors,Controlled Rectifiers and Commutation Techniques

Thyristors – Thyristor Characteristics, Two- transistor model of Thyristor, Turn ON and Turn OFF of Thyristor, di/dt protection, dv/dt protection, Type of Thyristors, Series operation and Parallel operation of Thyristors, Thyristor Firing Circuits, Unijunction Transistor. Controlled Rectifiers – Single Phase semiconverter with RL load, Single Phase full converter with RL load

Thyristor Commutation Techniques – Natural Commutation, Forced Commutation, Self Commutation, Complementary Commutation, External Pulse Commutation,

Unit II- AC Voltage Controllers, DC Choppers and Inverters

AC Voltage Controllers –Introduction, Principle of ON-OFF control, Principle of Phase control, Single Phase bi-directional controllers with inductive loads, Cycloconverters.

C Choppers – Principle of operation, Classification of Choppers – Class A, Class B, Class C, Class D and Class E Choppers.

Inverters-Introduction, classification of Invertors, Single phase, full bridge Voltage source inverter with RL load,

Unit III- Power Drives- DC Motor and AC Motor

DC Motor – Basic Characteristics, Speed control of DC motors – Armature voltage, Armature Resistance and Field flux controls, Solid state speed control of DC motor – Single Phase half wave converter, Single phase full wave converter.

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AC Motor (Induction Motor) – Construction & Principle, Speed control of Induction motor – Stator voltage, Stator frequency, Pole changing, Rotor resistance and Slip power recovery control, Basic Construction and principle of Stepper motor

Unit IV – Power conditioners:

EMI/ RFI filter, CVT, Voltage regulators, Solid state regulators, UPS online & OFF line, reliability of UPS system. Batteries used for UPS, Important terms related to the UPS System & comparison of UPS system.

Applications of Power Electronics: Electronic ballast, Power factor correction, Induction heating, Dielectric heating.

Unit V – Information Theory :Introduction, Unit of Information, Entropy, Rate of Information, Joint Entropy and Conditional Entropy, Mutual Information, Channel Capacity-noise-free channel, symmetric channel, Binary Symmetric channel & cascaded channel,Shannon's Theorem, Continuous Channel, Capacity of a Gaussian Channel: Shannon Hartley Theorem, Bandwidth S/N Trade-off.

Coding – Introduction, Coding Efficiency, Shannon-Fano Coding, Huffman Coding, Error-Control Coding, Block Codes, Convolution Codes.

TEXT BOOKS

1. Power Electronics - Muhammad H. Rashid, Prentice Hall of India, Second Edition, New Delhi
2. Power Electronics - A.K. Gupta & L.N. Singh, Dhanpat Rai Publishing Company, 1st Edition
3. Power Electronics - J. Asger, PHI Publication.
4. Communication System - R.P.Singh & S.D. Sapre TMH Analog and Digital
5. Power Electronics - R.M. Jalnekar & N.B. Pasalkar
6. Pspice Simulation of Power Electronic Circuits: Raymond Ramshaw
8. Communication Systems-Simon Haykin, John Wiley & sons, NY, 4th Edition
9. Information theory- F.M Reza, McGraw Hill
10. A Text book of Electrical Technology (Volume –II) - B. L. Thereja & A K Theraja, S Chand & Co. Ltd (2006)
11. Principles of Electrical Machines- V K Mehta & Mehta,S Chand & Co. Ltd (2006)
12. Elecrtrical Machines – A Hussain, Dhanpat Rai & Co

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PT. RAVISHANKAR SHUKLA UNIVERSITY, RAIPUR
SYLLABUS PRESCRIBED FOR THE EXAMINATION OF
M. Sc. Electronics
Semester-4
(Jan-June 2018)

Paper 1 -Digital Signal Processing

Max. Marks: 80, Min. Marks: 16
1. Student should be allowed to use Non Programmable Scientific Calculator in Examination hall

Unit I- Discrete Time Signals, Systems and Z-Transform

Discrete Time Signals, Systems-An introduction to analog signal processing, Discrete time signals & systems- discrete time signals (sequences), Linear shift, Invariant systems, Stability & Casuality, linear constant coefficient Differential equations, Frequency domain representation of discrete time systems & signals, Sampling of continuous time signals.
Z-Transform- Introduction, Z-transforms (of finite length sequences, Right sided, left sided & two sided sequences) Inverse Z-transform, Z-transform theorems & properties – Region of convergence of rational Z-transform, Linearity, Shift of a sequence, multiplication by an exponential sequence, Initial value theorem, Convolution of sequences, system functions.

Unit II-Discrete Fourier Transform

Discrete time fourier transform (DTFT), Representation of periodic sequence - Discrete Fourier series(DFS), Properties of the Discrete Fourier series- Linearity, Shift of a sequence, symmetry properties, periodic convolution; Fourier representation of finite duration sequences- The Discrete Fourier transform(DFT), Properties of discrete Fourier transform - Linearity, Circular shift of a sequence, Symmetry Properties, Circular convolution, Linear Convolution using the Discrete Fourier Transform.

Unit III- Fast Fourier Transform and Network Structures

Fast Fourier Transform (FFT), Inverse DFT, Radix FFT.
Signal Flow Graph Representation of Digital Network, Matrix Representation of digital Networks, Basic network structures for IIR systems (Direct form, cascaded form, and parallel form) Transposed forms, Basic network structures for FIR systems (direct form, cascaded form).

Unit IV- Digital IIR filter

Digital filter design techniques- design of IIR digital filters from analog filters, impulse invariance, Bilinear Transformation, Design examples: Analog-Digital Transformation –

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Digital Butterworth Filters (impulse invariance, bilinear transformation), Digital Chebyshev filters (impulse invariance, bilinear transformation), Comparison of IIR and FIR Digital Filters.

Unit V- Digital FIR filter

Finite impulse response (FIR) Filter Design,Rectangular, Triangular, Hanning, Hamming, Blackman and Kaiser Window, Linear phase and Optimal Filter .
Application Digital Signal Processing-speech processing, speech analysis- short term Fourier analysis, cepstral analysis & linear predictive analysis, speech coding, channel vocoder

TEXT BOOKS

1. Digital Signal Processing - A.V. Oppenheim & Schafer. PHI
2. Discrete Time Signal Processing - A.V. Oppenheim & Schafer. PHI
3. Digital Signal Processing - Johny Jonson, Pearson PHI
4. Digital Signal Processing - Proakis
5. Digital Signal Processing -Vallavaraj, Salivahanan, Ghanapriya, THM

Paper 2-Optical and Satellite Communication

Max. Marks: 80, Min. Marks: 16
1. Student should be allowed to use Non Programmable Scientific Calculator in Examination hall

Unit I-Optical Fibers

Optical fiber theory and applications, ages and disadvantages, parameters and types of optical fibers, Propagation of light through optical fiber ,single mode step index fiber, multimode step index fibers, multimode graded index fibers, Comparison of Three types of Optical fibers, Acceptance angle and acceptance cone, Numerical Aperture, , construction of optical fiber cables,

Transmission Characteristics of Optical Fiber: Attenuation in Optical Fibers, loss mechanisms - absorption and Rayleigh scattering, Radiation losses, Wavelength dispersion, intermodal and intramodal, Bending losses, Coupling losses: misalignment and mismatch losses

Unit II- Principle of Optical Communication

Optical Fiber Communication System Block Diagram
Optical sources: Heterojunction LED, Edge emitting LEDs, Injection Laser LEDs
Light Detectors: PIN Diode and Avalanche Photodiode, Structure of In, GaAs APDs Characteristics of Light Detectors, Connector types and splices, Optical Fiber System Link Budget, Optical fiber manufacturing processes. Optical fiber testing and parameter (cut off Wavelength, loss per unit length, numerical aperture, bending loss, connector/spliceloss) measurement

Unit III- Optical Fiber Communication Systems and Applications

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Typical Fiber Optic Communication System, Optical Transmitter, Optical Receiver, Optical Repeaters, Optical Amplifiers, semiconductor optical amplifiers, EDFA, Raman Amplifier. Basic idea of WDM and DWDM systems, System Architecture: Point to point link, Distributed Network, AN Fiber Optic Sensors in Health care, Optical Computing, Optical Logic Gates

Unit IV-Satellite Communication - I

Satellite Communication – Introduction, Kepler's laws, orbit, Power systems, Satellite Frequency Allocations and Band Spectrum, Elements of a Satellite Communication System, Active and Passive Satellites, Modem and Codec, Communication Satellite Link Design – General Link Design Equations, Effective Isolated Radiated Power (EIRP), System Noise Temperature, C/N and G/T ratio, Atmospheric and Ionosphere Effects on Link Design, Uplink Design, Complete Link Design, Interference Effects on complete link design, Earth Station parameters.

Unit V- Satellite Communication - II

Satellite orbits – synchronous orbit, orbital parameters, Satellite location with respect to the earth, Look Angles, Earth coverage and Slant range. Satellite Transponder model, Satellite RF Front End, Satellite Carrier Processing, Antenna – Antenna parameters, Gain, Resistance, Bandwidth, Beam-width and polarization, Parabolic antenna, Application of Satellite Communication in Television - Direct Home Broadcast, Telephone services and Data Communication.

TEXT BOOKS

1. Optical Fiber Communication -G. Keiser, Mc. Graw Hill
2. Fiber Optics Communication -D. C. Agrawal
3. Satellite Communication -D.C. Agrawal, Khanna Pub.
4. Satellite Communication -R.M. Gagliardi
5. Fundamentals of Optical Fibre Communication: Satish Kumar PHI
6. Optical fibre and Laser Anuradha De New Age International Publishers
7. Optical Fiber Communication: V.S.Bagad Technical Publications
8. Optical Fiber Communications', John Senior: PHI.
9 Electronic communications, Roddy and Coolen, PHI, New Delhi,

Paper 3- Automatic Control System and Artificial Neural Network

Max. Marks: 80, Min. Marks: 16

1. Student should be allowed to use Non Programmable Scientific Calculator in Examination Hall

2. Special graph paper viz. Polar graph & Semi log graph papers should be provided to the students in the examination hall.

Unit I - Fundamental of Control System

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Basic Definition, Classification of Control System, Open Loop & Closed loops System, Effect of feedback on System response, Impulse Response & Transfer Function, Block diagram, Block Diagram Reduction Techniques. Signal Flow Graph-Basic Definition in SFG, Rule for SFG, Properties of SFG, Masons Gain Formula.

Unit II -Time Domain analysis and Stability of Linear Control System

Time Response of Continuous Data system, test Signal ,Steady State Errors and error constants, Unit Step response, Time Domain specifications, time Response of first order System, Transient Response of Prototype second order System, effect of adding a zero to the system, Stability of Linear Control System-Absolute Stability, Relative Stability, Routh-Hurwitz Criterion-Ruth Tabulation, Special Cases.

Unit III- Frequency Domain Analysis and Frequency Response Plots

Frequency Domain Analysis - Frequency Response of closed loop control System, Frequency Domain Specifications of prototype Second Order System, Nyquist Stability Criterion and plot, Root Loci- basic properties, Relative Stability-Gain Margin & Phase Margin, Correlation Between Time & Frequency response, Polar Plot, Bode Plot.

Unit IV-State Variable Analysis and Controllors

State Variable Analysis and Design – Concept of state variables, state model, state model for linear continuous time system, diagonalization, solution of state equations, concept of controllability and observability, PID Controller.

Unit V- Artificial Neural Network

Introduction to ANS Technology-Models of a neuron, neural networks, viewed as directed graph, feedback from neurons to ANS, **Learning and training**- Hebbian, memory based, competitive, error-correction and learning. **Assignment problem** supervised and unsupervised learning. **Network architectures-Single layered**- feed forward networks, multi-layered feed forward networks, Activation and Synaptic Dynamic. **Stability and convergence-** single layered perception - least mean square algorithm, multilayered perceptions - backpropogation algorithm

TEXT BOOKS

1. Control systems Theory & Application - Samarajit Ghosh (Pearson Edu)
2. Control System Engineering - B.C.Kuo(PHI)
3. Control Systems Engineering - I.J. Nagrath, M. Gopal
4. Artificial Neural networks - B. Yagna Narayan
5. Neural Computing -Philips D. Wasserman

Theory and practice -Vannostrand Reinhold

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Paper 4 – Embedded System and Microcontroller

Max. Marks: 80, Min. Marks: 16
1. Student should be allowed to use Non Programmable Scientific Calculator in Examination hall

Unit I- Introduction to Embedded systems:
Introduction, Application Areas, Categories of embedded systems, Overview of embedded systems architecture, Specialties of embedded systems, challenges and issues in embedded software development Recent Trends, hardware architecture, Software architecture, Application software, Communication Software, core platform development, boot sequence, development/testing tools.

UNIT – II

Introduction to Microcontrollers – Microprocessors and Microcontrollers - Introduction to Intel 8051/8751/8031 Microcontrollers – Architecture, Internal diagram, Data memory, Interrupt Structure, I/O ports, Timer / counters, Serial ports and Registers, Addressing modes.
Interfacing of Peripherals with 8051 Microcontroller - Interfacing of EPROM's, RAM's, PPI 8255, Programmable Interval Timer -8253/54, Display/Key Board Controller - 8279, interfacing of 8 bit A/D and D/A converters.

Unit III
Instruction set, 8051 assembly language programming , internal structure of 8051, power resetting, built up RAM and ROM, I/O Programming and Addressing modes.
Applications of 80C51 Microcontrollers - Interfacing of LCD Modules, Stepper Motors. System Design with 89C51 to monitor frequency, voltage, displacement, Temperature, speed, traffic light control system with s/W development.

UNIT – IV
Counter and time details, counter and timer programming using 8051, interrupt programming, types of interrupt. Asynchronous serial communication, data programming, RS232 standard, RS422 standard, 1488 and 1489 standard, GPIB, max 232 driver, serial communication programming

Unit - V
PIC Microcontrollers – Introduction to PIC 16C6x/7x family microcontrollers, Architecture, Registers, Register File Structure, Addressing Modes, Instruction set. Interrupt Structure, Timers, Counters, I/O Port Concepts, Peripheral Interfacing and Applications, Features of RISC architectures, CISC and RISC architecture comparison, advantages of RISC, Power saving methods

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TEXT BOOKS

1.8051 Programming, Interfacing and Applications -K.J. Ayala, Penram Pub

2.8051 Microcontroller and Embedded systems -Muhammad Ali Mazidi & Janice Gillispie mazidi

3. Embedded systems - Raj Kamal, TMH

4. Embedded/Real Time Systems – Dr.K.V.K.K.Prasad, dreamtech Press.

5. Design with PIC Microcontrollers – John B.Peatman, Pearson Education Asia

6. PIC Microcontrollers: An Introduction to Microelectronics, Martin P. Bates, Elsevier.

BOOK FOR REFERENCE:

1. Intel Embedded Microcontrollers and Processors Vol. I

LAB COURSE "A"- ANALOG ELECTRONICS LAB

M.Sc. Electronics

July-Dec 2016

Semester I

Max. Marks: 100, Min. Marks: 20

1. To study the Astable and Monostable Multivibrator using IC741.
2. To study the RC Phase Shift Oscillator by determining its frequency of oscillation and Compare calculated and observed frequency.
3. To study the Schmitt Trigger using transistor and IC7413 by observing the output Waveform.
4. To study the Colpit Oscillator, determine its frequency of oscillation and compare the Calculated and observed frequency.
5. To study the Negative Feedback Amplifier by measuring closed loop gain and gain bandwidth product.
6. Verification of following network theorems (1) Superposition (2) Thevenin`s (3) Nortan`s theorem.
7. To study and plot the MOSFET characteristics.
8. To study the Active Band pass filter and calculate its (1) Bandwidth: - Lower cutoff & upper cutoff frequency. (2) Quality factor.
9. Construct a Wein Bridge Oscillator and determine its frequency of oscillation and compare calculated and observed frequency.
10. To study the Active Low pass filter and to evaluate: -

    (1) Cutoff frequency, (2) Band pass gain, and (3) Plot the frequency response.

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Jawed KBSeni Qureshi 7/11/15

11. To study the Clipping circuits as positive and negative logic.
12. To study the Clamping circuits as positive and negative logic.
13. To Study the phototransistor characteristics.
14. To study the comparison of Schmitt trigger and phototransistor.
15. Verification of the Maximum Power Transfer theorem.
16. To study the characteristics of JFET (Junction field effect transistor) in common source configuration & evaluate— 1. AC drain resistance, 2. Amplification factor and 3. Drain Resistance.
17. To study the operation of Class B Amplifier.
18. To study the Z parameter of a passive Two Port Network.
19. To study the Op – Amp as voltage to current converter.
20. To study of characteristics of NPN transistor in common emitter configuration and evaluate— 1. Input resistance, 2. Output resistance and 3.Current gain.
21. To study the Active High pass filter and to evaluate:--
(1) Low cutoff frequency, (2) Bandpass gain, and (3) Plot the frequency response.

Any other experiment of equal standard relevant to syllabus can also be set.

Note: -Students have to perform at least 15 experiments from the above list.

Reference Books

1 .Laboratory Experiments and PSPICE Simulations in Analog Electronics Maheshwari & Anand PHI
2 Laboratory Manual for Operational Amplifiers and Linear ICs, 2nd ed. Bell PHI
3. Student Reference Manual for Electronics Instrumentation Lab Wolf & Smith PHI
4. ELECTRONIC LAB PRIMER By B. Sasikala, S. Poorna Chandra S.Chand Pub

LAB COURSE "B"- DIGITAL ELECTRONICS LAB

M.Sc. Electronics

July -Dec 2016

Semester I

Max. Marks: 100, Min. Marks: 20

List of Experiments: -

1. Verify the following Boolean expressions--

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i) A + A'B = A +B ii) AB + AB' = A

iii) AB + A'C + BC = AB + A'C iv) AB + A'C = (A + C)(A' + B).

2. To study the operation of 4 bit binary full adder and subtractor (IC 7483) having input and output carry bits. Add and subtract any two binary numbers of four bits.

3. To study the characteristics of C-MOS integrated circuits, verify the operation of C-MOS Inverter/NAND gate ICs and study the voltage level of C-MOS for proper ON/OFF (logic 1 or logic 0) condition.
4. To study the interfacing of C-MOS to TTL IC's and vice-versa. Different TTL logic gates and C-MOS logic gates with pull up resistance are provided for interfacing.
5. To study the master slave J-K flip-flop and verify truth table.
6. To study R-S/D/T flip-flops using NAND ICs and verify truth table.
7. To study the operation of shift register as serial in parallel and parallel in serial mode.
8. To study the operation of shift register as parallel in parallel and serial in serial mode.
9. To study write/read operation of digital data into semiconductor memory using IC 7489. Store and retrieve some set of data. (RAM)
10. To study the operation and application of a modern LSI D/A converter. Parallel binary Inputs from switches are applied to DAC, which in turn converts the binary number into a proportional output voltage.
11. To study the operation of modulo-n-counter as MOD 3 & MOD 4 and verify the Truth Table.
12. To study the operation of modulo-n-counter as MOD 8 & MOD 9 and verify the Truth Table.
13. To study the operation of a Presetable Divide by N Counter and verify its truth table.
14. To study the operation of Multiplexer IC having 16: 1 channels.
15. To study the operation of Demultiplexer IC having 1:16 channels and 4 select inputs.
16. To study the operation of BCD Up-Down Counter.
17. To study the operation of Memory programming with seven segment display.
18. To study the operation of comparison of JK flip-flops and verify the difference with Timing diagram.

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Jawed HBTewari 7/11/15

Any other experiment of equal standard relevant to syllabus can also be set.

Note: -Students have to perform at least 15 experiments from the above list.

Books:

1.Laboratory Manual for Operational Amplifiers and Linear ICs, 2nd ed. **Bell PHI**

2.Student Reference Manual for Electronics Instrumentation Lab Wolf & Smith **PHI**

LAB COURSE "C"- ANALOG AND DIGITAL COMMUNICATION LAB

M.Sc. Electronics

Jan-June 2017

Semester II

Max. Marks: 100, Min. Marks: 20

List of Experiments: -

Analog Communication

1. To study the operation of balanced modulator DSBSC using IC 1496.
2. To study the phase modulation using IC 2206 and calculate the modulation index.
3. To study amplitude modulation and demodulation and construct and AM generator and a diode detector and observe its operations under various conditions.
4. To demonstrate (i) use of 4046 PLL as an FM modulator. (ii) Use of 4046 PLL IC as an FM demodulator.
5. To study the characteristics and testing methods if TT attenuators.
6. To study the Carrier Wave (CW) operation of Klystron tube and determine its operating frequency.
7. To study the Square Wave operation of Klystron tube and determine its operating frequency.
8. To study the modes of Klystron tube.
9. To determine the frequency and wavelength of rectangular waveguide, working on TE_{10} mode.
10. To determine the standing wave ratio (SWR) of Klystron tube.
11. To determine the Reflection Coefficient of Klystron tube.

Digital communication-

Revised and Approved by Board of Studies in Electronics on 7th November 2015

7/11/2015

1. Study of signal sampling and reconstruction techniques and to verify Nyquist criteria and tracing.
2. Study of PAM, PWM and PPM modulation and demodulation techniques.
3. Study of TDM pulse amplitude modulation and demodulation.
4. Study of pulse code modulation and demodulation techniques.
5. Study of delta and adaptive-delta modulation methods.
6. Study of Phase Shift Keying Modulation and Demodulation Technique.
7. Study of Amplitude Shift Keying Modulation and Demodulation Technique.
8. Study of Frequency Division Multiplexing and Demultiplexing

Any other experiment of equal standard relevant to syllabus can also be set.

Note: -Students have to perform at least 10 experiments from the above list.

Books: Laboratory Experiments and PSPICE Simulations in Analog Electronics Maheshwari & Anand PHI

LAB COURSE "D"- 8085 MICROPROCESSOR PROGRAMMING, STUDY CARDS AND INTERFACING LAB

M.Sc. Electronics
Jan-June 2017
Semester II

Max. Marks: 100, Min. Marks: 20

List of Experiments:-

1. Program of 8085 to add 8-bit numbers from memory & display result to C060H memory location & carry in C061 H.
2. Program of 8085 of 8085 to transfer the data of 16 consecutive locations into other 16 Consecutive locations in forward order and vice versa
3. Program of 8085 to search the memory location that contained 05 H data in a string of length of 16 byte and display it to memory location to C060 H.
4. Program of 8085 to search number of 05 H data in a string of length of 16 byte and display it to memory location to C060 H.

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Javed Kolkata 7/11/2015

output mode.

7. Program 8255 in mode 0 i.e. simple I/O mode. Program Port A in I/P mode, Port B in input mode. Read data from Port A&B, add it & display

*** STUDY OF 8253 CARD ***

8. Program 8253 in mode-0 i.e. interrupts on terminal count. Select counter c; Read/load lower 8-bits & then higher bits. Draw and explain the function of Gate, Out & Clock Signals.
9. Program 8253 in mode 1. Draw and explain the function of GATE, OUT and CLOCK Signals.
10. Program 8253 in mode 2. Draw and explain the function of GATE OUT and CLOCK Signals.
11. Program 8253 in mode 3 to generate square wave. Draw and explain the function of GATE, OUT and CLOCK Signals.

*** STUDY OF LBDR CARD ***

12. Study of Buffer IC-74L8245 on L.B.D.R. Card using 8085 M.P.U. kit.
13. Study of Latch IC-74L8245 on L.B.D.R. Card using 8085 M.P.U. kit.
14. Study of LBDR as 2 & 4 decoder.
15. To access memory locations (RAM) specified by generation control signals on L.B.D.R. card using 8085 M.P.U.

*** STUDY OF 8259 CARD ***

16. Study of master 8259 in stand-alone mode. Generate and interrupt request-using 8259 and display the respective interrupt in address field.
17. Study of 8259 in cascaded mode i.e. in 8259 as master and the other as slave. Generate an interrupt request using 8259 and display the respective interrupt in address field.

*** STUDY OF 8251 CARD ***

18. Interface 8251 with 8085 M.P.U. and program it in asynchronous transmitter mode, use 8251 Group A.

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19. Interface 8251 with 8085 M.P.U. and program it in asynchronous receiver mode, use 8251 Group A.
20. Interface 8251 with 8085 M.P.U. and program it in synchronous transmitter mode, use 8251 Group A.
21. Interface 8251 with 8085 M.P.U. and program 8251 Group A is in synchronous transmitter mode and 8251 B is in synchronous receiver mode.

*STUDY OF 8237/57 CARD *

22. Interface 8237 IC with 8085 M.P.U. memory to I/O transfer (Read Mode)
23. Interface 8237 IC with 8085 M.P.U. and Study memory to I/O transfer in block transfer mode (write mode).
24. Interface 8237 IC with 8085 M.P.U. and study I/O to memory transfer in single transfer mode (write mode)
25. Interface 8237 IC with 8085 M.P.U. and study I/O to memory transfer. In this mode data stored at 4150H to 415AH

Note: -Students have to perform at least 5 Study Cards from the above list.
PIO Card

*STUDY OF DAC CARDS *

26. Program to demonstrate DAC as positive going staircase (or ramp) generator.
27. Program to demonstrate DAC as triangular wave generator.
28. Program to demonstrate DAC as exponential binary staircase generator.
29. Program to demonstrate DAC as R-C charging and discharging waveform.

*STUDY OF DYNA THUMBWHEEL CARDS *

30. To study interfacing of Thumbwheel with microprocessor based system as Dyna-85.

*STUDY OF SERIAL DISPLAY INTERFACE CARDS *

31. To study interfacing of Serial Display Interface Card with microprocessor based system as Dyna-85.

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Note: -Students have to perform at least 2 PIO Cards from the above list

Any other experiment of equal standard relevant to syllabus can also be set.

LAB COURSE "E"-OPTICAL ELECTRONICS, TRANSDUCER AND INSTRUMENTATION LAB

M.Sc Electronics

July-Dec 2017

Semester III

Max. Marks: 100, Min. Marks: 20

List of Experiments:-

Optical Electronics

1. To study the operation of an Opto-coupler IC-4 N 26.
2. To study the Phototransistor characteristics.
3. To study the comparison of a Schmitt trigger and Phototransistor.
4. To study the similarities and differences between conventional LEDs and fiber optic LEDS.

Transducer control system Trainer kit

1. To study the characteristics of a 3 wire RTD and to observe the change in resistance as Temperature increases (Wheatstone bridge).
2. To study the application of 2 wire RTD in a potentiometer circuit.
3. To study the application of 3 wires RTD in a Wheatstone bridge circuit.
4. To study the characteristics of thermocouple and observe the change in output voltage with the change in temperature.
5. To study semiconductor diode as a temperature sensor.
6. To study transistor as a temperature sensor.
7. To study the application of thermistor in a DC wheatstones bridge circuit.
8. To study the application of thermistor in a non- inverting Op – Amp circuit.

Thyristor Application trainer

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1. To study & plot the SCR characteristics.
2. To study & plot the UJT characteristics.
3. To study & plot the DIAC characteristics.
4. To study & plot the TRIAC characteristics.

Virtual Instrumentation Using National Instrument LabView Software

1. Design a Virtual Instrument of Half adder digital circuit using LabView.
2. Design a Virtual Instrument of Full adder digital circuit using LabView.
3. Design a Virtual Instrument of Half subtractor digital circuit using LabView.
4. Design a Virtual Instrument of Full subtractor digital circuit using LabView.
5. Design a Virtual Instrument. to find maximum & minimum amplitude of given waveform using LabView.
6. Design a Virtual Instrument to convert Analog waveform to Digital waveform using LabView.
7. Design a Virtual Instrument to generate multitone waveform (sine & square) using LabView.
8. Design a Virtual Instrument to convert Celcius into equivalent Fahrenheit using LabView.

LAB Course "F"- 8086 MICROPROCESSOR PROGRAMMING INTERFACING AND "C" PROGRAMMING LAB

M.Sc Electronics
July-Dec 2017
Semester III

Max. Marks: 100, Min. Marks: 20

List of Experiments:-

8086 ASSEMBLY LANGUAGE PROGRAMMING

1. Write a program to transfer an 8-bit data from register to C060H memory location.
2. Write a program to transfer an 16-bit data from register to C060H memory location.
3. Write a program to add two 8-bit data and result is stored in C060H.

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87

4. Write a program to add two 16-bit data and result is stored in C060H.
5. Write a program to subtract two 8-bit data and result is stored in C060H.
6. Write a program to subtract two 16-bit data and result is stored in C060H.
7. Write a program to multiply two 8-bit data and result is stored in C060H.
8. Write a program to multiply two 16-bit data and result is stored in C060H.
9. Write a program to divide 16-bit data by 8-bit and result is stored in C060H.
10. Write a program to divide 32-bit data by 16-bit and result is stored in C060H.

* STUDY OF 8255 CARD *

Study the Interfacing of 8255 Study card with 8086 Microprocessor.

* STUDY OF 8259 CARD *

Study the Interfacing of 8259 Study card with 8086 Microprocessor.

List of C Programming

1. Write a program to calculate the roots of quadratic equation $Ax_2+Bx+C=0$.
2. Write a program to calculate the average of a set of n numbers including zero and negative numbers.
3. Write a program to sort an array element in ascending order using bubble sort technique.
4. Write a program to sort and array element in descending order using bubble sort technique.
5. Write a program to plot a sin (X).
6. Write a program to read and print a single dimension array A and B each having 10 elements write a program that prints out an array C having elements, which are sum of the elements of array A and B.
7. Write a program to find a row sum and column sum of a given matrix and built a new matrix with the help of row sum and column sum and previous matrix.
8. Write a program to read and print two-dimensional matrix of order nxm. Find the sum of diagonals.
9. Write a program that calculate and prints out the maximum and minimum of array.

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10. Write a program for sorting names in alphabetical order.
11. Write a program to plot and exponential series.
12. Write a program to print the terms in the exponential series, till the term is equal to 0.00001 also compute the exponential series of x,

    $e_x=1+x+x_2/2!+x_3/3!+.....+0.00001.$
13. Write a program for matrix multiplication.
14. Write a program for matrix addition.
15. Write a program for the operation of (a) addition (b) subtraction (c) multiplication (d) Division, using switch command
16. Write a program to find the factorial of a given number and Fibonacci series using switch command
17. Write a program to find the sum of natural numbers using function

Any other experiment of equal standard relevant to syllabus can also be set

LAB COURSE "G"- OPTICAL COMMUNICATION AND 8051 PROGRAMMING LAB

M.Sc. Electronics
Jan-June 2018
Semester IV

Max. Marks: 100, Min. Marks: 20
List of Experiments: -

Fiber Optics Communication kit

1. Study of setting up a fiber Optic Analog Link.
2. Study of setting up a fiber Optic Digital Link.
3. Study of Losses in Optical Fiber.
4. Measurement of Numerical aperture of a optical fiber.
5. Study of Manchester Coding & Decoding of optical signal.
6. Study of Time Division Demultiplexing through fiber optic link –B .
7. Measurement of Bit Error Rate of an optical signal through fiber optic link -B.

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8. Study of Eye Pattern of fiber through fiber optic ling –B.

9. Forming PC to PC Communication Link using Optical Fiber & RS-232Interface.

8051 Programming: -

Any 10 Basic programming in 8051 Microcontroller

General Programming Practical of 8051

1. Write a program to find the addition of two 8- Bit Numbers.
2. Write a Program to subtract Two 8 – Bit Numbers.
3. Write a Program to find Multiplication of Two 8- Bit Numbers.
4. Write a Program to find Division of Two 8- Bit Numbers.
5. Write a Program to find the Factorial of a given numbers.
6. Write a Program to transfer the Data block in Forward order.
7. Write a Program to transfer Data Block in Reverse order.
8. Write a Program to find Addition of Series of numbers.
9. Write a program for searching no. of (05H) in a given Memory Location.
10. Write a Program to find out no. of Even & Odd no. in a given Data Series.
11. Write a Program to count Zero, Positive, Negative no. in a given Data Series.
12. Write a program to count the numbers which are divisible by 3 in a given Data Series
13. Write a Program to find the largest number in a given Data Series.
14. Write a Program to find the smallest number in a given Data Series.
15. Write a Program to arrange the Data in ascending order.
16. Write a Program to arrange the Data in descending order.
17. Write a program to convert Binary Number to BCD Number.
18. Write a program to convert Binary Number to ASCII Number

Interfacing Practical of 8051

1. To Study & Analyze the Interfacing of 16×2 LCD.
2. To Study & Analyze the Interfacing of 5×7 LED Matrix.
3. To Study & Analyze the Interfacing of Seven Segment Display.

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4. To Study & Analyze the Interfacing of ADC & DAC Module.

5. To Study & Analyze the Interfacing of DC Motor.

6. To Study & Analyze the Interfacing of Stepper Motor.

7. To Study & Analyze the Interfacing of LEDs.

Any other experiment of equal standard relevant to syllabus can also be set.

Project & Seminar

Max. Marks: 100, Min. Marks: 20

Project

This course provides quality education to students on professional grounds. Apart from classroom lectures and Practical's, the students are also required to undertake a project in the fourth semester. This provides them with an opportunity to interact with the industry. Seminars are organized where eminent professionals from various organizations are invited.

Execution and documentation of a project on a specific topic with one of the following aspects

- Part of ongoing research projects in the department
- Developmental work related to industry requirements
- State of the art new technological studies
- Theoretical and experimental studies
- Development of prototypes in the finished product form
- Technical Writing and Project Documentation
- Presentation and Appreciation.

Seminar

Each student shall present a seminar in the Fourth semester on a topic relevant to Electronics for about 30 minutes. The topic should not be a replica of what is contained in the syllabus. The topic shall be approved by the Seminar Evaluation Committee of the Department. The committee shall evaluate the presentation of students. A seminar report in the prescribed form shall be submitted to the department after the approval from the committee.

The topics of current relevance covering following aspects should be chosen

- Collection of reference material
- Assimilation of concepts and preparing document
- Communication skills
- Presentation styles and use of projection aids
- Appraisal and evaluation of delivered seminars

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PT. RAVISHANKAR SHUKLA UNIVERSITY, RAIPUR (C.G.)

SYLLABUS

M. Tech in Optoelectronics and Laser Technology

SESSION – 2016-2018

Photonics has been deemed the 21st century revolutionary technology that would create as enormous impact as electronics did in the 20th Century. Graduates with training in photonics and related technologies are in high demand. There is and will continue to be a big global demand for skilled people with photonics training. Optoelectronics and Laser technology has emerged as multidisciplinary subject of great breadth and richness attracting the interest of scientists, technologists and industrialists due to its manifold scientific and technological applications, it is worth-mentioning that in our country the number of postgraduate programmes on modern optics are a few, and in chhattisgarh state, none of institutes and universities has M.Tech programme in Optoelectronics and Laser Technology. This program is approved and supported by University Grants commission, New Delhi under its innovative Programme for Teaching and Research in Interdisciplinary and Emerging Areas.

This 4-semester interdisciplinary M.Tech. Programme between the S.O.S. in Electronics and S.O.S. in Physics aims at providing advanced training in the interdisciplinary areas of Optoelectronics Optical communication and laser Technology and to generate trained professionals in these areas with a strong background in both engineering and science. The programme covers fields like fiber optics, laser, semiconductor Optoelectronics, optical electronics, optoelectronics instrumentation, optical communication techniques and systems, photonic switching and guided wave optical components and devices for dense WDM applications, integrates optics etc.

PT. RAVISHANKAR SHUKLA UNIVERSITY, RAIPUR (C.G.)

SYLLABUS

M. Tech in Optoelectronics and Laser Technology

SEMESTER – I

JULY – DECEMBER , 2016

Course Code	Subject	Marks
OE – 11	Modern Optics	100
OE - 12	Laser Technology	100
OE – 13	Optoelectronics	100
OE – 14	Optical Communication	100
OE – 15	Seminar	50
OE – 16	Comprehensive Viva voce	Grade
OE - 17	Fiber Optics, Laser and Optoelectronics and Communication Lab Course – I	150

SEMESTER – II

JANUARY - JUNE , 2017

Course Code	Subject	Marks
OE – 21	Physics of Advanced Materials	100
OE – 22	Fiber Optics & Laser Instrumentation and Solar Photovoltaic Technologies	100
OE – 23	Optical Networks	100
OE – 24	Advance Optical Communication	100
OE -25	Seminar	50
OE – 26	Comprehensive Viva voce	Grade
OE – 27	Fiber Optics, Laser and Optoelectronics and Communication Lab Course – II	150

SEMESTER – III

JULY – DECEMBER , 2017

Course Code	Subject	Marks
OE – 31	Minor Project and Industrial training	150
OE – 32	Dissertation (Phase – I)	200

SEMESTER – IV

JANUARY – JUNE - 2018

Course Code	Subject	Marks
OE – 41	Dissertation (Phase – II)	450
	Comprehensive Viva- voce	

PT. RAVISHANKAR SHUKLA UNIVERSITY, RAIPUR (C.G.)

SYLLABUS

SEMESTER – I

July-Dec. 2016

OE – 11 MODERN OPTICS

Unit – 1

Classification of optical processes, optical coefficients, complex refractive index and dielectric constant,

Optical materials : Crystalline insulators and semiconductor, glasses, metal, molecular materials, doped glass and insulator characteristics, Optical Physics in the Solid state, crystal symmetry, electronics bands, vibronic band, the density of state, delocalized states and collective excitation

Light propagation: Propagation of light in dense optical medium, Atomic oscillator, vibration oscillator, free electron **oscillation**, the Kramers – Kronig relationship, Dispersion, Optical anisotropy, birefringence. Matrix representation of polarization, Jones vector, Jones matrices, Jones calculus, orthogonal polarization. Reflection and refraction at a plane boundary, fresnel's equations.

Unit – 2

Excitons : Basic concept, free excitons in external electric and magnetic fields,

Free Excitions at light densities, frenkel excitons.

Luminescence : Light emission in solids, Interband luminescence, Direct and indirect gap materials, photoluminescence : Excitation and relaxation, degeneracy, Photoluminescence spectroscopy.

Electroluminescence : General Principles of electroluminescence, light emitting diodes, diode laser.

Unit – 3

Electromagnetism in dielectrics, Electromagnetism fields and Maxwell equation

Electromagnetism waves, Quantum theory of radiative absorption and emission

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Einstein coefficients, Quantum transition rates, selection rules.

Basic concept of phonons, Polaritons and polarons.

Unit – 4

Nonlinear optics : Non linear optics : Physical origin of optical nonlinearities, Non resonant and resonant nonlinearities, second order nonlinearities, Non liner frequency mixing, Crystal symmetry, Phase matching, Third order non linear media. Harmonic generation, mixing and parametric effects. multiphonon processes Two-photon absorption, saturated absorption, Spectroscopy Rayleigh, and Raman scattering. Stimulated Raman effect, Hyper Raman effect, Coherent Antistoke Raman scattering Self-focusing and self-phase modulation. Self-induced transparency. Solitons.

Unit – 5

Optical Design, Fourier Optics & Holography : Revision of geometrical optics. Fourier transforms. impulse response transfer function. Scalar diffraction, spatial and temporal coherence. Image forming systems, coherent and incoherent imaging. Spatial filtering. Holography (Fresnel, Fraunhofer, Fourier). Holographic techniques and applications. Fourier transforming property of thin lens.

Reference Books

Optical Electronics, A. Yariv Saunders

Optical Electronics, Ghatak & Thyagarajan, Cambridge U.K.

Essentials of Optoelectronics, A. Rogers (Chapman Hall)

Optical Properties of Solids Mark Fox

Jasprit Singh, Semi conductor Optoelectronics, McGraw Hill, 1995

OE12 LASER TECHNOLOGY

Unit - 1

Einstein Coefficients and Light Amplification

Introduction. The Einstein's coefficients, Quantum Theory for the Evaluation of the Transition

Rates and Einstein Coefficients, Interaction with radiation having a broad spectrum, Introduction of a near monochromatic wave with an atom having a broad frequency response, More accurate solution for the two level system, Line broadening mechanisms, Saturation Behavior of homogeneously and homogeneously broadening transitions.

Unit – 2

Laser Rate Equations : Introduction, The three Level System, The Four level System, Variation of Laser Power around Threshold, Optimum Output coupling. Laser spiking.

Semi classical Theory of Laser: Introduction, Cavity Modes, Polarization of cavity medium : First order & Higher order theory.

Unit – 3

Optical Resonators: Introduction, modes of a rectangular cavity and the open planar resonator, The Quality factor, The ultimate line width of the laser, Transverse and longitudinal mode selection switching. Mode locking in Lasers Co focal Resonator system, Planar resonators, General Spherical Resonator.

Unit – 4

Properties of Laser Beams and laser Structures

Coherence properties of Laser Light : Temporal Coherence, Spatial Coherence, Directionality

Semiconductor : Structure and properties, operating principle, Threshold condition, Power output.

Heterojunction Laser : Principle and structure, Losses in heterostructure laser, Heterostructure laser materials.

Distributed feedback lasers : Principle of working, Coupled mode theory.

Quantum well laser, Strained quantum well laser,

Unit – 5

Some important application of lasers :

Laser induced fusion : Introduction, The fusion process, laser energy requirements. The laser induced Fusion Reactors.

Lasers in Science : Harmonic Generation, Stimulated Raman Emission, Self focusing, Lasers in Chemistry, Rotation of the Earth, Lasers in isotope Separation.

lasers of light detection and ranging (LIDAR)

Reference Books

06

Lasers Theory and Applications : K. Thyagrajan and A.K. Ghatak, Macmillan Publication

W.T. Silfvast, Laser fundamentals, Cambridge University Press

Optical Electronics, Ghatak & Thyagarajan, Cambridge U.P. 0-521-31408-9

Essentials of Optoelectronic, A Rogers (Chapman Hall), 0-412-40890-2

Fowles G.R., Introduction to Modem Optics, 2nd Edition, Holt, Rienhart and Winston.

OE13 OPTOELECTRONICS, ORGANIC ELECTRONICS AND SEMICONDUCTOR DEVICE SIMULATION

Unit-1

Optical process in Semiconductors

Electron hole pair formation and recombination, absorption in semiconductor, effect of electric field on Absorption, Franz-keldysh and stark effects, Absorption in Quantum wells and Quantum confined stark effect, relation between Absorption and emission spectra, Stokes shift in optical transition, Deep level transitions, Measurement of absorption and luminescence Spectra, Time resolved Photoluminescence.

Unit – 2

Materials Growth & Fabrication Growth of optoelectronics materials by MBE, MOCVD, Plasma CVD, photochemical deposition. Epitaxy, interfaces and junctions (advantages/disadvantages of growth methods on interface quality, interdiffusion and doping. Quantum wells and band gap engineering

Equipments for Thin Film Deposition: Working principle of Vacuum Coating Unit , Spin Coating Unit and Spray pyrolysis apparatus and their specifications and features.

Unit – 3

Organic Electronics

Molecular materials, Electronic state in conjugated molecules, Optical spectra of molecules, Electronic vibration transitions, the Franck Condon principle hydrocarbons, conjugated polymer,

Organic Semiconductors: Conductivity and Mobility of nearly-fee Charge Carriers, Charge Carriers in Organic Semiconductors: Polarons, Shallow Traps and Deep Traps, Generation of Charge Carriers and Charge Transport: Experimental Methods. The TOF Method: Gaussian Transport. Space-Charge Limited Currents. Band or Hopping Conductivity, Electric-field

Dependence, Charge Transport in Disordered Organic Semiconductors. The Bassler Model

Unit – 4

Organic Optoelectronic Devices :

Organic Light-Emitting Diodes (OLEDs). The Principle of the OLED, Multilayer OLEDs. Structure, Fundamental processes Efficiency, Characterization of OLEDs

Organic photovoltaic diodes (OPVDs): Fundamental process, Exciton absorption, Exciton dissociation, Charge collection characterization of OPVDs, Relevant performance parameters

Unit 5

Introduction to Semiconductor Device Simulation: Need of Simulation, Process Simulation, Device Simulation device simulation sequence, hierarchy of transport models, DD Model, Relationship between various transport regimes and significant length-scales.

Numerical Solution Methods - finite difference scheme, discretization of Poisson's and current continuity equations.

Reference Books

1. Organic Electronics: Materials, Manufacturing, and Applications Hagen Klauk Wiley-VCH; 1 edition
2. Organic Molecular Solids Markus Schwoerer (Author), Hans Christoph Wolf, Wiley-VCH; 1 edition (March 27, 2007)
3. Semiconductor Devices Modeling and Technology" by Nandita Das Gupta and Amitava Das Gupta, Prentice Hall of India Pvt.Ltd.
4. Computational Electronics :Dragica Vasileska and Stephen M. Goodnick, CRC Press
5. Semiconductor Optoelectronics Devices: Pallabh Bhattacharya. Pearson Education
6. Optical Electronics, A. Yariv Saunders.
7. Optical Electronics, Ghatak & Thyagarajan, Cambridge U.P. 0-521-31408-9
8. Essentials of Electronic & Optoelectronics properties of semi conductor, Jasprit Singh, Cambridge University Press
9. Hand book of thin film technology, by L. I. Maissel and R. Glang
10. Thin film phenomena, By K. L. Chopra

OE14 OPTICAL COMMUNICATION

Unit -1

Need for fiber optic Communication, evolution of light wave systems and its components. Optical Fiber – their classification, essentials of electromagnetic theory – total internal reflection, Goos Hanchen shifts Dispersion in Single mode fiber, fiber losses, Non liner optical effects and polarization effect. Analysis of Optical fiber waveguides, electromagnetic mode. Theory for optical propagation attenuation and single distortion in optical waveguide. Characteristic equation of step-index fiber, modes and their cut-off frequencies, single-mode fibers, weakly guiding fibers, linearly polarized modes, power distribution. Graded-index fibers- WKB and other analysis,

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propagation constant, leaky modes, power profiles, dispersions – material, modal & waveguide, impulse response.

Unit -2

Physics and Technology of Optical Fiber

Passive photonic components: FO cables, Splices, Connectors, Couplers, Optical filter, Isolator, Circulator and Attenuator, switches.
Fabrication of optical fibers: MOCVD, OVD, VAD, PCVD; measurement of RI, attenuation. Etc. Fiber devices, fiber Bragg gratings, long period gratings, fiber amplifiers and lasers. Application of optical fibers in science, industry, medicine and defense.

Unit -3

Optical fiber systems, modulation schemes, Digital and analog fiber communication system, system design consideration, fiber choice, wavelength conversion, switching and cross connect Semiconductor Optical amplifier (SOA), characteristics, advantages and drawback of SOA, Raman amplifier, erbium doped fiber amplifier, gain and noise in EDFA, Brillion fiber amplifier, wideband Hybrid amplifier, noise characteristic, amplifier spontaneous emission, noise amplifier, noise figure, Cumulative and effective noise figure, Noise impairments, amplifier applications.

Unit -4

Optical Transmitters : Basic concepts, Light emitting diodes, Semiconductor laser, characteristics, Transmitter design, Optical Receivers; Basic concepts, P-n and pin photo detector. Avalanche photo detector MSM photo detector, Receiver design, Receiver noise, Receiver sensitivity, Sensitivity degradation, performance.
Electro-optic effect, electro optic retardation. Phase and amplitude modulators, transverse electro optic modulators, Acousto-optic effect, Raman-Nath and Bragg regime, acousto-optic modulators, magneto optic effects.

UNIT – 5

Wavelength division multiplexing (WDM): Multiplexing Technique, Topologies and architectures, Wavelength shifting and reverse, Switching WDM demultiplexer, optical Add/drop multiplexer. Dense wavelength division multiplexing (DWDM): System consideration, Multiplexer and demultiplexers, fiber amplifier for DWDM, SONET/SDH Transmission, Modulation formats, NRZ and RZ signaling, DPSK system modeling and impairments.

Text books :

[1] John. M. Senior, Optical fiber communication : principles, Prentice Hall of India.

[2] Gerd keiser, optical fiber communication, McGraw Hill, 3rd edition.

[3] D.K. Mynbaev, LL Scheiner, Fiber optic communication technology, Pearson Technology

[4] R.P. Khare, Fiber optic and optoelectronics, Oxford University press.

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[5] John Gowar, Optical Communication Systems, Prentice Hall of India.

[6] Optical Electronics, A. Yariv, Saunders

REFERENCE BOOKS

1 Light wave Communication Systems : A practical prospective : R Papannareddy, Penrum International Publishing.

2 Fiber optic communication Systems: G.P. Agrawal, Hohnawian and Sons.

3 Bahaa E.A. Saleh & Malvin Carl Teich, Fundamentals of photonics, John Wiley & Sons, 1991

OE 17 Fiber Optics, Laser and Optoelectronics and Communication Lab- I
Experiments are to be performed in the Advance Photonics Laboratory of S. O.S. in Electronics Department.

L 1 Fiber Optics Lab :

1. Study of setting up a Optic Analog Link.
2. Study of setting up a fiber Optic Digital Link.
3. Study of Losses in Optical Fiber.
4. Measurement of Numerical aperture of a optical fiber.
5. Study of Manchester Coding & Decoding of optical Signal.
6. Study of Time Division Demultiplexing through fiber optic link – B.
7. Measurement of Bit Error Rate of an optical signal through fiber optic link – B.
8. Study of Eye Pattern of fiber through fiber optic ling – B.
9. Forming PC to PC Communication Link-using Optical Fiber & RS – 232 Interface.

L2 – Laser Lab :

1. Study of Diode Laser characteristic.
2. Construction of laser beam expander.
3. Measurement of screw parameter.
4. Measurement of electro-optic coefficient.
5. Magneto-optic effect (Faraday Rotation)
6. High voltage sensor based on electro-optic effect.
7. Molecular Weight Measurement.
8. Holography.

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PT. RAVISHANKAR SHUKLA UNIVERSITY, RAIPUR (C.G.)

SYLLABUS

M. Tech in Optoelectronics and Laser Technology

SEMESTER – 2

JANUARY – JUNE, 2017

OE-21 PHYSICS OF ADVANCED MATERIALS

UNIT – 1

Nano Particles and Nano Structured Materials :

Properties of Individual Nano-Particle: metal nanoparticles, geometric and electronic structure, magnetic clusters, Semiconductor nanoparticles, optical properties, rare gas and molecular clusters, methods of synthesis of nanoparticles. Carbon nanostructure, C60 carbon nanotube and Application. **Bulk nano structured materials:** Solid disordered nanostructures, methods of synthesis, properties, metal nano-cluster composite glasses, porous silicon; Nano structured crystals.

UNIT 2

Quantum Nanostructures and Nano-Machines/Devices :

Quantum wells, wires and dots, preparation, size & dimensionality effects, excitons, single electron tunneling, applications of quantum nanostructure. Super conductivity. Self assembly, process of self assembly, semiconductor islands, monolayers. Catalysis, surface area of nanoparticles, porous, and colloidal materials. Nanomachines and devices; microelectromechanical system (MEMSs), nanoelectromechanical system (NEMSs).

UNIT 3

Material requirement for solid state lasers, Activator ions and centers, Material design parameters for semiconductor laser diode, choosing alloy composition and thickness, making ohmic contracts, Other III-V heterojunction laser materials. Introduction to organic laser. Material selection for light emitting diodes.

Electroluminescent materials:

Inorganic electroluminescence, AC powder EL, ACTFEL device, EL characteristics, EL excitation

mechanism. Electroluminescence in Organic solids, Material useful for organic thin film EL devices, polymeric material for EL.

UNIT 4

Characterization of Materials : Introduction to emission and absorption spectroscopy: Nature of electromagnetic radiation, electromagnetic spectrum, atomic, molecular, vibrational and X-ray energy levels Basics of UV-VIS spectroscopy: Radiation sources, wavelength selection, Cells and sampling devices, Detectors, Basic ideal of IR spectrometry: Correlation of Infrared spectra with Molecular Structure.

Fundamental of X-ray diffraction, Powder diffraction method, Quantitative determination of phases; Structure analysis **Epitaxial thin film techniques :** Liquid phase epitaxy, vapour phase epitaxy, Metal Organic chemical vapour deposition, Atomic layer epitaxy.

UNIT 5

Experimental techniques : High resolution X ray diffraction, Double Crystal diffraction, Drift mobility and Hall mobility, Hall effect for Carrier density and Hall mobility, Photoluminescence (PL) and Excitation Photoluminescence (PLE) Optical pump probe experiments. Basic idea of Microscopic Techniques : optical microscope, Scanning Electron Microscope (SEM), Transmission Electron , microscope (TEM), Atomic Force Microscopy (AFM), Scanning Tunneling Microscopy (STM), Thickness measurement – gravimetric method

Basics of Ellipsometry: optical parameter measurements (n and k)

Texts & Reference books

[1] Introduction to Nanotechnology by Charles P. Poole Jr. and Frank J. Owens (Willey Inter. Science pub 2003).

[2] Nanostructures and Nanomaterials – Synthesis properties and Applications by Guozhong Cao (Empirical College Press World Scientific Pub. 2004).

[3] Physics of Semiconductor Devices by S. M. Sze(Willey Int., 1981)

[4] Instrumental methods of analysis, H. H. Willard, L. L. Merritt, J A Dean, F A Sellte, CBs Publishers New Delhi 1996.

[5] Scanning Electron Microscopy : OOtley

[6] Handbook of Electroluminescent Materials Ed. D. R. Vij Inst of Physics, Bristol and Philadelphia

[7] Electronic and Optoelectronic properties of Semiconductor, Jaspreet Singh, Cambridge

OE – 22 FIBER OPTICS LASER INSTRUMENTATION AND SOLAR PHOTOVOLTAIC TECHNOLOGIES

Unit 1

OPTICAL FIBER AND THEIR PROPERTIES

Principle of light propagation through a fiber – Different types of fiber and their properties – Fiber materials and their characteristics – Transmission characteristic of fibers – absorption losses – scattering losses – Dispersion – measurement of optical fibers – optical sources – Optical detectors.

Unit 2

FIBER OPTIC SENSORS IN MEASUREMENTS

Fiber optic instrumentation system – Fiber optic sensors ,Different types of modulators – Application in instrumentation – Interferometric method of length – Measurement of pressure, temperature, current, voltage, liquid level and strain.

Unit 3

LASERS IN MEASUREMENTS AND TESTING

Laser for measurement of distance, length, velocity, acceleration, current, voltage, and atmospheric effect, Laser application in Spatial Frequency filtering.

Holography: Basic principle, methods; Holographic interferometry and applications; Holography for non – destructive testing – Holographic components

Unit 4

Lasers in Industry – Application in material processing, Laser Welding, Hole Drilling, Laser cutting, Laser Tracking

MEDICAL APPLICATION OF LASERS

Medical applications of lasers; laser and tissue interaction – Laser instrument of surgery.

Unit 5

Solar Photovoltaic Technologies

Generation of Photo voltage, Light Generated current,, I-V equation, Solar Cell Characteristics, parameters of solar cells, Relation of Voc and Eg

Design of solar cells: Upper limit of cell parameters, Losses in Solar Cell, Design for High Isc, Voc and FF Analytical Techniques: Solar Simulator-IV measurement, Quantum efficiency measurement, Minority carrier lifetime & diffusion length measurement.

REFERENCES

1. John and Harry, Industrial Laser and their applications, McGraw Hill
2. John F Ready, Industrial application of lasers. Academic press 1978
3. John Crisp, Introduction to Fibre Optics , an imprint of Elsevier Science 1996
4. Jasprit Singh, Semiconductor Optoelectronics, McGraw Hill 1995
5. Understanding Fiber Optics, 4th or 5th edition; Jeff Hech; Prentice Hall Publishers
6. Optical Fiber Communication Principles and Systems, A. Selvarajan, S. Kar and T. Srinivas TMH
7. Optical Fiber Communication, Keiser, G. McGraw Hill, Int. Student Ed.
8. Fiber Optic Communication System, G. P. Aggarawal, Willey Eastern
9. Introduction to Fiber Optics, A. Ghatak and K. Thyagrajan, Cambridge Univ. Press
10. Solar Photovoltaics: Fundamentals, Technologies and Applications, C. S. Solanki, 2nd Edition , Prentice Hall of India, 2011.
11. Solar cells: Operating principles, technology and system applications, by Martin A. Green, Prentice-Hall Inc, Englewood Cliffs, NJ, USA,

OE – 23 OPTICAL NETWORKS

Unit - I

WDM Technology and Issue in WDM Optical networks: Introduction – Optical networks – WDM – WDM optical network evolution- Enabling Technology for WDM optical networks – WDM optical network architecture – Issue in Wavelength routed networks – Next generation optical Internet networks

Unit – II

Wavelength Routing Algorithms : Introduction – Classification of RWA algorithms – Fairness and Admission control – Distributed control protocols – Permutation routing and Wavelength requirements

Wavelength Rerouting algorithms : Introduction – benefits of wavelength routing – Issue in Wavelength routing – Light path Migration – Rerouting schemes – Algorithm AG – Algorithm MWPG – Rerouting in WDM networks with Sparse Wavelength conversion – Rerouting in Multifiber networks – Rerouting in Multifiber Unidirectional ring Networks .

Unit - III

14

Wavelength Convertible networks : Introduction - need for Wavelength converters – Wavelength convertible switch architecture – routing in convertible networks – Performance evaluation of convertible networks – Networks with Sparse Wavelength conversion – Converter placement problem – Converter allocation problem.

Unit - IV

Virtual topology Design : Introduction – Virtual Topology design problem – Virtual topology sub problems – Virtual topology design Heuristics – Regular virtual topology design – predetermined virtual topology and lightpath routes – Design of multi fiber networks.

Virtual Topology Reconfiguration : Introduction – Need for virtual topology reconfiguration – Reconfiguration due to Traffic changes – reconfiguration for fault restoration.

Unit - V

Network Survivability and provisioning : Failures and Recovery – Restoration schemes – Multiplexing techniques – Distributed control protocols. Optical Multicast routing – Next generation optical Internet networks.

References :

1. C. Siva Ram Murthy and Mohan Gurusamy, "WDM Optical Networks : Concepts, Design and Algorithms ", Prentice Hall India 2002.
2. Rajiv Ramasami and Kumar N. Sivarajan, " Optical networks : A Practical Perspective", A Harcourt publishers international company 2000.

OE 24 ADVANCED OPTICAL COMMUNICATION

Unit - I : Components

Introduction to optical components – optical amplifiers – types – issue in optical amplifiers – photonic switching – cross connect – wavelength conversion – multiplexer – demultiplexer – filters – tunable filters – introduction to OICs and its applications.

Unit II : First Generation optical Networks

SONET/SDH – multiplexing , element of a SONET/SDH infrastructure - SONET/SDH physical layer, Computer interconnects – ESCON, Fiber channel, HIPPI , Metropolitan area networks –

FDDI, ATM, Layered Architecture - SONET/SDH layers – Second generation optical network layers.

Unit - III : WDM Technology

Introduction – WDM optical networking evolution – enabling technologies for WDM optical networks – WDM optical network architecture – DWDM – issues in WRN

Unit IV : OTDM Technology

Important issues of OTDM – optical solitons – applications of solitons . Optical pulse compression – fiber grating compressor – soliton effect compressor.

Unit - V : FTH and PON Technology

Proposed architecture and issues of Fiber to the home (FTH) – Passive Optical Network (PON) – Near space communication – open air optical communication. Inter satellite link hops(ISL). Introduction to all optical networks(AON) , Military , Civil, consumer and industrial applications

References Books :

1. Rajiv Ramaswami and Kumar N. Sivrajan, " Optical networks – A practical perspective", A Harcourt Publishers International Company 2000
2. R. G. Junsperger, " Integrated Optics – Theory and Technology, Springer Series in Optical Sciences", 3rd Edition 1991
3. Gerd Keiser, " Optical Fiber Communications",McGraw Hill International Edition 191
4. G. P. Aggarawal," Non Linear Optics", Academic Press.
5. Stamations V. Kartalopoulos, "Understanding SONET/ SDH and ATM Communication network for Next Millennium", PHI 2000.
6. C. Sivaram and mohan Gurusamy, " WDM Optical Networks : Concepts, Design and Algorithms" PHI India 2002.

OE – 27 FIBER OPTICS AND OPTICAL COMMUNICATION LAB – LAB II

Experiments are to be performed in the Advance Photonics Laboratory in S.O.S. in Electronics Department.

EXPERIMENTS

1) To calculate the wavelength of Laser using Michelson interferometer.
2) To determine the size of tiny particles using Laser.
3) To determine the grating pitch of transmission grating.
4) To determine the wavelength of a Laser using meter scale ruling.
5) To find the refractive index of glass (transparent materials) by measuring Brewster angle.
6) To determine the bending losses that occurs in a multimode fiber when it is bent along various radii.
7) To determine the absorption coefficient of transparent materials (glass slide).
8) To study the variation of splice losses due to transverse offset, angular tilt and longitudinal separation.
9) To observe the refraction of light in liquid and to calculate its refractive index.
10) To study the wavelength dependence of attenuation in the given optical fiber.
11) To determine insertion loss of each channel of WDM mux, loss uniformity and optical cross talk in channels.
12) To setup optical Add/Drop multiplexer (OADM) using fiber Bragg grating .
13) To setup the WDM link with the given components and determine the total loss for each wavelength.
14) To find the refractive index of transparent Bar using diode Laser.
15) To observe the absorption of Laser light when various colors are introduced in its path.
16) Preparation of thin films with the help of Vacuum Coating Unit and resistance/impedance measurement using Source measuring unit.
17) Preparation of thin films with the help of Spray pyrolysis method and resistance/impedance measurement using Source measuring unit.
18) Preparation of thin films with the help of Vacuum Coating Unit and optical constant measurement using ellipsometer

Note Students have to perform at least 15 experiments

SEMESTER III (July – December, 2017)
&
SEMESTER IV (January – June , 2018)

Project Work Scheme

The problem may be selected form an appropriate Industry or Institution. The candidate is expected to work under the guidance of a project guide for at least for a period as decided. In case the project work is taken up in an external Industry/Institution, the project shall have two guides: one in the participating organization (Industry/Institution) who is the external guide and the other shall be one of the faculty members form Department who is the internal guide. The dissertation should be submitted within tow calendar years form the starting date of the third semester, Six copies of the dissertation have to be submitted to the M.Tech Course Coordinator. These copies shall be distributed to the External examiner, Internal Examiner, Project guide (Faculty), Department Library and University Library and the Candidate.

Evaluation of Project Work

The project evaluation committee shall be responsible for the project work evaluation The project evaluation committee will be consisting of Chairman, Course Coordinator, an internal examiner and external examiner. The Chairman of the project evaluation committee shall be the Chairman Departmental Committee constituted as per norms of UGC. The project guide (faculty from department) shall be the internal examiner. The external examiner shall be a technical expert in the concerned subject form any organization other than that of the project guide and is selected form the panel of experts submitted by the Course Coordinator. The project work shall be evaluated through presentations and viva voice. The grade/marks shall be given to the students according to the level and quality of work and presentation/documentation.

PT. RAVISHANKAR SHUKLA UNIVERSITY, RAIPUR
SCHEME OF EXAMINATION & SYLLABUS PRESCRIBED FOR THE EXAMINATION OF

Course Work for
Ph.D.(Electronics)

EFFECTIVE FROM JULY 2016

Scheme of Examination

The Course Work for PhD degree in Electronics is a six month course after completion of P.G. degree in the subject. There shall be two compulsory papers based on the research areas of Electronics discipline. The structure of the course is given below:

S No	Theory Paper	Marks
1.	Research Methodology, Quantitative Methods & Computer Applications	100
2.	Review of Literature in Concerned Subject, Seminar/ Project Report	100
Total		**200**

Revised and approved by Board of Studies in Electronics on 07th November 2015

Paper I

Research Methodology, Quantitative Methods & Computer Applications

Unit I - Introduction and Design of research

Meaning, objective and significance of research, types and parameters of research, research process, identification and definition of the research problem, definition of construct and variables, pure and applied research design, exploratory and descriptive design methodology, qualitative Vs quantitative research methodology, field studies, field experiments Vs laboratory experiments, research design in social and physical sciences.

Unit II - Data Analysis

Procedure for testing of Hypothesis, the null hypothesis, determining level of significance , type I and type II errors, grouped data distribution, measures of central tendency, measures of spread/dispersion, normal distribution, analysis of variance: one way, two way, Chi square test and its application, students 'T' distribution, non parametric statistical techniques, binomial test, Correlation and regression analysis- discriminate analysis- factor analysis- cluster analysis, measures of relationship.

Unit III – Solar PV fundamentals and Emerging Solar Cell Technologies

P-N junction under illumination: Generation of Photo voltage, Light Generated current,, I-V equation, Solar Cell Characteristics, parameters of solar cells, Relation of Voc and Eg

Design of solar cells: Upper limit of cell parameters, Losses in Solar Cell, Design for High Isc, Voc and FF

Analytical Techniques: Solar Simulator-IV measurement, Quantum efficiency measurement, Minority carrier lifetime & diffusion length measurement.

Thin film solar cell technologies,: amorphous Si solar cells, CdTe solar cells, Dye Sensitized Solar cells, Present status of different PV technologies, Shockley-Queisser limit.

Unit IV – Molecular Devices and Semiconductor Device Simulation

Molecular Devices: Operation fundamentals of organic LEDs, Organic FETs and Organic solar cells, Basic physics underlying device operation, Fundamental benefits and limitations of the organic materials

Introduction to Semiconductor Device Simulation: Need of Simulation, Process Simulation, Device Simulation device simulation sequence, hierarchy of transport models, DD Model, Relationship between various transport regimes and significant length-scales.

Numerical Solution Methods - finite difference scheme, discretization of Poisson's and current continuity equations.

Revised and approved by Board of Studies in Electronics on 07th November 2015

Unit V - Image Fundamentals –

Digital Image representation, fundamental steps in Digital Image processing, image acquisition, storage, processing, communication & display, Simple image model, sampling and quantization, some basic relationships between pixels: Neighbors of a pixel, connectivity, labeling of connected Components, Relations, distance Measures.

Image Transforms

Introduction to Fourier Transform, The Discrete Fourier Transform, some properties of two dimensional Fourier transform: Separability, translation, periodicity & conjugate symmetry, rotation, distributive and scaling, average value, convolution and correlation, sampling. The Fast Fourier Transform: FFT algorithm, number of operations, the inverse FFT, implementation. Other Separable Image Transforms: Walsh Transforms, Discrete Cosine Transform, Hadamard Transform, the Haar & Slant transform.

Study of basic functions of image processing toolbox of Matlab software

Reference Books –

1. Research in education, By J W Best and J V Kann. Pearson/ Allyn and Bacon.
2. Research Methodology - Methods and Techniques, C K Kothari, New Age International.
3. Solar Photovoltaic's: Fundamentals, Technologies and Applications, C. S. Solanki, 2nd Edition, Prentice Hall of India, 2011.
4. Solar cells: Operating principles, technology and system applications, by Martin A. Green, Prentice-Hall Inc, Englewood Cliffs, NJ, USA,
5. Physics of Solar Cells: From Basic Principles to Advanced Concepts Peter Würfe Wiley-VCH; 1 edition
6. Organic Electronics: Materials, Manufacturing, and Applications Hagen Klauk Wiley-VCH; 1 edition
7. Organic Molecular Solids Markus Schwoerer (Author), Hans Christoph Wolf, Wiley-VCH; 1 edition (March 27, 2007)
8. Semiconductor Devices Modeling and Technology" by Nandita Das Gupta and Amitava Das Gupta, Prentice Hall of India Pvt.Ltd.
9. Digital Image Processing : Gonzalez and Woods, 2nd Edition, Pearson Education Publication
10. Fundamental of Digital Image Processing - A.K.Jain, PHI.

Paper – II

Review of Literature in Concerned Subject, Seminar/ Project Report

Revised and approved by Board of Studies in Electronics on 07th November 2015

School of Studies in Electronics & Photonics, PRSU, Raipur

M. Sc. Electronics CBCS Scheme & Syllabus

Session 2016-18

Sr. No.	Title of Elective Paper	Marks			Credit
		External	Internal	Total	
1.	EL1 Basics of Electronics[a]	48	12	60	3
2.	EL2 Fundamentals of Biomedical Equipments[b]	48	12	60	3

[a] For all students except for Electronics and Physics

[b] For all students

Each elective paper comprises of three units and carries a total of 3 credits.

Note: Student can earn maximum of 6 credits or minimum of 3 credits out of the aforesaid elective papers.

Enrolment of 10 students is minimum requirement for switching on the course for a particular semester with the maximum limit of 30 students

The courses will be offered either during the second or the third semester.

Classes will be held on 3pm to 4pm or 4pm to 5 pm.

Basis of Selection: First come and first serve basis.

Revised and approved by Board of Studies in Electronics on 7th November 2015

EL1 Basics of Electronics

Unit I

Basic electronics- Introduction, Applications, Concepts of charge, potential, voltage, current, power and their units, Active and passive components, Resistor and its color codes, Capacitors and its units, Transformer.

Unit II

Overview of Analog circuitry- Introduction to semiconductors, Conductors, Insulators, Diode and its type, Transistor and its types- NPN & PNP, Transistor as an amplifier and switch.

Unit-III

Digital Electronics- Analog vs digital signals, Concept of amplitude and frequency, Number system and their conversions, Boolean arithmetic, De – Morgan laws, basic logic gates: their realization, Universal gates, Exclusive – OR and Exclusive NOR-gates.

Text Books

Basic Electronics and Linear Circuit by N. N. Bhargava, DC Kulshreshtha and S. C. Gupta, Tata McGraw-Hill

Electronic Devices and Circuit Theory, 9th ed. Boylestad & Nashelsky , PHI

Digital Principal and Application - Malvino Leach, Tata Macgraw Hill

Modern Digital Electronics - R.P. Jain, Tata Mcgraw

References

Basic Electronics Solid State by B. L. Thereja, S Chand

Electronic Devices & Circuit Analysis – K Lal Kishore, BS Publications

Revised and approved by Board of Studies in Electronics on 7th November 2015

EL2 Basics of Biomedical Equipment

Unit I

Basics of measuring instruments of electronics- Overview of electricity, Circuit basics, Concept of various measuring parameters- voltage, current, power, ohm's law, Kirchhoff's law.

Unit II

Biomedical equipment overview- Electronics and Medicine, medical electronics, Importance of measuring instruments in Biomedical, Overview of Electrocardiograph- operation, origin of the ECG waveform

Unit III

Electroencephalography (EEG) - Signal sources, Recording modes, Applications of the EEG; Techniques to Aid observation- X-ray and Radiography, Diagnostic Ultrasound.

Text Books-

- Principles of Medical Electronics and Biomedical Instrumentation- C. Raja Rao, S. K. Guha, Universities Press (India Limited)
- Introduction to Biomedical Instrumentation- Mandeep Singh, PHI Learning Pvt. Ltd.

Reference Books-

- Biomedical instrumentation and measurements – Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer
- Measurements And Instrumentation- A.V.Bakshi U.A.Bakshi, Technical publication, Pune
- Biomedical Instrumentation and Measurment- R. Anandanatarajan, PHI

Revised and approved by Board of Studies in Electronics on 7th November 2015

PT. RAVISHANKAR SHUKLA UNIVERSITY, RAIPUR
SCHEME OF EXAMINATION & SYLLABUS PRESCRIBED FOR THE EXAMINATION OF

M.Phil in Electronics
SESSION 2016-2017

1. Objective of the course:

- To provide academic progression to students obtaining M.Sc. degree willing to pursue an academic career
- To provide academic progression to professionals engaged in academic fields
- To provide a bridge course for an M.Sc. student so as to encourage him / her for research.
- 4. To introduce emerging areas as discourses of study for promoting academic activities and research in related fields.

2. **Course Methodology:** A detailed treatment of each topic will be presented in class but a major portion of each class session will involve interaction and discussion. It is essential, therefore, that each student has a reading of the topic to be taken up in a class prior to attending the session. Written / presentation assignments will explore the issues and their logical consequences. Programming assignments will offer both programming experience and an opportunity to experiment with ideas. Dissertation work will involve students individually carry out a detail study on a topic and implement a related system.

Scheme of Examination :

The Master of Philosophy (M.Phil.) in Electronics is a full time course for one year after completion of M.Sc. in Electronics, Electronic Science, Physics, Instrumentation. Admission to M.Phil (Electronics) programme will be done through entrance examination.

The course structure will contain three theory papers, seminar (two) and dissertation as outlined below:

S.No.	Theory paper	Marks
1.	Paper I : Research Methodology , Quantitative Methods and Computer applications	100
2.	Paper II - Photonics, Advanced Concepts in Solar Cell Technologies and Nano Science and Technology	100
3.	Paper III : Digital Image Signal Processing	100
4.	Seminar - Seminar based on theory paper (Best two out of three)	50
5.	Dissertation –(a) Final Seminar based on Dissertation (b) Dissertation Script evaluation (c) Viva – Voce	50 75 25
	Grand Total	**500**

Revised and approved by Board of Studies in Electronics on 7th November 2015

Paper I

Research Methodology, Quantitative Methods & Computer Applications

Unit I - Introduction and Design of research

Meaning, objective and significance of research, types and parameters of research, research process, identification and definition of the research problem, definition of construct and variables, pure and applied research design, exploratory and descriptive design methodology, qualitative Vs quantitative research methodology, field studies, field experiments Vs laboratory experiments, research design in social and physical sciences.

Unit II - Data Analysis

Procedure for testing of Hypothesis, the null hypothesis, determining level of significance , type I and type II errors, grouped data distribution, measures of central tendency, measures of spread/dispersion, normal distribution, analysis of variance: one way, two way, Chi square test and its application, students 'T' distribution, non parametric statistical techniques, binomial test, Correlation and regression analysis- discriminate analysis- factor analysis- cluster analysis, measures of relationship.

Unit III – Solar PV fundamentals and Emerging Solar Cell Technologies

P-N junction under illumination: Generation of Photo voltage, Light Generated current,, I-V equation, Solar Cell Characteristics, parameters of solar cells, Relation of Voc and Eg
Design of solar cells: Upper limit of cell parameters, Losses in Solar Cell, Design for High Isc, Voc and FF
Analytical Techniques: Solar Simulator-IV measurement, Quantum efficiency measurement, Minority carrier lifetime & diffusion length measurement.
Thin film solar cell technologies,: amorphous Si solar cells, CdTe solar cells, Dye Sensitized Solar cells, Present status of different PV technologies, Shockley-Queisser limit.

Unit IV – Molecular Devices and Semiconductor Device Simulation

Molecular Devices: Operation fundamentals of organic LEDs, Organic FETs and Organic solar cells, Basic physics underlying device operation, Fundamental benefits and limitations of the organic materials
Introduction to Semiconductor Device Simulation: Need of Simulation, Process Simulation, Device Simulation device simulation sequence, hierarchy of transport models, DD Model, Relationship between various transport regimes and significant length-scales.
Numerical Solution Methods - finite difference scheme, discretization of Poisson's and current continuity equations.

Unit V - Image Fundamentals –

Digital Image representation, fundamental steps in Digital Image processing, image acquisition, storage, processing, communication & display, Simple image model, sampling

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and quantization, some basic relationships between pixels: Neighbors of a pixel, connectivity, labeling of connected Components, Relations, distance Measures.

Image Transforms

Introduction to Fourier Transform, The Discrete Fourier Transform, some properties of two dimensional Fourier transform: Separability, translation, periodicity & conjugate symmetry, rotation, distributive and scaling, average value, convolution and correlation, sampling. The Fast Fourier Transform: FFT algorithm, number of operations, the inverse FFT, implementation. Other Separable Image Transforms: Walsh Transforms, Discrete Cosine Transform, Hadamard Transform, the Haar & Slant transform.

Study of basic functions of image processing toolbox of Matlab software

Reference Books –

1. Research in education, By J W Best and J V Kann. Pearson/ Allyn and Bacon.
2. Research Methodology - Methods and Techniques, C K Kothari, New Age International.
3. Solar Photovoltaic's: Fundamentals, Technologies and Applications, C. S. Solanki, 2nd Edition, Prentice Hall of India, 2011.
4. Solar cells: Operating principles, technology and system applications, by Martin A. Green, Prentice-Hall Inc, Englewood Cliffs, NJ, USA,
5. Physics of Solar Cells: From Basic Principles to Advanced Concepts Peter Würfe Wiley-VCH; 1 edition
6. Organic Electronics: Materials, Manufacturing, and Applications Hagen Klauk Wiley-VCH; 1 edition
7. Organic Molecular Solids Markus Schwoerer (Author), Hans Christoph Wolf, Wiley-VCH; 1 edition (March 27, 2007)
8. Semiconductor Devices Modeling and Technology" by Nandita Das Gupta and Amitava Das Gupta, Prentice Hall of India Pvt.Ltd.
9. Digital Image Processing : Gonzalez and Woods, 2nd Edition, Pearson Education Publication
10. Fundamental of Digital Image Processing - A.K.Jain, PHI.

Paper II

Photonics, Advanced Concepts in Solar Cell Technologies and Nano Science &Technology

Unit I - Photonics

Classification of Optical processes, Optical coefficients, Optical materials, Concept of Excitons, Free and Frenkel excitons,

Light emission in solids, Interband luminescence, direct gap materials, indirect gap materials, Photoluminescence.

General principle of electroluminescence devices, Light emitting diodes, Material selection for light emitting diodes, Diode lasers, Inorganic electroluminescence, ACTFEL device, EL characteristics, EL excitation mechanism.

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Unit II - Advanced Concepts in Solar Cell Technologies

Need of sustainable energy sources, Sustainable Sun's energy, Concepts Fundamental limits on conversion efficiency Shockley-Queisser theory, Multiple Junction solar cells, Quantum dot solar cells, Intermediate band solar cells, Photon splitting and multi-application High efficiency c-Si solar cells, Staebler-Wronski effect

Fabrication of crystalline Si solar cells, Thin film crystalline Silicon solar cell technologies, Thin Cadmium Telluride and Copper Indium Gallium Selenide Cell Technologies.

Unit III -

Solar PV modules, Series and parallel connection of cells, Mismatch in series and parallel connection, PV module power output as function of temperature and solar radiation

Concentrators Photovoltaic (CPV) Cells- Light concentration, concentration ratio, Optics for CPV paraboloid reflector Compound parabolic concentrator Fresnel's Lens concentrator

Tracking requirement of CPV

Unit IV -

Introduction to thin films Two dimensional material, various methods of thin films growth, Molecular Beam Epitaxy (MBE), Controlled deposition of single Atomic Layer, Liquid Phase Epitaxy (LPE) ,and Vapour Phase Epitaxy (VPE), Characterization of thin Film. Application of thin film, Metal nanoclusters, semi conducting nanoparticles, rare gas and molecular clusters, methods of synthesis, carbon nanostructures, applications of carbon nanotubes, bulk nanostructured materials, solid disordered nanostructures, nanostructured crystals, photonic crystals.

Unit V -

Introduction to Nano science, Classification of Nano materials, Size dependence of properties, Energy Bands, Chemical Mechanical, Magnetic, Structural, Optical (linear & non-linear) properties of nanoparticles. Emergence of nanotechnology: Bottom-up & Top-down approach.

Reference Books -

1. Optical Properties of Solids Mark Fox Oxford University Press
2. Solar Photovoltaics: Fundamentals, Technologies and Applications, C. S. Solanki, Prentice Hall of India, 2011.
3. Solar cells: Operating principles, technology and system applications, by Martin A. Green, Prentice-Hall Inc, Englewood Cliffs, NJ, USA,
4. Fiber Optic Communication - Govind P. Agrawal, 3rd Edition, Wiley Series in Systems
5. Introduction to Nanotechnology- Charles P.Poole and Frank J.Ovens, Wiley and Sons
6. Nanostructures: Theory & Modelling : C. Delerue & M. Lannoo (Springer)
7. Nanotechnology-Basic Science and Emerging Technologies by M. Wilson, Kamali Kannangara Geoff Smith, Michelle Simmons, B, Raguse
8. Nanotechnology- An Introduction to Nanostructuring Techniques-Wolfgang Fritzsche

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9. Nanomaterials- synthesis, Properties & application A.S.Edelstein & R C Cammarata Introduction to Nanotechnology-Charles P. Pool;e. Jr. & Frank J. Qwens)"

Paper III - Digital Image Signal Processing

Unit I - Image Enhancement

Spatial domain methods and frequency domain methods, Enhancement by point processing: histogram processing, Image subtraction, image averaging. Spatial Filtering: smoothing and sharpening filters. Enhancement in the frequency Domain: lowpass, high pass and homomorphic filtering. Generation of spatial masks from frequency domain specifications, Color image processing: color fundamentals, color models, pseudo color image processing, full color image processing.

Unit II - Image Restoration

Degradation Model for continuous functions, discrete formulation, Diagonalization of circulant and Block Circulant matrices: curculant matrices block circulant matrices, effect of diagonalization on the degradation model. Algebraic approach to restoration: unconstrained and constrained restoration. Inverse filtering , least mean square (Wiener) filter , Constrained least squares Restoration, Interactive Restoration , restoration in the spatial domain , geometric transformations : spatial transformations ,gray level interpolation

Unit III- Image Compression

Fundamentals: coding redundancy, inter pixel redundancy, psycho visual redundancy, fidelity criteria. Image compression models: the source encoder and decoder, the channel encoder and decoder. Elements of information theory: measuring information, the information channel, fundamental coding theorems. Error free compression: variable length coding, bit plane coding, lossless predictive coding. Lossy Compression: Lossy predictive coding, transform coding.

Image Compression standards: binary image compression standards, continuous tone image compression standards.

Unit IV - Image Segmentation

Detection of discontinuities: point, line, edge and combined detection. Edge linking and boundary detection: local processing, global processing via the Hough Transform, global processing via graph theoretic techniques. Thresholding: foundation, the role of illumination, simple global thresholding, optimal thresholding, thresholding selection based on boundary characteristics, thresholds based on several variables. Region oriented segmentation, use of motion in segmentation.

Unit V - Image Representation, description and recognition

Representation schemes: chain codes, signature, boundary segments. Boundary descriptors: some simple descriptors, Fourier descriptors, Regional descriptors: topological descriptors, moments, Relational descriptors. Recognition: Elements of image analysis, patterns and patterns classes, Decision theoretic methods: matching, optimum statistical classifiers,

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structural methods. Interpretation: logical systems (predictive calculus), semantic networks, production systems.

Reference Books –

1. Digital Image Processing – Gonzalez and Woods, 2nd Edition, Pearson Education Publication
2. Digital Image Processing – Gonzalez and Woods, Pearson Education using Matlab Publication
3. Digital Image Processing – B.Chanda, D.Dutta and Majumdar Analysis, PHI Publication
4. Fundamentals of Digital Image Processing – S. Annadurai ,R.shanmugalakshmi,Pearson education
5. Digital Image Processing - Rafael C Conzalez & Richard E. Woods, AWL.
6. Fundamental of Digital Image Processing - A.K.Jain, PHI.
7. Digital Picture Processing - Rose field Kak.
8. Digital Image Processing - W.K.Pratt.

Dissertation- Marks: 150

Students individually will carry out a detail study on a topic and implement a related system. The study must include literature survey, methodology and proposed work, experimental details and results, modifications to be included and future directions, applications etc. A report is to be prepared and submitted under the guidance of a supervisor. The report should contain design, implementation and experimental details. The topics involved in the work should be related to the courses undertaken by the student till this portion of progression under the programme and have contemporary relevance. It can involve research and development oriented works and be carried out with an eye on the needs of the industry. The work must be defended through a presentation in front of a panel constituted by selected experts. The quality of the work should be reflected by at least one publication in conference proceedings/ journals etc.

Revised and approved by Board of Studies in Electronics on 7th November 2015