M.Sc. Electronics
Semester-I
Engineering Mathematics & Statistics
MSE-101
Full Marks-100

Unit-1
Vector Differential Calculus & Integral:
Vector Differentiation Calculus: scalar and vector functions, fields. Gradient, divergence and curl of a vector function.
Gradient of a scalar field, gradient as surface normal vector. Directional derivative, scalar potential, potential & conservative fields. Physical interpretation and properties. Vector Integral Calculus: Line, surface and volume Integrals, their general properties. Green's theorem in the plan and its applications. Statement of Stokes theorem and its applications. Gauss divergence theorem, applications.

Unit -2
Fourier Series & Transforms:
Fourier Series, Dirchilit conditions, determination of Fourier Co-efficients, Statement of Fourier Integral Theorems, Fourier series–sine and cosine series, Fourier Transforms & properties, Fourier Transform of various functions, Fourier Sine & Cosine transforms. Inverse transforms. Convolution Theorem, Parsevals Identity, applications.

Unit -3
Laplace Transforms:
Laplace transforms, Region of Convergence (ROC), Basic properties of Laplace Transforms. Laplace transform of derivatives and integrals, shifting theorem, differentiation and integration of transforms, inverse transforms, convolution property. Laplace transform of unit step function, impulse function and periodic function, Solutions of linear differential equations with constant coefficients using Laplace transform.

Unit -4
Z – Transforms:
Definition of Z- transform, Region of Convergence (ROC), properties, initial and final value theorem. Z transform of unit step sequence, unit ramp sequence, polynomial functions, trigonometric functions. Shifting property, convolution property, Inverse transform. Pole-Zero plots from z-transform. Solutions of 1st & 2nd order difference equations with constant coefficients using Z transforms.

Unit -5

Probability & Statistics:

Introduction: Probability- Mathematical approach and Statistical Approach. Types of Sampling-Simple Random Sampling Stratified Random Sampling. Random Variables, Probability Density function, Probability Mass Function. Mathematical Expectation-Mean, Expectations and Variance of a Distribution. Binomial, Poisson, Exponential, Normal Distributions.

Suggested Books:

1. *Advanced Engg. Mathematics by Erwin Kreyszig. Wiley India Pvt Ltd. Reprint 2008.*
2. *Signals and System by Samarjit Ghosh, Pearson Education, 2nd Reprint, 2007.*
3. *Digital Signal Processing by S. Salivahanan, A. Vallavara and C. Gnanpriya, Tata Mcgrow Hill, 29th Reprint, 2009.*
4. *Laplace and Fourier Transforms Goyal and Gupta ,2nd Ed,2009.*
5. *Higher Engineering Mathematics- Dr. B. S. Grewal, Khanna Publishers.*
6. *Fundamentals of Mathematical Statistics by V. K Gupta and S.C. Gupta; Sultan Chand & Sons; Reprint 2009.*

M.Sc. Electronics
Semester-I
C Programming
MSE-102
Full Marks-100

Unit-1

Overview of C, Features of C, IDE of C, Structure of C Program, Compilation & Execution of C Program. Identifiers, Variables, Expression, Keywords. Data Types, Constants, Scope and Life of Variables - Local and Global Variable. Operators: Arithmetic, Logical, Relational, Conditional and Bitwise Operators, Precedence and Associatively of Operators. Types Conversion in Expression, Basic Input/Output And Library Functions Single Character Input/Output i.e. getch(), getchar(), getche(), putchar(), Formatted Input/Output i.e. printf() and scanf(). Library Functions – Concepts, Mathematical and Character Functions, Control Structures - if Statement, if…….else Statement, Nesting of if ……..else statement, else if ladder, ? : Operator, switch Statement, Compound Statement Loop Controls – for, while, do-while Loops, break, continue, exit, goto Statement.

Unit-2

The Need of a Function, User Defined and Library Function. Prototype of a Function, Calling of a Function, Function Argument, Passing Arguments to Function, Return Values, Nesting of Function, main (), Command Line Argument, Recursion.

Unit-3

Arrays - Single and Multidimensional Arrays, Array Declaration and Initialization of Arrays, Array as Function Arguments, String: Declaration, Initialization, String Functions. Structure - Defining Structure, Declaration of Structure Variable. Accessing Structure Members, Nested Structures, Array of Structures, Structure Assignment, Structure as Function Argument, Function That Return Structure, Union.

Unit-4

Pointers- The & and * Operators, Pointers Expressions. Pointers v/s Arrays, Pointer to Functions. Static and Dynamic Memory Allocation in C. DMA Functions: malloc(), calloc(), sizeof(), free(), relloc().

Unit-5

File Management - Defining, Opening a File & Closing a File, Text File, Binary File. Functions for File Handling: fopen, fclose, getc, fgetc, putc, fputc, getw, putw, gets, puts, fgets, fputs, fprint, fscanf, fread, fwrite. Random Access to Files: fseek, ftell, rewind, File Name as Command Line Argument.

Suggested Books:

1. *Programmingin C by Balaguruswamy; Tata McGraw Hill;5th Ed,2011.*
2. *Programming with C by Gottfried Schaums Outline Series, TMH publications;*
3. *Thinking in C by Mahapatra, PHI publications;*
4. *Introduction to Computers and Information Technology by Anurag Seetha, Rain Prasad & Sons, Bhopal.*
5. *Computers Today S.K. Basandra, Galgotia Publications.*
6. *Program Design by Peter Juliff ; PHI, Publications. Reprint 2011.*

M.Sc. Electronics

Semester-I

Semiconductor Materials & Devices

MSE-103

Full Marks-100

Unit -1

Electronic Materials:

Introduction to semiconductor materials, Elemental and Compound semiconductors. Solid-state Structure, Band Structure. Conduction in solid, Drift and diffusion currents. Fermi-Dirac Energy distribution.

Intrinsic and extrinsic semiconductor, Electrons and Holes, Generation and recombination in semiconductors, Conductivity in semiconductors, Carrier concentration. Energy band structures of semiconductors, Mobilities and Drift Velocities.

Hall Effect and Magneto resistance. Concept of effective mass, density of states, derivation of Fermi level for intrinsic semiconductors, donors, acceptors, majority carriers (electrons and holes), dependence of Fermi level on temperature and doping concentration. Concepts of rectifying & ohmic contacts.

Unit -2

Junction Diodes:

Formation of p-n junction: Depletion layer, potential Barrier. Unbiased p-n junction, biased: forward bias and reverse bias, reverse leakage current, diode equation. Breakdown Mechanisms: Zener and avalanche breakdown, ideal diode and real diode, diode equivalent circuits. Junction Capacitances: Transition and diffused capacitance, power dissipation, Special diodes: Zener diode, Zener diode as a voltage regulator and other applications, varactor diode, tunnel diode, Schottky diode. Rectifier circuits: half-wave, full-wave, full-wave bridge rectifiers, Merits and demerits of different rectifier circuits. Filter circuits: series inductor filter, shunt capacitor filter, LC filter, π-section filter, RC filter. Power supply using transformer, rectifiers and filters, voltage regulation. Diode clipping and clamping circuits.

Unit -3

Bipolar Junction Transistor

BJT: Formation and Terminals, biasing of BJT, current components, Ebers-moll model. Configuration and operation, characteristics (Input, output and transfer). Early effect, base- width modulation, dc & ac load line & Q- point. Fixed bias, emitter bias, collector to base bias, voltage divider bias. Thermal stability, Transistor switching and amplification.

Unit -4

Field Effect Transistors:

JFET: Basic construction, operation and characteristics of JFET, detailed analysis of current flow. FET configurations, JFET biasing and voltage amplification, Merits and demerits and applications of JFET. MOSFET: Basic construction, operation of Enhancement only and DE-MOSFET, characteristics, detailed analysis of current flow of MOSFET. MOS capacitor, MOSFET configurations, p-MOS, n-MOS & Complementary MOS circuits.

Unit -5

OP-AMP:

Basic of OPAMP circuit, Ideal op-amp characteristics, offset current, offset voltage, Frequency and phase response, Bandwidth, CMRR. Non inverting & inverting circuit, adder and subtractor by OPAMP, OPAMP Voltage Comparator, Schmitt trigger circuit, integrator, differentiator. Instrumentation amplifier, Multivibrator- astable, monostable and bistable circuits, Passive & Active filters, low pass, high pass, band pass & band elimination filters, wave shaping circuits.

Suggested Books:

1. *Electronics Devices and Circuits- J. B. Gupta, Katson publishers, 5th Edition, 2012.*
2. *Electronic Devices and Circuits- David A. Bell, PHI, 5th Edition, 2008.*
3. *Physics of semiconductor devices- S.M Sze, John Wiley.*
4. *Semiconductor devices- J. Singh, Mcgrawhill.*
5. *Solid State Electronic Devices- Ben G. Streetman and Benerjee, PH, 5th Ed., New Delhi, 2006.*
6. *Electronic Devices and circuit Theory- Boylestad and Nashelsky, PHI, 9th Ed., 2006.*
7. *Electronic Circuits Analysis and Design- D.A. Neamen, Tata Mcgrow Hill, 4th Edition, 2007.*

M.Sc. Electronics

Semester-I

Electronic Circuit Lab-I

MSE-105

Marks-100

1. To design Rectifiers using capacitor filter
    a. Half wave Rectifier
    b. Full wave Rectifier
2. To design RC coupled amplifier using BJT
    a. Single stage
    b. Double stage
3. To study OPAM as an
    a. Inverting amplifier using IC741
    b. Non-inverting amplifier using IC741
4. To study active filters using OPAM
    a. Low pass
    b. High pass
    a. Band pass
5. To find the hysteresis curve of Schmitt Trigger using OPAM.
6. To study of OPAM as
    a. An Integrator
    b. Differentiator
7. To find out the frequency of
    a. Phase shift Oscillator
    b. Wein Bridge Oscillator
8. Determine the frequency using IC 555 timer of
    a. Astable Multivibrator
    b. Monostable Multivibrator

Suggested Books:

1. *Op-Amps and Linear Integrated Circuits by Ramakant A. Guykuwad, PHI, 4th Ed. 2011.*
2. *Electronics Laboratory Primer by S. Poorna Chandra and B. Sasikala; S. Chand,2009.*
3. *Electronics Lab Primer by Kandarpa Kumar Sarma, Global Publishing House (India), 2009.*

M.Sc. Electronics
Semester-II
Digital Electronics System & Design
MSE-201
Full Marks-100

Unit-1

Number Systems:

Introduction to Number Systems: Decimal, Binary, Octal and Hexadecimal systems, conversion from Decimal to Binary, Binary to Decimal, Octal to Decimal and Decimal to octal, Hexadecimal to Binary and Binary to Hexadecimal, Decimal to Hexadecimal and Decimal to Hexadecimal.
1s and 2s compliments of Binary numbers. Binary Arithmetic: Binary and Hexadecimal addition, subtraction, multiplication, division. Binary Codes: BCD, Excess- 3, Gray, ASCII, EBCDIC codes.

Unit-2

Boolean Algebra & Digital Logic Circuits:

Boolean algebra: Boolean Laws and axioms. Boolean representations- Sum of Product and Product of Sum, minterm, maxterm. Reduction of Boolean expressions. De Morgans theorems and its applications. K-arnaugh map simplification, Quin Maclousky minimization. Digital logic gates: NOT, AND, OR, NAND, NOR, Ex-OR gates. Introduction to digital logic circuits: DTL, RTL, TTL, DCTL, I^2L, HTL, ECL. MOS gates, P-MOS and N-MOS Logic Gates, CMOS Logic Gates, Integrated Injection Logic (I^2L), Comparison of Major IC Logic Types.

Unit-3

Combinational & Sequential Circuits:

Combinational circuits: Analysis and synthesis of combinational circuits, Multiplexer, Demultiplexer, Encoder, Decoder, Code-converter, Half Adder and Full adder, Subtractor, Comparator, Parity generator / checker, Priority encoder.

Sequential Circuits: Latches and Flip-flops, edge and level triggering, SR, JK, master-slave JK, D and T Flip-Flops; Registers- Buffer registers, shift registers: Serial-in serial-out, serial-in parallel-out, parallel-in parallel-out and parallel in serial-out, bidirectional and universal shift register; Counters- Asynchronous and synchronous counters.

Unit-4

Interface circuits:

Digital to Analog converter (DAC) -weighted resistor method, R-2R ladder method. Analog to Digital Converter (ADC) -parallel comparator method, counter method, successive approximation method, dual-slope method, Comparisons of different ADCs and DACs.

Unit-5

Memory:

Classification of memory: main memory, secondary memory, volatile and non-volatile memory, Read Only Memory (ROM) - PROM, EPROM, EEPROM. Random Access Memory (RAM)-static, dynamic, Memory characteristics. Memory organization and applications.

Suggested Books:

1. *Digital Design by M Morris Mano and M D Ciletti, PHI Pvt. Ltd, 4th Edition, 2007.*
2. *Digital Electronics Circuit and System by V.K. Puri; Tata McGraw Hill; 1st edition, 1997.*
3. *Introduction to Digital Electronics by NIIT; Prentice-Hall India; 1st edition, 2004.*
4. *Digital Electronics: Principles And Integrated Circuits; Anil K. Maini; Wiley India (P) Ltd.*
5. *Electronic Principle; A. Malvino and D. J. Bates; Tata McGraw Hill education.*
6. *Modern Digital Electronics; Bijendra N Jain, R P Jain, Jain R P; McGraw-Hill Science; Reprint 2010.*
7. *Fundamental of Digital Circuits by A. Anand Kumar; PHI; 2nd Ed.; 2009.*

M.Sc. Electronics
Semester-II
Network Theory and Analysis
MSE-202
Full Marks-100

Unit-1
Network Elements:
Basic concepts of network elements, passive and active elements, lumped and distributed elements. Voltage and current across resistance, capacitance and inductance with energy concepts. Series and Parallel connection of resistors, capacitors and inductors. Voltage source and current source related to network theory.

Unit-2
Analysis of Network Elements:
Graph and trees of a network. Initial and final value concepts. Voltage and current division rules. Kirchhoff's Current Law (KCL), Kirchhoff's Voltage Law (KVL). Nodal analysis, Mesh analysis, Star-Delta conversion. Network Theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Reciprocity theorem, Millman's theorem, Maximum power transfer theorem.

Unit-3
Response of RLC circuits:
DC and AC analysis of RC, RL and RLC circuits by differential equation and Laplace transformation. Transient and steady state response, time constant. Pole and Zero concepts. Resonance in series RLC and parallel RLC circuits and frequency responses, Resonance frequency, Quality (Q) factor and bandwidth.

Unit-4
Two Port Network:
Analysis of two port networks. Impedance (Z) parameters, Admittance (Y) parameters, Transmission (ABCD) parameters, Hybrid (h) parameters of two port network. Relation between different parameters.

Unit-5
Filters:
Concept of Decibel & Neper. Basic Relations in Filter, Characteristics impedance of a filter in Pass and Stop bands. Classification of Filters. Analysis of passive and active filters: constant k, LPF, HPF, BPF m-derive filters.

Suggested Books:

1. *Circuits and Networks by Analysis and Synthesis by A Sudhakar, McGraw Hill, 4th Edition, 2011.*
2. *Network Analysis by G. K. Mithal; Khanna publishers. 3rd Reprint, 2001.*
3. *Networks and Systems by D Roy Choudhury; Wiley Eastrn Ltd.; Reprint 2012.*
4. *Introduction to Circuit by Guillemin, E. A; John Wiley and Sons.Reprint 2010.*
5. *Circuit Theory and Design by Stewart, J. L; John Wiley and Sons.2nd ed,reprint 2009.*
6. *White Electromagnetic. A Handbook on Electrical Filters. White Electromagnetic, Inc.*
7. *Network Analysis and Synthesis by C L Wadhwa; Reprint 2012.*

M. Sc Electronics

Semester-II

IC Technology & Analog Electronic Circuits

MSE-203

Full Marks-100

Part A: IC Technology

Unit -1

Integrated Circuits:

Introduction to Integrated Circuits, Merits and Demerits, Application.

Scale of Integration: SSI, MSI, LSI, VLSI, ULSI, GSI. Moore's Law.

Classification of ICs: Monolithic, Thin and Thick film, Hybrid ICs. IC terminology, IC fabrication: Basic fabrication steps: Wafer, epitaxial growth, oxidation, photolithography, etching, diffusion, ion implantation, film deposition and metallization. Fabrication of diode, BJT, FET and MOSFET ICs.

Unit- 2

Thin Film IC:

Thin films: properties of thin films. Thin film deposition method- PVD, CVD, Epitaxy, theory of nucleation and growth in thin films; VPE, LPE, MOCVD, MBE techniques. Growth of multilayer structure, defects; diffusion, method of control and measurement of film thickness. Optical, electrical and mechanical characterization of thin films. Metallic, semiconducting and insulating films.

Part B: Analog Electronic Circuits

Unit-3

Transistor modeling:

BJT modeling: two port representation of the BJT with z, y, h-parameters. r_e & hybrid models of CE, CB,CC amplifiers. Calculation of input impedance, output impedance, voltage gain, current gain, power gain. Hybrid-π model of CE amplifier in voltage divider bias configuration. Effect of parasitic capacitances, Frequency response in low, mid and high frequency conditions, Transistor circuit noise. FET biasing- Self bias, fixed bias, voltage divider bias, simple problems.

Unit-4

Amplifiers:

Amplifiers: BJT as an amplifier: single stage and double stage amplifier (with various types of coupling). Power amplifier- Class A, B, C and AB type. Darlington pair, Transformer coupled amplifier, push pull amplifier, class B push pull circuits, complimentary symmetry amplifier. Distortion in amplifiers. Small signal AC equivalent circuits of FET as amplifiers; MOSFET: as an amplifiers (with various types of coupling).

Unit-5

Feedback and Oscillators:

Feedback: General theory of feedback, negative and positive feedback, effects of negative feedback. Current series and shunt, voltage series and shunt, amplifier circuit design with negative feedback. Positive feedback & Oscillation, Barkhausen criterion; types-RC, LC & crystal oscillators; Wein bridge, phase shift, Hartley and Colpitts Oscillators, frequency stability & Q-value.

Suggested Books:

1. *Semiconductor Devices: Physics and Technology; S. M. Sze; John Wiley & Sons, 2nd Ed,Reprint 2008.*
2. *Solid State Electronic Devices; Ben Streetman and S. Banerjee; Pearson Education,6th Ed,2007.*
3. *Semiconductor Devices: Basic Principles; Jasprit Singh; John Wiley and Sons ,Reprint 2009.*
4. *Semiconductor Devices; Kanaan Kano; Pearson Education*
5. *Semiconductor Device Fundamentals; Robert F. Pierret; Pearson Education,2nd Ed, Reprint 2009*
6. *VLSI;S.M.Sze, John Wiley & Sons 2nd Ed,Reprint 2007.*

M.Sc. Electronics
Semester-II
Digital Electronics Lab-I
MSE-204
Full marks-100

1. Design and Study of NOT, AND and OR gates using IC
2. Design and Study of Exclusive-OR and Exclusive-NOR gates using IC
3. Design and Study of NAND and NOR gates using IC.
4. Design and Study of Half Adder using IC.
5. Design and Study of Full Adders using IC.
6. Design and Study of Subtractor using IC.
7. Design and Study of Comparator using IC.
8. Design and Study of 4:1 Multiplexers using common gates.
9. Design and Study of 8:1 Multiplexers using IC.
10. Design and Study of 1:4 Demultiplexer using IC.
11. Design and Study of 3:8 Decoders using IC 74138.
12. Design and Study of Octal to Binary Encoder.
13. Design and Study of Seven Segment Displays
14. Design of A/D converter using IC
15. Design of D/A converter using IC

Suggested Books:

1. *Digital Electronics: Principles And Integrated Circuits; Anil K. Maini; wiley India (P) Ltd.*
2. *Dlectronic Principle; A. Malvino and D. J. Bates; Tata McGraw Hill education.*
3. *Modern Digital Electronics; Bijendra N Jain, R P Jain, Jain R P; McGraw-Hill Science.*
4. *Digital Logic and Computer Design; M. Marris Mano; Pearson Prentice Hall.*

M.Sc. Electronics
Semester-II
Electronic circuit lab-II
MSE-205
Full marks-100

1. Verification of voltage division rules
2. Verification of current division rules
3. Verification of Thevenin's Theorem
4. Verification of Norton's Theorem
5. Verification of maximum power transfer Theorem
6. Measurement of phase angle of waves by Lissajous figure and unknown frequency
7. Simulation of an inductance using OP-AMP 741
8. Study Bistable Multivibrator circuit
9. Study the loss of Transmission line using Trainer.

Suggested Books:

1. OP-AMP and Linear Integrated Circuit by R. Gayakwad.
2. Analog Electronics with Op-amps: A Source Book of Practical Circuits; Anthony Peyton, Vincent Walsh; Cambridge University Press.
3. Foundations of Analog and Digital Electronic Circuits; Anant Agarwal, Jeffrey H. Lang; Denis E. M. Penrose.

M.Sc Electronics
Semester-III
Microprocessor & Microcontroller
MSE-301
Full marks-100

Unit-1:

Introduction to microprocessor and microcontroller, Microprocessor based system, serial and parallel processing, uniprocessor and multiprocessor environment. Memory: primary and secondary memories, ROM, RAM etc. Architecture and Organization of microprocessor: ALU, Registers, memory, control unit, system bus.

Unit-2:

Internal architecture of 8085A. User programmable register, PC, SP, accumulator, flags. Buses: data, address, control unit. Pin configuration of 8085. Demultiplexing of data bus, generation of control signals. Instruction cycle, fetch and execute operation, machine cycle and T-state.

Unit-3:

Instruction format, data format, Instruction word size. Complete instruction set of 8085, classification of instructions. Addressing modes.
Interrupts: Hardware and software, maskable and non-maskable, vectored interrupts. Stack and subroutine, delay. Assembly language programming. Interfacing: memory and I/O interfacing to D/A, and A/D converters, LED, Seven segment display, switch, Bus RS 232 by assembly language programming for peripheral interfacing.
Introduction to 8255, 8251, 8237 and 8257 DMA Controller, 8279, block diagram, architecture, interfacing to various microprocessors.

Unit-4:

Introduction to 8086 architecture, register and memory organization. Pin diagram, minimum and maximum mode of 8086. Addressing modes, instruction set and assembly language programming. Introduction to 8088, 80386, 80486 processors.

Unit-5:

8051, 8031 family architecture, memory. Addressing modes, instruction sets, interrupts. I/O interfacing by assembly language programming to LCD, LED, DAC, ADC & sensors.

Suggested Books:

1. *Microprocessor 8085 and Its Interfacing by Sunil Mathur; 2nd Ed., Reprint 2011.*
2. *Microprocessor & Microcontroller; A.P. Godse, D.A. Godse; Technical Publication Pune.2nd Ed,Reprint 2010.*
3. *PIC Microcontrollers: An Introduction to Microelectronics; Martin Bates; Elsevier.*
4. *Microprocessors and Microcontrollers: Architecture Programming And System Design; Krishna Kant; Prentice Hall India.*
5. *Microprocessor Architecture, Programming and Applications with the 8085. Ramesh Gaonkar; PRI (India) Private limited; 5th Ed.; January 2007.*
6. *Microprocessor 8085and Its interfacing; Sunil Mathur; 2nd Ed., September, 2011.*
7. *8085 Microprocessor Programming and Interfacing; N.K.Srinath;PHI ;1st Ed,2005*
8. *The Intel 8086/8088 Microprocessor Architecture, Programming, Design and Interfacing; B. Singh Chhabra DR Publishing, 3rd Ed. 2001.*
9. *Fundamentals of Microprocessor and Microcomputers by B. Ram; Dhanpat Ray Publications; 6th Ed., Reprint 2006.*

M.Sc. Electronics
Semester-III
Electronics Communication System
MSE-302
Full Marks-100

Unit -1:
Introduction to communication system, Contaminations, The Audio Spectrum, Signal Power Units, Volume Unit. Noise. Signal-To-Noise Ratio. Analog And Digital Signals**.** Modulation, Fundamental Limitations in Communication System.

Unit -2:
Block diagram – of communication system, Transmitter & Receiver. Necessity for modulation - Types of communication systems. Definition of AM waveforms - Frequency spectrum and hand width - Modulation index. DSB-SC, SSB, Independent SB, Vestigial SB. Comparison and application of various AM schemes. Definition of FM & PM, Relationship between FM & PM - Frequency deviation - Spectrum and transmission BW of FM comparison of AM and FM systems. AM & FM transmitters & Receivers with block diagrams.

Unit -3:
Introduction to pulses, Sampling Theory, Sampling Analysis, Types Of Sampling. Types of Analog Pulse Modulation, PAM, PDM, PPM, SNR in Pulse Systems. Delta Modulation, Pulse Code Modulation. Quantization Noise Analysis, Differential PCM.

Unit -4:
Noise: Noise sources, external and internal noise. Noise figure, effect of noise in electronic circuits. Noise temperature, BER.

Unit -5:
Television of TV system - Block diagram. Scanning - Synchronisation - VSB transmission and reception. Color signal transmission.

Suggested Books

1. *Electronics Communication System by Kennedy; Tata McGraw Hill ; 4th Ed., 37th Reprint 2009*
2. *Electronics Laboratory Primer by S. Poorna Chandra and B. Sasikala; S. Chand,*
3. *An Introduction to Analog and Digital Communications, S.Haykin.*Willey Eastern, New York, 1989.
4. *Modern Digital and Analog Communication Systems* by B.P. Lathi, Oxford University Press; 3rd Ed.; 2010.
5. *Electronic Communication 4th edition;* Dennis Roddy and John Coolen, PHI, 1989.

M.Sc. Electronics
Semester-III
Electronics Communication Lab
MSE-303
Full Marks-100

1. Design of Amplitude Modulator and Demodulator
1 Design of Frequency Modulation and Demodulation
2 Design of Frequency Response of IF Amplifier
3 Design of Mixer
4 Design of Balanced modulator
5 Design of Pulse Amplitude Modulation
6 Design of Pulse Amplitude Demodulation
7 Design of Pulse width Modulation
8 Design of ASK, FSK and PSK
9 Design of VCO.

Suggested Books:

1. *Electronics Communication System by Kennedy; Tata McGraw Hill ; 4th Ed., 37th Reprint 2009.*
2. *Electronics Laboratory Primer by S. Poorna Chandra and B. Sasikala; S. Chand.*
3. *An Introduction to Analog and Digital Communications*, Willey Eastern, New York, 1989.
4. *Modern Digital and Analog Communication Systems* by B.P. Lathi; Oxford University Press; 3rd Ed.; 2010.

M.Sc Electronics

Semester-III

Microprocessor & Microcontroller Lab

MSE-304

Full Marks-100

1. Write programme for Addition of 8 bit and 16 bit number.
2. Write programme for Subtraction of 8 bit and 16 bit number.
3. Write programme for Multiplication of two numbers.
4. Write programme to find sum and average of a given series of numbers (8-bit).
5. Write programme for Array addition (multibyte).
6. Write programme for Logical operators – AND, OR and NOT logic gates.
7. Write programme for Decimal to ASCII and ASCII to Decimal conversion.
8. Write programme for Decimal to Hexa and Hexa to Decimal conversion.
9. Write programme to arrange a series of numbers (8-bit) in ascending/descending order.
10. Write programme move a block of data.

Suggested reading

1. *Microprocessor Architecture, Programming & Applications with 8085; by Ramesh S.Gaonkar; Prentice Hall of India; 4th edition, 2007.*
2. *Fundamentals of Microprocessor and Microcomputers by B. Ram; Dhanpat Ray Publications; 6th Ed., Reprint 2006.*
3. *Microprocessor 8085 and Its Interfacing by Sunil Mathur; 2nd Ed., Reprint 2011.*

M.Sc. Electronics

Semester-III

Electromagnetic Theory & Microwave Technology-I

MSE-305 A

Full Marks-100

Unit -1:

Electrostatics: Gauss Law, Laplaces' & Poissons' Equation, Boundary value problems Magneto statics: Faradays Law, Amperes Law, Dielectric & Magnetic Media, Biot Savart's Law, Magnetic Vector Potential. Relationship between Electrostatistics & Magnetostatistics, Maxwell's Law. Displacement Current & Displacement Current Density

Unit -2:

Wave Equation, Phasor Concept, Plane Waves in lossless & Lossy Media, Poynting Theorem, - Power &Power density, Wave propagation through different media.

Unit -3:

Fundamentals of transmission lines, parameters, Characteristic impedance, and Propagation constant, Distortions, Termination, Smith chart and Impedance matching, Wave guides; Rectangular and Circular waveguides, TEM waves, TE and TM modes, Power transmission and losses.

Unit -4:

Microwave Semiconductor devices - Schottky diodes, Point contact diodes, Varactor diodes, IMPATTT, TRAPATT, Gunn diode, Microwave tubes - Introduction, Multicavity Klystron, Velocity modulation and beam bunching, Reflex Klystron, Magnetron, working of magnetron, travelling wave tubes, other micro wave tubes, MTI, Beacons, CW Doppler radar.

Suggested Books:

1. *David M Pozar, Microwave Engineering, John Wiley & Sons*
2. *A course in Elecromagnetic Field Theory; Dr S.L.Gupta, Sanjeev Gupta.Dhanpath Ray; 1st Ed., 2010.*
3. *Advanced Engineering Mathematics by Erwin and Kreyszig; Wiley student edition.*
4. *Microwaves by K.C.Gupta; New Age International Publishers.*
5. *Electromagnetic waves and Radiation system by E.C.Jordan and K.G.Bamain; Prentice-Hall India.*
6. *Microwave circuits and passive Devices by M.L.Sisodia and G.S.Raghuvanshi; New Age International Publishers.*
7. *Microwave by Simon Haykin, 2nd Ed., 2007.*

M.Sc. Electronics
Semester-III

Digital Signal Processing-I

MSE-305 B
Full Marks-100

Unit-1

Introduction:

DSP system and its block diagram, application and advantages. Concept of discrete time signals, periodic, energy, power, unit sample, unit step, unit ramp, real and complex exponentials, arithmetic operation and sequences.

Unit-2

LTI Systems:

Definition, representation, impulse response, derivation of the output sequence, linear convolution, graphical and analytical method, stability and causality condition, recursive and non-recursive systems, FIR and IIR systems

Unit-3

Z Transform:

Definition of z transforms and Region of Convergence (ROC), and its properties. Inverse Z transform by power series expansion method, partial fraction method.

Transfer function of LTI discrete time system, Impulse response and transfer function, response of LTI discrete time system using z transform, convolution and de-convolution using z transform, causality and stability of LTI discrete time system, determination of poles and zeros of rational Z transform.

Unit-4

Realization of Digital Filters in Block Diagram and Signal Flow Graph Representation:

IIR filters: Direct form I, Direct Form II, cascade, parallel and ladder form structure

FIR Filters**:** Direct Form structure, Cascade form structure, Linear phase FIR structure

Text Books:

1. A Nagoorkani, "Digital Signal Processing", McGraw Hill Education (India) Pvt. Ltd (2e)

2. J.G.Proakis, D.G. Manolakis and D. Sharma, "Digital Signal Processing: Principles, Algorithm and Application", Pearson

3. P.Ramesh Babu, "Digital Signal Processing", Scitech

References:

1. A. V. Oppenheim, R.W. Schafer and J.R. Buck, "Discrete Time Signal Processing", Pearson

2. S.K.Mitra," Digital Signal Processing: A Computer based Approach", TMH (4e)

3. S. Salivahannan, A. Vallabraj and C. Gnanapriya, "Digital Signal Processing", TMH, 2e

4. M.H. Hayes, "Digital Signal Processing", Schaum's Outline, TMH, 2e

M.Sc. Electronics

Semester-III

Microprocessor and Microcontroller (MDC)

MSE-306

Full Marks-100

UNIT-I:

Introduction to 8-bit Microprocessor:

History of microprocessor, 8085 Microprocessor architecture, buses, registers, flags, 8085 pin configuration and function of each pin. Fetch, decode and execute operations. Op-code fetch, execute cycle, addressing modes of 8085.

UNIT-II:

Intel 8085 Microprocessor Instruction Set and Programming:

Data transfer, Arithmetic, Logical, Rotate, Branch and Machine control instructions. Development of 8085 assembly language programs, time delays, and 8085 interrupts, RST instructions.

UNIT-III:

Introduction to Advance Microprocessor:

Intel 8086 microprocessor architecture, organization and Addressing Modes- Instruction set. Assembly language programs for 8086/88 using Data movement instructions, Arithmetic instructions.

UNIT-IV:

Introduction to 8051 Microcontroller:

Architecture of 8051, block diagram, pin diagram of 8051, functional description of PSW, oscillator, clock, I/O port structure, registers, memory organization. Addressing modes, instruction sets and basic assembly language programming concept.

Text and Reference Books:

1. Microprocessors and Microcomputers – B. Ram, TMH.
2. Introduction to Microprocessors – Aditya P. Mathur, TMH.
3. Microprocessors: Architecture and Programming and Applications with 8085 - Ramesh S. Gaonkar, Penram Intl' Publishing.
4. The Intel microprocessors - 8086/8088,80186/80188, 80286/80386, 80486,Pentiums and Pentium Pro-processors - Architecture, Programming and Interfacing, Barry, B. Brey, PHI.
5. K J Ayala, The 8051 Microcontroller Architecture, Programming and Application, Penram international Publishing (India), 2004.
6. M. A. Mazidi, J. G. Mazidi and R. D. McKinlay, The 8051 Microcontroller and Embedded Systems, Prentice Hall of India, 2nd Ed,2006.
7. Udayashankara, 8051 Microcontroller- TMH.

M.Sc. Electronics
Semester-IV
Power Electronics & Control System
MSE-401
Full Marks-100

Part A: Power Electronics

Unit-1:

Introduction to basic knowledge of power electronics. Power generation and stations. Sources of electronic powers.

Unit-2:

Introduction to power devices: Power diodes, Power transistors. SCR, DIAC, TRIAC, GTO, IGBT, MCT, BJT, UJT, Choppers, working principle, design of power circuits using these devices. Introduction to AC phase: two phase, three phase. Opto-coupler and transformer. Half wave and full wave controlled and uncontrolled rectifiers circuits for power. AC control motors and DC control motors and their operations.

Unit-3:

Power inverters: series, parallel and bridge inverter in single phase with working principle. Basic theory of cooling system: natural convection, forced air cooling, liquid cooling and vapor phase cooling.

Part B: Control System

Unit-4:

Definition and types of Errors: Absolute, Relative and Observer Error; Accuracy, Precision and Resolutions, Mathematical Models of typical components. State variable representations, controllability and observability. Time domain and frequency domain analysis and associated mathematical tools. Control system and performance specifications: Transient and steady state condition. Stability of systems, Concept of poles and zeros, Routh Hurwitz stability criteria, Lyapunov functions.

Unit-5:

Definition and types of Transducers: Transducer for Position. Potentiometers, LVDT, Optical Encoders. Force: Strain Gage, Load cell, piezoelectric velocity. Thermocouple, Resistive Temperature detectors (RTD), Thermistors. Analog Volt-ohm-millimetre, DC Potentiometer. Measurement with CRO: Voltage, frequency and Phase, Oscilloscope probes. LED and LCD

Display drivers, Humidity transducers. Digital Meters, Instrumentation amplifier.

Suggested Books:

1. *Power Electronics; M Rashid; Prentice Hall of India Publication.*
2. *Power Electronics; Ned Mohan, Undeland, Robbins; John Wiley Publication.*
3. *Modem Power Electronics; P.C Sen; Wheeler Publication.*
4. *Electrical Devices; Dubey G.K; Narosa Press.*
5. *Instrumentation and Control Systems, 1st Edition; W. Bolton; Academic Press -Elsevier.*
6. *Instrumentation & control systems engineering handbook; Instrumentation Technology Magazine ;*
7. *Control engineering; N. M. Marris; McGraw Hill; Reprint 2012.*
8. *Control System by A. A. Kumar; PHI; Reprint 2007.*

M.Sc. Electronics

Semester-IV

Optoelectronics and Signal & System

MSE-402

Full Marks-100

Part A: Optoelectronics

Unit-1:

Introduction to Optics, wave nature of light, wave equations. Dielectric materials, optical materials. Reflection and Refraction of light in the interface of two media. Semiconductors related to optics, band gap of such materials. Polarization and modulation of light, Quantum effect in optics.

Unit-2:

Introduction to different type of fluorescent materials, LCD materials. LDR, photodiode, Phototransistor, LED. Optical Fiber, LASER etc., and their fabrication techniques. Different types of Optical Fiber, working principle, characteristics and parameters, and applications. Types of LASER, working principle, parameters and applications to electronics. Design of opto-electronic circuits for optical devices, working principle and their applications in electronics.

Part B: Signal & System

Unit-3:

Continuous and discrete time signals, signal properties. Transformation of the independent variable. Exponential and sinusoidal signals. Unit impulse and unit step functions. Continuous-Time and Discrete- Time Systems. Linear Shift – Invariant Systems. Stability and Causality. LTI Systems: Discrete time LTI systems, the Convolution Sum, Continuous time LTI systems, the Convolution integral, Properties of LTI systems, Convolution theorem. Graphical & analytical techniques overlap & add method, Commutative, Distributive, and Associative. LTI systems with and without memory, Invertibility.

Unit -4:

Laplace Transform, Inverse Laplace Transform. Properties of the Laplace Transform, Laplace Transform Pairs. Solving Differential Equations with Intial conditions. Introduction to z-Transform, Inverse z- Transform. z- transform Theorems and Properties. System Function. Two-Dimensional Z- Transform, applications.

Unit -5:

Fourier Transform: Aperiodic signals, Periodic signals. Properties of Continuous-time Fourier

transform, Convolution and Multiplication Properties, Properties of Fourier transform and basic Fourier transform Pairs.

Suggested Books:

1. *Mathematical Optics, V. Laksminarayanan and M. L. C.T. Alieve; CRC press.*
2. *Optical Materials and Applications; M. Wakaki; CRC press.*
3. *Organic Light Emitting Diode; L.F.R.Pereira; Pan Stanford Publishing*
4. *Optical properties of photonic structure; M.F.Limonov, R.D.L.Rue; Taylor & Francis.*
5. *Signals and Systems by P. R. Rao; Tat McGraw Hill*
6. *Analog and Digital Communication; S.Haykin, Wiley,Reprint 2009.*

M.Sc. Electronics
Semester-IV
Project
MSE-403
Full Marks-200

There will be a PROJECT preparation comprising in any electronics related field. The students have to present the project in two seminars i.e. initial presentation and Final presentation.

M.Sc. Electronics
Semester-IV
Elective Paper
Electromagnetic Theory & Microwave Technology-II
MSE-404 A
Full Marks: 100

Unit-1:

Introduction to Antenna; Radiation, Herzian Dipole, Field radiated by dipole & loop antennas, monopole antenna, effect of ground. Array Analysis, Special arrays like Binomical Yagi, Helical Antennas, Horn, Slot, Parabolodial Reflector, Lens & Microstrip antennas. Basics of RADAR in electronic communication.

Unit-2:

Review of scattering matrix concept, impedance matching network, couplers, power dividers, resonators and filters. Detectors, mixers, attenuators, phase shifters, amplifier and oscillator, Ferrite based circuits

Unit -3:

Microwave filters, Microwave resonators- transmission line resonators, rectangular wave guide cavities, Dielectric resonators, Introduction to microwave amplifiers and oscillators.

Unit -4:

Microwave measurement techniques:
Measurement based on transmission and reflection; Radiation pattern measurements, Antenna range design and evaluation, Anechoic chamber, Measurement based on perturbation techniques, Swept frequency measurements-Network analyser systems; Frequency response test set, TDR systems; RCS measurement; EMI measurement (TEM cell).

Suggested Books:

1. *P Bhartia & I J Bahl, Millimeter wave engineering and Applications, John Wiley & Sons*
2. *David M Pozar, Microwave Engineering, John Wiley & Sons*
3. *R E Collin, Antenna & Radio wave Propagation, McGraw Hill Book Co.*
4. *Jordan & Balman, Electromagnetic waves & Radiating System*
5. *R E Collin, Microwave Engineering, McGraw Hill CO.*

M.Sc. Electronics
Semester-IV
Elective Paper
Digital Signal Processing-II
MSE-404 B
Full Marks-100

Unit-1

Discrete Time Fourier Transform (DTFT) of a Signal:

Definition- Frequency Spectrum of discrete time signals, Magnitude and phase spectrum, Inverse Discrete time Fourier Transform, Comparison of Fourier Transform of discrete and continuous time signal, properties of Discrete Time Fourier transform

Unit-2

Discrete Fourier Series:

Properties of Discrete Fourier Series, Periodic convolution

Fourier Representation of Finite Duration Sequences:

Discrete Fourier Transform (DFT), Properties of DFT, Circular Convolution, Linear Convolution using DFT, relation between DFT and z transform. Fast Fourier Transform (FFT), Decimation in time FFT algorithm, Decimation in Frequency FFT algorithm.

Unit-3

IIR Filter Design:

Impulse Invariance Method: Design steps for Impulse Invariance method. Drawback of Impulse Invariance Method. Bilinear transformation method. Comparison of Impulse Invariance Method and Bilinear transformation method

Basic Lowpass Analog Filter Approximation:

Butterworth filter approximation**,** Chebyshev filter approximation**,** Elliptic filter approximation

Unit-4

FIR Filter Design:

Ideal Frequency Response of Linear Phase FIR filters: Characteristics of FIR Filters with linear phase. Design of Linear Phase FIR filter using windows

Text Books:

1. A Nagoorkani, "Digital Signal Processing", McGraw Hill Education (India) Pvt. Ltd (2e)

2. J.G.Proakis, D.G. Manolakis and D. Sharma, "Digital Signal Processing: Principles, Algorithm and Application", Pearson

3. P.Ramesh Babu, "Digital Signal Processing", Scitech

References:

1. A. V. Oppenheim, R.W. Schafer and J.R. Buck, "Discrete Time Signal Processing", Pearson

2. S.K.Mitra," Digital Signal Processing: A Computer based Approach", TMH (4e)

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