This is a two years (4- Semester) course. There will be *19 Theory modules* (Papers) in which *15 modules are core papers and 4 modules are elective papers*. In addition, the students will be required to take examination in 4 modules of laboratory experiments, each module with maximum marks 100. In semester IV, there will also be a *Project work*. The details of the modules are given below:

SEMESTER – I

MODULE ELE-C-101 : CLASSICAL AND QUANTUM MECHANICS

MODULE ELE-C-102 : PHYSICS OF ELECTRONIC MATERIALS

MODULE ELE-C-103 : MATHEMATICAL & COMPUTATIONAL METHODS IN ELECTRONICS

MODULE ELE-C-104 : ELECTROMAGNETICS, ANTENNA AND PROPAGATION

MODULE ELE-E-101 : INTRODUCTORY ELECTRONICS

MODULE ELE-P-105 : PRACTICAL

SEMESTER – II

MODULE ELE-C-201 : CONTROL SYSTEM

MODULE ELE-C-202 : ADVANCED DIGITAL ELECTRONICS

MODULE ELE-C-203 : LINEAR WAVE SHAPING, AMPLIFIERS AND POWER SUPPLIES

MODULE ELE-C-204 : PULSE AND WAVE SHAPING NETWORKS

MODULE ELE-P-205 : PRACTICAL

MODULE ELE-E-201 : POWER ELECTRONICS

SEMESTER – III

MODULE ELE-C-301 : FIBER AND INTEGRATED OPTICS

MODULE ELE-C-302 : COMMUNICATION ELECTRONICS

MODULE ELE-C-303 : IC TECHNOLOGY AND VLSI DESIGNING

MODULE ELE-C-304 : MICROPROCESSOR & INTERFACING

MODULE ELE-E-301 : BASICS OF VHDL AND PROGRAMMING

MODULE ELE-P-305 : PRACTICAL

SEMESTER – IV

MODULE ELE-C-401 : COMPUTER PROGRAMMING WITH C AND INTRODUCTION TO MATLAB

MODULE ELE-C-402 : OPTO ELECTRONICS AND COMMUNICATION

MODULE ELE-C-403 : COMPUTER NETWORKS

MODULE ELE-E-401 : THIN FILM TECHNOLOGY

MODULE ELE-P-404 : PRACTICAL

MODULE ELE-P-405 : PROJECT

M. Sc. (Electronics) Semester – I

CLASSICAL AND QUANTUM MECHANICS

Module ELE-C-101 **(4 Credits)**

UNIT – I (14 Lectures)

The Lagrangian formulation and equations of motion, Applications of Lagrangian formulation-Atwood's machine, Bead sliding on a rotating wire **(6 Lectures)**
Hamilton's principle, Calculus of variation and its applications **(5 Lectures)**
Extension of Hamilton's principle to non holonomic systems-example of rolling on inclined plane. **(3 Lectures)**

UNIT – II (14 Lectures)

Hamiltonian formulation and equations of motion, Modified Hamilton's principle, Principle of least action **(5 Lectures)**
Cyclic coordinates and Conservation theorems, Derivation of Hamilton's equations from variational principle (**4 Lectures)**
Normal coordinates Normal modes of vibration, Application to coupled oscillators **(5 Lectures)**

UNIT – III (12 Lectures)

Origin of quantum theory, Time dependent Schrodinger equation and wave packets **(4 Lectures)**
Rayleigh-Schrodinger time-independent perturbation theory for non-degenerate and degenerate systems, first and second order perturbation theory **(5 Lectures)**
Applications of perturbation theory-Zeeman and Stark effect **(3 Lectures)**

UNIT – IV (13 Lectures)

Matrix formulation of quantum mechanics, Dirac notation **(3 Lectures)**
Schrodinger, Heisenberg and Interaction pictures, **(5 Lectures)**
Harmonic oscillator, Quantization of an LC circuit with a source **(3 Lectures)**
Radiation field interaction with matter **(2 Lectures)**

PHYSICS OF ELECTRONICS MATERIALS

Module ELE-C-102 **(4 Credits)**

UNIT – I (12 Lectures)

***Lattice Dynamics**:* Lattice heat capacity, Einstein model, Debye model, Heat capacity of glasses & amorphous solids **(5 Lectures)**
Thermal expansion, Thermal conductivity, Lattice thermal resistivity, Umklapp processes, Heat capacity of amorphous materials **(7 Lectures)**

UNIT – II (12 Lectures)

Dielectrics, Ferroelectrics & Magnetic Properties: Frequency dependence of dielectric function, polarization, Dielectric constant & Polarisability, Dielectric losses **(5 Lectures)**
Ferroelectric crystals, Anti Ferro electricity, Ferro electric domains **(2 Lectures)**
Piezoelectricity, Ferro electricity, Dia Para & Ferro magnetism,Ferrites and their behaviour at high frequencies **(5 Lectures)**

UNIT – III (13 Lectures)

Semiconductors: Lattice properties of fourth group elements, Structure, Physical constants, influence of impurities & Lattice defects **(4 Lectures)**
Fermi level, Electron-hole distribution in energy bands, Temperature dependence of Fermi-level, Hall effect in semiconductors **(5 Lectures)**
Constant energy surfaces and effective mass in Si & Ge, Amorphous semiconductors **(4 Lectures)**

UNIT – IV (12 Lectures)

Super conductivity and Liquid crystals: Meissner effect, London equations, BCS theory, Josephson Effect, High T_c superconductors **(5 Lectures)**
Types of liquid crystals and their mesomorphous phases, Applications of liquid crystals **(4 Lectures)**
Elementary Theory of Order, Transition Metal Alloys **(3 Lectures)**

MATHEMATICAL & COMPUTATIONAL METHODS IN ELECTRONICS

Module ELE-C-103 **(4 Credits)**

UNIT – I (13 Lectures)

Differential equations and their solutions: Special functions and their properties, Bessel and Legendre polynomials **(5 Lectures)**
Laplace, Fourier and Z- transforms, their properties and applications in electronics **(8 Lectures)**

UNIT – II (12 Lectures)

Signal and system modeling concept: Examples of systems, signal models, energy and power spectral densities **(5 Lectures)**
Introduction to system modeling concepts, Impulse response of a fixed linear system **(4 Lectures)**
Convolution correlation, Auto correlation function **(3 Lectures)**

UNIT – III (12 Lectures)

Methods of numerical analysis: Finite difference with equal and unequal intervals, Interpolation formulae **(4 Lectures)**
Errors and accuracy tests in numerical analysis, the iterative algorithms for solving equations and finding roots **(5 Lectures)**
Discrete Fourier Transform, Fast Fourier Transform **(3 Lectures)**

UNIT – IV (12 Lectures)

Practical Consideration: Convergence rate accuracy, Introduction to linear systems, Triangular system **(6 Lectures)**
Factorization methods for solving AX:b:partial pivoting strategy **(3 Lectures)**
Solving linear system using Gaussian elimination methods **(3 Lectures)**

ELECTROMAGNETICS, ANTENNA AND PROPAGATION

Module ELE-C-104 **(4 Credits)**

UNIT – I (12 Lectures)

Maxwell's equations, Vector and Scalar potentials, Wave equations, Gauge Transformation **(5 Lectures)**
Poynting's Theorem, Plane Waves in a Non- Conducting medium **(3 Lectures)**
Reflection and refraction of electromagnetic waves, Propagation of waves in a conducting medium **(4 Lectures)**

UNIT – II (12 Lectures)

Fields and radiation of a localized source, electric dipole fields and radiation, magnetic dipole and electric quadruple fields **(6 Lectures)**
Centre fed linear Antenna, the antenna as a boundary value problem **(4 Lectures)**
Scattering by induced dipoles **(2 Lectures)**

UNIT – III (13 Lectures)

Transmission lines, Reflection Coefficient and impedance **(4 Lectures)**
Smith Chart-Measurement of impedance, Measurement of standing wave ratio **(4 Lectures)**
Coaxial lines, Twin wire transmission line, Micro strip line, Stubs and Baluns **(5 Lectures)**

UNIT – IV (12 Lectures)

Wave guides, modes in a rectangular wave guide, Energy flow and attenuation in wave guides **(5 Lectures)**
Measurement technique, Impedance measurement **(3 Lectures)**
Phase and group velocities, dispersion **(4 Lectures)**

INTRODUCTORY ELECTRONICS

Module ELE-C-101 **(3 Credits)**

UNIT – I (15 Lectures)

Direct Current Circuit, Ideal Voltage and Current Sources, Thevenin's Theorem, Norton's Theorem **(5 Lectures)**
Alternating Current AC Power, RC High Pass and RC Low Pass Filter, Series and Parallel Resonance **(5 Lectures)**
Fourier analysis and Pulses, Integrating and Differentiating circuits, Double Differentiation Compensated Voltage Divider, Pulse Output analysis **(5 Lectures)**

UNIT – II (12 Lectures)

Semiconductor Physics, p-n junction, Diode applications, Transistor action, Biasing and Current flow **(3 Lectures)**
Amplification, Stability, Common Emitter Amplifier Design, Emitter Follower, Feed Back and Amplifier Circuits **(5 Lectures)**
Noise, Thermal and Shot Noise Correlation Techniques, Convolution **(4 Lectures)**

UNIT – III (14 Lectures)

Pulse and Digital Circuits, Binary Number System, Logic Circuits, Bi-stable Multi-vibrator, Mono-stable Multi-vibrator, Schmitt Trigger, IC Regulated Power Supplies, Cables and Connectors **(5 Lectures)**
Quantization, Sampling theorem, Flat top and Natural sampling **(3 Lectures)**
Time Domain and Frequency Domain analysis, The Sine Function, Fourier Transform Pairs, Gibbs Effect, Harmonics, Chirp Signals, Idea of Modulation and Demodulation **(6 Lectures)**

PRACTICAL

Module ELE-P-105 **(4 Credits)**

LIST OF EXPERIMENTS:

1. Single Stage Amplifier
2. Zener Diode
3. Hall Effect
4. Energy Band Gap (Four Probe)/ Forbidden Energy Gap
5. Schmitt Trigger
6. Study of the Multivibrators
7. Study of IC-723 as Voltage and Current Regulator
8. Modulation and Demodulation
9. Negative Feedback amplifier

M. Sc. (Electronics) Semester – II

CONTROL SYSTEM

Module ELE-C-201 **(4 Credits)**

UNIT – I (12 Lectures)

The Control Systems, Basic components of control system, Open-loop and closed-loop systems **(4 Lectures)**
Transfer functions of linear systems, block diagrams. Signal flow graphs, their properties and gain formula **(6 Lectures)**
Transfer functions of discrete-data systems **(2 Lectures)**

UNIT – II (12 Lectures)

Stability of linear control systems: BIBO and Asymptotic stability **(4 Lectures)**
Routh-Hurwitz criterion, Stability of discrete-data systems **(3 Lectures)**
Time response of continuous-data systems, Steady-state error, Step, ramp and parabolic inputs **(5 Lectures)**

UNIT – III (13 Lectures)

Transient response, Unit-step response for a proto-type second order system, damping ratio and damping factor, natural undamped frequency, Maximum overshoot, delay time and rise time, settling time **(8 Lectures)**
Effect of adding poles and zeroes to transfer functions, Root locus techniques, Properties and constructions of the Root loci **(5 Lectures)**

UNIT – IV (13 Lectures)

Frequency response, M_r, ω_r and bandwidth of the proto-type second order system **(3 Lectures)**
Nyquist stability criterion, Nyquist path, Application to systems with minimum phase transfer functions **(4 Lectures)**
Design of Control systems, specifications and principles, Compensation schemes, PD, PI and PID Controllers **(6 Lectures)**

ADVANCED DIGITAL ELECTRONICS

Module ELE-C-202 **(4 Credits)**

UNIT – I (13 Lectures)

Boolean algebra, Truth tables Logic gates: OR, AND, Inverter gates, The Universal NOR and NAND gates, XOR and XNOR gates, De-Morgan's Theorem **(6 Lectures)**
Reduction Technique, Karnaugh map simplification, Parity check, Half adder, Full adder, Parallel binary adder, half and full subtractors **(7 Lectures)**

UNIT – II (14 Lectures)

Monostable and Bistable multivibrators, Schmitt trigger **(3 Lectures)**
Latches, R.S. Flip/Flop, The D Flip/Flop, T Flip/Flop, J K Flip/flop, Master-Slave flip/flop, Race Problem **(6 Lectures)**
Binary Ripple counter, Modified counters using Negative feedback **(5 Lectures)**

UNIT – III (13 Lectures)

Shift Registers**:** Universal Shift Register, Shift counter, Ring Counter **(5 Lectures)**
D/A converter and A/D converter, Simultaneous and Counter method of A/D converter, Successive Approximation method **(5 Lectures)**
Seven segment LED display, BCD to seven segment decoder **(3 Lectures)**

UNIT – IV (12 Lectures)

Transistor as a Switch, TTL integrated circuits, CMOS integrated circuit **(4 Lectures)**
Logic families and their characteristics, comparing Logic families, interfacing **(5 Lectures)**
Introduction to VHDL and Programming techniques **(3 Lectures)**

LINEAR WAVE SHAPING, AMPLIFIERS AND POWER SUPPLIES

Module ELE-C-203 **(4 Credits)**

UNIT – I (12 Lectures)

Laplace transforms and their applications to circuit analysis, Linear circuit elements R.C. Networks **(6 Lectures)**
High pass and Low pass R.C. circuits, Response to various waveforms, Integrating and Differentiating circuits **(6 Lectures)**

UNIT – II (13 Lectures)

D.C. Amplifiers, Differential amplifiers, long tail pairs, high frequency amplifiers, broadband amplifiers, methods of achieving broadbanding **(7 Lectures)**
Emitter follower at high frequencies, Bode plots, Power amplifiers, Complementary emitter follower and its applications, Cascade amplifiers **(6 Lectures)**

UNIT – III (12 Lectures)

Electronically regulated power supplies, high and low voltage supplies **(5 Lectures)**
Inverters for high voltage applications of SCR in regulating power supplies, IC 723, Switch mode power supply **(7 Lectures)**

UNIT – IV (12 Lectures)

Operational amplifiers and their applications, Active filters, IC 741 **(5 Lectures)**
Thermal noise, Transistor noise, Noise calculations and measurements, Signal to noise ratio, Noise figure and its calculation **(7 Lectures)**

PULSE AND WAVE SHAPING NETWORKS

Module ELE-C-204 **(4 Credits)**

UNIT – I (14 Lectures)

***Network Theory*:** Terminology and Notation, Equivalence of T & Configurations, Network Theorems-Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer theorem **(8 Lectures)**
Network analysis using matrices, Loop-currents and Node- Potentials, Transient and Steady- State response of some electric circuits **(6 Lectures)**

UNIT – II (13 Lectures)

RC, RL AND RLC Networks: Transient and steady-state response of a High-Pass RC Circuit connected to a square-wave generator of finite impedance, Response of a high pass RC circuit to a Trapezoidal waveform **(7 Lectures)**
Quantitative study of "Tilt" introduced in a square wave when propagated through an RC Network, Distortion in Square-wave pulse transmitted through an amplifier **(6 Lectures)**

UNIT – III (12 Lectures)

Distributed networks and Transformers: Quantitative study of Shunt-Capacitor filter and Series- Inductor Filter **(6 Lectures)**
Transformer model and its equivalent circuit, Quantitative study of Pulse-response of a transformer **(6 Lectures)**

UNIT – IV (14 Lectures)

Clipping, Comparator and Clamping Circuits: Clipping Circuits, Diode clipper, Break region, Transfer Characteristics, Limiting by Bottoming, Clipping at two independent levels **(6 Lectures)**
Comparator circuits, Diode Differentiator Comparator, Operation of a Diode Clamping Circuit **(4 Lectures)**
Response of a Clamping circuit to a Transient wave form (quantitative), Quantitative analysis of Steady-State output wave form of a Clamping Circuit for a Square-Wave input **(4 Lectures)**

POWER ELECTRONICS

Module ELE-E-201 **(3 Credits)**

UNIT – I (13 Lectures)

Types of Power Electronic Circuits, Power Semiconductor Devices, Thyristor characteristics, Two-Transistor model, Turn on and Turn off, Series and parallel operation **(8 Lectures)**

Thyristor commutation, Thyristor model, UJT, UJT P Spia Simulation commutation, Controlled rectifiers **(5 Lectures)**

UNIT – II (14 Lectures)

Single phase semi, full and dual converters, single phase series converter, power factor improvement, Extinction Angle control, Symmetrical angle control **(4 Lectures)**

Pulse width modulation control, Sinusoidal pulse width modulation, AC voltage controllers, On-Off and phase control, Single phase bidirectional controllers **(4 Lectures)**

DC choppers, step up and step and down operation, classification of choppers, switching mode regulators, single phase Invertors, Voltage control of single phase invertors, Current source invertors, Resonant pulse converters **(6 Lectures)**

UNIT – III (13 Lectures)

Cycloconvertors, Single and three phase cycloconvertors, Reduction of output harmonics **(4 Lectures)**

Power supplies, Switched mode AC power supplies, Arrangement of UPS system Protection of Devices and Circuits **(4 Lectures)**

Snubber circuits, supply and load side transients, voltage protection by selenium diodes and metal oxide, Varistors, fusing AC and DC motors **(5 Lectures)**

PRACTICAL

Module ELE-P-205 **(4 Credits)**

LIST OF EXPERIMENTS:

1. Universal Shift Register
2. Clipper and Clamper
3. A/D, D/A Converter
4. Binary Arithmetic
5. Programmable Array/Logic Array
6. Multiplexer IC Encoding and Decoding
7. Solving the Boolean Equations
8. To solve a five variable Boolean expression using single IC 74150
9. 2's Compliment
10. PID Controller

M. Sc. (Electronics) Semester – III

FIBER AND INTEGRATED OPTICS

Module ELE-C-301 **(4 Credits)**

UNIT – I **(12 Lectures)**

Modal analysis of guided modes in symmetric step-index planar wave-guides, Optical fiber-Numerical aperture, V-parameter, refractive index profile, classification **(7 Lectures)** Modal analysis for a step-index fiber Approximate technique of study of propagation characteristics of graded index fibers **(5 Lectures)**

UNIT – II **(12 Lectures)**

Pulse dispersion in optical fiber, attenuation, losses. Polarization maintaining fibers Concept of dispersion shifted and dispersion flattened fiber **(6 Lectures)** Misalignment fiber losses, Splices and connectors, Fiber materials, Fabrication of optical fibers **(6 Lectures)**

UNIT – III **(13 Lectures)**

Laser Principle –Einstein's coefficients, Rate equations of three and four level lasers, Ruby laser, He-Ne laser, Free Electron Laser (qualitative), Properties of laser **(6 Lectures)** Fiber-Optic Sensors, Intensity Modulated Sensors, Interferometric Sensors, Sagnac Effect (**4 Lectures)**

A fiber gyroscope, Application of polarization maintaining fibers, Basic idea of Optical soliton in optical fibers **(3 Lectures)**

UNIT – IV **(13 Lectures)**

Modes in an asymmetric planar waveguide, Fabrication of integrated optical devices-channel, rib and strip waveguides, Electro-optic modulators and switches–directional coupler **(6 Lectures)**

Phase modulator-Mach-Zehnder interferometer modulator and switch Acousto-optic effect **(3 Lectures)**

Acousto-optic modulators-Raman Nath modulators, Bragg type modulator, Prism, Grating and tapered coupler, Fiber-Bragg grating **(4 Lectures)**

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COMMUNICATION ELECTRONICS

Module ELE-C-302 **(4 Credits)**

UNIT – I (12 Lectures)

Antennas: Introduction, Short electric doublet, Power radiated, Radiation resistance and Radiation pattern, Half wave antenna and Quarter wave antenna, current distribution on resonant and non resonant antennas, effect of ground **(7 Lectures)**

Antenna arrays: Broadside and End-fire arrays, Directors and Reflectors, Yagi-Uda antenna, antenna feeding and impedance matching **(5 Lectures)**

UNIT – II (13 Lectures)

Frequency Modulation: Analysis and frequency spectrum, Noise suppression, Capture effect, pre-emphasis and de-emphasis, Reactance modulator, Varactor modulator **(7 Lectures)**

FM generation using Voltage controlled Oscillator, Foster-Seely Discriminator and Ratio detector, VCO and PLL FM demodulator, Automatic frequency control **(6 Lectures)**

UNIT – III (14 Lectures)

Television: TV camera tubes, Image Orthicon, Vidicon and Plumbicon, Interlaced scanning, Transmitter/ Receiver, Synchronization, Resolution, TV signal, Vestigial Sideband modulation **(6 Lectures)**

Block diagram of B/W TV receiver, Varactor tuning, Synn Separator and vertical/ horizontal circuits **(4 Lectures)**

Principles of Colour Television, Colour subcarrier and Chroma Modulation, Colour Picture tube **(4 Lectures)**

UNIT – IV (15 Lectures)

Digital Communication: Sampling and Pulse Code Modulation, Signal Reconstruction, Aliasing, Advantages of Digital Communication, Quantizing, Compander, Encoder, Transmission Bandwidth and Output SNR, T1 Carrier System, Synchronizing and Signaling, Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation, Output SNR, Comparison with PCM. **(8 Lectures)**

Principles of Digital data transmission, Line Coding, Bipolar Signaling, Nyquist Criterion for zero ISI, Pulse generation, Scrambling, Regenerative Repeater, Eye Diagram, Detection Error Probability, M-ary Communication, Digital Carrier Systems, M-ary QAM, Digital Multiplexing, Digital Hierarchy **(7 Lectures)**

IC TECHNOLOGY AND VLSI DESIGNING

Module ELE-C-303 **(4 Credits)**

UNIT – I (12 Lectures)

Crystal Lattice, Lattice Defects, Manufacture of Metallurgical Grade Silicon, Manufacture of Electronic Grade Silicon **(6 Lectures)**
Czochralski and Float Zone Refining Techniques, Wafer Preparation (Silicon Shaping Operations), Vapour Phase Epitaxy **(6 Lectures)**

UNIT – II (12 Lectures)

Thermal Oxidation, Other techniques of Oxidation, Theory of Diffusion, Methods of Diffusion, Ion Implantation, Masking, Steps in the masking of a top contact PNP transistor **(7 Lectures)**
Photolithography, Step and Repeat Process, Pinhole and Multi-lens Camera technique **(5 Lectures)**

UNIT – III (13 Lectures)

Etching: Traditional and Modern techniques. Bonding: Die Bonding, Wedge Bonding, Ball Bonding, Stitch Bonding, Ultrasonic Bonding. Assembling: Circuit Probing, Scribing **(8 Lectures)**
Packages: DIPs, PGA, SO, CC, Flatpack, Silicon monolithic Assembly, Multichip Assembly, Thin Film Assembly, Encapsulation, Testing **(5 Lectures)**

UNIT – IV (12 Lectures)

Process Control Methods: Yield and Reliability, Causes of IC Failure **(5 Lectures)**
VLSI process Integration: NMOS IC Technology, CMOS IC Technology, Bipolar IC Technology **(7 Lectures)**

MICROPROCESSOR & INTERFACING

Module ELE-C-304 **(4 Credits)**

UNIT – I (12 Lectures)

Introduction to Microprocessor, Microprocessor 8085: PIN Out and Signals, Internal architecture, Flags, Program counter, Introduction to 8085 Instruction Set: Data Transfer, Arithmetic & Logical Instruction, Branch and Machine Code, Opcode Format **(8 Lectures)**
Addressing Mode Timing Diagram, Machine Cycle **(4 Lectures)**

UNIT – II (12 Lectures)

Subroutine and Sub-programming, CALL and RETURN, STACK, PUSH & POP, 8085 Interrupts, RST Code; SID, SOD, RIM and SIM, Delay Program Calculation **(6 Lectures)**
Memory Organization, Introduction to 8086, BUS Interface and Execution unit, Register and Memory Organization**(6 Lectures)**

UNIT – III (14 Lectures)

Addressing and Interfacing, Basic Interfacing Concept, Introduction to I/O and Memory Mapped Techniques, Handshaking, Interfacing I/O devices, Display, Keyboard **(7 Lectures)**
Generating Control Signals, De Multiplexing of address Bus, Programming Technique, Interfacing 8155, Programmable I/O Ports and Timer IC, Programmable Peripheral Interface 8255 with 8085 **(7 Lectures)**

UNIT – IV (12 Lectures)

Programmable Interval Timer 8254 (8253) and Interfacing to 8085, Basic Concepts of Serial I/O, Synchronous and Asynchronous Transmission, ASCII Characters **(6 Lectures)**
BIT and BAUD rate, Data Communication, MODEM, Rs-232, 825/A USART, Line Driver and Line Receiver, Introduction to DMA Controller 8257, Interrupt Controller 8259 **(7 Lectures)**

BASICS OF VHDL AND PROGRAMMING

Module ELE-E-301 **(3 Credits)**

UNIT – I (14 Lectures)

Writing Entities for Digital circuits, Scalar Data Types and Operations, Object Types: constants, variables, signal and files; Data Types: scalar, integer, floating, physical, enumeration, type declarations, sub types, expressions and operators for these data types **(6 Lectures)**

Sequential statements: If, case, Null, Loop, Exit, Next statements, While loops, For loops, Assertion and Report statements **(4 Lectures)**

Composite Arrays: Arrays, Array aggregates, unconstrained array types, strings, Bit vector, Standard logic Array, Array operation and record **(4 Lectures)**

UNIT – II (13 Lectures)

Behavioral Modeling: Process statements, variable and signal assignments, inertial and transport delay models, signal drivers, multiple and postponed processes **(3 Lectures)**

Dataflow Modeling: Concurrent signal assignment, multiple drivers, Block statement, Structural Modeling: Component declaration, component instantiation, resolving signal values **(6 Lectures)**

Configuration: Basic configuration, configuration for structure modeling, mapping library entities; Generics: Generic AND, NAND, OR, NOR, XOR and XNOR gates, functions and subprograms **(4 Lectures)**

UNIT – III (14 Lectures)

Writing a test bench, converting real and integers to time, dumping and reading from text file, VHDL modeling of basic gates, half and full adder of AOI, IOA, OAI, multiplexes, decoders (dataflow, behavioral, and structural modeling), three state driver, parity checker **(5 Lectures)**

D, T, JK, and SR flip flops, flip flops with preset and clear, modeling for multiplexers, priority encoder, ALU etc., modeling regular structures, delays, conditional operations, synchronous logic, state machine modeling, Moore and Mealy machines, generic priority encoder, clock divider, shift registers, pulse counter etc. **(5 Lectures)**

PLD devices, PROM, PAL, EPLD, GAL, FPGA, FLGA, DRAM etc. and their applications, FPGA programming, design exercise, ASIC design using CAD tools **(4 Lectures)**

PRACTICAL

Module ELE-P-305 **(4 Credits)**

LIST OF EXPERIMENTS:

1. Study of Microprocessor 8086
2. Study of OPAMP Characteristics
3. Study of OPAMP Applications
4. Study of Timer IC 555
5. RZ, NRZ & Manchester coder, Decoder
6. Study of Pulse amplitude modulation and time Division Multiplexing
7. A/D & D/A Convertor
8. LED & Photo detector Characteristics
9. To determine the numerical aperture of a given optical fiber

M. Sc. (Electronics) Semester – IV

COMPUTER PROGRAMMING WITH C AND INTRODUCTION TO MATLAB

Module ELE-C-401 **(4 Credits)**

UNIT – I (14 Lectures)

Introduction to C, Data types, Constants, Variables and arrays, Strings, Declarations, Expressions, Statements, Symbolic constants **(4 Lectures)**
Operators: Arithmetic, binary, relation for common operations, Operator precedence and Associativity, Bitwise operations, Special operators, Data input and output, Single character input and output, Formatted input and output, String input and output **(5 Lectures)**
Control statements: the while and do-while statements, the for statement, nested loops, if-else statement, the switch statement, the break statement, the continue statement, the comma operator, the go to statement **(5 Lectures)**

UNIT – II (12 Lectures)

Functions, defining a function, accessing a function, passing arguments to a function, specifying argument data types, String-handling function, Recursion, Storage classes, automatic, external, static and register variables **(7 Lectures)**
Arrays, defining and processing, passing arrays to a function, multi-dimensional arrays, initialization **(5 Lectures)**

UNIT – III (13 Lectures)

Pointers: declaration; passing pointers to a function, pointers and one dimensional arrays, operations on pointers, pointers and multidimensional arrays, arrays of pointers, passing function to other functions **(7 Lectures)**
Structures and unions defining and processing a structure, structures and pointers, passing structure to a function, self referential unions **(6 Lectures)**

UNIT – IV (14 Lectures)

User-defined data types, Enumerations, Bit fields, Dynamic memory allocation **(4 Lectures)**
Data files, defining, opening and closing a file, input/output operations on files, error handling, random access to files, Multi file programs command line parameters **(6 Lectures)**
Macros C. Pre processer, Introduction to MATLAB **(4 Lectures)**

OPTOELECTRONICS AND COMMUNICATION

Module ELE-C-402 **(4 Credits)**

UNIT – I (14 Lectures)

The basic communication system, Advantages of fiber optic communication, Elements of optical fiber communication link **(4 Lectures)**
Optical sources, Light emitting diode structure, material, operating characteristics, modulation capability, Rise time **(4 Lectures)**
Laser diode structure and operating characteristics, modal properties, radiation pattern, modulation of Laser diode, threshold condition and temperature effects **(5 Lectures)**

UNIT – II (12 Lectures)

Light detectors, Principle of photo detection, Performance parameters of photo diode, Quantum efficiency, Responsivity, detector response time **(4 Lectures)**
PIN photodiode, Avalanche photo diode, Temperature effect, Frequency response of photodiode, Effect of drift time, junction capacitance **(5 Lectures)**
Various types of noises, signal to noise ratio and Noise equivalent to power (NEP) of photodiode **(3 Lectures)**

UNIT – III (12 Lectures)

Digital modulation formats, Quantization, Bit rate, Pulse Code Modulation, Line Coding, RZ, NRZ and Manchester coding **(5 Lectures)**
Eye pattern, time division multiplexing, Direct detection and coherent heterodyne detection, Advantages, NEP Heterodyne, Optical frequency division multiplexing **(7 Lectures)**

UNIT – IV (12 Lectures)

Wavelength Division multiplexing, DWDM, Optical multiplexer and Demultiplexer design, ADD/DROP Multiplexer, EDFA **(5 Lectures)**
Fiber Bragg Grating system design, Component choice, Power, Rise time and Bandwidth budget, receiver sensitivity, dBm scale **(4 Lectures)**
Dispersion and attenuation, consideration in link length calculations **(3 Lectures)**

COMPUTER NETWORKS

Module ELE-C-403 **(4 Credits)**

UNIT – I (13 Lectures)

Introduction: Uses of Computer networks, Network hardware, Network software **(3 Lectures)**
The OSI reference model, The TCP/IP reference model, The B-ISDN and ATM reference model, The Physical layer, Bandwidth–limited signals **(5 Lectures)**
The maximum data rate of a channel. Transmission media, the telephone lines and modem, Circuit switching and packet switching, Narrowband ISDN **(5 Lectures)**

UNIT – II (14 Lectures)

The data link layer. Services provided to the network layer, Framing, Flow control, Error control, Error detection and correction **(4 Lectures)**
Elementary data link protocols, the unrestricted simplex protocol, the simplex stop and wait protocol, a simplex protocol for a noisy channel, Sliding window protocol, the one bit sliding window protocol, the protocol using go back n, the protocol using selective repeat **(6 Lectures)**
The data link layer in the Internet, Point to point protocol, Introduction to the data link layer in ATM **(4 Lectures)**

UNIT – III (13 Lectures)

ALOHA, pure and slotted ALOHA, Carrier Sense Multiple Access protocols, persistent and non-persistent CSMA, CSMA with Collision Detection **(5 Lectures)**
Collision free protocols, Bitmap protocol, binary countdown, limited–contention protocols **(4 Lectures)**
IEEE standard 802 for LANs and MANs Ethernet, Token bus and Token ring, Fast Ethernet **(4 Lectures)**

UNIT – IV (13 Lectures)

Datagram and virtual circuit subnets, Introduction to routing algorithms and the optimality principle **(3 Lectures)**
The IP protocol; IP addresses; subnets IP v6, Introduction to the network layer in ATM networks, Elements of transport protocols **(5 Lectures)**
Network security, Traditional cryptography, substitution ciphers and Transposition ciphers, Secret Key algorithms, data Encryption, Public Key Encryption and Digital signature **(5 Lectures)**

THIN FILM TECHNOLOGY

Module ELE-E-401 **(3 Credits)**

UNIT – I (12 Lectures)

Physical Vapour deposition methods, Vacuum conditions during evaporation, Substrate Deposition **(5 Lectures)**
DC sputtering R – F sputtering, Magnetron sputtering, Ion – beam sputtering, thin film Monitoring Techniques, optical methods of monitoring, Electrical methods of monitoring **(7 Lectures)**

UNIT – II (12 Lectures)

Thin film characterization Techniques, X-ray diffraction, low and high energy electron diffraction **(4 Lectures)**
Auger electron spectroscopy, ESCA, Electron Microscopy, AFM, Scanning Electron Microscopy (SEM) **(5 Lectures)**
Spectrophotometer, Thermal characterization of Materials **(3 Lectures)**

UNIT – III (12 Lectures)

Thin film diodes, transistors, Hot electron amplifier **(5 Lectures)**
Thin film micro-circuitry: Basic processing steps, preparation of drawings **(7 Lectures)**

PRACTICAL

Module ELE-P-404 **(4 Credits)**

LIST OF EXPERIMENTS:

1.) Computer Programming with C Language:-

a) Write a program to calculate factorial of n random numbers
b) Write a program to input a number and print its binary equivalent
c) Write a program to find transpose of a 3X3 matrix
d) Write a program to accept names and total marks of 20 students
e) Display names of the students securing highest and lowest marks
f) Write a program to find the roots of a quadratic equations

2.) To print a thick film resistor and to study its characteristics

3.) Preparation of printed circuit board of a given circuit, assemble the circuit

4.) To deposit a thin film using spin coating

PROJECT

Module ELE-P-405 **(4 Credits)**

The project is an essential component of the Masters courses. It is a substantial piece of full-time independent work which occupies the final months of the course. Students may also be required by their project markers to demonstrate any system that arose from the project. The project involves both the application of skills learned in the past and the acquisition of new skills. It allows the students to demonstrate their ability to organize and carry out a major piece of work according to sound scientific and engineering principles. The types of activity involved in each project will vary but all will typically share the following features:

- Research the literature and gather background information
- Analyze the requirements, compare alternatives and specify a solution
- Design and implement the solution
- Experiment and evaluate the solution
- Develop written and oral presentation skills