BUNDELKHAND UNIVERSITY, JHANSI
DEPARTMENT OF PHYSICS

SYLLABUS

M. Sc. (ELECTRONICS)

Papers Name	Theory	Internal		Total
First Semester				
ET-101 Engineering Mathematics	70	30		100
ET-102 Semiconductor Electronics	70	30		100
ET-103 Electrodynamics & Antenna Theory	70	30		100
ET-104 Programming & Computational Methods	70	30		100
ET-105 Electronics Practical/Lab Project				50
ET-106 Computer Practical				50
		Total		**500**
Second Semester				
ET-201 Digital Electronics	70	30		100
ET-202 Sensors, Transducers & Electronic Measurement	70	30		100
ET-203 Organization & Computer System Architecture	70	30	100	
ET-204 Network Analysis and Synthesis	70	30		100
ET-205 Electronics Practical/Lab Project			100	
		Total		**500**
Third Semester				
ET-301 Electronic Communication & Radar	70	30		100
ET-302 Fiber Optics & Optical Communication	70	30		100
ET-303 Microprocessor & Application	70	30		100
ET-304 Microwave Generation & Propagation	70	30		100
ET-305 Electronics Practical/Lab Project			100	
		Total		**500**
Fourth Semester				
ET-401 Microelectronics	70	30		100
ET-402 Control System	70	30		100
ET-403 Major Lab Project				100
ET-404 Field Project				200
		Total		**500**
	Grand Total			**2000**

M. Sc. (ELECTRONICS) First Semester
ET-101
ENGIEERING MATHEMATICS

UNIT-1 ELEMENTS OF COMPLEX VARIABLE & DIFFERENTIAL EQUATIONS

Analyticity of Complex function, Cauchy Remain Condition, Cauchy Theorem, Cauchy Integral formula, Taylor Series, Laurent expansion, Zeros, Singular points. Residues, Cauchy Residue Theorem, Cauchy principal value, Evaluation of definite integral Jordan Lemma & its application, two-dimensional wave equation, heat flow equations.

UNIT-2 FOURIER SERIES & APPLICATIONS

Need for Fourier series, Periodic functions, and definition of Fourier series, Dirichlet Condition Odd & Even function, half range Fourier Sine & Cosine series. Parsevi Identity Uniform Convergence, Application of Fourier Sine & Cosine series, Integration & Differentiation of Fourier series, Ides of Double Fourier series.

UNIT-3 FOURIER & LAP LACE TRANSFORMS

Need for Fourier Integrals, the Fourier integrals, Equivalent form of Fourier integral Theorem, Fourier transform, Fourier integrals, Equivalent form of Fourier integral Fourier Integrals, the convolution theorem, application of Fourier integrals to find Bounded solutions of Laplace equation and for boundary value problems, Lap lace Transform of simple functions and derivatives, solution of Partial differential equation For an infinite region using integral transform method.

UNIT-4 SPECIAL FUNCTIONS I

Singularity structure of a general second order Homogeneous differential equation Series Expansion method for solving differential equation, occurrence of Bessel & Hermit differential equation in physical problems, Series solution, Generating functions & Recurrence relations& Orthogonal of Bessel function, Recurrence relations & orthogonality of Legender & Leaguers Polynomials

Text and Reference Book

1. Applied Mathematics for engineers & Physicist: Pi pes
2. Mathematical Physics: Harper
3. Advanced Engineering Mathematics: Kreyazig
4. Elements of Complex variable: Churchill

M. Sc. (ELECTRONICS) First Semester

ET-102

SEMICONDUCTOR ELECTRONICS

UNIT-1 SEMICONDUCTOR DIVICES AND POWER SUPPLY

Concept of Semiconductors, Idea of doping, origin of bands in semiconductor, Fermi Level, junction diode, Zener and Avalanche break down in diode, rectifier, Idea of PIV, efficiency of rectifier, ripple factor.

UNIT-2 TRASISTORS AND ITS APPLICATIONS

Idea of bipolar transistors, Characteristics of transistors in different modes, relationship between their Parameters, transistor as an amplifier, Concept of Load line. Biasing of transistors, fixed bias method, emitter stabilized biasing method Feedback biasing, potentials divider method. Location of Q-point for a bipolar transistor, Class A, B and C type amplifier, class A power amplifier, FET and MOSFET and their characteristics.

UNIT-3 OSCILLATOR PRINCIPLES AND IC 555

Feed back requirements for oscillations, Basic oscillator analysis. Hartley and collpits Oscillators, piezoelectric, frequency controls RC oscillators. Multivibrators and their Types, idea of IC 555,block diagram & its working 555 timer, application of 555 for Pulse generation, Square, triangular wave generator.

UNIT-4 OPERATIONAL AMPLIFIER &APPLICATIONS

Differential amplifier circuit configuration, dual input balanced output differential Amplifier voltage gain, diff Input resistance, inverting and non-inverting inputs, Common mode rejection ratio, idea of IC 741,block diagram and its working, Operational input resistance, input capacitance, offset voltage, supply rejection ratio. Ideal OP AMP, and Equivalent circuit of an amp, inverting and non inverting Amplifier, Use of op amp as sing changer, scale changer, phase shifter, voltage to current Converter, Differential D.C. Amplifier, bridge amplifier a.c. voltage follower, analog Integration and differentian, F to V and V to F converter, peak detector, Schmitt Trigger, saw-toothed and triangular wave generator.

Text and Reference Book

1. Electronic fundamentals and application: J D. Ryder
2. Integrated Electronics: Mill man & Halkias
3. Principal of Electronics: Malvino

M. Sc. (ELECTRONICS) First Semester
ET-103
ELECTRODYNAMICS & ANTEENA THEORY

UNIT-1 FIELD EQUATION & CONSERVATIVES LAW

Equation of continuity, Displacement current, Maxwell equation. Energy in electromagnetic field. Poynting vector, Momentum in electromagnetic field, Maxwell stress tensor, electromagnetic potential, Non uniqueness of electromagnetic potential, Lorentz gauge, retarded potentials, lienard Richard potential, fields of charged potentials in uniform motion, field of an accelerated charge at low and high velocity

UNIT-2 PLANE ELECTROMAGNETIC WAVE PROPAGATION

E.M. wave in free space. Propagation of E.M. wave in Isotropic dielectrics, Orthogonality of E, H, & K Propagation of E. M. wave in Anisotropy Dielectrics, Plane wave in Conducting media, Refractive index of Conducting media, Skin depth, Energy lost in Conducting media, Phase of attenuated E.M. wave.

UNIT-3 PROPAGATION OF E.M. WAVE IN PLASMA AND LONOSPHERE

Propagation of E.M. wave in Isotropic Plasma, Dispersion relation, Concept of Phase Velocity & Group velocity, Propagation in presence of magnetic field, Cut off & Resonance Conditions. Propagation in Presence of magnetic field, idea of ionosphere, Stratification of layer, skip distance, max. Usable frequency, (MUF), echo, Appletron-Hartee formula and propagation through lonosphere and Magnetosphere.

UNIT-4 ANTENNA FUNDAMENTAL AND ANTENNA ARRAY

Application of network theorem to antenna, equality of effective length, directional property of dipole Antenna, Radiative field strength, radiation resistance and radiative power short dipole, thin linear antenna, Marconi antenna, traveling wave antenna and effect of earth on vertical pattern. Half wave antenna, Two element array, horizontal pattern in broadcast array, multiplication of pattern, binomial array, antenna gain, effective area, idea of super directive antenna, radiation from sheet and current element.

Text and Reference Book

1. Classical Electrodynamics: J.D. Jackson
2. Introduction to Plasma Physics: F.F. Chen
3. E. M wave & radiating system: Jordan & Ball man
4. Antenna theory: Cross.

M. Sc. (ELECTRONICS) First Semester

ET-104

COMPUTATIONAL METHODS AND PROGRAMMING

UNIT-1 FUNDAMENTAL OF PROGRAMMING

An Over view: Problem identification. Analysis design Coding. Testing and debugging. Implementation. Modification and maintenance, algorithm and flowcharts; characteristics of good Program-accuracy, simplicity and robustness. Portability, Minimum resource, time requirement, and modularization: Fundamental of C Programming: History of-C structure of C Program. Data types Constant and variable, Operators and expression.

UNIT-2 CONTROL STATEMENT AND FUNCTIONS ('C' Programming)

Control construct: if-else, for, while do-while, Case statement: Array, Formatted and unformatted I/O: Type modifier and storage classes, ternary operator type conversions and type casting priority and associatively of operators. Molecular programming: Function, Arguments, Return value, parameters passing, Call by value, Call by reference, Return statement, scope, visibility and life time rules static variables, Calling a function recursion, basics, compression with iteration, break, continue, exit, go to, string.

UNIT-3 COMPUTATIONAL METHODS I

Accuracy and Precision, Significant figures, Various Errors, Computational Algorithms, Roots of Nonlinear Equation (algebraic and Transcendental) the Iterative method. False-Position method and Newton-Rapson method, convergence of solution.

UNIT-4 COMPUTATIONAL METHOD II

Solution of simultaneous linear equations, Gauss Elimination method, Gauss Seidel method, Matrix Inversion integration, Trapezoidal rule Simpson rule, Gauss Method, Numerical solution of ordinary differential equations. Euler Method, Predirector Corrector Method, Range-Kutta Method.

Text and Reference Book

1. The C programming language by Kerningham and Rictchie
2. The sprit C of by cooper Mullish
3. Let us C by KanetKar Y
4. Numerical Method by V. Rajaramanna

M.Sc. (ELECTRONICS) Second Semester
ET – 201
DIGITAL ELECTRONICS

UNIT –1 BINARY SYSTEMS

Binary number system and other codes, binary arithmetic series and parallel processing of bites, logic of the addition operation, logic fundamentals . Boolean theorems, synthesis of Boolean functions, karnaugh diagram logic circuits for addition.

UNIT -2 LOGIC GATES

Logic gates AND, OR, NOT, NAND and NOR gates. Universal gate, XOR, XNOR Gate, logic gates their operations using TTL logic, ECL gates. CMOS inverter circuits. Design idea of logic circuits. Binary adders, half adders, full adder, MSI adders, serial operation, arithmetic functions, binary subtraction, parity checker generation.

UNIT-3 DIGITAL SWITCHING CIRCUITS

Transistor as a switch, multivibrators, RS flip-flop, D- flip-flop, JK flip-flop, monostable multivibrator, Astable multivibrator, shift register, counter, decode matrix, digital to analog converter, analog to digital converter, multiplexer and demultiplexer.

UNIT-4 REGISTER AND COUNTERS AND ITS APPLICATION

Ring, Ripple and Decade counter, up down counters, idea of registers, divide by N Counters. Synchronous counters, parallel carry. Application of counters. Dynamic MOS Circuit, two phase MOS, Idea of MOS shift registers & MOSROM.

Text and Reference Book

1. Electronics fundamentals and application: Mottershed.
2. Integrated Electronics: Millman & Halkias.
3. Principle Of Digital Electronics: Malvino & Leach.

M. Sc. (ELECTRONICS) Second Semester
ET-202
SENSORS TRANSDUCERS & ELECTRONIC MEASUREMENTS

UNIT-1 OPTICAL SENSORS

Special response, photoconductive sensors, junction type photoconductors (pn & pin diode, npn photo diode), photo transistor, Application of photo diode & photo transistors, light operated relays. Electro optic shaft encoder, photovoltaic sensors, photo emissive sensors, Photomultiplier, Phototube

UNIT-2 TRANSDUCERS

Classification of transducers, selecting transducers, strain gauge, Hall effect, Idea of displacement, capacitive & inductive, variable differential, oscillating transducers, Photoelectric transducers, piezoelectric transducers, potentiometer transducers, resistance thermometers, thermocouples, thermister & applications, pyrometers, Solid state thermometer radiator, multiplier phototubes

UNIT-3 OSCILLOSCOPES

Cathode ray tube diffraction, screen of CRT, idea of CRT circuits, vertical deflection system, Delay line, horizontal deflections systems, oscilloscope props, time delay measurement, idea of storage oscilloscope

UNIT-4 MEASUREMENT OF BASIC PARAMETERS

Amplitude DC meter, chopper established amplifier, voltmeter using rectifier, true RMS responding voltmeter , electronic multimeter, resistances ranges, Differential voltmeter, general characteristics ramp type DVM

Text and Reference Book

1. W.D Copper & A.D Herjrie : Electronic instrumentation and measurement techniques
2. Sawheny : Electronic instrumentation and measurement techniques

M.Sc. (ELECTRONICS) Second Semester
ET-203
ORGANIZATION AND COMPUTER SYSTEM ARCHITECTURE

UNIT-1
Data representation, Register Transfer & Micro-Operation overview Of Digital Circuits, fixed point representation, floating point representation, register transfer languages register transfer, Bus Memory, transfer Arithmetic Micro-operation, Shift Micro-operation, Arithmetic Logic Shift Unit , Basic Computer Organization & design

UNIT–2
Programming of Basic Computer, Pipeline & Vector Processing & CPU Machine language, assembly language, the assembler (First Pass & Second Pass Assembler), parallel processing Pipelining, Arithmetic Pipeline, General Register Organization, control words Stack Organization, Instruction Format, Addressing modes, data transfer & manipulation

UNIT–3
Computer Arithmetic & Input-Output Organization, Addition & subtraction, Multiplication Algorithm, Division Algorithm, Floating point Arithmetic Operations, Peripheral Devices, Input-Output Interface , Asynchronous Data Transfer, Modes of transfer, Priority Interrupt, Direct Memory Access(DMA), Input- Output processor(IOP), Serial Communication

UNIT–4
Memory Organization & Multiprocessors. Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory cache, Memory, Virtual Memory, Characteristics of Multiprocessor, Interconnection structures, Time shared common bus (omega network), Hypercube Interconnection.Interleaving: Cache & virtual memories & Architectural aids to implement these, Input – Output Devices & Characteristics
Multiprocessors: Characteristics of multiprocessors, Interconnection Structures, Inter processor Arbitration, Inter Processor Communication and synchronization, Cache Coherence, Parallel Processing

Text and Reference Book

1. Mano, M. “Computer system & architecture” (3rd edition) Prentice Hall India, New Delhi,1994
2. Computer Organization By John P Hays TATA Mc –Graw Hill
3. Albert Paul Malvino and Donald P . Leach “Digital Principles and Applications.

M.Sc. (ELECTRONICS) Second Semester
ET – 204
NETWORK ANALYSIS AND SYNTHESIS

UNIT-1
Node & mesh analysis, Superposition theorem, Thevenin's theorem, Reciprocity theorem, Norton's theorem, Maximum power transfer theorem, Millman theorem. Initial and final condition on network element, differential equation and integral differential equation of first and second order system, step and zero input response of first and second order system.

UNIT-2
The philosophy of transform method, the Laplace transform. Use of Laplace transform, the solution of integral differential equation. Transforms of waveforms synthesized with ramp and sinusoidal function. Introduction of signals, the Transform domain.

UNIT-3
Sinusoids, phasors, AC circuit analysis, the concept of complex frequency, concept of port network, function of one port and two port network, poles and zeroes of network function, relation of two port variable, short circuit admittance and parameter, open circuit impedance transmission. Idea of four port, hybrid parameters.

UNIT-4
Network synthesis, Hurwitz polynomials, immittance function, synthesis of immittance function, Foster and Cauer form, synthesis of LC, RL and RC circuits.

Text and Reference Book

1. Network Analysis: M.E. Valkenberg
2. Basic Electrical Engineering: Thareja
3. Basic Circuit Theory: G.K.Mithall
4. Circuit Theory: A.Charavarty
5. Network Analysis: Shudhakar Rao (TMH)

M.Sc. (ELECTRONICS) Third Semester
(ET- 301)
ELECTRONIC COMMUNICATION AND RADAR

UNIT-1 CONCEPT OF COMMUNICATION

Communication system, classification of signals, study of basic block diagram of communication system, bandwidth and its requirement, modulation and its type, need of modulation, Noise and its type, noise figure, noise temperature.

UNIT-2 AMPLITUDE & FREQUENCY MODULATION & DEMODULATION

Amplitude modulation frequency spectrum, Amplitude modulation circuits, collector modulation, square modulation, DSB, SSB, amplitude-modulation transmitters, principle of super heterodyne receiver, Square law detectors, linear diode detectors, Frequency & Phase modulation, frequency spectrum, Reactance tube modulators, frequency modulation using varacter diode, Armstrong method of frequency modulation, frequency stabilization.

UNIT-3 DIGITAL COMMUNICATION

Pulse modulation, Sampling Theorem, PAM, PWM, PPM, TDM, FDM, Pulse code modulation, quantization, PCM encoding, delta modulation, coding code efficiency, parallel transmission, error detectors and correction codes, ASK, FSK PSK and M Array signaling.

UNIT-4 RADAR COMMUNICATION

Continuous and pulse radar system, general study of pulsed radar using A type indicator, radar range equation, radar performance factors, radar transmitting system, rotary spark gap modulator, hard value pulsar, radar wave from range determination, radar antennas, duplexer, radar receiver, automatic tracking radar, Doppler effect in radar.

Text and Reference Book

1. Miller: Modern electronic communication
2. G K Mithal: Radio engineering
3. D Ruddy and J Colin: Electronics communication
4. J D Ryder: Electronics fundamental and applications.

M. Sc. (ELECTRONICS) Third Semester
ET- 302
FIBER OPTICS AND OPTICAL COMMUNICATION

UNIT-1 FIBER FUNDAMENTALS

Optical fiber modes and configuration, fiber types, mode theory for circular wave guide equation, wave equation for step index fibers, modal equation, modes in step index fibers, modes in graded index fibers,

UNIT-2 FIBER LOSSES

Fiber material fabrication attenuation units, absorption, scattering losses, radiative losses, core and cladding losses, signal distortion in optical wave guide, information capacity determination group delay, material dispersion, wave guide dispersion, inter modal dispersion.

UNIT-2 OPTICAL SOURCES

Light emitting diode, light sources material, internal quantum efficiency, spontaneous & stimulated emission, width product, laser diodes, laser diode structure and threshold conditions, modal properties and radiation patterns, modulation of laser diodes, temperature effects, idea of power launching and coupling, idea of integrated optics.

UNIT-3 PHOTO DETECTORS

Pin photo detectors, avalanche photo diodes, photo detectors noise, noise sources, detector response time (depletion layer photo current), response time, avalanche multiplication noise and temperature effect in avalanche gain, photodiode materials, photo transistor an overview, Basic idea of receiver operation.

Text and Reference Book

1. G Keiser: Optical fibers
2. Ghatak: Opto electronics
3. Senior: Optical communication

M. Sc. (ELECTRONICS) Third Semester
ET- 303
MICROPROCESSOR AND APPLICATION

UNIT-1 INTRODUCTION OF MICROPROCESSOR

Introduction of microprocessor, Digital computer, microprocessor architecture and its operations, memory, memory map, memory and instruction fetch, memory classification, input and output devices, logic device for interfacing, 8085 microprocessor, control signals external initiated signals including interrupts, microprocessor communication and bus timings 8085 machine cycle and bus timing memory interfacing.

UNIT-2 INTERFACING AND DATA TRANSFER SCHEME

Interfacing I/O devices: Basic interfacing concept, device selection and data transfer, input interfacing, interfacing I/O decoder, interfacing output displays, interfacing circuits and its analysis, interfacing input devices, multiple port address, Memory mapped I/O diagnosing routing and machine cycles data transfer scheme: Synchronous data transfer, asynchronous data transfer, hand shaking.

UNIT-3 CODE CONVERSION AND PROGRAMMING

BCD to binary conversion and binary to BCD conversion, BCD to seven-segment-LED code conversion, BCD addition and subtraction, Subtraction with carries Stack and Subroutine: Stack subroutine, conditional call and return instruction, advance subroutine concept, Assembly language programming: Data transfer operations, instruction format, writing and executing simple programming, instruction set of 8085, addressing modes, arithmetic operations, logic operations, branch operations, writing a assembly language program, Programming techniques: Looping, counting and indexing, additional data transfer and 16-bit arithmetic instructions. Arithmetic operations related to memory, logic operation rotate, LOGIC operations compare.

UNIT-4 APPLICATION OF MICROPROCESSOR

Application of Microprocessor: Instruction temperature monitoring system, system requirements, over all system design, hardware design, software design, closed loop control, process of Growing synthesis quartz, data acquisition system, I/O device control, development of interface for CRT, printer and keyboards.

Text and Reference Book

1. A P Malvino and Leach: Digital computer principle
2. A P Mathur: Introduction to microprocessor
3. Gaonkar: Microprocessor

M.Sc. (ELECTRONICS) Third Semester
ET- 304
MICROWAVE GENERATION AND PROPAGATION

UNIT-1 MICROWAVE GENERATORS

Transit time effect at high frequency, failure of triodes/diodes at high frequency, concept of velocity modulation and current modulation, klystron operation and characteristics, reflex klystron, magnetron, principle of operation of microwave characteristics Traveling wave tube.

UNIT-2 MICROWAVE SOLID STATE DEVICES

Microwave transistors, microwave field effect transistors, tunnel diode, concept of transferred electron devices, Gunn diode, impact avalanche transit time IMPATT, TRAPATT diode and BARRITT diode.

UNIT-3 TRANSMISSION LINES AND WAVE GUIDE

Transmission line equation and solution, reflection and transmission coefficient, standing wave ratio, line impedance, smith chart, propagation of EM waves in rectangular wave guide, solution of wave equation and dispersion in rectangular wave guide and cut off wave length, TE and TM modes in rectangular wave guide.

UNIT-4 MICROWAVE PROPAGATION AND COMPONENTS

Wave propagation in circular wave-guide, solution of wave equation in cylindrical coordinates, TE and TM modes in circular wave-guide, TEM modes in circular wave-guide, power transmission and losses in circular wave guide, cavity resonators, wave guide Tee, magic tee, circulator and isolators, idea of directional couplers, microwave measurement frequency, impedance, SWR.

Text and Reference Book

1. Atwater: Microwaves
2. Rich: Fundamentals of microwaves
3. Plonsey & Collin: Field theory of guided waves
4. Liao: Fundamentals of microwaves

M.Sc. (ELECTRONICS) Fourth Semester
ET- 401
MICROELECTRONICS

UNIT-1 CRYSTAL GROWTH TECHNIQUES AND PROCESSING

Classification for IC, electronic grade silica, czechralski and float zone crystal growing methods, silicon shaping, lapping, polishing and wafer preparation, vapor phase epitexy, oxidation, optical lithography, photo mask, photo resist and process, limitations of optical lithography, idea of electron and x ray lithography, wet chemical etching, reactive plasma etching.

UNIT-2 DEPOSITION SYSTEM

Evaporation theory, physical vapor deposition method, designs construction of high vacuum coating units, flash electron beam, evaporation system, idea of d.c. and r.f. Sputtering system.

UNIT-3 DOPPING AND DIFFUSION

Doping by diffusion, ion implementation, neutron doping, basic monolithic IC, fabrication of integrated resistor and capacitor and their equivalent circuit, integrated inductors.

UNIT-4 FABRICATION OF MONOLITHIC CIRCUITS

Fabrication of monolithic diode in various configurations, fabrication of integrated transistors, idea of buried layer fabrication, monolithic circuit layout and design rule, isolation methods, monolithic FET, MOSFET, idea of HEMT, CCD, MOS IC, ISI, MSI and hybrid IC.

Text and Reference Book

1. Milliman and Taub: Integrated Electronics
2. Milliman and Gross: Microelectronics
3. K L Chopra: Thin film plasma
4. Botkar: Integrated Electronics
5. W S Khokle and Tandan: Integrated circuit

M.Sc. (ELECTRONICS) Fourth Semester
ET- 402
CONTROL SYSTEM

UNIT-1 INTRODUCTION TO CONTROL SYSTEM

Introduction to control system, open loop/ closed loop control system, Laplace transformation, derivation of Laplace transformation, transfer function, poles and zeros of transfer function and its relationship with impulse response, procedure determine transfer formation of a control system.

UNIT-2 SIGNAL FLOW GRAPH

Block diagram and their reduction, signal flow graph, Mason's gain formula, drawing signal flow graph from given block diagram.

UNIT-3 TRANSIENT RESPONSE ANALYSIS

Time response analysis of control system, transition and steady state response, input test signal, time response of first order control system, second order control system.

UNIT-4 STABILITY ANALYSIS

Stability analysis, stability in terms of characteristic equation, determine the number of roots having positive real part for polynomial, Hurwitz determination of a polynomial, Routh-Hurwitz criterion, Nyquist creation, gain margin and phase margin, gain-phase plot, bode plot, root locus.

Text and Reference Book

1. B S Manke: Linear control system
2. Nagrath and Gopal: Control system engineering
3. Benjamin Kuo: Automatic control system