JABALPUR ENGINEERING COLLEGE, JABALPUR (M.P.)

Scheme of M.Sc. Examination w.e.f. July, 2017

First Semester (M.Sc. Applied Physics)

S.NO.	SUBJECT CODE	SUBJECT	Periods Per Week				Maximum Marks (Theory Slots)			Maximum marks (Practical Slots)		Total Marks	Remarks
			L	T	P	TOTAL Credits	End Sem. Exam	Mid Sem Exam	Assignment/ Quiz	End Semester Practical/ Viva	Practical Record/ Assignment/Quiz/ Presentation		
1	AP1001	Mathematical Physics	4	1		5	70	20	10			100	
2	AP1002	Electronics-I	4	1		5	70	20	10			100	
3	AP1003	Solid State Physics-I	4	1		5	70	20	10			100	
4	AP1004	Quantum Mechanics-I & Statistical Mechanics	4	1		5	70	20	10			100	
5	AP1005	LAB-I (General Lab)			5	5				60	40	100	
6	AP1006	Lab-II (Electronics Lab)			5	5				60	40	100	
7	AP1007	Industrial Training/Seminar			2	2					50	50	
		TOTAL	16	4	12	32	280	80	40	120	130	650	

L-Lecture   T-Tutorial   P-Practical

Dr. B. Singh

Dr. Durgesh Nandin

Dr. K. K. Kushwaha
Ap/phy/ JEC/JBP

Dr. S. K. Mahobia

R. Nigam

JABALPUR ENGINEERING COLLEGE, JABALPUR

M.Sc. I Semester

MATHEMATICAL PHYSICS

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	**P**	
M.Sc. App. Physics	Mathematical Physics	AP1001	"Min" D	"Min" D	

UNIT-1

Algorithm development and flowcharting, searching, sorting and updating, Newton Raphson, Secant and successive approximation method, Langrange and Newton-Gregory Forward Interpolation formula. Trapezoidal and Simpson rules. Gauss elimination method.

UNIT-2

Orthogonal Curvilinear coordinates, Cylindrical Polar and Spherical polar coordinate, Equation of continuity. Rank of Tensor, Transformation laws, Fundamental operations with tensors, Christoffel Symbols. Associated tensors, Geodesics, Einstein's tensor.

UNIT-3

Fourier series, Fourier Transforms and their properties, Fourier integral Theorem. Sine and Cosine transform. Laplace Transform, Basic properties, The Inversion problem. Convolution theorem. Periodic functions. Applications of Laplace Transforms.

UNIT-4

Complex functions, Cauchy Riemann equations, Cauchy theorem, Cauchy's integral formula. Taylor and Laurent series. Residue theorem, Contour integration, Conformal Mapping. Solutions of Laplace equations, Wave equation. Heat conduction equation and Poisson's equation.
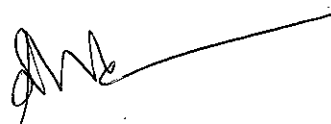
UNIT-5

Bessel Function, Recurrence formula, Generating Function, Bessel's Integral, Modified Bessel functions. Legendre polynomials, Roldrigue's formula, Orthogonality property, Associated Legendre function and Spherical harmonics Hermite Polynomials,Orhogonality property.

Reference Books:
1. Mathematical Physics: B.D.Gupta.
2. Vector Analysis: Speigel.
3. Matrices and Tensors: A.W.Joshi.
4. Special Functions: J.N.Sharma.
5. Computer Oriented Numerical Methods: E. Balagurusamy.
6. CONM: Rajaraman.

JABALPUR ENGINEERING COLLEGE, JABALPUR

M.Sc. I Semester

ELECTRONICS-I

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
M.Sc. App. Physics	Electronics-I	AP1002	"Min" D	"Min" D	

UNIT-1

Fundamentals of Filter circuits, Low, High and Band pass filters, Variations of characteristic impedance over the Pass Band. Band eliminated filters, m-derived, π and T section filters. Attenuation Bridge networks, Regulated Power Supply expression for load and line regulation.

UNIT-II

Fermi level in semiconductors, p-n junction, Forward and reverse biasing of p-n junction and their energy band diagrams, derivation of expression for potential barrier, Diffusion and transaction capacitance, Derivation of continuity equation, Solution of d.c. and Small a.c. signals, Bias stabilization - fixed bias, self bias (emitter bias), bias compensation-diode, thermistor and resistor compensators, Analysis of CE, CB, CC amplifiers using h-parameter, Approximate models, Emitter follower, Darlington emitter follower, Bootstrapped emitter follower.

UNIT-III

Field effect transistors, JFET, Pinch-off voltage, Volt ampere characteristics, Small signal model, MOSFET-enhancement and depletion type, Small signal model, Biasing FET, FET as common source amplifiers at low, middle and high frequency, Common drain source, amplifiers at high frequency, FET as voltage variable resistor.

UNIT- IV

Beam power tube- characteristic curve and tube parameters, Multigrid tube, Gas filled tube, Thyratrons-Negative grid and positive grid, Phototube thermistor, Sensistors, Varactor diode. Variable capacity diode, Step recovery diode, Cathode ray tube. Deflection sensitivities-electrostatic and electromagnetic, Time base circuits, CRO and its applications.

UNIT-V

Instruments: Multimeter, V.T.V.M. Transistor voltmeter, Digital voltmeter, Audio & Signal generators, Q meter, Pulse and square wave generator.

Books recommended:
Electronic Devices and Circuits: Millman and Hakim.
Electrical & Electronic Instrumentation: R K Sawhney.

JABALPUR ENGINEERING COLLEGE, JABALPUR

M.Sc. I Semester

SOLID STATE PHYSICS-I

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
M.Sc. App. Physics	Solid State Physics-I	AP1003	"Min" D	"Min" D	

UNIT-I

Elements of Crystal Physics: Ionic crystals, Covalent crystals, Metal crystals, Molecular crystals, Hydrogen bonded crystals, Geometric and crystallographic projections, Stereographic net, Concept of symmetry, Symmetry transformations and symmetry elements, 32 points of symmetry. Crystal classes and crystal systems, Symmetry of Internal structures of crystals, Coordinate systems of crystallography. Law of rational indices, Miller indices, The Zone law, Crystal forms and their combinations, Distribution of crystal form in crystal system.

UNIT-II

Lattice Dynamics . Elastic waves, Atomic displacements and phonons Vibrational modes of Monatomic lattice, Vibrational modes of two and three dimensional lattices. Phonon statistics and lattice specific heats, Thermal conduction.

UNIT-III

Dielectric properties of solids: Macroscopic description of static dielectric constant, The static electronic and ionic polrizabilities of molecules, Orientational polarization, Static dielectric constant of gases, one electric field according to Lorentz, Static dielectric constant of solids.
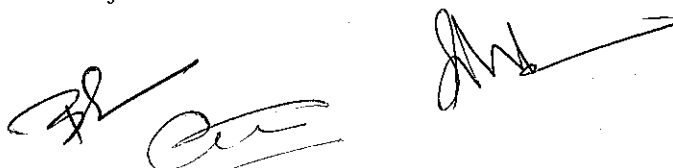
UNIT- IV

Theories of solids: Free electron theory of solids, Its application to explain electrical conductivity, Hear capacity of electron gas, Thermionic emission, Band theory of solids, The Kronig Penny model. Brillouine zone.

UNIT-V

Imperfections in solids: Point defects, Lattice vacancies in interstitial atoms, color centres, Line defect, Edge dislocation. Screw dislocation, Dislocation motion, Stress filed around dislocation, Strain due to dislocation motion, Grain boundary

Books Recommended:
1. Introduction to solid state physics : C.Kittel.
2. Fundamental of Solid State Physics : A.J. Dekker.
3. Solid State Physics : Hernrajani & Kakani.

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M.Sc. I Semester

QUANTUM MECHANICS-I & STATISTICAL MECHANICS

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
M.Sc. App. Physics	Quantum Mechanics-I & Statistical Mechanics	AP1004	"Min" D	"Min" D	

UNIT-1

Physical basis and postulates and Quantum Mechanics. Application of Schrodinger wave equation to Rigid Rotator and Hydrogen atom, Orbital Angular Momentum and its Eigen functions.

UNIT-II

Types of Operator-Linear, Harmonic, Hermitian, Conjugate, Parity, Projection, Identity, Reflection. Adjoint of an operator, Unitary operator, inverse operator, Properties of Hermitian operator, Commutation rules for components of orbital angular momentum, Eigen values and Eigen functions, Properties of Eigen functions, Vector representation of Orthogonality relation, Expansion theorem, Classical Poisson bracket, Quantum Poisson bracket and equation of motion.

UNIT-III

The Dirac Delta function and its properties, Kronceker Delta function, Approximate method for stationary states, Time Independent Perturbation theory for Non Degenerate states Application to (a) Perturbed Harmonic Oscillator (b) Normal Helium atom (c) Normal Zeeman effect.

UNIT-IV

Bose-Einstein Statistics, B-E distribution law, Planck's law of Radiation, Wien's Displacement law Rayleigh Jeans Law, Bose Gas, Degeneracy of Bose Gas.

UNIT-V

Fermi--Dirac statistics, F-D Distribution law, Fermi energy, Electron gas in metals, Degenerate Fermi Gas, Thermionic emission, Properties of Liquid Helium II.

Books Recommended:
1. Quantum Mechanics-E.I. Schiff.
2. Quantum Mechanics-Pauling & Wilson.
3. Quantum Mechanics-Ghatak & Loknathan.
4. Quantum Mechanics-Powell & Cressmann.
5. Statistical Mechanics-Satya Prakash.
6. Statistical Mechanics-K. Huang.