

THIRD SEMESTER

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|---------------------------------------|---|
| 1. Course Code : | 8. Maximum marks : 500 |
| 2. Course Name : M.Sc. Physics | 9. Minimum Passing percentage : 36 |
| 3. Total Paper : 4 | |
| 4. Compulsory Paper : 4 | |
| 5. Optional Paper : 0 | |
| 6. Practical : Y | |
| 7. Practical Percentage : 36 | |

Sub. code	Subject Name	Theory										Practical		Total	
		Paper					CCE		Total Marks						
		1 st	2 nd	3 rd	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
Compulsory papers															
	Condensed matter physics-I	85	0	0	85	131	15	5	160	36	0	0	160	36	
	Nuclear and particle physics	85	0	0	85	131	15	5	160	36	0	0	160	36	
	Digital electronics	85	0	0	85	131	15	5	160	36	0	0	160	36	
	Atomic and molecular physics	85	0	0	85	131	15	5	160	36	0	0	160	36	
	Lab A	0	0	0	0	0	0	0	0	0	50	18	50	18	
	Lab B	0	0	0	0	0	0	0	0	0	50	18	50	18	

Department of Higher Education, Govt. of M.P.

Post Graduate Semester wise Syllabus

as recommended by Central Board of Studies and approved by the Governor of M.P.

उच्च शिक्षा विभाग, म.प्र. शासन

स्नातकोत्तर कक्षाओं के लिये सेमेस्टर अनुसार पाठ्यक्रम

केंद्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म. प्र. के राज्यपाल द्वारा अनुमोदित

~~संशोधन संकाय, 2014-15~~

Class / कक्षा : M.Sc.
Semester / सेमेस्टर : III
Subject / विषय : Physics
Title of Subject Group : Condensed Matter Physics-I
विषय समूह का शीर्षक :
Paper No. / प्रश्नपत्र क्रमांक : I
Compulsory / अनिवार्य या
Optional / वैकल्पिक अनिवार्य : Compulsory
Max. Marks अधिकतम अंक : 85

Particulars / विवरण

Unit-1	Crystal structure: Bravais lattice in two and three dimension. Simple crystal structures: Hexagonal close packed structure, Diamond structure, zinc blende structure, sodium chloride structure, cesium chloride structure.
Unit-2	Crystal diffraction by X-Ray: Reciprocal lattice, Reciprocal lattice of bcc and fcc lattice. Relation between crystal lattice axes and crystal reciprocal lattice axes. Bragg diffraction. Condition in term of reciprocal lattice vector. Brillouin zones.
Unit-3	Elastic properties of solids: Stress and strain components, elastic compliance and stiffness constants, elastic energy density, reduction of number of elastic constants, elastic stiffness constants for isotropic body, elastic constant for cubic isotropic bodies, elastic waves, waves in (100) direction, experimental determination of elastic constants.
Unit-4	Lattice vibration and phonons: Lattice dynamic of a diatomic linear lattice. Lattice vibrational spectrum. The concept of phonons momentum of phonons. Inelastic scattering of photons by phonons. Inelastic scattering of neutrons by phonons. Inelastic scattering of X-Ray.
Unit-5	Thermal properties and band theory of solids: Anharmonicity, thermal expansion, thermal conductivity, equation of state of solids, gruneisen constant. Band theory, classification of solids, concepts of effective mass. Fermi surfaces, anomalous skin effect, De Hass van alphen effect, cyclotron resonance, magneto resistance.

Suggested Readings :

1. Verma and Srivastava: Crystallography for solid State physics.
2. Azaroff: Elementary to Solids.
3. Omar: Introduction Solids state physics.
4. Kittle: Solids state physics
5. Huang: theoretical solids state physics
6. Weertman and weertman: Elementary dislocation theory
7. Buerger: Crystal structure physics.
8. Made lung: introduction to solids state physics.

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~~संशोधन विभाग, म.प्र. शासन~~

Class / कक्षा	: M.Sc.
Semester / सेमेस्टर	: III
Subject / विषय	: Physics
Title of Subject Group	: Nuclear and Particle
Physics	
विषय समूह का शीर्षक	:
Paper No. / प्रश्नपत्र क्रमांक	: II
Compulsory / अनिवार्य या Optional / वैकल्पिक अनिवार्य	: Compulsory
Max. Marks अधिकतम अंक	: 85

Particulars / विवरण

Unit-1	Nuclear Interaction and Nuclear reaction: Nuclear forces, exchange and tensor forces, meson theory of nuclear forces, Low-energy n-p scattering and spin dependence of n-p forces. Direct and compound nuclear reaction mechanism, reciprocity theorem.
Unit-2	Accelerators of charged particles: Study of cyclotron, phase stability, frequency modulated cyclotron (synchrocyclotron) magnetic induction accelerator (Betatron), Electron synchrotron and linear accelerator (Linac)
Unit-3	Nuclear models: Liquid drop model, Bohr-wheeler's theory of nuclear fission, shell model, spin orbit interaction, magic number, spin and angular momenta of nuclear ground state, nuclear quadrupole moment.
Unit-4	Nuclear decay and elementary particles: β Decay, general features of β ray spectrum, Fermi theory of β decay, selection rules, parity in β decay, multipole radiation, internal conversion, nuclear isomerism.
Unit-5	Elementary particles: Classification of elementary particles, fundamental interaction, parameters of elementary particles. Symmetry and conservation laws, symmetry schemes of elementary particles SU(3)

Suggested Readings :

1. Introduction to Nuclear physics : H.A. Enge
2. Nuclear radiation detectors : S.S. Kapoor and V.S. Ramamurthy
3. Atomic and Nuclear physics : S.N. Ghoshal
4. Nuclear and Particle physics : D.C. Tayal
5. Nuclear Physics : R.C. Sharma
6. Introduction to Nuclear physics : KRANE
7. Nuclear physics Principles & Application : Lilley

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Class / कक्षा	: M.Sc.
Semester / सेमेस्टर	: III
Subject / विषय	: Physics
Title of Subject Group	: Digital Electronics
विषय समूह का शीर्षक	:
Paper No. / प्रश्नपत्र क्रमांक	: III
Compulsory / अनिवार्य या Optional / वैकल्पिक अनिवार्य	: Compulsory
Max. Marks अधिकतम अंक	: 85

Particulars / विवरण

Unit-1	Number system (Binary, Octal, Decimal, hexadecimal) and conversion between them. Boolean arithmetic, signed and unsigned binary numbers, 1's complement, 2's complement,
Unit-2	Codes: BCD, Gray, ASCII, EBCDIC, Demorgans theorem, Gates: OR, AND, NOT, NOR, OR, NAND, XOR, XNOR, Boolean algebra, karnaugh map, adder and subtractor circuit design.
Unit-3	Multiplexer, demultiplexer, encoder, decoder, parity checker and generator, Flip-Flops: R-S, D, J-k, J-k Master slave flip flop, race around condition registers, shift registers (left and right shift)
Unit-4	Counters-asynchronous (ripple) counter, synchronous (parallel) counter, MOD-5 counter and MOD-10 counter, BCD counter, Up-Down counter, Shift Register counter (Ring counter)
Unit-5	Digital to analog conversion (Binary weighted register method, R-2R ladder network method, complete DAC structure. Analog to digital converters (Stair case or counter method, single slope, equal slope, successive approximation ADC)

Suggested Readings :

1. "Digital principles and applications" by A.P.Malvino and Donald P.Leach, Tata Megraw-Hill company, New Delhi, 1993.
2. "Microprocessor Architecutre, Programming and Applications with 8085/8086 by Rames S. Gaonkar, Wiley-eastern Ltd. 1987 (for unit V)"
3. Digital electronics –S.N. Ali
4. Digital electronics –Morries Mano
5. Microprocessor and Microcomputers-B.Ram-Dhanpat Rai publications V edition.

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Class / कक्षा	: M.Sc.
Semester / सेमेस्टर	: III
Subject / विषय	: Physics
Title of Subject Group	: Atomic and Molecular Physics
विषय समूह का शीर्षक	:
Paper No. / प्रश्नपत्र क्रमांक	: IV
Compulsory / अनिवार्य या Optional / वैकल्पिक अनिवार्य	: Compulsory
Max. Marks अधिकतम अंक	: 85

Particulars / विवरण

Unit-1	Nuclear Magnetic Resonance Spectroscopy: Concept of Nuclear Magnetic resonance spectroscopy, Interaction between nuclear spin and magnetic field, population of energy level, relaxation processes, spin-spin interaction and spin-spin coupling between two and more nuclei (Qualitative)
Unit-2	Electronic spectra of Diatomic Molecules: Franck Condon principles, dissociation and pre-dissociation, dissociation energy. Born-Oppenheimer-approximation, vibrational coarse structure of electronic spectra (bands progression and sequence).
Unit-3	Raman Spectra Raman effect, quantum theory of Raman effect, Molecular polarisability in Raman effect, Vibrational Raman spectra, vibration-rotation Raman Spectra of diatomic molecules, application of Raman and infrared spectroscopy in the structure determination.
Unit-4	Mossbauer Spectroscopy: Mossbauer effect, principles of Mossbauer spectroscopy, recoil less emission of gamma emission, line width and resonance absorption, application of mossbauer spectroscopy (Isomer shift, Quadra pole splitting magnetic field effect).
Unit-5	Electron Spin Resonance spectroscopy: Elementary Idea about ESR, Principle of ESR, ESR spectrometer, splinting of electron energy levels by a magnetic field, G-Values, simple experimental setup of ESR. ESR spectra of free radicals in solution, An Isotropic system.

Suggested Readings :

1. Fundamentals of Molecular Spectroscopy-C.B. Banwell.
2. Spectra of Diatomic Molecules-Herzberg.
3. Mossbauer Spectroscopy-M.R.Bhide
4. NMR and Chemistry-J.W.Akitt
5. Modern Spectroscopy-J.M.Hollons