DR. A. P. J. ABDUL KALAM UNIVERSITY, INDORE

Dr. A.P.J. Abdul Kalam University, Indore

DEPARTMENT OF PHYSICS

Scheme and syllabus

M.Sc. PHYSICS

Academic Year 2017-18

DR. A. P. J. ABDUL KALAM UNIVERSITY, INDORE

Scheme

Marks Distribution for

M.Sc. Physics –III and IV Semester

Year 2017-18

M.Sc. -III SEMESTER (PHYSICS)

Paper	Subject Code	Paper Title	Max. Marks		
			End sem	CCE	Total
I	MSP301T	Condensed Metter Physics	85	15	100
II	MSP302T	Nuclear and Practice	85	15	100
III	MSP303T	Atomic &Molecular Physics-II	85	15	100
IV	MSP304T	Digital Electronics	85	15	100
V	MSP305P	LAB A	-	-	50
VI	MSP306P	LAB B	-	-	50
		TOTAL	**500**		

DR. A. P. J. ABDUL KALAM UNIVERSITY, INDORE

Class: M.Sc. Physics
Max. Marks: 85+15 = 100
Semester: III
Subject: Physics–I

Title of Paper: Condensed Metter Physics

UNIT I

Crystal structure: Bravais lattice in two and three dimension. Simple crystalStructures: Hexagonal close packed structure, Diamond structure, zinc bleed e Structure, sodium chloride structure, cesium chloride structure.

UNIT II

Crystal diffraction by X-Ray Reciprocal lattice, Reciprocal lattice of bee and feeLattice. Relation Between crystal lattice axes and crystal reciprocal lattice axes. Bragg differection. Condition in term of reciprocal lattice vector. Brillouin zones.

UNIT III

Elastic properties of solids: Stress and strain components, elastic compliance and Stiffness constants, elastic energy density, reduction of number of elastic constabls elastic stiffness constant for isotropic body, elastic constant for cubic isotropic bodies. Elastic waves in (100) direction. Experimental determination of Elastic contants.

UNIT IV

Lattice vibration and phonons: Lattice dynamic of a diatomic linear lattice. LatticeVibrational spectrum. The concept of phonons momentam of phonons. Inelastic Scattering of photons by phonons, Inelastic scattering of neutrons by phononsInelastic scattering of X-Ray.

UNIT V

Thermal properties and band theory of solids: and band theory of solids: Anharmonicity thermal Expansion thermal conductivity. Equation of state of solids, gruncisen constant. Band theory,Classification of solids, concepts of effective mass. Fermi surfaces, anomalous skinEffect, De Hass van alphen effect, eyeclotron resonance, magneto resistance

Suggested Readings :

1. Vrema and Srivastava : Crystallography for solid State physics.
2. Azaroff : Elementary to Solids.
3. Omar : Introduction Solids state physics.
4. Kittle : Solids state physics .
5. Huong : theoretical Solids state physics.

DR. A. P. J. ABDUL KALAM UNIVERSITY, INDORE

Class: M.Sc. Physics
Max. Marks: 85+15 = 100
Semester: III
Subject: Physics –II
Title of Paper: Nuclear and Practice

UNIT I

Nuclear Introduction 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 II

Accelerators of charged -particles: Study of cycclotron , phase stability, Frequency modulated cyclotron (synchorocyclotron) magnetic induction Accelerator (Betatron), Electron synchrotron and linear accelerator (Linac)

UNIT III

Nuclear models: Liquid drop model, Bohr - wheeler's theory of nuclear hssion Shell model, spin orbit interaction, magic number , spin and angular momenta Of nuclear ground state, nuclear quadrupole moment.

UNIT IV

Nuclear decay and elementary particles: B Decay, genral features of B ray Spectrum, Fermi theory of B decay, selection rules, parity in B decay, multipole Radiation, internal conversion, nuclear isomerism.

UNIT V

Elementary particles: Classification ofclementary 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 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

DR. A. P. J. ABDUL KALAM UNIVERSITY, INDORE

Class: M.Sc. Physics
Max. Marks: 85+15 = 100
Semester: III
Subject: Physics –III
Title of Paper: Atomic &Molecular Physics-II

UNIT I

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) types of NMR techniques (qualitative) applications.

UNIT II

Electronic spectra of Diatomic Molecular: Frank Condon principles. Dissociation And pre-dissociation. Frank Condon factor, Determination. of dissociation Energy . Born – Oppenheimer- approximation, vibrational course structure of Electronic spectra (bands progression and sequence).

UNIT III

Raman Spectra :- Raman effect quantum theory of Raman effect. Molecular Polarisibility in Raman effect. Vibrational Raman spectra, vibratrionrolation Raman Spectra of diatomic molecules, application of Raman and infrared Spectroscopy in the structure determination.

UNIT IV

Mossbauer Spectroscopy : Mossbauer effect, principles of Mossbauer spectroscopy Recoil less emission of gamma emission. Linc width and resonance absorption Application of Mossbauer spectroscopy (Isomer shift, Quadra pole splitting Magnetic field effect)

UNIT V

Electron Spin Resonance spectroscopy : Elementary Idea about ESR, Principle of ESR, ESR spectrometer. Splitting of electron energy levels by a magnetic field, G Values. Hyper fine coupling Chemical shift 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 Spetroscopy - M.R. Bhide

DR. A. P. J. ABDUL KALAM UNIVERSITY, INDORE

Class: M.Sc. Physics
Max. Marks: 85+15 = 100
Semester: III
Subject: Physics –IV
Title of Paper: Digital Electronics

UNIT I

Number system (Binary, Oetal, Decimal, hexadecimal) and conversion Between them. Boolean arithmetic, signed and unsigned binary numbers, Complement, 2' s complement.

UNIT II

Codes: BCD, Gray, ASCH, EBCDIC, Demorgans theorem, OR, AND, NOT, NOR, OR, NAND, XOR, XNOR, Boolean algebra, karnaugh map, Adder andsubstractor circuit design.

UNIT III

Multiplexer, Demultiplexer, encoder, decoder, parity cheeker and generator, Flip – Flop: R-S,D, J-k, J-k master slave flip flop, race around condition Registers, shift registers (left and right shift)

UNIT IV

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 V

Digital to analog conversion (Binary weighted register method, R-2R ladder Network method, complete DAC structure Analog to digital converter (Stair Case or counter method, single 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

3 Digital electronics - S.N. Ali

4 Digital electronics - Morries Mono

5 Microprocessor and Microcomputers - B.Ram – Dhanpat Rai publications V Edition.

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Scheme

Marks Distribution for

M.Sc. Physics – IV Semester

Year 2017-18

M.Sc. IV SEMESTER (PHYSICS)

Paper	Subject Code	Paper Title	Max. Marks		
			End sem	CCE	Total
I	MSP401T	Condensed Metter Physics -II	85	15	100
II	MSP402T	Laser Physics	85	15	100
III	MSP403T	Computer Programming & Informatics	85	15	100
IV	MSP404T	Communication Electronic	85	15	100
V	MSP405P	LAB A	-	-	50
VI	MSP406P	LAB B	-	-	50
		Total	**500**		

DR. A. P. J. ABDUL KALAM UNIVERSITY, INDORE

Class: M.Sc. Physics
Max. Marks: 85+15 = 100
Semester: IV
Subject: Physics –I
Title of Paper: Condensed Matter Physics

UNIT I

Super Conductivity Concept of super conducting State, persistent current, critical temperature, meissner effect, thermodynamics of the super conducting transition, London equation and penetration depth, coherence length, Type 1 and 2 Type superconductors, B.C.S. Theory of super conductivity. AC and DC Josephson effects, Josephson Tunneling.

UNIT II

Magnelism: Weiss theory of ferromagnetic Heisenberg model and molecular field theory, Domain and Bloch wall energy, Spin waves and mangnons, curie weiss law for susceptihdity, Ferri and anti Ferrimagnetin.

UNIT III

Imperfection in crystals: Imperfection in atomic packing. Point defects, inferstitial Schottky and frenkel defects, lattice vacancies colour centers , F centers, F centers . coagulation of centers . production ofcolour centers and screw dislocation. Mechanism of plastic deformation in solids, stress and strain fields of screw and edge dislocation. Elastic energy of dislocation, slip and plastic deformation, shear strength of single crystal. Burgers vector stress fields around dislocation.

UNIT IV

Thin Film Nucleation and growth of thin films, Various method of preparation of thin films (chemical vapour deposition . sputtering , Laser ablation). Study of surface topography by multiple beam interferometer, conditions for accurate determination of step height and film thickness (Fizeau frings) Electrical conductivity of thin films, Hall coefficient quantum size effect in thin film.

UNIT V

Nano structuresL: Definition and properties of nano structured material , different method of preparation of nano materials, plasma enchanted chemical vapour deposition . electro deposition , Structure of single wall carbon nano tubes (classification, chiral vector Cn, Translation vetor T, Symmetry vector R, Unit Cell, Brillouin Zone) Electronic, mechanical, thermal and phonon properties.

Suggested Readings :

1. Kittel: Solid State Physics 2. Huang Theoretical Solid State Physics
2. Weertroom and Weertman: Elementary Dislocation theory

Thomes : Multiple Electron microscopy 5. Tolansky: Multiple Beam Interferometer

DR. A. P. J. ABDUL KALAM UNIVERSITY, INDORE

Class: M.Sc. Physics
Max. Marks: 85+15 = 100
Semester: IV
Subject: Physics –II
Title of Paper: Laser Physics

UNIT I

Basic Principal of Lasser Introduction tolasser, spontaneous and stimulated emission , Einsein Coefficients. Idea of light amplification. Population invertion, laser pumping Schemes for two and three level system with threshold condition for laser oscillation.
Properties of Lasser Beams and Resonators:

UNIT II

Properties ofLasser - Temporal coherence, spatial coherence, directionality and Monochromatic oflasser beam, resonators, vibrational mode of resonators , Laser amplification, open resonator.

UNIT III

Types of lasers: Solid state lasers i.e. Ruby Laser, Nd – YagLasser, Semiconductor laser, Gas Lasser i.e.Carbon dioxideLasser, He - Ne Laser, Basic idea about liquid laser, Dye laser and chemical laser i.e. HCI and HF lasers.

UNIT IV

Application of Lassers Holography and its principle, theory of holograms, reconstruction of image, Charateristics of Holographs, Application of lasers in chemistry and optics Laser in Industry i.e. laser belding, Hole drilling, laser cutting, application of Lasers in medicine:

UNIT V

Basic idea about non –linear optics Harmonic generation, second and third harmonic generation, phase matching , Optical mixing, parametric generation of light, self-focusing of light.

Suggested Readings:

1 Lassersyelto
2 Optical electronics Yarive
3 Laser spectra scopy – demtroder
4 laser spectroscopy and instrumentation demotroder
5 Molecular spectra scopy king
6 Non linear optics by B.B. Loud

DR. A. P. J. ABDUL KALAM UNIVERSITY, INDORE

Class: M.Sc. Physics
Max. Marks: 85+15 = 100
Semester: IV
Subject: Physics –III

Title of Paper: Computer Programming and Informatics

UNIT I

Conceptual framework of computer languages (Algorithm, Flowcharts) Need of structured programming, Top- down, bottom-up and modular Programming design. Introduction to C languages – basic structure of CProgram .Character set, keyword and identifiers, C data types, variable And data type declaration. Various operators like arithmetic, relationalLogical, assignment, conditional, increment and decrement operators, Evaluation of expression and operator precedence.

UNIT II

Input and output statement, control statement (If, If - else statements, switch, while, Do… while and for statements) Simple C programming like search of prime number between given range of numbers. Finding the smallest and largest of Three numbers, sume of algebraic series, factorial of given number, roots of a Quadratic equation, binary to decimal and decimal to binary conversion etc.

UNIT III

Functions: need of functions, calling the function by value and by reference, category of functions: on return, argument but not return, argument with return Recursion .One and two dimensional arrays. String. And string handling functions like sprint 0, strepy 0, sscan0, strelen 0, sizeorf0, stremp0 etc. Simple programs Using user define functions, arrays and string functions.

UNIT IV

Networks:

Terminals - Dumb terminals, smart terminals, intelligent terminals.

Types of network: . According to range : LAN, MAN, WAN, Client server.

According to topologies: BUS, RING, STAR, Mesh Network.

Internet : History of Internet Service Provider (ISP) introduction to Type of internet account -shell /Ac, TCP/IP A/c, types of connectivity –Diapup, Leased lines, Satellite , IP Adress- class A, class-B, class C, Domain Name address. URL absolute and Relative.

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UNIT V

Web enabled technology (Email and HTML)

Web Brower, Internet Exporer, Netscape, Navigator, Station and Dynamic web page

Introduction to HTML tags

- <HTML>, <TITLE>, <HEAD>, <BODY>
- <P>, <BR>, <ALIGN>, <I>, <DIV>, <PRE>, and their attributes.
- <IMG>, <a> and their attributes.
- Ordered and unordered list tags
- Tables and associated tags and its properties

Creation of simple forms using text, Password, text area, radio, submit, Reset and Hidden.

Brief idea about HTTP, Search engine, its working, types of search engine.sab directiories meta search engines, search function- AND and OR. Population serach engines.

Suggested Reading

1. Lets C - Yashwat Kanetkar
2. Programming with C - Balaguruswami
3. Internet and Web Page - V.K. Jain "O" level model M1.2
4. Internet and Web page design – Dr. P.D. Murarka "O" level model M1.2
5. Internet and Web page design – Pearl Software "O" level model M1.2
6. C#2008in simple step Dreamtech press
7. C#2008 Programming block book Dreamtech press

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Class: M.Sc. Physics
Max. Marks: 85+15 = 100
Semester: IV
Subject: Physics –IV

Title of Paper: Communication Electronics

UNIT I

Communication Electronics: Amplitude modulation - generation of AM waves Demodulation of AM waves, DSBSC modulation, Generation of DSBSC waves, Coherent detection of DSBC waves, SSB modulation, generation and Detection of SSB waves, vestigial sideband modulation

UNIT II

Programming of Waves : ground waves, sky wave, space wave, propagation, Maximum usable frequency, skip distance, virtual height, fading of signals, Satellite communication: orbital satellite, geostationary satellites, orbital Pattern, look angles , orbital spacing, satellite system, link modules.

UNIT III

Microwave: Advantage and disadvantage of microwave transmission loss in Free-space, programming of microwaves, atmospheric effects on propagation. Fresnel Zone problem used in microwave communication system.

UNIT IV

Digital Communication: Pulse – modulation system, sampling theorem, Law Pass and Band pass signals, PAM, channel BW for a PAM signal, Natural Sampling, Flat top sampling, signals Recovery through Holding Quantization Of signals, Quantization. Differential PCM Data Modulation, Adaptive Delta Modulation. CVSD

UNIT V

Data Transmission: Base band signal receiver, probability of error, optimum Filter, white noise, matched filter and probability of error, coherent reception Correlation, PSK, FSK, non coherent detection of FSK, different PSK , QPSK, calculation of error probability for BPSK, BFSK, and QPSK.

Book Suggested

1 Digital Communication : W. Tomasi 2. Microwave : K.C. Gupta
2 Microwave Devices& Circuits : S.Y. Lio