

FOURTH SEMESTER

- | | |
|---|---|
| 1. Course Code :
2. Course Name : M.Sc. Physics
3. Total Paper : 4
4. Compulsory Paper : 3
5. Optional Paper : 1
6. Project : Y | 7. Maximum marks : 600
8. Minimum Passing percentage : 36
9. Project work : 100
10. Project passing marks : 36
11. Practical : 2
12. Practical Passing Marks : 18 Marks each |
|---|---|

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-II	85	0	0	85	131	15	5	160	36	0	0	160	36	
	Laser Physic	85	0	0	85	131	15	5	160	36	0	0	160	36	
	Computer Programming and Informatics	85	0	0	85	131	15	5	160	36	0	0	160	36	
Optional paper (Select any one)															
	(A) Computer Architecture Networking & Assembly Language Programming	85	0	0	85	131	15	5	160	36	0	0	160	36	
	(B) Material Science	85	0	0	85	131	15	5	160	36	0	0	160	36	
	(C) Environmental physics	85	0	0	85	131	15	5	160	36	0	0	160	36	
	(D) Communication Electronics	85	0	0	85	131	15	5	160	36	0	0	160	36	
	(E) Digital Electronics	85	0	0	85	131	15	5	160	36	0	0	160	36	
	Practical : Lab (A)	0	0	0	0	0	0	0	0	0	50	18	50	18	
	Practical : Lab (B)	0	0	0	0	0	0	0	0	0	50	18	50	18	
	Project work	0	0	0	0	0	0	0	160	36	0	0	160	36	

Department of Higher Education, Govt. of M.P.
Post Graduate Semester wise Syllabus
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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 (अ) विभाग द्वारा~~

Class / कक्षा : M.Sc.
Semester / सेमेस्टर : IV
Subject / विषय : Physics
Title of Subject Group : Condensed Matter Physics-II
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	<p>Super Conductivity:</p> <p>Concept of super conducting state, persistent current, critical temperature, meissner effect, thermodynamics of the super conducting transitions, London equation and penetration depth, coherence length, Type I and Type II superconductors, B.C.S. theory of superconductivity. AC and DC Josephson effects, Josephson Tunneling.</p>
Unit-2	<p>Magnetism:</p> <p>Weiss theory of ferromagnetic Heisenberg model and molecular field theory, Domain and Bloch wall energy, Spin waves and mangnons, curie weiss law for susceptibility, Ferri and anti ferrimagnetic.</p>
Unit-3	<p>Imperfection in crystals:</p> <p>Imperfection in atomic packing, point defects, interstitial Schottky and frenkel defects, lattice vacancies colour centres, F centres, F' centres, coagulation of F centres, production of colour centres and V centres, explanation of experimental facts, line defects, edge 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.</p>

Unit-4	Thin film: Study of surface topography by multiple beam interferometer, conditions for accurate determination of step height and film thickness (Fizeau fringes) Electrical conductivity of thin films, expression for electrical conductivity of thin films, Hall-coefficient quantum size effect in thin film.
Unit-5	Nano structure: Definition and properties of nano structured material, different method of preparation of nano materials, plasma enhanced chemical vapour deposition, electro deposition. Structure of single wall carbon nano tubes (classification, chiral vector C_n , Translational vector 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
3. Weertman and Weertman: Elementary Dislocation theory
4. Thomas: Multiple Electron microscopy
5. Tolansky: Multiple Beam Interferometer
6. Heavens: Thin films
7. Chopra: Physics of thin films.

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~~Session (2019-2020)~~

Class / कक्षा	: M.Sc.
Semester / सेमेस्टर	: IV
Subject / विषय	: Physics
Title of Subject Group	: Laser 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	Basic principles of laser: Introduction to laser, spontaneous and stimulated emission. Einstein coefficients. Idea of light amplification. Population inversion, laser pumping schemes for two and three level system with threshold condition for laser oscillation.
Unit-2	Properties of Laser Beams and Resonators: Properties of Laser-Temporal coherence, spatial coherence, directionality and monochromatic of laser beam, resonators, vibrational mode of resonators, laser amplification, open resonator.
Unit-3	Types of lasers: Solid state lasers i.e. Ruby Laser, Nd-Yag Laser, Semiconductor laser, Gas laser i.e. Carbon dioxide Laser, He-Ne Laser, Basic idea about liquid laser, Dye laser and chemical laser i.e. HCl and HF lasers.
Unit-4	Application of Lasers Holography and its principle, theory of holograms, reconstruction of image, characteristics of Holographs, Application of lasers in chemistry and optics laser in Industry i.e. laser welding, Hole drilling, laser cutting, application of lasers in medicine.

Unit-5	<p>Basic idea about non-linear optics</p> <p>Harmonic generation, second and third harmonic generation, phase matching, optical mixing, parametric generation of light, self-focusing of light.</p>
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Suggested Readings :

1. Laser-syelto
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

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~~Session 2019-2020~~

Class / कक्षा	: M.Sc.
Semester / सेमेस्टर	: IV
Subject / विषय	: Physics
Title of Subject Group	: Computer Programming and Informatics
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	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 C program. Character set, keyword and identifiers, C data types, variable and data type declaration. Various operators like arithmetic, relational, logical, assignment, conditional, increment and decrement operators. Evaluation of expression and operator precedence.
Unit-2	Input and output statement, control statement (If, If-else, If nested if-else statements, switch, while, Do...while and for statements) Simple C programs like search of prime number between given range of numbers, finding the smallest and largest of three numbers, sum of algebraic series, factorial of given number, roots of a quadratic equation, binary to decimal and decimal to binary conversion etc.
Unit-3	Functions: need of functions, calling the function by value and by reference, category of functions: no argument no return, argument but not return, argument with return. Recursion. One and two dimensional arrays. String and string handling functions like sprintf (), strcpy (), sscanf(), strlen(), sizeof(), strcmp() etc. Simple programs using user define functions, arrays and string functions.
Unit-4	Network: Terminals-Dumb terminals, smart terminals, intelligent terminals. Types of network: <ul style="list-style-type: none"> • 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-Dialup, Leased lines, Satellite. IP Address-Class A, Class B, Class C Domain Name address. URL-absolute and

	relative
Unit-5	<p>Web enabled technology (Email and HTML):</p> <p>Web Browser: Internet Explorer, Netscape Navigator, Station and Dynamic web page</p> <p>Introduction to HTML. HTML tags:</p> <ul style="list-style-type: none"> • <HTML>, <TITLE>, <HEAD>, <BODY> • <P>,
, <ALIGN>, <I>, , <DIV>, <PRE>, and their attributes. • , <a> and their attributes. • Ordered and Unordered list tags • Tables and associated tags and its properties. <p>Creation of simple forms using text. Password, text area, radio, submit, Reset and Hidden.</p> <p>Brief idea about HTTP. Search engine, its working, types of search engines: sub directories meta search engines, search function-AND and OR. Population search engines.</p>

SUGGESTED READINGS :

1. Let us C : Yashwat Kanetkar
2. Programming with C : Balaguruswami
3. Internet and Web Page : V.K.Jain
'O' level module M1.2
4. Internet and Web Page design : Dr. P.D. Murarka
'O' level module M1.2
5. Internet and web page design : Pearl Software
'O' level module M1.2
6. C# 2008 in simple step
Dreamtech press
7. C# 2008 programming block book
Dreamtech press

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~~सिद्धान्त, प्रयोग एवं प्रोजेक्ट~~

Class / कक्षा	:	M.Sc.
Semester / सेमेस्टर	:	IV
Subject / विषय	:	Physics
Title of Subject Group	:	Computer Architecture, Networking & Assembly Language Programming
विषय समूह का शीर्षक	:	
Paper No. / प्रश्नपत्र क्रमांक	:	IV-A
Compulsory / अनिवार्य या Optional / वैकल्पिक अनिवार्य	:	Optional
Max. Marks अधिकतम अंक	:	85

Particulars / विवरण

Unit-1	Graphical User Interface: Common Graphical User Interfaces & its Functionality, GUI Design Consideration: Psychological factors & Standards; GUI Examples: Microsoft Windows, Macintosh Toolbox, X-windows, NeXt, etc.
Unit-2	Operating System: Evolution of Operating System – Serial Processing, Batch Processing, Multiprogramming; Operating System Structure – Layered Structure Approach, Virtual Machine, Client-Server Model & Kernel Approach.
Unit-3	Logic Circuits - Logic Gates, Logic Circuits, Combinational Circuits – Canonical and Standard Forms, Minimization of Gates; Design of Combinational Circuits; Examples of Logic Combinational Circuits – Adders, Decoders, Multiplexer, Encoder, Programmable Logic Array, Read Only Memory (ROM). Sequential Circuit's Definition, Flip Flops – Basic Flip-Flops, Excitation Tables, Master Slave Flip Flops, Edge Triggered Flip-flops; Sequential Circuit Design & its examples – Registers, Counters (Asynchronous & Synchronous), RAM; Design of a Simple Counter.
Unit-4	Assembly Language Programming (ALP)-I: Microprocessor Architecture: Microcomputer Architecture; Structure of 8086 CPU [The Bus Interface Unit, Execution Unit (EU)]; Register Set of 8086; Instruction Set of 8086 – Data Transfer Instructions, Arithmetic Instructions, Bit

	<p>Manipulation Instructions, Program Execution Transfer Instructions, String Instructions, Processor Control Instructions; Addressing Modes – Register, Immediate, Direct & Indirect Addressing Modes.</p> <p>Introduction to ALP: Need and use of ALP; Assembly Program Execution; An Assembly Program and its components - The Program Annotation & Directives; Input Output in ALP - Interrupts, DOS Function Calls (Using INT 21H); The Types of Assembly Programs – COM Programs, Exe Programs & Bin Programs.</p>
Unit-5	<p>Assembly Language Programming (ALP)-II:</p> <p>Simple Assembly Programs – Data Transfer, Simple Arithmetic Application, Application Using Shift Operations, Larger of the Two Numbers; Programming With Loops and Comparisons – Simple Program Loops, Find the Largest and the Smallest Array Values, Character Coded Data, Code Conversion;</p> <p>Programming for Arithmetic and String Operations – String Processing, & Arithmetic Problems.</p> <p>Use of Arrays in Assembly; Modular Programming – The stack, FAR and NEAR Procedures, Parameter Passing in Procedures, External Procedures.</p> <p>Interfacing Assembly Language Routines to High Level Language i.e. C.</p>

Suggested Readings:

- | | | |
|---|---|----------------------------|
| 1. Computer Architecture | : | Morris Mano |
| 2. Operating System Concepts | : | Silberchatz Galwin Gagne |
| 3. Web Technology | : | A.S. Godbole & Atul Kahate |
| 4. Digital Electronics | : | Malvino & Leech |
| 5. Advance Microprocessor & Peripherals | : | A.K. Ray & Bhurchandi |
| 6. Introduction to Microprocessor | : | Mathur |

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~~विज्ञान शाखा, भौतिकी~~

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

Particulars / विवरण

Unit-1	Classification of Materials: Types of materials: Crystalline, Polycrystalline, Amorphous (Introduction and their structure), Elementary idea of polymers (structure and properties methods of polymerization, Glasses: Structure and properties, Type of Glasses, Fracture in glasses, Composite Materials: Introduction, their types and properties, Different types of bonding, Madelung energy for ionic crystal.
Unit-2	Phase Transitions:- Thermodynamics of phase transformation, Free-energy calculation, I and II order transformation, Hume-Rother rule, solid solid solution and types of solid solutions, phase rule, One, Two component systems, Eutectic and peritectic phase diagrams, Lever rule, phase diagrams of Mg-Al, Fe-C Kinetics of transformations, Homogeneous and heterogeneous nucleation, Growth kinetics.
Unit-3	Diffusion in Materials:- Mechanism of diffusion, Energy of formation and motion, long distance motion, Rate theory of diffusion, Einstein relation (relation between diffusivity and mobility), Fick's laws of diffusion and solution of Fick's second law, Kirkendall effect, Diffusion of vacancies in ionic crystals, Experimental determination of Diffusion coefficient.

Unit-4	Elastic and Anelastic Behaviour:- Atomic models for elastic behaviour, Elastic deformation in single crystals, Elastic anisotropy, Elastic constant and elastic module (Cubic system, isotropic body), Rubber like elasticity, anelastic behaviour, Thermo-elastic effect and relaxation process, Idea of visco elastic behaviour (Spring-Dashpot model), Determination of elastic constant of cubic crystal by ultrasonic wave propagation
Unit-5	Transport Properties of Solids:- Electrical conductivity of metals and alloys, Extrinsic, intrinsic semiconductors and amorphous semiconductors, Scattering of electrons by phonons, impurity, etc, Relaxation time, Carrier mobility and its temperature dependence, Mathiessen's rule for resistivity, temperature dependence of metallic resistivity.

Book Suggested

1. Introduction to Solids : L. V. Azaroff
2. Introduction to Solid State Physics : C. Kittel
3. Materials and engineering : Raghawan
4. Diffusion Kinetics for Atoms in Crystals : Manning
5. Theoretical solid State Physics : Huang
6. Materials Science and engineering : Callister VI Ed.

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~~विश्व पर्यावरण विज्ञान~~

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

Particulars / विवरण

Unit-1	Essentials of Environmental Physics:- Structure and thermodynamics of the atmosphere. Composition of air. Greenhouse effect. Transport of matter, energy and momentum in nature. Stratification and stability of atmosphere. Laws of motion, hydrostatic equilibrium.
Unit-2	Solar and Terrestrial:- Physics of radiation. Interaction of light with matter. Rayleigh and Mie scattering. Laws of radiation (Kirchoffs law, Planck's law, Wien's displacement law, etc.). Solar and terrestrial spectra. UV radiation. Ozone depletion problem. IR absorption
Unit-3	Environmental Pollution and Degradation:- Elementary fluid dynamics. Diffusion. Turbulence and turbulent diffusion. Factors governing air, water and noise pollution. Air and water quality standards. Waste disposal. Gaseous and particulate matters. Wet and dry deposition
Unit-4	Environmental Changes and Remote Sensing:- Energy sources and combustion processes. Renewable sources of energy: Solar energy, wind energy, bioenergy, hydropower, fuel cells, nuclear energy.
Unit-5	Global and Regional Climate:- Elements of weather and climate. Stability and vertical motion of air. Horizontal motion of air and water. Pressure gradient forces. Viscous forces. Inertia forces. Reynolds number. Enhanced Greenhouse Effect. Global climate models.

BOOK SUGGESTED

- 1 Solar Energy , Narosa Publication G.N.Tiwari
- 2 The Physics of Atmosphere (Cambridge University Press, 1977) J.T. Houghton
- 3 Renewable Energy Resources (Eibs, 1988) J.Twidell and J. Weir
- 4 An Introduction to Solar Energy for Scientists and Engineers John Wiley, Sol Wieder 1982
- 5 The Physics of Monsoons (Allied Publishers 1992). R.N. keshavamurthy and M. Shanker Rao

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~~Sessions (I & II) 2019-2020~~

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

Particulars / विवरण

Unit-1	Communication Electronics: Amplitude modulation – generation of AM waves demodulation of AM waves, DSBSC modulation, Generation of DSBSC waves, coherent detection of DSBSC waves, SSB modulation, generation and detection of SSB waves, vestigial sideband modulation.
Unit-2	Propagation 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-3	Microwave: Advantages and disadvantages of microwave transmission loss in free-space, propagation of microwaves, atmospheric effects on propagation, Fresnel Zone problem used in microwave communication systems.
Unit-4	Digital Communications: Pulse-Modulation system, sampling theorem, Low 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 Delta Modulation, Adaptive Delta Modulation, CVSD.

Unit-5	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, differential PSK, QPSK, calculation of error probability for BPSK, BFSK, and QPSK .
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Book Suggested

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|---------------------------------|---------------|
| 1. Digital Communications | : W. Tomasi |
| 2. Microwave | : K. C. Gupta |
| 3. Microwave Devices & Circuits | : S.Y. Lio |

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~~8284A/2018-2019~~

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

Particulars / विवरण

Unit-1	OP-AMP:- Differential amplifier circuit configurations: dual input balanced output dual input, single input unbalanced output (ac analysis) only, block diagram of a typical op amp analysis, schematic symbol of an op- amp.
Unit-2	OP-AMP Parameters:- Ideal op-amp., Op-amp parameters; input offset voltage, input offset current, input bias current, CMRR, SVRR, large signal voltage gain, Slew rate, Gain band width product, output resistance, supply currents power consumption, inverting and non-inverting inputs.
Unit-3	Application of OP-AMP: Inverting and non-inverting amplifier, summing, scaling and averaging amplifier, integrator and differentiator. Oscillator Principles: oscillator types, frequency, stability response, the phase shift oscillator, Wein-bridge oscillator, L-C tunable oscillator, square wave generator.
Unit-4	Microprocessors and Micro Computers: Microprocessor and Architecture: Intel 8086, Microprocessor architecture modes of memory addressing, 8086/8088 Hardware specification: Pin-outs and pin functions, clock generator (8284A) Bus buffering and latching, Bus timing, Ready and wait state, Minimum mode versus maximum mode.

Unit-5	Programming the Microprocessors: Addressing modes: Data addressing modes, program memory addressing modes, stack memory-addressing modes. Instruction set: data movement Instructions, Arithmetic and logic instructions, program control instructions. Programming example: Simple assembly language programs table handling direct table addressing, searching a table sorting a table using pseudo ops.
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BOOK SUGGESTED

1. Digital Principles and Application : A. P. Malvino & D. P. Leech
2. Op-Amps & Linear Integrated circuits : R. A. Gayakwad
3. Electronics : D. S. Mathur
4. Digital Principles & Applications : Malvino & Leech
5. Microprocessor Architecture, Programming
& Applications with 8085/8086 : R.S. Gaonker
6. Microprocessor & Digital Systems : D.V. Hall
7. Fundamentals of Electronics : Borker