DEPARTMENT OF PHYSICS

SYLLABUS AND SCHEME OF STUDIES AND EXAMINATIONS

OF

MASTER OF SCIENCE IN PHYSICS

as per NEP 2020
Curriculum and Credit Framework for Postgraduate Programme

With Multiple Entry-Exit, Internship and CBCS-LOCF
With effect from the session 2025-26

DEPARTMENT OF PHYSICS

Under

FACULTY OF SCIENCE

BHAGAT PHOOL SINGH MAHILAVISHWAVIDYALAYA KHANPUR KALAN-131305 (SONEPAT) HARYANA

B.P.S. Mahila Vishwavidyalaya, Khanpur Kalan, Sonepat (Haryana)
M.Sc. Physics (Two year Course)
According to NEP guidelines
Scheme of Examination
(For university teaching department and affiliated colleges/ Institute)
Effective from Session 2025-26
Semester - I

Course type	Code	Nomenclature	Contact hours (L+T+P)	Credit	Duration of Exam	Examination Scheme		
						Internal Marks	External Marks	Total
CC-1	M25-PHY-101	Mathematical Physics	4+0+0=04	04	3 hours	30	70	100
CC-2	M25-PHY-102	Classical Mechanics	4+0+0=04	04	3 hours	30	70	100
CC-3	M25-PHY-103	Quantum Mechanics–I	4+0+0=04	04	3 hours	30	70	100
CC-4	M25-PHY-104	Physics of Electronic Devices	4+0+0=04	04	3 hours	30	70	100
CC-5	M25-PHY-105	Physics Lab-I	0+0+8=08	04	3 hours	30	70	100
DSC-1	M25-PHY-106	Physics Lab-II	0+0+8=08	04	3 hours	30	70	100
VAC	M25-PHY-107	Constitutional, Human and Moral Values, and IPR	2+0+0=02	02	2 hours	15	35	50

17/8/25

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Semester - II

Course Type	Code	Nomenclature	Contact hours (L+T+P)	Credits	Duration of Exam	Examination Scheme		
						Internal Marks	External Marks	Total Marks
CC-6	M25-PHY-201	Statistical Mechanics	4+0+0=04	04	3 hours	30	70	100
CC-7	M25-PHY-202	Quantum Mechanics - II	4+0+0=04	04	3 hours	30	70	100
CC-8	M25-PHY-203	Atomic & Molecular Physics -I	4+0+0=04	04	3 hours	30	70	100
CC-9	M25-PHY-204	Electrodynamics and Wave Guides	4+0+0=04	04	3 hours	30	70	100
CC-10	M25-PHY-205	Physics Lab-III	0+0+8=08	04	3 hours	30	70	100
DSC-2	M25-PHY-206	Physics Lab-IV	0+0+8=08	04	3 hours	30	70	100
SEC-I	M25-PHY-207	Introduction to Origin Lab	0+0+4=04	02	2 hours	15	35	50
Internship	M25-PHY-208	An internship course of 4 Credits of 4-6 weeks duration during summer vacation after 2nd semester is to be completed by every student. Internship can be either for enhancing the employability or for developing the research aptitude.		04		100	00	100

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Semester - III

Course Type	Code	Nomenclature	Contact hours (L+T+P)	Credits	Duration of Exam	Examination Scheme		
						Internal Marks	External Marks	Total Marks
CC-11	M25-PHY- 301	Atomic & Molecular Physics –II	4+0+0=04	04	3 hours	30	70	100
CC-12	M25-PHY-302	Solid State Physics	4+0+0=04	04	3 hours	30	70	100
DSC-3	M25-PHY-303	Electronics - I	4+0+0=04	04	3 hours	30	70	100
DSC-4	M25-PHY-304	Computational Physics –I	4+0+0=04	04	3 hours	30	70	100
DSC-5	M25-PHY-305	Electronics Lab-I	0+0+8=8	04	3 hours	30	70	100
PC-1	M25-PHY-306	Computational Physics Lab-I	0+0+8=08	04	3 hours	30	70	100
OEC*				02				50

Note: *Students of the department of physics opt this paper from the pool adopt by the university.

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Effective from Session 2025-26
Semester - IV

Course Type	Code	Nomenclature	Contact hours (L+T+P)	Credit	Duration of Exam	Examination Scheme		
						Internal Marks	External Marks	Total Marks
CC-13	M25-PHY-401	Nuclear & Particle Physics	4+0+0=04	04	3 hours	30	70	100
CC-14	M25-PHY-402	Physics of Nano-materials	4+0+0=04	04	3 hours	30	70	100
DSC-6	M25-PHY-403	Electronics - II	4+0+0=04	04	3 hours	30	70	100
DSC-7	M25-PHY-404	Computational Physics –II	4+0+0=04	04	3 hours	30	70	100
DSC-8	M25-PHY-405	Electronics Lab-II	0+0+8=8	04	3 hours	30	70	100
PC-2	M25-PHY-406	Computational Physics Lab -II	0+0+8=08	04	3 hours	30	70	100
SEC-II	M25-PHY-407	Python Lab	0+0+4=4	02	2 hours	15	35	50

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B.P.S. Mahila Vishwavidyalaya, Khanpur Kalan, Sonepat (Haryana)
M.Sc. Physics
According to NEP guidelines
Scheme of Examination for the students who opt for research project
(For university teaching department and affiliated colleges/ Institute)
Effective from Session 2025-26
Semester - IV

Course Type	Code	Nomenclature	Contact hours (L+T+P)	Credits	Duration of Exam 3 hours	Examination Scheme		
						Internal Marks	External Marks	Total Marks
DSC-6	M25-PHY-403	Electronics - II	4+0+0=04	04	3 hours	30	70	100
DSC-7	M25-PHY-404	Computational Physics –II	4+0+0=04	04	3 hours	30	70	100
DSC-8	M25-PHY-405	Electronics Lab -II	0+0+8=8	04	3 hours	30	70	100
SEC-II	M25-PHY-406	Python Lab	0+0+4=4	02	2 hours	15	35	50
Project	M25-PHY-408	Research Project	0+0+0=0	12	3 hours	00	300	300

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Semester – IV

Course opted	Code	Nomenclature	Contact hours (L+T+P)	Credits	Duration of Exam 3 hours	Examination Scheme		
						Internal Marks	External Marks	Total Marks
CC-13	M25-PHY-401	Nuclear & Particle Physics	4+0+0=04	04	3 hours	30	70	100
CC-14	M25-PHY-402	Physics of Nano-materials	4+0+0=04	04	3 hours	30	70	100
DCS-6	M25-PHY-403	Electronics - II	4+0+0=04	04	3 hours	30	70	100
SEC-II	M25-PHY-406	Python Lab	0+0+4=4	02	3 hours	15	35	50
Project	M25-PHY-407	Research Project	0+0+0=0	12	3 hours	00	300	300

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Program: The Program Specific Outcomes of the course M.Sc. Physics

Learning Outcomes

1 The students would be able to realize various applications with proper understanding of linear vector space and matrices, differential equations, special functions, series expansion and integral transforms. The students are enabled to understand the motion of a mechanical system using Lagrange and Hamilton formalisms, concept of central force motion and moving co-ordinate systems and theory of small oscillations.

2 The students would be able to understand the concepts of Quantum mechanics and capable to solve problems such as hydrogen atom, determination of the energies and wave functions of first and second order. The students would be able to explain ground state of hydrogen and helium molecules and analyse various transitions and their selection rules.

3 The students would be able to explain basic physics and application of different types of electronic devices, familiarization with integrated circuit fabrication technology, design of switching circuits and to seek career in advance research.

4 The students would be able to apply ensemble theory to complex problems, analyze the peculiar gas behaviour and explore the applications of Ising Model and different approximations.

5 Analysis of effect of doping in semiconductor materials, carrier concentration and mobility, fabrication of various active & passive circuit components and metal semiconductor junctions, devices in the microwave region and related applications. In addition, the student will be able to differentiate between different lattice types, explain motion of electron in periodic lattice, understand lattice vibrations in solids and explain various types of magnetic phenomena and possible applications.

6 The student will be able to explain Raman effect and different types of Raman spectra, Electronic spectra and electronic bands using Born Oppenheimer approximation and Frank Condon principle and origin of x-rays and different types of x-rays alongwith emission and absorption spectra. The students would be able to appreciate NMR, ESR and Mossbauer spectroscopy and related applications in the field of spectroscopy/material science/ lasers.

7 Understanding the nature of a specific numerical problem, designing programs in different languages, new necessary basic knowledge of various web enabling languages like Matlab, Progrmming in C and Python to acquire a vision for use of computer in research prospective.

8 The students will be able to implement Boolean expressions, design basic building blocks of ICs for different operations and develop building blockes for ICs using MOSFET. The students will be able to understand the fabrication process of solar cells, photodiodes, PMT's etc. and realize operational amplifier and related applications such as comparator, A/D & D/A convertor, oscillators etc.

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Learning Specific Outcomes:-

- Understanding the fundamental of Physics and capability of developing ideas based on them.
- Inculcate reasoning.
- Prepare and motivate students for research studies in Physics and related fields.
- Provide knowledge of a wide range of experimental techniques.
- Provide advanced knowledge on various topics in Physics, empowering the students to pursue higher degrees at reputed academic institutions.
- Strong foundation on electronics basics which have strong links and application in real world.
- Good Understanding of computational methods which can be used in modern programming of different problems.
- Nurture problem solving skills, thinking, creativity through assignments, project work and seminar. Assist students in preparing (personal guidance, books) for competitive exams e. g. NET, Gate, etc.

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M.Sc. Physics Semester-I

Mathematical Physics: M25-PHY-101 (CC-1)

Theory Marks: 70
Internal Assessment Marks: 30
Total Marks: 100
Time: 3 Hours

COURSE OUTCOMES

1 The students would get sufficient exposure /understanding of the complex variables and applications of matrices to physical problems

2 The students would be able to solve problems based on differential equations

3 The analysis of special functions would equip a student for effective tackling of specific problems.

4 The students would be able to realize various applications with proper understanding of series expansion and integral transforms

Unit -I

Complex variables: Analyticity and Cauchy-Riemann Conditions, Cauchy's integral theorem and formula, Taylor's series and Laurent's series expansion, Cauchy's residue theorem, Singular points and evaluation of residues, Jordan's Lemma, Evaluation of infinite integrals using Cauchy's residue theorem and Jordan's Lemma; Linear operators.

Matrices: Cayley-Hamiltion Theorem, Inverse of matrix, Orthogonal, Unitary and Hermitian matrices, Eigen values and eigenvectors of matrices, Similarity transformation, Matrix diagonalization, Simultaneous diagonalization and commutativity.

Unit –II

Second order linear differential equation with variable coefficients, ordinary point, singular point, series solution around an ordinary point, series solution around a regular singular point; the method of Frobenius, Wronskian and getting a second solution, Solution of Legendre's equation, Solution of Bessel's equation, Solutions of Laguarre and Hermite's equations.

Unit –III

Special functions, Generating functions for Bessel function of integral order Jn(x), Recurrence relations, Integral representation; Legendre polynomials Pn(x), Generating functions for Pn(x), Recurrence relations, orthogonality, Rodrigue's Relation; Hermite Polynomials; Generating functions, Rodrigue's relation & orthogonality for Hermite polynomials; Laguerre polynomials; Generating function and Recurrence relations, Orthogonality, Rodrigue's Relation, The Gamma Function, The Dirac – Delta Function.

Unit -IV

Integral transform, Laplace transform, Properties of Laplace transforms such as first and second shifting property, Laplace Transform of Periodic Functions, Laplace transform of derivatives, Laplace Transform of integrals, Inverse Laplace Transform by partial fractions method, Fourier series, Evaluation of coefficients of Fourier series Cosine and Sine series, Applications of Fourier Series, Fourier Transforms, Fourier sine and cosine Transforms, Fourier transform of derivatives, Applications of Fourier Transforms.

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Note: The syllabus is divided into four units. Nine questions will be set in all. Question No.1 will be compulsory having four parts covering the whole syllabus. In addition there will be two questions from each unit and the student is to answer one question from each unit.

Text and Reference Books:

1. Mathematical Physics by B. S. Rajput
2. Matrices and Tensors for Physicists by A. W Joshi
3. Mathematical Physics by Mathews and Walkers
4. Mathematics for Physicists by Mary L Boas
5. Mathematical Methods for Physicists (6th edition) by Arfken and Weber
6. Mathematical Physics by H K Dass
7. Mathematical Physics by P.K. Chattopadhyay (T)

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M.Sc. Physics Semester-I

Classical Mechanics: M25-PHY-102 (CC-2)

Theory Marks: 70

Internal Assessment Marks: 30

Time: 3 Hours

COURSE OUTCOMES

1. Student would be able to describe and understand the motion of a mechanical system using Lagrange and Hamilton formalisms.
2. Students would become able to understand the concepts of central force motion and moving co-ordinate systems.
3. Students would become able to understand Variational principle and Hamilton-Jacobi theory.
4. Student would get basic ideas about the theory of small oscillations and use of poisson's bracket which will lead to understand the concepts of quantum mechanics.

Unit I

Newton's law of motion, Mechanics of a system of particles, Degrees of freedom, Constraints, Generalized coordinates, Principle of virtual work, D'Alembert's principle and Lagrange's equations of motion, some applications of Lagragian formulation, Velocity dependent potentials and dissipation function, motion of a charged particle in electromagnetic field, Hamilton's principle, derivation of Lagrange's equations from the Hamilton's principle, Generalized momentum and cyclic coordinates, Conservation theorems.

Unit II

Hamilton's equations, two body problem, Central force; definition and characteristics; general analysis of orbits; closure and stability of circular orbits; Kepler's laws and equations; artificial satellites; Rutherford scattering.

Unit III

Variational Principle, Hamilton's and Lagrange's Equation of motion from Variational principle; Principle of least action; variation and end points; Hamilton-Jacobi theory: Hamilton's characteristic functions; Hamilton-Jacobi equation, use of H-J method for the solution of harmonic oscillator problem.

Unit IV

Small Oscillations and Canonical Transformations: Canonical transformation; generating functions, properties of Poisson bracket, angular momentum, Poisson brackets; Theory of small oscillations: Eigen value equation and its solution, Small oscillations in normal modes, Examples of coupled oscillators: Two coupled pendulums and double pendulum.

Note: The syllabus is divided into four units. Nine questions will be set in all. Question No.1 will be compulsory having four parts covering the whole syllabus. In addition there will be two questions from each unit and the student is to answer one question from each unit.

Text and Reference Books

1. Classical Mechanics by N C Rana and P S Joag (Tata McGraw Hill, 1991)
2. Classical Mechanics by H Goldstein (Addison Wesley, 1980)
3. Mechanics by A. Sommerfeld (Academic Press, 1952)
4. Introduction to Dynamics by I Perceival and D Richards (Cambridge Univ. Press, 1982)
5. Classical Mechanics by J.C. Upadhayaya

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M.Sc Physics Semester I

Quantum Mechanics-I – M25-PHY-103 (CC-3)

Theory Marks: 70
Internal Assessment Marks: 30
Total Marks: 100
Time: 3 Hours

COURSE OUTCOMES

1 Student would be able to understand the concepts of operators in Quantum mechanics.

2 Students would be able to apply Pauli spin matrices to explain angular momentum.

3 Students would be capable to solve problems such as hydrogen atom.

4 Students can determine energies and wave functions of first and second order using Perturbation Theory

Unit I

General formalism of Quantum Mechanics: States and operators; Representation of States and dynamical variables; Linear vector space; Bra Ket notation, Linear operators; Orthonormal set of vectors, Completeness relation; Hermitian operators, their eigenvalues and eigenvectors, The fundamental commutation relation; Commutation rule and the uncertainty relation; Simultaneous eigenstates of commuting operators; The unitary transformation; Dirac delta function; Relation between kets and wave functions; Matrix representation of operators; Solution of linear harmonic oscillator problem by operator methods.

Unit II

Angular momentum operator: Angular momentum operators and their representation in spherical polar co-ordinates; Eigenvalues and eigenvectors of L2 , spherical harmonics; Commutation relations among Lx Ly Lz ; Rotational symmetry and conservation of angular momentum; Eigenvalues of J^2 and Jz and their matrix representation; Pauli spin matrices; Addition of angular momentum.

Unit III

Solution of Schrodinger equation for three dimensional problems: The three-dimensional harmonic oscillator in both cartesian and spherical polar coordinates, eigenvalues, eigenfunctions and the degeneracy of the states; Solution of the hydrogen atom problem, the eigenvalues, eigenfunctions and the degeneracy.

Unit IV

Perturbation Theory: Time independent perturbation theory; non-degenerate case, the energies and wave functions in first order the energy in second order; Anharmonic perturbations of the form $x\lambda$, $x\lambda^3$ and x^4; Degenerate perturbation theory; Stark effect of the first excited state of hydrogen.

Note: The syllabus is divided into four units. Nine questions will be set in all. Question No.1 will be compulsory having four to eight parts covering the whole syllabus. In addition, there will be two questions from each unit and the student is to answer one question from each unit.

Text and Reference Books:

1. Quantum Mechanics by Ghatak and Loknathan
2. Quantum Mechanics by Powell and Craseman
3. Quantum Mechanics by S. Gasiorowicz
4. Quantum Mechanics by A.P. Messiah
5. Modern Quantum Mechanics by J.J. Sakurai
6. Quantum Mechanics by L.I.Schiff
7. Quantum Mechanics by Mathews and Venkatesan

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M.Sc. Physics Semester-I

Physics of Electronic Devices- M25-PHY-104 (CC-4)

Theory Marks: 70
Internal Assessment Marks: 30
Total Marks: 100
Time: 3 Hours

COURSE OUTCOMES

1 Students would be able to explain the basic physics and application of different transistor types.
2 Students would be able to appreciate the functioning and applications of various optoelectronic and memory devices.
3 Students having familiarization with negative resistance devices and will be in a position to design switching circuits involving these device.

Unit I

Charge Carriers in Semiconductors: Energy Bands: Metals, Semiconductors and Insulators, Direct and Indirect Band Gap Semiconductors, Electrons and Holes, Effective mass, Intrinsic and Extrinsic Semiconductors, Concept of Fermi Level, Electron and Hole Concentration at Equilibrium, Temperature Dependence of Carrier Concentrations, Compensation and Space Charge Neutrality, Conductivity and Mobility, Effect of Temperature and Doping on Mobility.

Unit II

P-N Junction Diode, Transistors: Bipolar junction Transistor (BJT) Transistor operating modes, Transistor action, Transistor biasing configurations and characteristics, The Ebers-Moll model, Field Effect Transistors: Junction Field Effect Transistor (JFET), Metal Oxide Semi-Conductor Field Effect Transistor(MOSFET), FET Parameter.

Unit III

Optoelectronic Devices: Vacuum Photodiode, Photo-Multipliers, Micro-channels, Zener Diode, Power Diode, P-N Junction Photodiode, PIN Photodiode, Avalanche Photodiode, Phototransistor, Solar Cell, Varactor Diode, Light Emitting Diode (LED)

Unit IV

Negative Resistance devices: Tunnel Diode, Backward Diode, Uni-junction Transistor, p-n-p-n devices, p-n-p-n characteristics Thyristor, Silicon Controlled Switch, SCR. AC/DC converters: Half wave & full wave rectifier, clamping circuits, clipping circuit, Characteristics. Switching circuit: Monostable, Bistable and Astable.

Note: The syllabus is divided into four units. Nine questions will be set in all. Question No.1 will be compulsory having four to eight parts covering the whole syllabus. In addition there will be two questions from each unit and the student is to answer one question from each unit.

Text & Reference Books

1. Semiconductor Devices - Physics and Technology by S.M. Sze (Wiley).
2. Solid State Electronic Devices by Ben G. Streetman (PHI).
3. Semiconductor Physics and Devices by Donald A Neamen (Tata-McGraw Hill).
4. Integrated Electronics by J. Millman and C.C. Halkias (Tata-McGraw Hill).
5. Semiconductor Devices by Kanaan Kano (PHI).
6. Semiconductor Optoelectronic Devices by Pallab Bhattacharya (Pearson)
7. Semiconductor Device Fundamentals by Robert F Pierret (Addison-Wesley).
8. Electronic Devices and Circuit Theory by Robert L. Boylestad (Pearson)

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M.Sc. Physics Semester-I

Physics Lab-I- M25-PHY-105 (CC-5)

External Practical Marks: 70
Internal Assessment Marks: 30
Total Marks: 100
Time: 3 Hours

COURSE OUTCOMES

1 Students would be able to determine specific charge of an electron and understand helical path of electron in electromagnetic field.
2 To find the capacitance of a capacitor.
3 Students would be able to calculate band gap energy of semiconductors and will understand its dependence on temperature
4 Students would be able to understand the plateau characteristics of G.M. counter and its applications.

[1] Measurement of resistivity of a semiconductor by four probe method at different temperatures
[2] Measurement of Hall coefficient of given semiconductor: Identification of type of semiconductor and estimation of charge carrier concentration.
[3] To study Faraday effect using He-Ne Laser.
[4] Ultrasonic Interferometer for liquids
[5] Experiment with microwaves (microwave training kit, basic version)
[6] To determine the capacitance of a parallel plate Capacitor using Capacitance and permittivity kit
[7] To determine the curie temperature of Ferrites
[8] To verify V-I characteristics of a Semiconductor.
[9] To study the characteristics (illumination, I-V, Power-load, Areal and Spectral characteristics) of a Photovoltaic cell
[10] To determine the band gap of Ge Crystal.
[11] To measure the numerical aperture (NA) of optical fiber
[12] To study the plateau characteristics of G.M counter and to find the absorption co-efficient of Al-foil.
[13] To determine the value of e/m i.e. specific charge for an electron by Helical Method.
[14] To find Flashing and Quenching voltage of Neon gas and determine the capacitance of a unknown capacitor.

Note: Out of the list as above, a student has to perform at least 08 (eight) practical's in the semester

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M.Sc. Physics Semester-I
Physics Lab-II - M25-PHY-106 (DSC-1)

External Practical Marks: 70
Internal Assessment Marks: 30
Total Marks: 100
Time: 3 Hours

COURSE OUTCOMES

1 The students would get hands on experience on experiments and relation to theory
2 Theoretical results for different networks matched with experiments would enable students for complex circuits
3 The students would get equipped for applications based on solid state devices
4 The students would be able to differentiate between analog and digital electronics

[1] Design/study of a Regulated Power Supply.
[2] Design of a Common Emitter Transistor Amplifier.
[3] Transistor Biasing and Stability.
[4] To study the frequency response of a single state negative feedback amplification for various feedback circuit. Negative Feedback (voltage series/shunt and current series/shunt)
[5] To study rectifier and filter circuits and draw wave shapes.
[6] Characteristics and applications of Silicon Controller Rectifier.
[7] To study the characteristics of a junction transition and determination of FET parameters.
[8] FET and MOSFET characterization and application as an amplifier.
[9] Uni-junction Transistor and its application.
[10] Bridge Rectifier using SCR with DC and AC Gate.
[11] To determine high resistance by leakage using a transistor.
[12] To draw characteristics of opto-electronic devices.

Note: Out of the list as above, a student has to perform atleast 08 (eight) practicals in the semester.

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M.Sc. Physics Semester-I

Constitutional, Human and Moral Values and IPR- M25-PHY-107 (VAC)

Theory Marks: 35
Internal Assessment Marks: 15
Total Marks: 50
Time: 2 Hours

COURSE OUTCOMES

1 Learn the different Constitutional Values, Fundamental rights and duties enshrined in the India Constitution.

2 Understand concepts of Intellectual Property Rights, Copyright, Patent, Trademark etc., and about threats of Plagiarism.

UNIT-I

Constitutional Values: Historical Perspective of Indian Constitution; Basic Values enshrined in the Preamble of the Indian Constitution; Concept of Constitutional Morality; Patriotic Values and Ingredients Nation Building; Fundamental Rights and Duties ; Directive Principles of the State Policy.
Humanistic Values: Humanism, Human Virtues and Civic Sense; Social Responsibilities of Human Beings; Ethical ways to deal with human aspirations.

UNIT-II

Intellectual Property Rights: Meaning, Origins and Nature of Intellectual Property Rights (IPRs); Different Kinds of IPRs – Copyright, Patent, Trademark, Trade Secret/Dress, Design, Traditional Knowledge; Infringement and Offences of IPRs – Remedies and Penalties; Basics of Plagiarism policy of UGC.

Note: The syllabus is divided into two units. Five questions will be set in all. Question No.1 will be compulsory having three to five parts covering the whole syllabus. In addition there will be two questions from each unit and the student has to answer one question from each unit.

Text and Reference Books:

1.Ahuja, V K. (2017). *Law relating to Intellectual Property Rights*, India, IN: Lexis Nexis.
2. Neeraj, P., &Khusdeep, D. (2014). *Intellectual Property Rights*, India, IN: PHI learning Private Limited.
3. Basu, D.D., *Introduction to the Constitution of India* (Students Edition) Prentice Hall of India Pvt. Ltd., New Delhi, 20th ed., 2008.
4. Dhar, P.L. & R.R. Gaur, *Science and Humanism*, Commonwealth Publishers, New Delhi, 1990.
5. Govindarajan, M., S. Natarajan, V.S. Sendilkumar (eds.), *Engineering Ethics (Including Human Values)*, Prentice Hall of India Private Ltd, New Delhi, 2004.
6. Illich, Ivan, *Energy & Equity*, Trinity Press, Worcester, 1974.

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M.Sc. Physics Semester-II

Statistical Mechanics: M25-PHY-201 (CC-6)

Theory Marks: 70
Internal Assessment Marks: 30
Total Marks: 100
Time: 3 Hours

COURSE OUTCOMES

1 The students are able to appreciate cellular nature of phase space and interface of Statistical Mechanics with Thermodynamics

2 Knowledge of ensemble theory would result in greater insight into solutions of various complex problems

3 The students would be able to analyze the peculiar gas behavior and are in a position to extend the treatment to complex problems

4 The students would be equipped to explore the applications of Using Model and to understand different approximations

UNIT- I

The Statistical Basis of Thermodynamics: The macroscopic and microscopic states, contact between statistics and thermodynamics, classical ideal gas, Gibbs paradox and its solution; Elements of Ensemble Theory: Phase space and Liouville's Theorem, The micro canonical ensemble theory and its application to ideal gas of monatomic particles, Equipartition and virial theorems, canonical ensemble and its thermodynamics, partition function, classical ideal gas in canonical ensemble theory, energy fluctuations.

UNIT- II

The grand canonical ensemble: Equilibrium between a system and a particle-energy reservoir and significance of statistical quantities, Classical ideal gas in grand canonical ensemble theory. Density and energy fluctuations; Elements of Quantum Statistics: Quantum states and phase space, quantum statistics of various ensembles, An ideal gas in quantum mechanical ensembles, statistics of occupation numbers.

UNIT- III

Ideal Bose Systems: Basic concepts and thermodynamic behavior of an ideal Bose gas, Bose Einstein condensation, Laser cooling of atom as an example of Bose Condensate, Discussion of gas of photons (the radiation fields) and phonons (The Debye field), Planck's Radiation formula (Black body radiation); Ideal Fermi Systems: Thermodynamic behavior of an ideal Fermi gas, discussion of heat capacity of a free-electron gas at low temperatures, Pauli paramagnetism.

UNIT- IV

Elements of Phase Transitions: First- and second-order phase transitions (Introduction), Diamagnetism, paramagnetism, and ferromagnetism. a dynamical model of phase transitions, Ising Model, Fluctuations: Thermodynamic Fluctuations, random walk and Brownian motion, introduction to non-equilibrium processes, diffusion equation.

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Note: The syllabus is divided into four units. Nine questions will be set in all. Question No.1 will be compulsory having four parts covering the whole syllabus. In addition there will be two questions from each unit and the student is to answer one question from each unit.

Text and Reference Books:

1. Statistical Mechanics by R.K. Pathria (Butterworth-Heinemann, Oxford)
2. Statistical Mechanics by K. Huang (Wiley Eastern, New Delhi)
3. Statistical Mechanics by B.K. Agarwal and M. Eisner (Wiley Eastern, New Delhi)
4. Elementary Statistical Physics by C. Kittel (Wiley, New York)
5. Statistical Mechanics by S.K. Sinha (Tata McGraw Hill, New Delhi)
6. Statistical Mechanics by Gupta and Kumar
7. Statistical and Thermal Physics by F. Reif.

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M.Sc.Physics Semester II
Quantum Mechanics–II – M25-PHY-202 (CC-7)

Theory Marks: 70
Internal Assessment Marks: 30
Total Marks: 100
Time: 3 Hours

COURSE OUTCOMES

1 Students would be able to explain ground state of hydrogen and helium molecules.
2 Students get enabled to analyze various transitions and their selection rules.
3 Students would be capable to understand 3D collisions.
4 Students would be capable to calculate spin states of identical particles.

UNIT- I

Variational methods: Ground state of Helium by both variational and perturbation methods; The hydrogen molecule; WKB approximation; Time dependent perturbation theory; Constant perturbation; Harmonic perturbation; Fermi's golden rule; Adiabatic and sudden approximation.

UNIT- II

Semi-classical theory of radiation: Transition probability for absorption and induced emission; Electric dipole transition and selection rules; Magnetic dipole transitions; Forbidden transitions; Higher order transitions; Einstein's coefficients.

UNIT- III

Collision in 3D and scattering: Laboratory and C.M. reference frames; scattering amplitude; Differential scattering cross section and total scattering cross section; The optical theorem; Scattering by spherically symmetric potentials; Partial waves and phase shifts; Scattering by a perfectly rigid sphere and by square well potential; The Born approximation.

UNIT- IV

Identical particles: The principle of indistinguishibility; Symmetric and antisymmetric wave functions; Spin and statistics of identical particles; The Slater determinant; The Pauli exclusion principle; Spin states of a two electron system; States of the helium atom; Collision of identical particles.

Note: The syllabus is divided into four units. Nine questions will be set in all. Question No.1 will be compulsory having four to eight parts covering the whole syllabus. In addition there will be two questions from each unit and the student is to answer one question from each unit.

Text and Reference Books:

1. Quantum Mechanics by Ghatak and Loknathan
2. Quantum Mechanics by Powell and Crassman
3. Quantum Mechanics by S. Gasiorowicz
4. Quantum Mechanics by A.P. Messiah
5. Modern Quantum Mechanics by J.J. Sakurai
6. Quantum Mechanics by L.I. Schiff
7. Quantum Mechanics by Mathews and Venkatensan.

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Khanpur Kalan, Sonipat (Haryana)

M.Sc Physics Semester II

Atomic and Molecular Physics-I M25-PHY-203 (CC-8)

Theory Marks: 70
Internal Assessment Marks: 30
Total Marks: 100
Time: 3 Hours

COURSE OUTCOMES

The student will be expected to be able to explain:

1 Atomic spectra of one and two electron atoms.

2 The change in behavior of atoms in external applied electric and magnetic field.

3 Diatomic molecules and their rotational vibrational and rotational vibrational spectra.

UNIT- I

One Electron systems and Pauli principle: Quantum states of one electron atoms, atomic orbitals, Hydrogen spectrum, Pauli principle, spectra of alkali elements, spin orbit interaction and fine structure in alkali spectra, Spectra of two electron systems, equivalent and non-equivalent electrons.

UNIT- II

The influence of external fields, Two electron system Hyperfine structure and Line broadening: Normal and anomalous Zeeman effect, Paschen Back effect, Stark effect, Two electron systems , interaction energy in LS and jj coupling, Hyperfine structure (magnetic and electric, only qualitative).

UNIT- III

Diatomic molecules and their rotational spectra: Types of molecules, Diatomic linear symmetric top, asymmetric top and spherical top molecules, Rotational spectra of diatomic molecules as a rigid rotator, energy levels and spectra of non-rigid rotor, intensity of rotational lines.

UNIT- IV

Vibrational and Rotational Vibration spectra of Diatomic molecules: Vibrational energy of diatomic molecule, Diatomic molecules as a simple harmonic oscillator, Energy levels and spectrum, Morse potential energy curve, Molecules as vibrating rotator, vibration spectrum of diatomic molecules, PQR Branches.

Note: The syllabus is divided into four units. Nine questions will be set in all. Question No.1 will be compulsory having four to eight parts covering the whole syllabus. In addition there will be two questions from each unit and the student is to answer one question from each unit.

Text and Reference Books:

1. Introduction to Atomic and Molecular Spectroscopy by V.K. Jain
2. Introduction to Atomic spectra by H.E. White
3. Fundamentals of molecular spectroscopy by C.B. Banwell
4. Spectroscopy Vol I and II by Walker and Straughen
5. Introduction to Molecular spectroscopy by G. M. Barrow
6. Spectra of diatomic molecules by Herzberg
7. Molecular spectroscopy by Jeanne. L. McHale
8. Modern spectroscopy by J.M. Holias
9. Atomic and Molecular Spectra by Raj Kumar

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Khanpur Kalan, Sonipat (Haryana)

M.Sc Physics Semester II

Electrodynamics and Wave Guides M25-PHY-204 (CC-9)

Theory Marks: 70
Internal Assessment Marks: 30
Total Marks: 100
Time: 3 Hours

COURSE OUTCOMES

1 Student would be able to formulate and solve electrodynamic problems in relativistic covariant form in four dimensional space.

2 Student would gain the knowledge about electrostatic and magnetic fields produced by static and moving charges in a variety of simple configurations.

3 Student would be able to analyze the basics of theory of transmission lines and waveguides.

4 Student would be able to find angular distribution of power radiated.

UNIT- I

Review of four-vector and Lorentz transformation in four dimensional space; Conservation of charge and four current density; Electromagnetic field tensor in four dimensions and Maxwell's equations; Lorentz invariants of electromagnetic fields; Dual field tensor; Transformation of electric and magnetic field vectors; Covariance of force equation.

UNIT- II

Radiating systems: Field and radiation of a localized source; Oscillating electric dipole; Centre fed linear antenna; Lienard-Wiechert potential ; Electric and magnetic fields due to a uniformly moving charge and accelerated charge; Linear and circular acceleration and angular distribution of power radiated.

UNIT- III

Radiative reaction force; Scattering and absorption of radiation; Thompson scattering and Rayleigh scattering; Normal and anomalous dispersion; Ionoshere; Propagation of electromagnetic wave through ionosphere; Reflection of electromagnetic waves by ionosphere; Motion of charged particles in uniform E and B fields; Time varying fields.

UNIT- IV

Wave guides; Modes in a rectangular wave guide; Attenuation in wave guides; Dielectric wave guides; Circuit representation of parallel plate transmission lines; Transmission line equations and their solutions; Characteristic impedance and propagation coefficient; Low loss radio frequency and UHF transmission lines.

Note: The syllabus is divided into four units. Nine questions will be set in all. Question No.1 will be compulsory having four to eight parts covering the whole syllabus. In addition there will be two questions from each unit and the student is to answer one question from each unit.

Text and Reference Books

1. Classical Electrodynamics by J.D. Jackson
2. Introduction to Electrodynamics by D.J. Griffiths
3. Electromagnetic by B.B. Laud
4. Classical Electricity and Magnetism by Panofsky and Phillips
5. Fundamentals of Electromagnetics by M.A. WazedMiah

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M.Sc. Physics Semester II
Physics Lab-III M25-PHY-205 (CC-10)

External Practical Marks: 70
Internal Assessment Marks: 30
Total Marks: 100
Time: 3Hours

COURSE OUTCOMES

1 Characterize the semiconductor materials by determining resistivity, band gap, mobility, and carrier type.
2 Understand phase transitions in ferroelectric materials and find the ferroelectric curie temperature.
3 Analyze the experimental data of powder diffraction in terms of indexing of peaks coming from different crystal planes and lattice parameters.
4 Find the magnetic susceptibility and energy loss/volume/cycle in ferromagnetic materials.

[1] To determine the Dielectric constant of polar and non-polar liquids
[2] Determination of Ionization Potential of mercury
[3] To determine the Magnetic susceptibility of a solid sample.
[4] To study B-H curve of a given ferrite sample and find energy loss in case of ferrite Core.
[5] Determination of e/m of electron by Helical method.
[6] Stefan's constant by the black copper radiation plates (Electrical Method).
[7] To determine the heat capacity of solids
[8] To verify the existence of different harmonics and measure their relative amplitudes using Fourier Analysis kit
[9] To study of dielectric constant as a function of temperature and determine the Curie temperature
[10] To determine the Dielectric Constant of different solid samples
[11] Study of lead tin phase diagram
[12] To determine Boltzmann Constant (k) make use of the black body Radiation.
[13] To determine Planck's Constant (h) by measuring the voltage drop across light-emitting diodes (LEDs) of different colors
[14] To determine the value of energy levels using Frank-Hertz experiment
[15] Dissociation Energy of I2 molecule

Note: Out of the list as above, a student has to perform at least 08 (eight) practicals in the semester

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M.Sc. Physics Semester-II
Physics Lab-IV M25-PHY-206 (DSC-2)

External Practical Marks: 70
Internal Assessment Marks: 30
Total Marks: 100
Time: 3 Hours

COURSE OUTCOMES

1 Students would be able to draw diode characteristics
2 Students would be able to understand ESR spectrometer
3 Students get familiarized with hysteresis loop.
4 Students would be able to understand different components in Low pass and high pass filter.

[1] To study the low pass, High Pass and Band Pass filters using active and passive elements.
[2] Study of the Dispersion relation for the "Monoatomic Lattice" and Comparison with theory using Lattice dynamic kit
[3] Study of Hybrid parameters of a Transistor
[4] Study of the Dispersion relation for the Di-atomic Lattice, Acoustical mode and Energy gap and Comparison with theory using Lattice dynamic kit
[5] To determine the wavelength of spectral lines using prism spectrometer.
[6] To determine the wavelength of white light using a diffraction grating.
[7] Characteristics of Photovoltaic cell.
[8] To calibrate the prism spectrometer with mercury vapor lamp and hence to find out the Cauchy's constant.
[9] To study the frequency response of a single state negative feedback amplification for various feedback circuit. Negative Feedback (voltage series/shunt and current series/shunt)
[10] Astable, Monostable and Bistable Multivibrater.
[11] Characteristics and applications of Silicon Controller Rectifier.
[12] Study of characteristics of Fiber Optic LED & Detector, Measurement of Numerical Aperture and Study of Frequency Modulation & Demodulation using Fiber Optic Link.
[13] Study of Diode Characteristics
[14] To determine magneto resistance of a Bismuth crystal as a function of magnetic field.
[15] To study hysteresis in the electrical polarization of a TGS crystal and measure the Curie temperature.

Note: Out of the list as above, a student has to perform atleast 08 (eight) practicals in the semester

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Khanpur Kalan, Sonipat (Haryana)

M.Sc. Physics Semester-II
Introduction to Origin: M25-PHY-207 (SEC-I)

Theory Marks: 35
Internal Assessment Marks: 15
Total Marks: 50
Time: 3 Hours

COURSE OUTCOMES

1. Introduce the fundamental features of Origin software
2. Provide hands-on experience in handling datasets and generating reports

UNIT I

Introduction to Origin Software: Overview of Origin software and its applications, Installing and setting up Origin, User interface and navigation, Importing data from Excel to origin, import text file in origin, to import txt csv file in origin , to import multiple ascii dat files in origin CSV, and other formats, Data organization in Origin, Data cleaning and preparation

UNIT II

Graphing and Statistical Tools: Creating basic plots (scatter, line, bar, etc.), Customizing graphs (axes, labels, legends), Advanced graphing techniques (contour plots, 3D surface plots), Changing the color and line style of plots in origin Basic statistical analysis (mean, median, standard deviation), Curve fitting and regression analysis, smooth charts and graphs in Origin deconvolute peaks and perform curve fitting (linear, polynomial, exponential decay, Gaussian distribution) in Origin FWHM vs. Integration Width Analysis in Origin.

Text & Reference Books:

1. URL http://www.originlab.com
2. Dr. Shahid Ali Yousafzai, OriginPro: Data Lpotting and Analysis-Udemy
3. https://www.youtube.com/channel/UCvmhJBxOCFE9Ehv137EJKtg.
4. Benenke, T. W., & Schwippert, W. W. (1997). Datenanalyse und praesentation mit Origin: Anwendungsbeispiele und loesngsvorschlaege aus der praxis. Bonn: Addison-Wesley-Longman
5. originlab.com/Support,originlab.com/Forum,originlab.com/Doc,originlab.com/Webinars
6. http://originlab.com/
7. 2024/11/21 Origin 2025: Slicer, Recent Origin Files browser, Time Series Pivot, Save local opju to cloud, connect to google sheet, Report Style, Graph Style, Notes window preview, New Dialog to build Summary Sheet

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Khanpur Kalan, Sonipat (Haryana)

M.Sc Physics Semester III

Atomic and Molecular Physics-II M25-PHY-301 (CC-11)

Theory Marks: 70
Internal Assessment Marks: 30
Total Marks: 100
Time: 3 Hours

COURSE OUTCOMES

1 The student will be expected to be able to explain NMR spectroscopy and Mossbauer spectroscopy.
2 The student will be expected to be able to explain ESR spectroscopy
2 The student will be expected to be able to understand the laser idea.
3 The student will be expected to be able to explain different types of Laser.

UNIT- I

NMR, The principle of NMR, NMR Spectrometer, Type of NMR, Type of Nuclei viewed from the standard point of NMR, high resolution and broad line NMR, relaxation mechanism, chemical shift, spin-spin coupling, Application of NMR Spectroscopy, Mossbauer spectroscopy, Mossbauer spectrometer, isomer nuclear transition, Resonance, fluorescence, Mossbauer effect, Mossbauer nuclei, Isomer shift, quadrupole splitting, Magnetic hyperfine structure, Application of Mossbauer spectroscopy

UNIT- II

ESR spectrometer, substances which can be studied by ESR, Resonance conditions, Description of ESR by precision, relaxation mechanism, features of ESR spectra(a) the g factor (b) fine structure (c) hyperfine structure (d) the ligand hyperfine structure, applications of ESR

UNIT- III

Spontaneous and stimulated emission, Absorption, Einstein coefficients, The LASER idea, Properties of LASER beams, Rate equations, methods of obtaining population inversion, LASER resonator.

UNIT- IV

He-Ne Laser, Nd: YAG Laser, Semiconductor Laser, CO_2 Laser, Nitrogen Laser, Dye Laser, Laser application: holography materials processing fusion reactions, Laser isotope separation.

Note: The syllabus is divided into four units. Nine questions will be set in all. Question No.1 will be compulsory having four parts covering the whole syllabus. In addition there will be two questions from each unit and the student is to answer one question from each unit.

Text and Reference Books:

1. Introduction to Atomic and Molecular Spectroscopy by V.K. Jain
2. Introduction to Atomic spectra by H.E. White
3. Fundamentals of molecular spectroscopy by C.B. Banwell
4. Spectroscopy Vol I and II by Walker and Straughen
5. Introduction to Molecular spectroscopy by G. M. Barrow
6. Spectra of diatomic molecules by Herzberg
7. Molecular spectroscopy by Jeann L. McHale
8. Molecular spectroscopy by J.M. Brown
9. Spectra of atoms and molecules by P. F. Bemath
10. Modern spectroscopy by J.M. Holias

17/7/25

Chairperson
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Khanpur Kalan, Sonipat (Haryana)

M.Sc. Physics Semester-III
Solid State Physics M25-PHY-302 (CC-12)

Theory Marks: 70
Internal Assessment Marks: 30
Total Marks: 100
Time: 3 Hours

COURSE OUTCOMES

The student will be expected to be able to:

1 Differentiate between different lattice types and explain the concept of reciprocal lattice and crystal diffraction using X-rays

2 Explain motion of electron in periodic lattice of solids under different binding conditions, concept of energy band and effect of same on electrical properties

3 Lattice vibrations in solids and identity different types of defects in crystals.

4 Explain various types of magnetic phenomenon, physics behind them and their possible applications.

UNIT- I

Crystalline solids: Basic of crystal structure, lattice, the basis, lattice translation, vectors, two and three dimensional Bravais lattice, Conventional units cells of NaCl, Diamond, CsCl structures, Reciprocal lattice. Interaction of x-rays with matter, absorption of x-rays, elastic scattering from a perfect lattice, the reciprocal lattice and its application to diffraction techniques Ewald's construction, the Laue, powder and rotating crystal methods, x-rays and electron microscopic techniques, atomic form factor, crystal structure factor and intensity of diffraction maxima. Crystal structure factors of bcc, fcc, monatomic diamond lattice

UNIT- II

Vibration of one dimensional mono and diatomic chains, phonon momentum, density of normal modes in one and three dimensions, quantization of lattice vibrations, measurement of phonon dispersion using elastic neutron scattering, Point defects, Frankel and Schottky defects, line defects and planer(stacking)faults, observation of imperfection in crystals.

UNIT- III

The Drude model: Assumptions, dc and ac conductivity of metals, thermal conductivity of metal; Lorentz modification of Drude model; the Fermi Dirac distribution function; The Sommerfeld model; the density of states, Free electron gas at 0K, Energy of electron gas at 0K, Electron heat capacity; Thermionic and Field enhanced emission from metals, Change of work function, The contact potential between two metals; The Hall effect and their applications, Basics of thermoelectric effects, types and their applications.

UNIT- IV

Electron in periodic lattice, Bloch theorem Kronig-Penny model and band theory, concept of brillouin zone classification of solids on the basic of band theory of solids, effective mass, weak-binding method and its application to linear lattice, tight-binding method and its application to cubic bcc and fcc crystals, concepts of holes, Fermi surface : construction of Fermi surface in two- dimension

Note: The syllabus is divided into four units. Nine questions will be set in all. Question No.1 will be compulsory having four to eight parts covering the whole syllabus. In addition there will be two questions from each unit and the student is to answer one question from each unit.

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Text and Reference Books:

1. Verma and Srivastava: Crystallography for Solid State Physics
2. Azaroff: Introduction to Solids
3. Omar: Elementary Solid State Physics
4. Aschroft&Mermin: Solid State Physics
5. Kittel: Solid State Physics
6. Chaikin and Lubensky: Principles of Condensed Matter Physics

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Khanpur Kalan, Sonipat (Haryana)

M.Sc. Physics Semester -III

Electronics – I M25-PHY-303 (DSC-3)

Theory Marks: 70
Internal Assessment Marks: 30
Total Marks: 100
Time: 3 Hours

COURSE OUTCOMES

1 Student would be able to understand various properties, types and application of op-amp.
2. Students would get familiar with various types of amplifier and their operating condition.
3. Students would be able to understand the basic principle and various types of oscillators.
4. Student would be able to understand frequency response of RC coupled, phase shift oscillator.

UNIT- I

AC load line, Transistor models and parameters, Equivalent circuits, Two-Port devices and Hybrid model, Transistor Hybrid model, Transistor h-parameters, Conversion for h-parameter for three Transistor Configurations, Analysis of a Transistor Amplifier Circuit for CE, CB, CC, Comparison of Transistor Amplifier Configurations, Linear Analysis of a Transistor Circuit, Miller's Theorem and its Dual.

UNIT- II

The amplifier pass band, couplings for multistage Amplifiers, classification of amplifiers, frequency response, RC coupled amplifier and its low frequency response.
Operating conditions for power amplifier, power relations ideals transformer, voltage limitations of transistor, non linear distortions, push pull principle, class B push-pull amplifier, phase inverter for push pull input.

UNIT- III

Differential amplifier, CMRR, circuit configuration, emitter coupled supplied with constant current, transfer characteristics, block diagram of Op. Amp. Off-set currents and voltages, PSRR, Slew rate, universal balancing techniques, Inverting and non-inverting amplifier, Basic Applications- summing, scaling, current to voltage and voltage to current signal conversion, differential dc amplifier, voltage follower, bridge amplifier, AC-coupled amplifier.

UNIT- IV

Op Amp- Integration, differentiation, analog computation, Butterworth active filters circuits, Comparators, Logarithmic amplifier, antilogarithmic amplifier, sample and hold circuits Digital to analog conversion –ladder and weighted resistor types, analog to digital conversion- counter type, regenerative comparator (Schemitt trigger), Basic principle of oscillators,: Feedback, Square wave generator, pulse generator, triangle wave generator. Sinusoidal oscillators using op-amp: Phase shift, Colpitts, Hartley and Wein Bridge oscillator.

Note: The syllabus is divided into four units. Nine questions will be set in all. Question No.1 will be compulsory having four to eight parts covering the whole syllabus. In addition there will be two questions from each unit and the student is to answer one question from each unit.

Text and Reference books:

1. Integrated Electronics by J. Millman and C.C. Halkias (Tata-McGraw Hill)
2. Fundamental of Electronics by J.D. Ryder (Prentice Hall Publication).
3. Electronics communication Systems by George Kennedy and Bernard George (McGraw Hill)
4. Linear Integrated Circuits by D.Roy Choudhury and Shail Jain (Wiley Eastern Ltd)
5. Solid State Electronic Devices by Ben G. Streetman ((Prentice Hall of India)
6. Electronic Devices and Circuit Theory by Robert L. Boylestad (Pearson).
7. Electronic Devices and Circuits, by David A. Bell (Oxford)

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Khanpur Kalan, Sonipat (Haryana)

M.Sc Physics Semester - III

Computational Physics – I M25-PHY-304 (DSC-4)

Theory Marks: 70
Internal Assessment Marks: 30
Total Marks: 100
Time: 3 Hours

COURSE OUTCOMES

1 Students would acquire a vision for use of computer in research prospective.
2 Students would be able to understand different numerical methods.
3 Students would be able to design C programs to solve numerical computationally.

UNIT- I

Interpolation: Finite differences; Interpolation with equally spaced points; Gregory - Newton's Interpolation formula for forward and backward interpolation; Interpolation with unequally spaced points: Lagrangian interpolation; Numerical Integration: Newton-cotes formulae: Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Numerical Differentiation: Derivatives of function using Newton forward and backward interpolation.

Numerical Solution of First Order Differential Equations: First order Taylor Series method; Euler's method; Runge-Kutta methods.

UNIT- II

Roots of Linear, Non-linear Algebraic and Transcendental equations: Bisection Method; Iterative method; Regula Falsi method; Newton-Raphson method and modified Newton Raphson method, Curve Fitting: Principle of least square, Solution of Simultaneous Linear Equations: Gaussian elimination method; Gauss- Jordan elimination method; Matrix inversion. Eigen values and Eigen vectors: Jacobi's method for symmetric matrix.

UNIT- III

Programming in C: Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language. Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes. Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity. Conditional Branching: Applying if and switch statements, nesting if and else, use of break and default with switch.

UNIT- IV

Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements. Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions. Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, Passing arrays to functions. Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation.

Note: The syllabus is divided into four units. Nine questions will be set in all. Question No.1 will be compulsory having four to eight parts covering the whole syllabus. In addition there will be two questions from each unit and the student is to answer one question from each unit.

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Text and Reference Books:

1. Sastry: Introductory methods of Numerical Analysis.
2. Rajaraman: Numerical Analysis.
3. C. Haribaskaran: Numerical Methods.
4. Ram Kumar: Programming with FORTRAN 77.
5. Press, Teukolsky, Vellering and Flannery: numerical Recipes in FORTRAN.
6. Desai: FORTRAN programming and Numerical methods.
7. Dorn and McCracken: Numerical Methods with FORTRAN IV case studies.
8. Mathew: Numerical methods for Mathematics, Science and Engineering.
9. Jain, Iyngar and Jain: Numerical methods for Scientific and Engineering Computation"

7/5/25

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M.Sc. Physics Semester-III

Electronics Lab-I M25-PHY-305 (DSC-5)

External Practical Marks: 70
Internal Assessment Marks: 30
Total Marks: 100
Time: 3Hours

COURSE OUTCOMES

1 Student would be able to understand various application of op-amp.
2. Students will get hand on experience on various rectifier and filter circuits.
3. Student would be able to understand Wein Bridge and Phase shift oscillator.
4. Student would be able to understand push pull amplifier and UJT.

[1] To study various applications of op-amp
[2] Frequency response of RC coupled Amplifier.
[3] Study of Emitter follower/Darlington Pair Amplifier
[4] To study the characteristics and frequency response of a Chopper Amplifier
[5] Wein Bridge and Phase shift oscillator.
[6] To study the frequency response of a two stages (a) Transformer coupled amplifier (b) Choke coupled amplifier.
[7] Addition, subtraction, multiplication & division using 8085/8086
[8] Transfer characteristics of TTL inverter and TTL trigger inverter with two digital volt meter
[9] To study network theorems.
[10] To study rectifier and filter circuit.
[11] To study the load characteristics of a class B push pull amplifier.
[12] To draw saw tooth waves using UJT and find its frequency.

Note: Out of the list as above, a student has to perform atleast 08 (eight) practicals in the semester

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M.Sc. Physics Semester III

Computational Physics Lab-I M25-PHY-306 (PC-1)

External Practical Marks: 70
Internal Assessment Marks: 30
Total Marks: 100
Time: 3 Hours

COURSE OUTCOMES

1 Students would develop understanding for programming concepts

2 Students would learn the practical implementation of programming languages for carrying numerical calculations.

3 Students would be benefited from their enhanced computational skills in context of higher studies in physics or business purposes as well.

List of programs using C

[1] Numerical Integration
[2] Least square fitting
[3] Numerical solutions of equations (single variable)
[4] Solution of H-atom problem
[5] Solution of RL circuits
[6] Numerical solution of simultaneous linear algebraic equations
[7] Numerical solution of ordinary differential equation
[8] Numerical Solution of second order ordinary differential equations
[9] Motion of Projectile thrown at an angle
[10] Simulation of Planetary Motion
[11] Charging and discharging of Capacitor
[12] Solution of LCR circuit

Note: Out of the list as above, a student has to perform atleast 08 (eight) practicals in the semester

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Khanpur Kalan, Sonipat (Haryana)

M.Sc. Physics Semester-IV

Nuclear and Particle Physics: M25-PHY-401 (CC-13)

Theory Marks: 70
Internal Assessment Marks: 30
Total Marks: 100
Time: 3 Hours

COURSE OUTCOMES

1. Students would be able to realize the nature of nuclear force.
2. Students would be able to understand the structure of nucleus and would be able to find out spin, parity, magnetic moments etc. of different nuclei.
3. Students would be able to understand different nuclear decays and reactions.
4. Students would gain a basic knowledge about Elementary Particles and their interactions.

UNIT- I

Basic characteristics of nucleus: Size, Density, Nuclear mass, Packing fraction, Binding energy, spin, parity, Angular momentum, Magnetic dipole moment, Electric quadrupole moment, Isospin, and Statistical properties of nucleus; Two nucleon problem: Common potentials used for calculation of nuclear forces viz. Wigner, Majorana, Bartlett and Heisenberg potentials, The ground state of deuteron, Qualitative features of Nucleon – nucleon scattering, Effective range theory in n – p scattering; Meson theory of nuclear force (Qualitative discussion)

UNIT- II

Types of nuclear reactions: compound and direct nuclear reactions, Reaction cross – section, Reaction cross - section in terms of partial wave treatment, Balance of mass and energy in nuclear reactions, Q-equation and its solution; Liquid drop model: Similarities between liquid drop and nucleus, semi-empirical mass formula, Bohr-Wheeler theory of fission, Merits and limitations of Liquid drop model; Shell model: Experiment evidences for shell effect, Magic numbers, Main assumptions of single particle shell model, Spin-orbit coupling in single particle shell model, Estimation of spin, parities and magnetic moments of nuclei by single particle shell model

UNIT- III

Nuclear Decays: Alpha (α) decay, α- disintegration energy, Range of α-particles, Range – energy relationship for α-particles and Geiger – Nuttall law; Beta decay, Pauli's neutrino hypothesis, Fermi theory of beta decay, Kurie plot, selection rules for beta decay, Fermi and Gamow-Teller Transitions, Parity non-conservation in beta decay, Detection and properties of neutrino; Gamma decay, Multipole transitions in nuclei, Angular momentum and parity selection rules; Internal conversion, Nuclear isomerism

UNIT- IV

Elementary Particle Physics: Classifications of elementary particles: fermions and bosons, particles and antiparticles; Fundamental interactions in nature; Type of interaction between elementary particle: Symmetry and conservation laws; Classification of hadrons: Strangeness, Hypercharge, Gelleman - Nishijima formula, Elementary ideas of CP and CPT invariance; Quark model, Baryon Octet, Meson Octet, Baryon Decuplet, Gell-Mann-Okubo formula for octet and decuplet, necessity of introducing colour quantum number, SU (2) and SU (3) multiples (qualitative only)

Note: The syllabus is divided into four units. Nine questions will be set in all. Question No.1 will be compulsory having four parts covering the whole syllabus.

17/5/25

Chairperson
Department of Physics
B.P.S. Mahila Vishwavidyalaya
Khanpur Kalan, Sonipat (Haryana)

Text and Reference Books:

1. Nuclear Physics Theory and Experiment by R.R. Roy and B.P. Nigam (New Age International (P) Limited, Publishers)
2. Nuclear Physics- An introduction by S B Patel (New Age International (P) Limited, Publishers)
3. Concepts of Modern Physics by Arthur Beiser, S Mahajan, and S Rai Choudhury (Mc Graw Hill Education)
4. Introductory Nuclear Physics by Kenneth S. Krane (Wiley, New York)
5. Introductory Nuclear Physics by Y.R. Waghmare (Oxford – IBH, Bombay)
6. Nuclear Physics, 2nd addition by Kapaln (Narosa, Madras)
7. Introduction to Nuclear Physics by F.A. Enge (Addison-Wesley)
8. Nucleon Interaction by G.E. Brown and A.D. Jackson (North-Holland, Amsterdam)
9. Nuclear and Particle Physics by S L Kakani and Shubhra Kakani (Viva Books)
10. Introduction to high Energy Physics by P.H. Perkins (Addison-Wesley, London, 1982)
11. Introduction to Elementary Particles by D. Griffiths (Harper and Row, New York, 1987)

17/5/25

Chairperson
Department of Physics
B.P.S. Mahila Vishwavidyalaya
Khanpur Kalan, Sonipat (Haryana)

M.Sc. Physics Semester IV

Physics of Nano-Materials M25-PHY-402 (CC-14)

Theory Marks: 70
Internal Assessment Marks: 30
Total Marks: 100
Time: 3 Hours

COURSE OUTCOMES

1. To understand the concept and properties of Nanomaterials.
2. To understand the concept of superconductivity and various properties of superconductor.
3. To understand the concept of fabrication techniques for preparation of Nanomaterials.
4. To understand the concept of quantitatively photoluminescence spectroscopy of Nanomaterials.

UNIT- I

Crystals of inert gases: Van der Waals-London Interaction, Repulsive Interaction, Equilibrium Lattice Constants; Cohesive Energy; Ionic crystals: Electrostatic or Madelung energy, Evaluation of the Madelung constant; Covalent crystals; Metals; Hydrogen bonds, Atomic radii, Ionic crystal radii, Lattice vacancies; Diffusion; Color centers: F centers, Other centers in alkali halides; Frenkel defects; Schottky vacancies

UNIT- II

Occurrence of superconductivity, Destruction of superconductivity by magnetic fields; Meissner effect; Heat capacity; Energy gap; Microwave and infrared properties; Isotope effect; Thermodynamics of the superconducting transition; London equation; Coherence length BCS theory of superconductivity; BCS ground state; Flux quantization in a superconducting ring Duration of persistent currents; Type-II superconductors; Vortex state; Estimation of HC1 and HC2; Single particle tunneling; Josephson superconductor tunneling; Dc and Ac Josephson effect; Macroscopic quantum interference

UNIT- III

Nanomaterials, Synthesis/Fabrication of Nanomaterials/Nanostructures: Bottom up and Top down Approaches for Synthesis of Nano Materials, Synthesis of Zero-Dimensional Nanostructures (Nanoparticles): Sol-Gel Process, Synthesis inside Micelles or Using Micro-Emulsions and Growth Termination, Epitaxial Core-Shell Nanoparticles, Ball Milling, One-Dimensional Nanostructures (Nanowires, Nanorods Nanotubes): Vapor (or solution)-liquid-solid (VLS or SLS) growth and Size Control, Electrochemical deposition, Lithography,

UNIT- IV

Two-Dimensional Nanostructures (Thin Films & Quantum Wells): Molecular Beam Epitaxy (MBE), MOCVD, Cluster Beam Evaporation, Ion Beam Deposition, Chemical Bath Deposition Technique Characterization of Nanomaterials Effect of Particle Size and Strain on Width of XRD Peaks of Nanomaterials, Determination of Crystallite/Particle Size and Strain in Nanomaterials Using Debye Scherrer's Formula and Williamson–Hall's Plot, Photoluminescence (PL) Spectroscopy: Basic Principle and idea of Instrumentation, Shift in PL Peaks with Particle Size, Determination of Alloy Composition in Thin Films of Compound Semiconductors, Estimation For Width of Quantum Wells.

Note: The syllabus is divided into four units. Nine questions will be set in all. Question No.1 will be compulsory having four to eight parts covering the whole syllabus. In addition there will be two questions from each unit and the student is to answer one question from each unit.

17/5/25

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Department of Physics
B.P.S. Mahila Vishwavidyalaya
Khanpur Kalan, Sonipat (Haryana)

Text and Reference Books:

1. Physics of Low Dimensional Semiconductors by John H. Davies (Cambridge Univ. Press).
2. Introduction to Nano-technology by Charles P. Poole & Jr. Frank J. Owens (Wiley Inter-science).
3. Quantum Mechanics for Nanostructures by Vladimir V. Mitin, Dmitry I. Sementsov & Nizami Z. Vagidov (Cambridge University Press).
4. Nanostructures & Nanomaterials: Synthesis, Properties & Applications by Guozhong Cao (Imperial College Press).
5. Introduction to Nano: Basics to Nanoscience and Nanotechnology by Amretashis Sengupta & Chandan Kumar Sarkar (Editor) [Springer].
6. Solid State Physics by A. J. Dekker (Macmillan).

17/3/25

Chairperson
Department of Physics
B.P.S. Mahila Vishwavidyalaya
Khanpur Kalan, Sonipat (Haryana)

M.Sc Physics Semester IV

Electronics – II M25-PHY-403 (DSC-6)

Theory Marks: 70
Internal Assessment Marks: 30
Total Marks: 100
Time: 3 Hours

COURSE OUTCOMES

After successful completion of the course, the students will be able to

1. To understand the various types of gates and their applications.
2. To understand the various combinational and sequential digital circuits.
3. To understand the digital MOSFETs.
4. To understand the modulation and its various types.

UNIT- I

Metal oxide semiconductor field effect transistors, enhancement mode transistor, depletion mode transistor, p-channel and n-channel devices, MOS invertors- static inverter, dynamic inverter, two phase inverter, MOS NAND gates, NOR gates, complementary MOSFET technology, CMOS inverter, CMOS NOR gates and NAND gates, MOS shift register and RAM.

UNIT- II

Fundamentals of modulation, Frequency spectra in AM modulation, power in AM modulated class C amplifier, Efficiency modulation, frequency conversion, SSB system, Balanced modulation, filtering the signal for SSB, phase shift method, product detector, Pulse modulation, Network Theorems.

UNIT- III

Positive and negative logic designations, OR gate, AND gate, NOT gate, NAND gate, NOR gate, XOR gate, Circuits and Boolean identities associated with gates, Boolean algebra- DeMorgans Laws, Sum of products and product of sums expressions, Minterm, Maxterm, K-maps, don't care condition, deriving SOP and POS expressions from truth tables.

UNIT- IV

Combinational Digital circuits: Binary adders: half adders & full adders,Decoders, Multiplexer, Demultiplexer, Encoders, ROM and its application (binary, BCD, Excess-3 Code, Gray Code & BCD to seven segment), Digital comparator, Parity checker and generator Sequential Digital Circuits: 1-bit memory, Flip-Flops- RS, JK, master slave JK, T-type and D-type flip flops, Shift-register and applications, Asynchronous counters and Synchronous counters.

Note: The syllabus is divided into four units. Nine questions will be set in all. Question No.1 will be compulsory having four to eight parts covering the whole syllabus. In addition there will be two questions from each unit and the student is to answer one question from each unit.

Text and Reference books:

1. Integrated Electronics by J. Millman and C.C. Halkias (Tata McGraw Hill).
2. Digital Electronics by William Gothmann (Parentice Hall of India)
3. Digital logic by J. M.Yarbrough (Thomson Publication).
4. Electronic Fundamentals And Applications by John D. Ryder (Prentice-Hall)
5. Foundation for Microwave Engineering by Robert E. Collin (Wiley)

17/5/25

Chairperson
Department of Physics
B.P.S. Mahila Vishwavidyalaya
Khanpur Kalan, Sonipat (Haryana)

M.Sc. Physics Semester IV

Computational Physics – II M25-PHY-404 (DSC-7)

Theory Marks: 70
Internal Assessment Marks: 30
Total Marks: 100
Time: 3 Hours

COURSE OUTCOMES

1 Students would be able to understand framework of computer languages
2 Students would be able to solve numerically various physical problems
3 Students would gain the necessary basic knowledge of application of MATLAB for problem solving

UNIT-I

Introduction to Programming using Python: Structure of a Python Program, Functions, Interpreter shell, Indentation. Identifiers and keywords, Literals, Strings, Basic operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment Operator, Bit wise operator). Standard libraries in Python, notion of class, object and method.

UNIT- II

Creating Python Programs: Identifiers and keywords; Literals, numbers, and strings; Operators; Expressions; Input/output statements; Defining Functions; Control structures (conditional statements, loop control statements, break, continue and pass, exit function), default arguments. Mutable and immutable objects. Testing and debugging a program

UNIT- III

MATLAB –I: Introduction; windows; arithmetic operation on scalars and their precedence; variables; elementary math built in function; useful commands for managing variables: clear ,clc, who, whose; creating and working with one and two dimensional arrays, vector & matrices operations, solving linear system; element by element operation on arrays, script files; input/output commands

UNIT- IV

MATLAB –II: Equations conditional statements and loops, relational and logical operators, break & continue statements; two dimensional plots; plotting multiple graphs in the same plot using hold on, hold off; line commands, user defined function and function files; polynomials; curve fitting and interpolation; find minimum and maximum value of function.

Note: The syllabus is divided into four units. Nine questions will be set in all. Question No.1 will be compulsory having four to eight parts covering the whole syllabus. In addition, there will be two questions from each unit and the student is to answer one question from each unit.

Text & Reference Books:

1. Introduction to Numerical Analysis by F B Hildebrand (Tata McGraw Hill)
2. Fortran Programming and Numerical methods by R C Desai (Tata McGraw Hill).
3. Computer Applications in Physics by Suresh Chandra (Narosa Publishing House)
4. Numerical Recipes in Fortran 77 By William H. Press, Saul A Teukolsky, William T Vellerling and Brain P. Flannery (Cambridge University Press)
5. An introduction to MATLAB by Amos Gilat
6. Computational Physics an Introduction by R C Verma, P K Ahluwalia and K C Sharma (New Age International).

17/5/25

Chairperson
Department of Physics
B.P.S. Mahila Vishwavidyalaya
Khanpur Kalan, Sonipat (Haryana)

M.Sc. Physics Semester IV
Electronics Lab -II M25-PHY-405 (DSC-8)

External Practical Marks: 70
Internal Assessment Marks: 30
Total Marks: 100
Time: 3Hours

COURSE OUTCOMES

After successful completion of the course, the students will be able to

1 Understand the fabrication process of solar cells, photodiodes, PMT's etc.

2 Analyse the functioning of various communication devices such as TV, Radio, mobile phone etc.

3 Realize the performance of operational amplifier for various mathematical operations such as addition, subtraction, differentiation, integration etc.

4 Understand circuit analysis and implementation of operational amplifier for various applications like comparator, A/D & D/A convertor, oscillators etc.

[1] Pulse position/Pulse width Modulation/Demodulation
[2] FSK Modulation Demodulation using Timer/PLL
[3] PLL circuits and applications
[4] BCD to Seven Segment display
[5] To study the digital comparator, 3 to 8 line Decoder and tri-state digital O/P circuits
[6] To study the binary module-6 and 8 decade counter and shift register.
[7] Study of frequency Multiplication using PLL
[8] Study of Frequency Modulation and Demodulation
[9] Study of Pulse Amplitude Modulations & Demodulation
[10] Study of Module-N Counter using Programmable Counter IC 74190 with input Logics with LED display
[11] Digital I: Basic Logic Gates, NAND and NOR and Flip flops
[12] To study the digital comparator, 3 to 8 line Decoder and tri-state digital O/P circuits
[13] Working of Half & Full Adders
[14] Working of Half & Full subtractor

Note: Out of the list as above, a student has to perform atleast 08 (eight) practical's in the semester

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Chairperson
Department of Physics
B.P.S. Mahila Vishwavidyalaya
Khanpur Kalan, Sonipat (Haryana)

M.Sc. Physics Semester IV

Computational Physics Lab-II M25-PHY-406 (PC-2)

External Practical Marks: 70
Internal Assessment Marks: 30
Total Marks: 100
Time: 3 Hours

COURSE OUTCOMES

1 Students would develop understanding for programming concepts.

2 Students would learn the practical implementation of programming languages for carrying numerical calculations.

3 Students would be benefited from their enhanced computational skills in context of higher studies in physics or business purposes as well.

List of programs using MATLAB

[1] As a calculator
[2] Roots of quadratic equation using command window
[3] Numerical solutions of equations (single variable)
[4] Resonant frequency of LCR circuit
[5] Coefficient of friction in each test and find average of it
[6] Numerical solution of simultaneous linear algebraic equations
[7] Numerical solution of ordinary differential equation
[8] Numerical Solution of second order ordinary differential equations
[9] Create a matrix and find its transpose, inverse and determinant
[10] To find eigen value and eigen vector of given matrix
[11] Create a matrix using zeroes, ones, eye and linespace commands and another vector, then replace a particular row or column by the 5th root corresponding to that vector.
[12] Charging and discharging of Capacitor
[13] Using input and disp command
[14] Showing vectorized role of fprintf command
[15] Calculate the voltage across each resistor in a circuit when the resistors are connected in series
[16] Plotting a function and its first three derivatives on same plot/ figure
[17] Hold on and hold off command
[18] Plot light intensity vs. distance using label, title, axis text, legand etc. commands.
[19] Find the sum of the first n terms of the series using loop. Execute the script file for given n.
[20] Using nesting loop and conditional statement.
[21] AC to DC converter
[22] Write a function file for given function then use it.
[23] To find subtraction; multiplication & division operation for given two polynomials.
[24] To find roots & derivatives of given polynomial.
[25] Program on curve fitting
[26] Find minimum & maximum value for given function.

Note: Out of the list as above, a student has to perform at least 12 (twelve) practicals in the semester. Five more practicals can be done of their own choice.

17/5/25

Chairperson
Department of Physics
B.P.S. Mahila Vishwavidyalaya
Khanpur Kalan, Sonipat (Haryana)

M.Sc. Physics Semester IV
Python Lab M25-PHY-407 (SEC-II)

External Practical Marks: 35
Internal Assessment Marks: 15
Total Marks: 50
Time: 2 Hours

COURSE OUTCOMES

CO 1: Introduce the fundamental features of Python in physics.
CO2: Provide hands-on experience in handling datasets and generating reports.

An introduction to the Python language at M.Sc. level is suitable for students with no previous programming experience. It introduces the basic elements of programming with variables and arrays, assignments, arithmetic and functions, inputs, outputs, conditionals, and loops, all in the Python language. The ideas are illustrated with examples drawn from various branches of physics, including classical mechanics, special relativity, and quantum physics.

List of programs using Python

[1] Familiarization with python as a programming language, making general purpose programs in python
[2] Visualizing Data in Python: Graphs and Graphs.
[3] Making and using functions: inbuilt and library
[4] Making and using functions: User defined.
[5] Curve fitting using Python, Solving Matrices using numpy, Solving polynomial equations using sympy.
[6] Create a list and perform the following methods
1) insert() 2) remove() 3) append() 4) len() 5) pop() 6) clear()
[7] Using a numpy module create an array and check the following: 1. Type of array 2. Axes of array 3. Shape of array 4. Type of elements in array.
[8] Simulate and visualize the trajectory of a projectile with and without air resistance.
[9] Convert from polar to Cartesian coordinates,
[10] Write a programme to determine I-V characteristic of diode using Python.
[11] Model SHM using differential equations and plot displacement vs time.
[12] Simulate heat flow in a rod using finite difference methods.
[13] Stimulate the measure motion with an accelerometer, monitor temperature with a thermistor.
[14] Use random number generation to simulate decay over time. Compare theoretical vs simulated decay curves.
[15] Stimulate 1D and 2D Simulation of Wave-packets in Python.
[16] Python tools like Fourier transforms and the Schrödinger equation to visualize how wave packets evolve over time.
[17] Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR
[18] Start a Python interpreter and use it as a Calculator.
[19] Strings a. Write a program to find the length of the string without using a library functions.
[20] Write a program to check if two strings are anagrams or not.
[21] Write a program to check if the substring is present in a given string or not
[22] Simulate double-slit interference patterns using wave equations.

Note: Out of the list as above, a student has to perform at least 12 (twelve) practical's in the semester. Five more practical's can be done of their own choice.

17/3/25

Chairperson
Department of Physics
B.P.S. Mahila Vishwavidyalaya
Khanpur Kalan, Sonipat (Haryana)

M.Sc. Physics Semester-IV
Research Project M25-PHY-408

Viva Voce Marks: 100
Marks for Dissertation Report: 200
Total Marks: 300

Course Outcome:

At the end of this course, the students should be able to:

1. To understand some basic concepts of research and its methodologies.
2. To identify appropriate research topics.
3. To select and define appropriate research problem and parameters.
4. To prepare a project proposal (to undertake a project).
5. To organize and conduct research (advanced project) in a more appropriate manner

The aim of the project work in M.Sc. (Physics) is to expose the students to preliminaries and methodology of research and as such it may consist of review of some research papers, development of a laboratory experiment, fabrication of a device, working out some problem, participation in some ongoing research activity, analysis of data, etc. The work can be in Experimental Physics or Theoretical Physics in the thrust as well as non-thrust research areas of the department. The students must submit their project in the department before the last date given by the department. Internal assessment of the project work will be carried out by a committee constituted by Chairperson of the Department through power presentation given by candidate during the semester. External assessment of the work will be carried out by an external examiner through presentation given by candidates.

Guidelines for Project

1. Dissertation will be evaluated internally by a committee constituted by Chairperson of the department during the semester and externally at the end of semester by the external examiner.
2. Panels will be submitted consisting four external examiners from each specialization. The competent authorities will appoint four external examiners from each discipline. One external examiner for each discipline shall be called in an order of preference from a panel of examiners submitted by the department.
3. The candidate shall be required to submit two soft bound copies of project along with a CD in the department
4. The student will defend her work through presentation before the examiner and will be awarded marks in percentage. A student who could not score passing marks in the project exam shall have to resubmit her work after making all corrections/improvements & this dissertation shall be evaluated as above. The candidate is required to submit the corrected copy of the project in hard bound within two weeks after the viva -voce.
5. In case a candidate's project is rejected or she is unable to complete it within the prescribed period for her category, she may be allowed extension by the chairperson on recommendation of the supervisor, up to the limits prescribed for completion of degree by a candidate.
6. Lay out of project will contains cover page, certificate signed by student and supervisor table contents, introduction, methodology, result and discussion conclusion chapter and references. - The typing shall be done on both sides of the paper (instead of single side printing) - The font size should be 12 with Times Roman Format - The text of the project may be typed in 1.5 (one and a half) space. - The paper to be used should be A-4 size. - The total no. of writing pages should be between 30 to 50 for dissertation.

17/5/25

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