GOVT. COLLEGE FOR WOMEN, LAKHAN MAJRA, ROHTAK

DEPARTMENT OF PHYSICS

VISION

- The department wishes to recognize for its highly educated and dedicated faculty and the education they provides to the students. The students will have the best instructions through the finest educational technology available and a stimulating environment in their classes.

MISSION

- The mission of the department is to expand the vast knowledge in physics and other closely related science and its conveyance to the students in a healthy and learning environment.

Department of Physics

Faculty Members

Sr. No.	Name of the Faculty Member	Qualifications
1	Dr. Anjali Maan, Asstt. Professor	M.Sc, Ph.D
2	Dr. Sunil Dhankhar, Asstt. Professor	M.Sc, M.Tech (IIT-K), Ph.D, B.Ed

Programme Outcomes of B.Sc (Physics)

- Students are expected to acquire knowledge in physics including the major disciplines of quantum mechanics, classical mechanics, optics, electromagnetic theory, electronics, nuclear physics, relativity etc. after the completion of the B.Sc programme.
- Students will develop an understanding of the impact of physics and science on society.
- Students are expected to develop written and oral communication skills in communicating physics related topics.
- Student will have set his foundation to pursue higher education in physics.
- Students will have developed interdisciplinary approach after completing the programme and can pursue higher studies in subjects other than physics.
- Students will be able to apply the laws of physics in real life situations to solve the problems.
- Students are expected to apply conceptual understanding of physics to general real- world situations.

Course Outcomes for B.Sc Physics

Mechanics (PHY-101) Course Outcomes

- Understand the Newtonian mechanics of a single particle and system of particles.
- Understand and apply Lagrange's formalism with special emphasis on generalised co-ordinates.
- Examine the link between symmetry properties and conservation laws.
- Understand the dynamics involved in a rigid body.

Electricity and Magnetism (PHY-102) Course Outcomes

- Understand the basic mathematical tools of physics.
- To understand the basic concepts of Electric field, Electric potential, Magnetic field and magnetic properties of matter.
- Gain knowledge of Gauss laws and solve the electric field for various geometric objects.
- Enable to understand the different types of magnetic field and concept of hysteresis.
- Able to derive the Maxwell's equation in free space and material media and understand the concept of poynting vector.

Properties of Matter, Kinetic Theory and Relativity (PHY-201) Course Outcomes

- Understand the principles of elasticity and the strength of solid materials.
- Understand the various aspects of kinetic theory of gases and different transport mechanisms.
- Understand and appreciate the concept of space-time and the relative character of the physical quantities.

Electromagnetic Induction and Electronic Devices (PHY-202) Course Outcomes

- Understand the behaviour of transient currents and alternating currents in LCR circuit.
- Acquire basic knowledge of physical and electrical conducting properties of semiconductors.
- Apply the basic ideas of transistor in the construction of different types of feedback amplifiers and oscillators.

Computer Programming, Thermodynamics (PHY-301) Course Outcomes

- Understand flowcharts, algorithms and different statements and utilize them in solving different problem.
- To understand the concept of first and second law of thermodynamics to get knowledge of various thermodynamic processes.
- To understand, analyse and apply the concepts and facts about the basic ideas behind different heat engines.
- To understand, analyse and apply the concepts and facts of entropy, thermodynamic potentials, Maxwell's thermodynamic relations and phase transitions.

Optics – I (PHY-302), Course Outcomes

- To understand mathematical methods like Fourier transform to solve the various problems in physics.
- To understand the various aspects of geometrical optics.
- To study the characteristic properties of light using the phenomenon of interference by division of wave front.

Statistical Mechanics (PHY-401), Course Outcomes

- To understand and analyse some of the basic concepts of statistical physics.

- To gain knowledge of three statistics and use them in practical applications.

Optics –II (PHY-402), Course Outcomes

- To study the characteristic properties of light using the phenomenon of interference by division of amplitude.
- To study the theory of diffraction, its types and polarization of light and their applications in devising optical elements.

Solid State Physics (PHY-501), Course Outcomes

- Understand basics concepts and different crystal lattices and distinguish the crystal structures. Procedure behind the construction of reciprocal lattice is understood and applied the same in explaining the diffraction patterns.
- To understand the relationship between the real and reciprocal space and learn the Bragg's X-ray diffraction in crystals.
- To gain knowledge about various theory of specific heat of solids and their outcomes.

Quantum Mechanics (PHY-502), Course Outcomes

- To understand the various experimental techniques to realize dual nature of light and matter and its applications to solve problems**.**
- To understand the nature of light - particle and wave nature of light on the basis of interference, diffraction, polarization, photoelectric effect, Compton effect.
- Get basic ideas of quantum mechanics to solve fundamental problems in quantum mechanics.
- Understand the theory of Schrodinger equations and their applications.

Atomic, Molecular and Laser Physics (PHY-601),Course Outcomes

- To understand the basic concepts of spectroscopic principles and rules. Students would learn technique in spectroscopy and know about their applications.

- Beneficial for the students to explore R & D opportunities in various areas of science and technology such as biomedical, industrial and environmental fields.
- To understand the theory of lasing and the construction and working of solid state lasers, gas lasers and semiconductor lasers.

Nuclear Physics (PHY-602), Course Outcomes

- To understand the structure of nucleus, various properties and their measurements and to study different nuclear models.
- Expands the knowledge of students especially, the various applications of nuclear physics.
- To study transformations of nuclei and the phenomenon of radioactivity, nuclear transformations leading to fission, fusion and the design of nuclear reactors.
- To study the purpose and design of radiation detectors and particle accelerators.
- To gain knowledge about alpha, beta and gamma ray and their decay.
- Open the door to carry out research in the field of nuclear physics, high energy physics, nuclear astrophysics, nuclear reactions and applied nuclear physics.

SCHEME OF EXAMINATION

B.Sc. (PASS COURSE) PHYSICS Semester I – II w.e.f. 2016-17

Semester I

Paper No.	Paper Code	Name of the paper	Max. marks	IA	Time
Paper I	PHY-101	Mechanics	45	10	3 Hrs.
Paper II	PHY-102	Electricity and Magnetism	45	10	3 Hrs.
Paper III	PHY-103	Practical	40	-	3 Hrs.

Semester II

Paper No.	Paper Code	Name of the paper	Max. marks	IA	Time
Paper I	PHY-201	Properties of Matters, Kinetic Theory and Relativity	45	10	3 Hrs.
Paper II	PHY-202	Electro-magnetic Induction and Electronic Devices	45	10	3 Hrs.
Paper III	PHY-203	Practical	40	-	3 Hrs.

B.Sc. (PASS COURSE) PHYSICS Semester III – IV w.e.f. 2017-18

Semester III

Paper No.	Paper Code	Name of the paper	Max. marks	IA	Time
Paper I	PHY-301	Computer Programming Thermodynamics	45	10	3 Hrs.
Paper II	PHY-302	Optics- I	45	10	3 Hrs.
Paper III	PHY-303	Practical	40	-	3 Hrs.

Semester IV

Paper No.	Paper Code	Name of the paper	Max. marks	IA	Time
Paper I	PHY-401	Statistical Mechanics	45	10	3 Hrs.
Paper II	PHY-402	Optics- II	45	10	3 Hrs.
Paper III	PHY-403	Practical	40	-	3 Hrs.

INTERNAL ASSESSMENT :- The Internal Assessment for theory papers comprises of

(i) Attendance-	**2.50**
(ii) Unscheduled test	**2.50**
(iii)Assignments-	**5.00**
Total	**10**

B.Sc. PHYSICS
SCHEME OF EXAMINATION

Semester-I

Paper I- PHY 101 : MECHANICS

Max. Marks : 45
Internal Assessment : 10
Time : 3 Hrs.

NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit I

Mechanics of single and system of particles, conservation of laws of linear momentum, angular momentum and mechanical energy, Centre of mass and equation of motion, constrained motion, degrees of freedom.

Unit II

Generalised coordinates, displacement, velocity, acceleration, momentum, force and potential. Hamilton's variational principle , Lagrange's equation of motion from Hamilton's Principle. Linear Harmonic oscillator, simple pendulum, Atwood's machine.

Unit III

Rotation of Rigid body, noment of inertia, torque, angular momentum, kinetic energy of rotation. Theorems of perpendicular and parallel axes with proof. Moment of inertia of solid sphere, hollow sphere, spherical shell, solid cylinder, hollow cylinder and solid bar of rectangular cross-section. Acceleration of a body rolling down on an inclined plane.

References

1. Classical Mechanics by V.K.Jain (Ane 2009)
2. Classical Mechanics by H. Goldstein (2nd Edition)
3. Berkeley Physics Course, Vol. I, Mechanics by E.M. Purchell

B.Sc. PHYSICS

Paper II- PHY 102 : ELECTRICITY AND MAGNETISM

Max. Marks : 45
Internal Assessment : 10
Time : 3 Hrs.

NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit I

Mathematical Background : Scalars and Vectors, dot and cross product, Triple vector product, Scalar and Vector fields, Differentiation of a vector, Gradient of a scalar and its physical significance, Integration of a vector (line, surface and volume integral and their physical significance), Gauss's divergence theorem and Stocks theorem.

Electrostatic Field : Derivation of field E from potential as gradient, derivation of Laplace and Poisson equations. Elecotric flux, Gauss's Law and its application to spherical shell, uniformly charged infinite plane and uniformity charged straight wire, mechanical force of charged surface, Energy per unit volume.

Unit II

Magnetostatistics : Magnetic Induction, magetic flux, solenoidal nature of Vector field of induction. Properties of B (i) .B = 0 (ii) xB= J. Electronic theory of dia and para magnetism (Langevin's theory). Domain theory of ferromagnetism. Cycle of Magnetisation - Hysteresis (Energy dissipation, Hysteresis loss and importance of Hysteresis curve).

Unit III

Electromagnetic Theory : Maxwell equation and their derivations, Displacement Current. Vector and scalar potentials, boundary conditions at interface between two different media, Propagation of electromagnetic wave (Basic idea, no derivation). Poynting vector and Poynting theorem.

References :

1. Electricity and Magnetism by Reitz and Milford (Prentice Hall of India)
2. Electricity and Magnetism by A.S. Mahajan and A.A. Rangwala (Tata McGraw Hill).

B.Sc. PHYSICS
Paper III Phy- 103
PRACTICALS

Max. Marks : 40
Time : 3 Hrs.

SPECIAL NOTES

1. Do any eight experiments .
2. The students are required to calculate the error involved in a particular experiment (percentage error).

NOTE

1. Distribution of Marks :

Experiment :	= 20 marks
Viva Voce :	= 10 marks
Lab Record :	= 10 marks
Total	= 40 marks

For giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure :-

1. Each student has to perform a minimum number of experiments prescribed in the syllabus.
2. After the completion of a practical the teacher concerned will check the note-book and conduct the viva-voce of each student to find out how much concepts related to the theoertical and experimental part of the experiment he/she has understood. According to his/her performance marks will be recorded in their practical note book. These marks will constitue the lab record.
3. To complete the final marks for lab. record a separate register for each class of B.Sc will be maintained. The Student will be assigned a separate page on the register. On this page the marks obtained by the student in different practicals will be recorded. While taking the final average the total marks obtained willbe divided by the total no. of required practicals, instead of the number of practicals performed by the student. This record will be signed by the concerned teacher.
4. The lab. record register will be presented to the external practical examiners for lab. record marks. The external examiners will verify the record randomly.

B.Sc. PHYSICS
Paper III- PHY 103
PRACTICALS

Max. Marks : 40
Time : 3 Hours

Note: Do eight experiments, selecting four from each section.

Section A

1. Moment of Inertia of a fly-wheel
2. M.I. of an irregular body using a torsion pendulum.
3. Young's modulus by bending of beam.
4. Viscosity of water by its flow through a uniform capillary tube.
5. Mechanical equivalent of Heat by Callender and Barne's method.

Section B

1 E.C.E. of hydrogen using voltameter.
2 Calibration of thermocouple by potentiometer.
3 Frequency of A.C. mains and capacity by electrical vibrator.
4 Inductance (L) by Anderson Bridge (A.C. method)
5 To draw forward and reverse bias characteristics of a semiconductor diode.
6 Zener Doide voltage regulation characteristics.
7 To study the characteristics of a solar cell.

B.Sc. PHYSICS
SCHEME OF EXAMINATION

Semester-II

Paper I- PHY 201 : PROPERTIES OF MATTER, KINETIC THEORY AND RELATIVITY

Max. Marks : 45
Internal Assessment : 10
Time : 3 Hrs.

NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit - I

Properties of Matter (Elasticity) : Elasticity, Hooke's law, Elastic constants and their relations, Poisson's ratio, torsion of cylinder and twisting couple. Bending of beam (bending moment and its magnitude) cantilevers, Centrally loaded beam.

Unit - II

Kinetic Theory of Gases : Assumptions of Kinetic Theory of gases, Law of equipartition of energy and its applications for specific heats of gases. Maxwell distribution of speeds and velocities (derivation required), Experiomental verification of Maxwell's Law of speed distribution : most probable speed, average and r.m.s. speed, mean free path. Transport of energy and momentum, diffusion of gases. Brownian motion (qualitative), Real gases, Van der Waal's equation.

Unit - III

Theory of Relativity : Reference systems, inertial frames, Gallilean invariance and Conservation laws, Newtonian relativity principle, Michelson - Morley experiment : Search for ether. Lorentz transformations length contraction, time dilation, velocity addition theorem, variation of mass with velocity and mass energy equivalence.

References

1. Properties of Matter by D.S. Mathur.
2. Heat and Thermodynamics (Vth Edition) by Mark W. Zemansky.
3. Berkeley Physics Course, Vol.-I Mechanics by E.M. Purchell.

B.Sc. PHYSICS

Paper II- PHY 202 : ELECTRO MAGNETIC INDUCTION AND ELECTRONIC DEVICES

Max. Marks : 45
Internal Assessment : 10
Time : 3 Hrs.

NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit I

Electromagnetic Induction : Growth and decay of current in a circuit with (a) Capacitance and resistance (b) resistance and inductance (c) Capacitance and inductance (d) Capacitance resistance and inductance.

AC circuit analysis using complex variables with (a) capacitance and resistance, (b) resistance and inductance (c) capacitance and inductance (d) capacitance, inductance and resistance Series and parallel resonant circuit. Quality factor (Sharpness of resonance).

Unit II

Semiconductor Diodes : Energy bands in solids. Intrinsic and extrinsic semiconductor, Hall effect, P-N junction diode and their V-I characteristics. Zener and avalanche breakdown. Resistance of a diode, Light Emitting diodes (LED). Photo conduction in semiconductors, photodiode, Solar Cell.

Diode Rectifiers : P-N junction half wave and full wave rectifier. Types of filter circuits (L and - with theory). Zener diode as voltage regulator, simple regulated power supply.

Transistors : Junction Transistors, Bipolar transistors, working of NPN and PNP transistors, Transistor connections (C-B, C-E, C-C mode), constants of transistor. Transistor characteristic curves (excluding h parameter analysis), advantage of C-B configuration. C.R. O. (Principle, construction and working in detail).

Unit III

Transistor Amplifers : Transistor biasing, methods of Transistor biasing and stabilization. D.C. load line. Common-base and common-emitter transistor biasing. Common-base, common-emitteer amplifers. Classification of amplifers. Resistance-capacitance (R-C) coupled amplifer (two stage; concept of band width, no derivation). Feed-back in amplifers, advantage of negative feedback Emitter follower.

Oscillators : Oscillators, Principle of Oscillation, Classification of Oscillator. Condition for self sustained oscillation : Barkhousen Criterion for oscillations. Tuned collector common emitter oscillator. Hartley oscillator. Colpitt's oscillator.

References :

1. Electricity and Magnetism by Reitz and Milford (Prentice Hall of India)
2. Electricity and Magnetism by A.S. Mahajan and A.A. Rangwala (Tata McGraw Hill).
3. Basic Electronics and Linear circuits by N.N. Bhargava, D.C. Kulshreshtha and S.C. Gupta (TITI, CHD).
4. Soild State Electronics by J.P. Agarwal, Amit Agarwal (Pragati Prakashan, Meerut).
5. Electronic Fundamentals and Applications by J.D. Ryder (Prentice Hall India).

B.Sc. PHYSICS
Paper III Phy- 203
PRACTICALS

Max. Marks : 40
Time : 3 Hrs.

SPECIAL NOTES

1. Do any eight experiments .
2. The students are required to calculate the error involved in a particular experiment (percentage error).

NOTE

Distribution of Marks :

Experiment :	= 20 marks
Viva Voce :	= 10 marks
Lab Record :	= 10 marks
Total	= 40 marks

For giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure :-

1. Each student has to perform a minimum number of experiments prescribed in the syllabus.
2. After the completion of a practical the teacher concerned will check the note-book and conduct the viva-voce of each student to find out how much concepts related to the theoretical and experimental part of the experiment he/she has understood. According to his/her performance marks will be recorded in their practical note book. These marks will constitute the lab record.
3. To complete the final marks for lab. record a separate register for each class of B.Sc will be maintained. The Student will be assigned a separate page on the register. On this page the marks obtained by the student in different practicals will be recorded. While taking the final average the total marks obtained will be divided by the total no. of required practicals, instead of the number of practicals performed by the student. This record will be signed by the concerned teacher.
4. The lab. record register will be presented to the external practical examiners for lab. record marks. The external examiners will verify the record randomly.

B.Sc. PHYSICS
Paper III- PHY 203
PRACTICALS

Max. Marks : 40
Time : 3 Hours

Note: Do eight experiments, selecting four from each section.

Section A

1 Surface Tension by Jeager's method.
2 Modulus of rigidity by Maxwell's needle.
3 Elastic constants by Searle's method.
4 Thermal conductivity of a good conductor by Searle's method.
5 'g' by Bar pendulum.

Section B

1 Low resistance by Carey Foster's Bridge with calibration.
2 Determination of impendance of an A.C. circuit and its verification.
3 Frequency of A.C. mains by sonometer using an electromagnet.
4 Measurement of angle dip by earth inductor.
5 High resistance by substitution method.
6 Verification of Inverse square law by photo-cell.

B.Sc. PHYSICS
SCHEME OF EXAMINATION
Semester III

Paper I- PHY 301 : Computer Programming, Thermodynamics

Max. Marks : 45
Internal Assessment : 10
Time : 3 Hrs.

NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit-I

Computer Programming : Computer organisation, Binary representation, Algorithm development, flow charts and their interpretation.
Fortran Preliminaries; Integer and floating point arithmetic expression, built in functions executable and non-executable statements, input and output statements, Formats, I.F. DO and GO TO statements, Dimesion arrays statement function and function subprogram.

Unit-II

Thermodynamics-I : Second law of thermodynamics, Carnot theorem, Absolute scale of temperature, Absolute Zero, Entropy, show that dQ/T=O, T-S diagram Nernst heat law, Joule's free expansion, Joule Thomson (Porous plug) experiment. Joule - Thomson effect. Liquefication of gases. Air pollution due to internal combustion Engine.

Unit-III

Thermodynamics-II : Derivation of Clausius - Claperyron latent heat equation. Phase diagram and triple point of a substance. Development of Maxwell thermodynamical relations. Application of Maxwell relations in the derivation of relations between entropy, specific heats and thermodynamic variables.
Thermodynamic functions : Internal energy (U), Helmholtz function (F), Enthalpy (H), Gibbs function (G) and the relations between them.

References :

1. Rajaraman, Fortran Programming.
2. Schaum Series, Fortran 77.
3. Ram Kumar, Programming with Fortran - 77.
4. S. Lokanathan and R.S., Gambir, Statistical and Thermal Physics (An Introduction), Prentice Hall of India, Pvt., Ltd. (1991, New Delhi).
5. J.K. Sharma and K.K. Sarkar, Thermodynamics and statistical Physics, Himalaya Publishing House (1991, Bombay.)
6. M.W. Zemansky and R. Dittman, Heat and Thermodynamics, McGraw Hill, New York (1981).

B.Sc. PHYSICS
Paper-II PHY 302
Optics – I

Max. Marks : 45
Internal Assessment : 10
Time : 3 Hrs.

NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit-I

Fourier Analysis and Fourier Transforms : Speed of transverse waves on a uniform string. Speed of longitudinal waves in a fluid, superposition of waves (physical idea), Fourier Analysis of complex waves and its application for the solution of triangular and rectangular waves, half and full wave rectifier out puts. Fourier transforms and its properties. Application of fourier transform to following function.

(I) $f(x) = e^{-x2/2}$

(II) $f(x) = I\ [x] < a$
$0\ [x] > a$

Unit-II

Geometrical Optics : Matrix methods in paraxial optics, effects of translation and refraction, derivation of thin lens and thick lens formulae, unit plane, nodal planes, system of thin lenses, Chromatic, spherical coma, astigmatism and distortion aberrations and their remedies.

Physical Optics

Unit-III

Interference : Interference by Division of Wavefront : Fresnel's Biprism and its applications to determination of wave length of sodium light and thickness of a mica sheet, Lioyd's mirror, phase change on reflection.

References

1. Mathematical Physics by B.S. Rajput and Yog Prakash Pragati Prakashan.
2. Theory and Problems of Laplace Transforms by Murrari R. spiegel, McGraw Hill Book Company.
3. Optics by Ajay Ghatak, Tata McGraw Hill 1977.
4. Introduction of Optics by Frank L. Pedrotti and Leno S. Pedrotti, Prentice Hall 1987.

B.Sc. PHYSICS

Paper-III Phy- 303
Practicals

Max. Marks : 40
Time : 3 Hrs.

Special Notes

1. Do any eight experiments.
2. The students are required to Calculate the error involved in a particular experiment (Percentage error).

Distribution of Marks :

Experiments :	=	20 Marks
Viva-Voce :	=	10 Marks
Lab. Record :	=	10 marks
Total		40 Marks

For Giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure.

1. After the completion of a practical the teacher concerned will check the note-book and conduct the viva-voce of each student to find out how much concepts related to the theoretical and experimental part of the experiment he/she has understood. According to his/her performance marks will be recorded on their practical note book. These marks will contribute the lab Record.
2. To complete the final marks for lab. Record a separate register for each class of B.Sc. will be maintained. The students will be assigned a separate page on this register. On this page the marks obtained by the student in different practicals will be recorded. While taking the final average the total marks obtained will be divided by the total no. of required practicals, instead of the number of practicals performed by the student. This record will be signed by the concerned teacher.
3. The Lab. Record register will be presented to the external practical examiners for lab. Record marks. The external examiner will verify the record randomly.

B.Sc. PHYSICS
Paper III- PHY 303
PRACTICALS

Max. Marks : 40
Time : 3 Hours

Note: Do eight experiments, selecting four from each section.

Section A

1 To measure the (a) area of a window (b) height of an inaccesible object.
2 Refractive index and dispersive power of a prism material by spectrometer.
3 Resolving power of a telescope.
4 Comparision of Illuminating Powers by a Photometer.
5 Ordinary and extra ordinary refractive indices for calcite or quartz**.**

Section B

(i) Electronics

1 To draw common base and common emitter characteristics of a transistor and calculate transistor and calculate transistor characteristics parameters.
2 To study the ripple factor in a.d.c. power supply.
3 Electronic Voltmeter measurement of peak, average & R.M.S. values of signal.
4 Study of voltage doubler and trippler circuits.

(ii) Computer Experiments

1 To print out all natural (even/odd) number between given limits using computer.
2 To find maximum, minimum and range of a given set of numbers using computer.
3 To evaluate sum of finite series.

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B.Sc. PHYSICS
SCHEME OF EXAMINATION
Semester IV

Paper I- PHY 401 : Statistical Mechanics

Max. Marks : 45
Internal Assessment : 10
Time : 3 Hrs.

NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit-I

Probability, some probability considerations, combinations possessing maximum probability, combinations possessing minimum probability, distribution of molecules in two boxs. Case with weightage (general). Phase space, microstates and macrostates, statistical fluctuations constraints and accessible States Thermodynamical probability.

Unit-II

Postulates of Statistical Physics. Division of Phase space into cells, Condition of equilibrium between two system in thermal contact. b-Parameter. Entropy and Probability, Boltzman's distribution law. Evaluation of A and b. Bose-Einstein statistics, Application of B.E. Statistics to Plancks's radiation law, B.E. gas.

Unit-III

Fermi-Dirac statistics, M.B. Law as limiting case of B.E. Degeneracy and B.E., Condensation. F.D. Gas, electron gas in metals. Zero point energy. Specific heat of metals and its solution.

References

1. B.B. Laud, "Introduction to Statistical Mechanics" (Macmillan 1981).
2. F. Reif, "Statistical Physics' (McGraw Hill 1988).
3. K. Huang, "Statistical Physics" (Wiley Eastern 1988).

B.Sc. PHYSICS
Paper-II PHY 402
Optics – II

Max. Marks : 45
Internal Assessment : 10
Time : 3 Hrs.

NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit-I

Interference by Division of Amplitude :Colour of thin, films, wedge shaped film, Newton's rings. Interferometers: Michelson's interferometer and its application to (I) Standardisation of a meter (II) determination of wave length. Fresuel's Diffraction : Fresnel's half period zones, zone plate, diffraction at a straight edge, rectangular slit and circular apperture.

Unit-II

Fraimhoffer diffraction : One slit diffraction, Two slit diffraction N-slit diffraction, Plane transmission granting spectrum, Dispersive power of a grating , Limit of resolution, Rayleigh's criterion, resolving power of telescope and a grating.

Unit-III

Polarization :Polarisation and Double Refraction : Polarisation by reflection, Polarisation by scattering, Malus law, Phenomenon of double refraction, Huytgen's wave theory of double refraction (Normal and oblique incidence), Analysis of Palorised light : Nicol prism, Quarter wave plate and half wave plate, production and detection of (i) Plane polarized light (ii) Circularly polarized light and (iii)Elliptically polarized light, Optical activity, Fresnel's theory of rotation, Specific rotation, Polarimeters (half shade and Biquartz).

References

1. Optics by Ajay Ghatak, Tata McGraw Hill 1977.
2. Introduction of Optics by Frank L. Pedrotti and Leno S. Pedrotti, Prentice Hall 1987.

B.Sc. PHYSICS
Paper-III Phy- 403
Practicals

Max. Marks : 40
Time : 3 Hrs.

Special Notes

1. Do any eight experiments.
2. The students are required to Calculate the error involved in a particular experiment (Percentage error).

Note:-

Distribution of Marks :

Experiments :	=	20 Marks
Viva-Voce :	=	10 Marks
Lab. Record :	=	10 marks
Total		40 Marks

For Giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure.

1. After the completion of a practical the teacher concerned will check the note-book and conduct the viva-voce of each student to find out how much concepts related to the theoretical and experimental part of the experiment he/she has understood. According to his/her performance marks will be recorded on their practical note book. These marks will contribute the lab Record.
2. To complete the final marks for lab. Record a separate register for each class of B.Sc. will be maintained. The students will be assigned a separate page on this register. On this page the marks obtained by the student in different practicals will be recorded. While taking the final average the total marks obtained will be divided by the total no. of required practicals, instead of the number of practicals performed by the student. This record will be signed by the concerned teacher.
3. The Lab. Record register will be presented to the external practical examiners for lab. Record marks. The external examiner will verify the record randomly.

B.Sc. PHYSICS
Paper III- PHY 403
PRACTICALS

Max. Marks : 40
Time : 3 Hours

Note: Do eight experiments, selecting four from each section.

Note:- This course will contain two parts (i) Electronics and (ii) Computer experiments. Students have to perform a minimum of four experiments from each part.

Section A

1 To draw a graph between wave length and minimum deviation for various lines from a Mercury discharge source.
2 Determination of wave length of Na light and the number of lines per centimeter using a diffraction grating.
3 Wave length by Newton's Rings.
4 Measurement of (a) Specific rotation (b) concentration of sugar solution using polarimeter.
5 To find the equivalent focal length of a lens system by nodal slide assembly.

Section B

(i) Electronics

1 To draw frequency response curve of transistorised R.C. coupled amplifier.
2 Study of series and parallel resonance circuits.

3 To find out the frequency of a tuning fork by Melde's experiment.

(ii) Computer Experiments

1 Find the roots of a quadratic equation.
2 To find intergration of a definite integral by trapezoidal rule.
3 To find the area of a triangle, sphere and cylinder.
4 Given value for a,b,c and d and a set of values for the variable x evaluate the function defined by

F(x)= ax2+bx+c if x<d
F(x)= O if x=d
F(x)= ax2+bx+c if x>d

For each value of x, and print the value of x and (fx). Write a program for an arbitrary number of x values.

Scheme of Examination
B. Sc. (Pass Course) Physics Semester-V & VI for the sessions 2018-19

Semester-V

Paper No.	Title	Time	Total Marks	Internal Assessment	Max. Marks
Phy-501	Solid State Physics	3 Hrs.	55	10	45 (Theory)
Phy-502	Quantum Mechanics	3 Hrs.	55	10	45(Theory)
Phy-503	Practical	3 Hrs.	40		40

Semester-VI

Paper No.	Title	Time	Total Marks	Internal Assessment	Max. Marks
Phy-601	Atomic, Molecular and Laser Physics	3 Hrs.	55	10	45 (Theory)
Phy-602	Nuclear Physics	3 Hrs.	55	10	45 (Theory)
Phy-603	Practical	3 Hrs.	40		40

Internal Assessment :- The Internal Assessment for theory papers comprises of

(i)	Attendance-	2.50
(ii)	Unscheduled test	2.50
(iii)	Assignments-	5.00
	Total	10

B.Sc. PHYSICS
SCHEME OF EXAMINATION
Semester -V

Paper I- PHY 501 : SOLID STATE PHYSICS

Max. Marks : 45
Internal Assessment : 10
Time : 3 Hrs.

NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit-I

Crystalline and gallssy forms, liquid crystals. Crystal structure, periodicity, lattice and basis, crystal translational vectors and axes. Unit cell and primitive cell, Winger Seitz primitive Cell, symmetry operations for a two dimensional crystal, Bravais tattices in two and three dimensions.

Unit-II

crystal planes and Miller indices, Interplanner spacing, Crystal structures of Zinc sulphide, Sodium Chloride and diamond, X-ray diffraction, Bragg's Law and experimental x-ray diffraction methods, K-space.

Unit-III

Reciprocal lattice and its physical significance, reciprocal lattice vectors, reciprocal lattice to a simple cubic lattice, b.c.c and f.c.c.

Specific heat : Specific heat of solids, Einstein's theory of specific heat, Debye model of specific heat of solids.

References

1. Introduction to solid state Physics (5_{th} Ed.) by kittel, Wiley eastern Limited

B.Sc. PHYSICS
Paper I- PHY 502 : QUANTUM MECHANICS

Max. Marks : 45
Internal Assessment : 10
Time : 3 Hrs.

NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit-I

Failure of (Classical) E.M. Theory. quantum theory of radiatio (old quantum theory), Photon, photoelectric effect and Einsteins photoelectric equation compton effect (theory and result). Inadequancy of old quantum theory, de-Broglie hypothesis. Davisson and Germer experiment. G.P. Thomson experiment. Phase velocity group velocity, Heisenberg's uncertainty principle. Time-energy and angular momentum, position uncertainty Uncertainty principle from de-Broglie wave, (wave-partice duality). Gamma Ray Maciroscope, Electron diffraction from a slit.

Unit-II

Derivation of time dependent Schrodinger wave equation, eigen values, eigen functions, wave functions and its significance. Normalization of wave function, concept of observable and operator. Solution of Schrodinger equation for harmomic oscillator ground states and excited states.

Unit-III

Application of Schrodinger equation in the solution of the following one-dimensional problems : Free particle in one dimensional box (solution of schrodinger wave equation, eigen function, eigen values, quantization of energy and momentum, nodes and antinodes, zero point energy).

i) One-dimensional potential barrie $E>V_0$ (Reflection and Transmission coefficient.

ii) One-dimensional potential barrier, $E>V_0$ (Reflection Coefficient, penetration of leakage coefficient, penetration depth).

References :

1. Quantum Mechanics by L.I. Schiff, McGraw Hill Book Company, Inc.
2. Quantum Mechanics by B. Crasemand and J.D. Powel (Addison Wesley.
3. Quantum Mechanics by A.P. Messiah.

B.Sc. PHYSICS

Paper -III Phy- 503

(Practicals)

Max. Marks : 40

Time : 3 Hrs.

Special Notes

1. Do 4 experiments from section (i)& 4 experiments form Section (ii).
2. The students are required to calculate the error involved in a particular experiment (percentage error).
3. Use of simple non-programmable scientific calculate is allowed.

Note :

1. The practical examinations will be

Experiments	=20 marks
Viva-Voce	=10 marks
Lab Record	= 10 marks
Total	= 40 marks

For giving marks under Lab. Record each college maintain practical assessment record by using the following procedure.

I. Each student has to perform a minimum number of experiments prescribed in the syllabus.

II. After the completion of a practical the teacher concerned will check the note-book and conduct the Viva-voce of each student to find out how much concept related to the theoretical and experimental part of the experimental part of the experiment he/she has under stood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.

III. To complete the final marks for lab. Record a separate register for each class of B.Sc. will be maintained. The student will be assigned a separate page on this register. On this page the marks obtained by the student in different practicals will be recorded While taking the final average the total marks obtained will be divided by the total no of required practicals instead of the number of practicals performed by the student. This record will be signed by the concerned teacher.

IV. The lab. Record register will be presented to the external practical examiner for lab. Record marks. The external examiner will verify the record randomly.

B.Sc. PHYSICS

Paper III- PHY 503
PRACTICALS

Max. Marks : 40
Time : 3 Hours

Note: Do eight experiments, selecting four from each section.

Section A

i) Solid State Electronics

1 Transistor as voltage Amplifier in C-B Configuration.
2. Transistor as voltage Amplifier in C-E Configuration.
3. Study of Hartley Oscillator (Calibration of Gang Condenser).
4. a) To Draw the Plateau of G.M. Counter.
   b) To Determine the Mass Attention Coefficient by G.M.Counter.

ii) Computer Experiment :

1. Compute the sum of an infinite series upto three significant figures. For example, compute. for different x using Do loops. Calculate factorials through function subprogram.
2. Let there be N(Say=100) students in a class. Arrange their marks in descending or ascending orders.
3. Write a Fortran Program which evaluates v and y as function of verying between and increments of using the relation.

Section B

1. Young's modulus by Newtons rings method.
2. Resolving power of a prism.
3. Thickness of a thin plate using air wedge.
4. Resolving Power of plane transmission grating.
5. Rydberg constant by Hydrogen gas spectrum.

B.Sc. PHYSICS

SCHEME OF EXAMINATION
Semester -VI

Paper I- PHY 601 : ATOMIC MOLECULAR AND LASER PHYSICS

Max. Marks : 45
Internal Assessment : 10
Time : 3 Hrs.

NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed

Unit -I

Vector atom model, quantum numbers associated with vector atom model, penetrating and non-penetrating orbits (qualitiative description), spectral lines in different series of ailkali spectra, spin orbit interaction and doublet term seperation LS or Russel-Saunder Coupling jj coupling (expressions for inteaction energies for LS and jj coupling required).

Unit-II

Zeeman effect (normal and Anormalous) Zeeman pattern of D_1 and D_2 lines of Na-atom, Paschen, Back effect of a single valence electron system. Weak field Strak effect of Hydrogen atom.

Diseete set of electronic energies of molecules. quantisation of Vibrational and ratiational energies Raman effect (Quantitative description) Stoke's and anti Stoke's lines.

Unit-III

Main features of a laser : Directionality, high intensity, high degree of coherence, spatial and temporal coherence, Einstein's coefficients and possibility of amplification, momentum transfer, life time of a level, kinetics of optical obsorption. Threshold condition for laser emission, Laser pumping, He-Ne laser and RUBY laser (Principle, Construction and Working). Applications of laser in the field of medicine and industry.

References

1. Introduction to Atomic and Molecular Spectroscopy by V.K.Jain, Narosa (2007)
2. Introduction to Atomic Spectra by H.B. White.
3. Atomic spectra by G. Herzberg.
4. Molecular Spectra and Molecular Structure by G. Herzberg.
5. Fundamentals of molecular spectroscopy by Colin N. Banwell and Elaine M.Mc-Cash.
6. Lassers, Theory and Application (2nd Ed.) by Thagrajan and Ajay Ghatak.
7. Laser and Nonlinear Optics by B.B. Laud (2_{nd} Ed.)
8. Introduction to Optics by Frank L. Pedrotti and Lens S. Pedrotti, Prentice Hall, 1987.

B.Sc. PHYSICS

Paper II- PHY 602 : NUCLEAR PHYSICS

Max. Marks : 45
Internal Assessment : 10
Time : 3 Hrs.

NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit-I

Nuclear mass and binding energy, systematics nuclear binding energy, nuclear stability, Nuclear size, spin, parity, statistics magnetic dipole moment, quadrupole moment (shape concept), Determination of mass by Bain-Bridge, Bain-Bride and Jordan mass spectrograph, Determination of charge by Mosley law Determination of size of nuclei by Rutherford Back Scattering.

Unit-II

Interaction of heavy charged particles (Alpha particles), alpha disintegration and its theory Energy loss of heavy charged particle (idea of Bethe formula, no derivation), Energetics of alpha -decay, Range and straggling of alpha particles. Geiger-Nuttal law.

Introduction of light charged particle (Beta-particle), Origin of continuous beta-spectrum (neutrino hypothesis) types of beta decay and energetics of beta decay, Energy loss of beta-particles (ionization), Range of electrons, absorption of beta-particles.

Interaction of Gamma Ray, Nature of gamma rays, Energetics of gamma rays, passage of Gamma radiations through matter (photoelectric, compton and pair production effect) electron position anhilation. Asborption of Gamma rays (Mass attenuation coefficient) and its application.

Unit-III

Nuclear reactions, Elastic scattering, Inelastic scatting, Nuclear disintegration, photoneclear reaction, Radiative capture, Direct reaction, heavy ion reactions and spallation Reactions, conservation laws. Q-value and reaction threshold.

Nuclear Reactors General aspects of Reactor design. Nuclear fission and fusion reactors (Principles, construction, working and use)

Linear accelerator, Tendem accelerator, Cyclotron and Betatron accelerators.

Ionization chamber, proportional counter, G.M. counter detailed study, scintillation counter and semiconductor detector.

references :

1. Atomic and nuclear Physics, Vol. II by S.N. Ghashal.
2. Nuclear Physics by D.C. Tayal, Umesh Prakashan, 125, Goblind Dev Khurja (UP).
3. Concept of Modern physics by arther Besier, Tata McGraw Hill Publications.
4. Nuclear Physics by W.E. Burcham.
5. Nuclear Radiation Detectors by S.S. Kapoor
6. Experimental Nuclear Physics by M. Singru.

B.Sc. PHYSICS

Paper -III Phy- 603

(Practicals)

Max. Marks : 40

Time : 3 Hrs.

Special Notes

1. Do 8 experiments.
2. The students are required to calculate the error involved in a particular experiment (percentage error).
3. Use of simple non-programmable scientific calculate is allowed.

Note :

1. The practical examinations will be

Experiments	=20 marks
Viva-Voce	=10 marks
Lab Record	= 10 marks
Total	= 40 marks

For giving marks under Lab. Record each college maintain practical assessment record by using the following procedure.

I. Each student has to perform a minimum number of experiments prescribed in the syllabus.

II. After the completion of a practical the teacher concerned will check the note-book and conduct the Viva-voce of each student to find out how much concept related to the theoretical and experimental part of the experimental part of the experiment he/she has under stood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.

III. To complete the final marks for lab. Record a separate register for each class of B.Sc. will be maintained. The student will be assigned a seperate page on this register. On this page the marks obtained by the student in different practicals will be recorded While taking the final average the total marks obtained will be divided by the total no of required practicals instead of the number of practicals performed by the student. This record will be signed by the concerned teacher.

IV. The lab. Record register will be presented to the external practical examiner for lab. Record marks. The external examiner will verify the record randomly.

B.Sc. PHYSICS
Paper III- PHY 603
PRACTICALS

Max. Marks : 40
Time : 3 Hours

Note: Do eight experiments, selecting four from each section.

Section A

(i) Electronics

1 e/m by Thomson method.
2 Study of B-H Curve by C.R.O.
3 To study Hall effect.
4 Measurement of Energy Gap of Four Probe Method.

(ii) Computer Experiments

1. Program of compute product of two matrics A and B of different dimensions. This is an exercise to illustrate the use of subscripted variable and implied Do loops.
2. Evaluate the difine integral 1=h *f* f(x)dx. through Simpson's one. third rule.
3. USe of the least-quare curve fitting to fit a straight line to a given set of data.
4. Consider and array X with subscripted variables x; i = 1.
   2 .....N.
   It is desired to find the average and the standard deviation using the formulas.

Section B
Optics

1. Wave length of Sodium light by fresnel's biprism.
2. Velocity of ultrasonic waves by grating formation in CC14.
3. Diameter of Lycopodium powder particies by Carona rings.
4. To study double sit interference by He-Ne laser.
5. Diameter of a thin wire by diffraction method (using He-Ne Laser).