SCHEME OF EXAMINATION
B.Sc. (PASS COURSE) PHYSICS Semester I – IV w.e.f. 2012-13

Semester I

	Paper No.	Name of the paper	Max. marks	I.A.	Time
Paper I	PHY-101	Mechanics	45	10	3 Hrs.
Paper II	PHY-102	Electricity and Magnetism	45	10	3 Hrs.

Semester II

	Paper-No.	Name of the paper	Max. marks	I.A.	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-103	Practical	40	-	3 Hrs.
Paper IV	PHY-203	Practical	40	-	3 Hrs.

Semester – III

Paper no.	Paper Code	Title	Max. marks	I.A.	Time
Paper I	PHY-301	Computer Programming, Thermodynamics	45	10	3 Hrs.
Paper II	PHY-302	Optics -I	45	10	3 Hrs.

Semester – IV

Paper no.	Paper Code	Title	Max. marks	I.A.	Time
Paper I	PHY-401	Statistical Mechanics	45	10	3 Hrs.
Paper II	PHY-402	Optics-II	45	10	3 Hrs.
Paper III	PHY-303	Practical	40	-	3 Hrs.
Paper IV	PHY-403	Practical	40	-	3 Hrs.

Note:

1. Paper Nos. PHY 103 & 203; PHY 303 & PHY 403 will run concurrently throughout the year. Practical examination will be held at the end of 2nd Semester

(for PHY 103 & PHY 203) and 4th Semester (for PHY-303 & PHY 403). **The work load for practical is 3 periods / week/ practical paper.**

2. One Practical from each paper is to be performed in the practical examination.

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 peform 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

1. Moment of Inertia of a fly-wheel
2. M.I. of an irregular body using a torsion pendulum.
3. Surface Tension by Jeager's method.
4. Young's modulus by bending of beam.
5. Modulus of rigidity by Maxwell's needle.
6. Elastic constants by Searle's method.
7. Viscosity of water by its flow through a uniform capillary tube.
8. Thermal conductivity of a good conductor by Searle's method.
9. Mechanical equivalent of Heat by Callendao and Barne's method.
10. 'g' by Bar pendulum.

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

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 peform 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 203
PRACTICALS

Max. Marks : 40
Time : 3 Hours

1. E.C.E. of hydrogen using an Ammeter.
2. Calibration of thermocouple by potentiometer.
3. Low resistance by Carey Foster's Bridge with calibration.
4. Determination of impendance of an A.C. circuit and its verification.
5. Frequency of A.C. mains and capacity by elctrical vibrator.
6. Frequency of A.C. mains by sonometer using an electromagnet.
7. Measurement of angle dip by earth inductor.
8. High resistance by substitution method.
9. Inductance (L) by Anderson Bridge (A.C. method)
10. To draw forward and reverse bias characteristics of a semiconductor diode.
11. Zener Doide volage regulation characteristics.
12. Verification of Inverse square law by photo-cell.
13. To study the characteristics of a solar 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).

Note:-

1. The practical examination will be held in two sessions of 3 hours.
2. 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

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. To draw a graph between wave length and minimum deviation for various lines from a Mercury discharge source.
4. Determination of wave length of Na light and the number of lines per cerntimeter using a diffraction grating.
5. Wave length by Newton's Rings.
6. Resolving power of a telescope.
7. Comparision of Illuminating Powers by a Photometer.
8. Measurement of (a) Specific rotation (b) concentration of sugar solution using polarimeter.
9. Ordinary and extra ordinary refractive indices for calcite or quartz.
10. To find the equivalent focal length of a lens system by nodal slide assembly.

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:-

1. The practical examination will be held in two sessions of 3 hours.
2. 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:- This course will contain two parts (i) Electronics and (ii) Computer experiments. Students have to perform a minimum of four experiments from each part.

(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. To draw frequency response curve of transistorised R.C. coupled amplifier.
4. To find out the frequency of a tuning fork by Melde's experiment.
5. Study of series and parallel resonance circuits.
6. Electronic Voltmeter measurement of peak, average & R.M.S. valus of signal.
7. 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. For example, S=.
4. Find the roots of a quadratic equation.
5. To find intergration of a definite integral by trapezoidal rule.
6. To find the area of a triangle, sphere and cylinder.
7. 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 arbitary number of x values.

Scheme of Examination
B. Sc. (Hons.) Physics Semester-V & VI for the sessions 2012-13

Semester-V

Paper No.	*Title*	Periods Per week	Total Marks	Internal Assessment	Max. Marks
Phy-501	Mathematical Physics V	3	50	5	45
Phy-502	Electro-magnetic Theory-I	3	50	5	45
Phy-503	Statistical Physics-I	3	50	5	45
Phy-504	Physics of Materials -I	3	50	5	45
Phy-505	Electronics Devices: Physics and Application -I	3	50	5	45
Phy-506	Any one of the following (a) Nano Technology (b) Environmental Physics	 3 3	 50 50	 5 5	 45 45
		Total Marks	300		

Semester-VI

Paper No.	*Title*	Periods Per week	Total Marks	Internal Assessment	Max. Marks
Phy-601	Mathematical Physics VI	3	50	5	45
Phy-602	Electro-magnetic Theory-II	3	50	5	45
Phy-603	Statistical Physics-II	3	50	5	45
Phy-604	Physics of Materials –II	3	50	5	45
Phy-605	Electronics Devices: Physics and Application –II	3	50	5	45
Phy-606	Any one of the following (a) Nano Technology (b) Environmental Physics	 3 3	 50 50	 5 5	 45 45
Phy-507	Physics Lab. V	6	75	--	75
Phy.508	Physics Lab.VI And Project	6	75	--	75
Phy-607	Physics Lab. VII	6	75	---	75
Phy.608	Physics Lab.VIII And Project	6	75	---	75
		Total Marks	600		

Note:

1. Paper Nos. PHY 507 & PHY 607; PHY 508 & PHY 608 will run concurrently throughout the year. Practical examination will be held at the end of 6th Semester (for PHY-507 & PHY-607) and (for PHY-508 & PHY-608). **The workload for practical is 6 periods/ week/ practical paper.**
2. One Practical from each paper is to be performed in the practical examination

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 6 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

This course will consist of two parts :
i) Solid State Electronics
ii) Computer Experiments
Student have to perform a minimum of four experiments from each part.

i) Solid State Electronics

1. e/m by Thomson method.
2. Transistor as voltage Amplifier in C-B Configuration.
3. Transistor as voltage Amplifier in C-B Configuration.
4. Study of B-H Curve by C.R.O.
5. Study of Hartley Oscillator (Calibration of Gang Condenser).
6. To study Hall effect.
7. Measurement of Energy Gap of Four Probe Method.
8. a) To Draw the Plateau of G.M. Counter.
   b) To Determine the Mass Attention Coefficient by G.M.Counter.

ii) Computer Experiment :

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.
5. 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.
6. Let there be N(Say=100) students in a class. Arrange their marks in descending or ascending orders.
7. Write a Fortran Program which evaluates v and y as function of verying between and increments of using the relation.

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

Wave length of Sodium light by fresnel's biprism.
Velocity of ultrasonic waves by grating formation in CC14.
Diameter of Lycopodium powder particies by Carona rings.
To study double sit interference by He-Ne laser.
Diameter of a thin wire by diffraction method (using He-Ne Laser).
Young's modulus by Newtons rings method.
Resolving power of a prism.
Thickness of a thin plate using air wedge.
Resolving Power of plane transmission grating.
Rydberg constant by Hydrogen gas spectrum.

Scheme of Examination
B. Sc. (Hons.) Physics Semester-V & VI for the session 2013-14

Semester-V

Paper No.	*Title*	Periods Per week	Max. Marks	Internal Assessment	Total Marks
Phy-501	Mathematical Physics V	3	40	10	50
Phy-502	Electro-magnetic Theory-I	3	40	10	50
Phy-503	Statistical Physics-I	3	40	10	50
Phy-504	Physics of Materials -I	3	40	10	50
Phy-505	Electronics Devices: Physics and Application -I	3	40	10	50
Phy-506	Any one of the following (a) Nano Technology (b) Environmental Physics	 3 3	 40 40	 10 10	 50 50
Phy-507	Physics Lab. V	6	75	--	75
Phy.508	Physics Lab.VI And Project	6	75	--	75
Total Marks					450

Semester-VI

Paper No.	*Title*	Periods Per week	Max. Marks	Internal Assessment	Total Marks
Phy-601	Mathematical Physics VI	3	40	10	50
Phy-602	Electro-magnetic Theory-II	3	40	10	50
Phy-603	Statistical Physics-II	3	40	10	50
Phy-604	Physics of Materials –II	3	40	10	50
Phy-605	Electronics Devices: Physics and Application –II	3	40	10	50
Phy-606	Any one of the following (a) Nano Technology (b) Environmental Physics	 3 3	 40 40	 10 10	 50 50
Phy-607	Physics Lab. VII	6	75	---	75
Phy.608	Physics Lab.VIII And Project	6	75	---	75
	Total Marks				450

Note:

1. One Practical from each paper is to be performed in the practical examination

B.Sc.(Hons) Physics

Phy-501 (Semester-V) Mathematical Physics-V

Max. Marks : 40
Internal Assessment: 10
Time : 3 Hrs.

NOTE :

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

Unit I: Linear Vector Spaces and Matrices.

Introduction to groups, rings and fields.

Vector spaces and subspaces. Linear independence-basis and dimensions. Linear transformations. Algebra of linear transformations. Non-singular transformations. Isomorphism. Representation of linear transformations by matrices.

Unit II:

Matrix algebra Addition and multiplication null and unit matrices. Singular and non-singular matrices. Inverse of a matrix Eigenvalues and eigenvectors. Digitalization solution of coupled linear ordinary differential equations.

Special matrices: Hermitian and skew symmetric and antisymmetric, orthogonal and unitary matrices Similarity transformations and bilinear and quadratic forms. Trace of a matrix Cayley-Hamilton theorem. Function of a matrix.

Metric spaces. Inner product and metric concept.

Recommended Books

1 Mathematical Physics by **P. K. Chattopadhyay (T)**
2 Mathematical Physics by ***B.S. Rajput***
3 Mathematical Physics by ***Mathews and Walkers***
4 Mathematics for Physicists ***by Mary L Boas***.
5 Matrices and Tensors for Physicists by ***A. W. Joshi***

B.Sc.(Hons) Physics

Phy-502 (Semester-V) Electromagnetic Theory-I

Max. Marks : 40
Internal Assessment: 10
Time : 3 Hrs.

NOTE :

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

Unit- I

Maxwell equations. Displacement current, Vector and scalar potentials. Gauge transformations : Lorentz and Coulomb gauge. Boundary conditions at interface between different media, Wave equations, Plane waves in dielectric media.

Poynting theorem and Poynting vector. Energy density. Physical concept of electromagnetic (e.m) field momentum density and e.m field angular momentum density.

Unit -II

Reflection and refraction of a plane wave at a plane interface between dielectrics. Fresnel formulae, Total internal reflection, Brewster's angle, Waves in conducting media, Metallic reflection (normal incidence), Skin depth.

Maxwell's equations in microscopic media (plasma), Characteristic plasma frequency, Refractive index, Conductivity of an ionized gas, Propagation of e.m. waves in ionosphere.

Book Prescribed

1 Electromagnetics by **B. B. Laud**
2 Classical Electricity and Magnetism by **Panofsky and Phillips**
3 Electromagnetic Theory and Electrodynamics by **Satya Praksh.**
4 Electromagnetic fields and Waves by **V. V. Sarwate.**
5 Electrodynamics by **Gupta S. L. , Singh S. P. and Kumar V**

B.Sc.(Hons) Physics

Phy-503 (Semester-V) Statistical Physics-I

Max. Marks : 40
Internal Assessment: 10
Time : 3 Hrs.

NOTE :

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

Unit- I : Classical Statistics

Entropy and thermodynamic probability, Maxwell Boltzmann distribution law, Partition function, Thermodynamic functions of finite number of energy levels, Thermodynamic functions of an ideal gas, Classical entropy expression, Gibbs paradox. Law of equipartition of energy, applications to specific heat and its limitations.

Unit -II : Classical Theory of Radiation

Properties of thermal radiation, Kirchhoff's law, Stefan-Boltzmann law and Wien's displacement law

Quantum Theory of Radiation

Planck's law of black-body radiation, Deduction of Wien's radiation formula, Rayleigh-Jeans law. Stefan-Boltzmann law and Wien's displacement law from Planck's law.

Laser: working principle, thermal equilibrium of radiation, principle of detailed balance, Einstein's A and B coefficients, population inversion, Two-level and three-level systems.

Book Prescribed

1 Statistical Mechanics by **K. Huang**
2 Statistical Mechanics by **R. K. Pathria**
3 Statistical Mechanics by **B. K. Aggarwal and M. Eisner**
4 Statistical Physics by **Landoan and Lif Shitz**
5 Statistical Mechanics by **R. Kubo**
6 Elementary Statistical Mechanics by **Gupta and Kumar**

B.Sc.(Hons) Physics

Phy-504 (Semester-V) Physics of Materials-I

Max. Marks : 40
Internal Assessment: 10
Time : 3 Hrs.

NOTE :

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

Unit I : Crystal Structure

Amorphous and crystalline materials.

Lattice translation vectors, Lattice with a basis-central and non-central elements. Unit cell, reciprocal lattice, Types of lattices, Crystal diffraction : Bragg's law, diffraction of X-rays, atoms and geometrical structure factor.

X-ray diffraction methods – measurement of lattice parameter for cubic lattices.

Unit II: Elementary Lattice Dynamics

Lattice vibrations Linear monoatomic and diatomic chains, Acoustical and optical phonons, Qualitative description of the phonon spectrum in solid, Brillouin zones, Einstein and Debye theories of specific heat of solids T^3 law.

Magnetic Properties of Matter

Response of substances of magnetic field Dia, Para and Ferri and Ferromagnetic materials. Classical Langevin theory of dia and paramagnetic domains, Quantum mechanical treatment of paramagnetism, Curle's law, Weiss's theory of ferromagnetism and ferromagnetic domains and discussionof B.H hysteresis, Qualitative discussion of ferrimagnets and ferrites.

Book Prescribed

1 Introduction to Solid State Physics by **C. Kittel**
2 Solid State Physics : Structure and Properties of Material by **M. A. Wahab**
3 Solid State Theory by **W. A. Harrison**
4 Solid State Physics by **H. E. Hall.**

B.Sc.(Hons) Physics

Phy-505 (Semester-V) Electronics Devices : Physics and Applications-I

Max. Marks : 40
Internal Assessment: 10
Time : 3 Hrs.

NOTE :

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

Unit I

Mesh analysis for d.c. and a.c. circuits: Nodal analysis duality in networks. Equivalent of a four terminal network. Thevenin and Norton theorem. Maximum power tranfer, superposition and reciprocity theorems. Z, Y, H parameters.

Basic semiconductor physics – p and n type semiconductors, energy level diagram, conductivity and mobility, pn junction fabrication (simple idea). Barrier formation in pn junction diode, current flow mechanism in forward and reverse biased diode (recombination, drift and saturation of drift velocity).

Unit II

Single pn junction devices (physical explanation, current voltage characteristics and one or two applications, Two terminal devices-rectifier diode, Zener diode, photo diode, LED, solar cell and varactor diode. Three-terminal devices-junction field effect transistor (FET), unijunction transistor (UJT) and their equivalent circuits.

Two junction devices p-n-p and n-p-n transistors, physical mechanism of current flow, active, cutoff and saturation regions. Transistor in active region and equivalent circuit.

Book Prescribed

1 Introduction to Semiconductor Devices by **M. S. Tyagi**
2 Semiconductor Electronics by **A. K. Sharma, New Age International Publisher (1996)**
3 Optical Electronics by **Ajay Ghatak and K. Thygarajan, Cambridge Univ. Press**
4 Semiconductor Device- Physics and Technology by **S. M. Sze, Wiley (1985)**
5 Measurement, Instrumentation and Experimental Design, in Physics and Engineering by **M. Sayer and A. Mansingh, Prentice Hall, India (2000)**

B.Sc.(Hons) Physics

Phy-506 (a) (Semester-V) Nano Technology

Max. Marks : 40
Internal Assessment: 10
Time : 3 Hrs.

Note:

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

Unit- I

Free electron theory (qualitative idea) and its features, Idea of band structure, Metals, insulators and semiconductors, Density of states in bands, Variation of density of states with energy, Variation of density of states and band gap with size of crystal.

Unit -II

Electron confinement in infinitely deep square well, confinement in two and one dimensional well, Idea of quantum well structure, Quantum dots, Quantum wires.

Text and Reference Books:

1. Nanotechnology Molecularly designed materials by **Gan -Moog Chow, Kenneth E. Gonsalves, American Chemical Society**
2. Quantum dot heterostructures by **D. Bimerg, M. Grundmann and N.N. Ledenstov, John Wiley & Sons, 1988.**
3. Nano technology : :molecular speculations on global abundance by **B.C. Crandall, MIT Press 1996.**
4. Physics of low dimensional semiconductors by **John H. Davies, Cambridge Univ. Press 1997.**
5. Physics of Semiconductors nano structures by **K.P. Jain, Narosa 1997**.
6. Nano fabrication and bio system : Integrating materials science engineering science and biology by **Harvey C. Hoch, Harold G. Craighead and Lynn Jelinskii, Cambridge Univ. Press 1996.**
7. Nano particles and Nano structured films ; Preparation characterization and applications Ed. J.H. **Fendler, John Wiley & Sons 1998.**

B.Sc.(Hons) Physics

Phy-506 (b) (Semester-V) Environmental Physics

Max. Marks : 40
Internal Assessment: 10
Time : 3 Hrs.

NOTE :

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

Unit -I Essentials of Environmental Physics

Structure and thermodynamics of the atmosphere, Composition of air, Greenhouse effect Transport of matter, energy and momentum in nature, Stratification and stability of atmosphere. Laws of motion, hydrostatic equilibrium, General circulation of the tropics, Elements of weather and climate of India.

Unit -II Solar and Terrestrial Radiation

Physics of radiation, Interaction of light with matter, Rayleigh and Mie scattering, Laws of radiation (Kirchoffs law, Planck's law, Wien's displacement law, etc.), Solar and terrestrial spectra, UV radiation, Ozone depletion problem, IR absorption energy, balance of the earth atmosphere system.

Text and Reference Books

1. **Egbert Boeker & Rienk Van Groundelle** : Environmental Physics (John Wiley).
2. **J.T. Hougtion** : The Physics of Atmosphere (Cambridge University Press 1977).
3. **J. Twidell and J. Weir,** Reneable Energy Resources (Elbs, 1988).
4. **Sol Wieder**. An introduction to Solar Energy for Scientists and Engineers (John Wiley, 1982)
5. **R.N. Keshavamurthy and M. Shanker Rao** : The Physics of Monsoons (Allied Publishers, 1992).
6. **G.J. Haltiner and R.T. Williams** : Numerical Weather Prediction (John Wiley , 1980

B.Sc.(Hons) Physics

Phy-507 (Semester-V) Physics Laboratory V

Max. Marks : 75
Periods **per week : 6 Hrs.**
Time : 3 Hrs**.**

Laboratory report	15
Viva	20
Practical	40

Unit- I: Measurement of Magnetic Field and Related Parameters

1. Measurement of field strength B and its variation in a solenoid (determination or dB/dx).
2. Determination of B-H curve using ballistic galvanometer.
3. Determination of magnetic susceptibility for liquids and solids.
4.

Unit -II: Polarisation

1. Polarisation of light by simple reflection (determination of variation of percentage reflection and degree of polarization with angle of incidence).
2. Determination of specific rotation for cane sugar solution.
3. Study of elliptically polarized light.

B.Sc.(Hons) Physics

Phy-508 (Semester-V) Physics laboratory –VI & Project

Max. Marks : 75
Periods per week : 6 Hrs.
Time : 3 Hrs.

Laboratory report	15
Viva	20
Practical	40

Unit I : Power supply

1. To design a semiconductor power supply of given rating using half wave a full wave or bridge rectifier and investigate the effect of C-filter.
2. To investigate simple regulation and stabilization circuits using zener diodes and voltage regulator Ics.

Unit II: Transistor Applications:

1. to study the various transistor biasing configurations.
2. To design of CE amplifier of a given gain (midgain) using voltage divider bias.
3. To design an oscillator of given specifications.
4. To study the characteristics of a FET and design a common source amplifier.

Operational Amplifier based Experiments.

1. To investigate the use of an op-amp as an integrator.
2. To investigate the use of an op-amp as a differentiator
3. To design an analog circuit to simulate the solution of first/second order differential equation.
4. To design an op-amp oscillator.

B.Sc.(Hons) Physics

Phy-601 (Semester-VI) Mathematical Physics-VI

Max. Marks : 40
Internal Assessment: 10
Time : 3 Hrs.

NOTE :

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

Unit I: Cartesian Tensors

Transformation of co-ordinates. Tensorial character of physical quantities. Symmetric and anti-symmetric lasers, Contraction and differentiation, Pseudotensors, Kronecker and attemating tensors, Step function and Dirac delta function.

Fourier transform . Fourier integral theorem, Sine and cosine transforms.

Unit II : Integral Transforms:

Convolution theorem, Solution of one dimensional diffusion and wave equations, Heat flow in an infinite and semi-in-finite rod.

Laplace transform, Transform of elementary functions, Derivatives and integrals, Unit step function, Periodic function, Translation substitution and convolution theorem, Solution of first and second order ordinary differential equations, Solution of partial differential equations.

Evaluation of integrals using transforms.

Recommended Books

1 Mathematical Physics by P. K. Chattopadhyay (T)
2 Mathematical Physics by *B. S. Rajput*
3 Mathematical Physics by *Mathews and Walkers*
4 Mathematics for Physicists *by Mary L Boas*.
5 Matrices and Tensors for Physicists by *A. W. Joshi*

B.Sc.(Hons) Physics

Phy-602 (Semester-VI) Electromagnetic Theory-II

Max. Marks : 40
Internal Assessment: 10
Time : 3 Hrs.

NOTE :

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

Unit -I

Polarization of e.m. waves. Description of linear, circular and elliptical polarization,

Propagation of e.m waves in anisotropic media,Symmetric nature of dielectric tensor. Fresnel's formula, Light propagation in uniaxial crystal. Double refraction, Nicol prism, Production of circularly and elliptically polarized light, Babinet compensator, Analysis of polarized light.

Unit -II

Wave guides, Coaxial transmission line, Modes in rectangular wave guide, Energy flow and attenuation in wave guides, Rectangular resonant caves.

Planar optical wave guides, Planar dielectric wave guide, condition of continuity at interface, Phase shift on total reflection, eigenvalue equations, phase and group velocity of the guided waves, field energy and power transmission.

Book Prescribed

1. ***Electromagnetics by*** *B. B. Laud*
2. ***Classical Electricity and Magnetism by*** *Panofsky and Phillips*
3. ***Electromagnetic Theory and Electrodynamics by Satya Praksh.***
4. ***Electromagnetic fields and Waves by V. V. Sarwate.***
5. ***Electrodynamics by Gupta S. L. , Singh S. P. and Kumar V***

B.Sc.(Hons) Physics

Phy-603 (Semester-V) Statistical Physics-II

Max. Marks : 40
Internal Assessment: 10
Time : 3 Hrs.

NOTE :

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

Unit -I : Bose Einstein Statistics

B.E. distribution law, Thermodynamic functions of an ideal weakly degenerate gas, Strongly degenerate Bose gas, Bose-Einstein condensation properties of liquid He (qualitative description). Radiation as photon gas, Bose's derivation of Planck's law, Thermodynamic functions of photon gas.

Specific heat of hydrogen: quantization of rotational and vibration motion, ortho and para hydrogen.

Unit -II : Fermi-Dirac Statistics.

Fermi-Dirac distribution law, Fermi energy. Thermodynamic functions of an ideal weakly degenerate Fermi gas. Strongly degenerate Fermi gas, Electron gas in a metal, specific heat of metals, Richardson's equation of thermionic emission.

Third law of thermodynamics, Absolute definition of entropy, Consequences of third law, unattainability of absolute zero.

Book Prescribed

1 Statistical Mechanics by **K. Huang**
2 Statistical Mechanics by **R. K. Pathria**
3 Statistical Mechanics by **B. K. Aggarwal and M. Eisner**
4 Statistical Physics by **Landoan and Lif Shitz**
5 Statistical Mechanics by **R. Kubo**
6 Elementary Statistical Mechanics by **Gupta and Kumar**

B.Sc.(Hons) Physics

Phy-604 (Semester-VI) Physics of Materials-II

Max. Marks : 40
Internal Assessment: 10
Time : 3 Hrs.

NOTE :

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

Unit I: Dielectric Properties of Materials.

Polarization, Local electric field at an atom. Depolarization field, Lorentz fields of dipoles inside a cavity.

Dielectric constant and polrizability: Electric susceptibility, polarizability, Clausius-Mosotti equation. Qualitative discussion of ferroelectric properties of materials and P-E hysteresis loop.

Unit II : Electrical Properties of Materials

Qualitative description of free electron theory and its inadequacies with reference to Hall effect and specific heat of electrons in a metal.

Elementary band theory-Bloch theorem, Kronig-Penney model, effective mass of electron, concept of hole. Band gaps, difference between conductors, semiconductors and insulators, intrinsic and extrinsic, conductivity in semiconductors, mobility of carriers (lattice & semiconductors (qualitative).

Book Prescribed

1. Introduction to Solid State Physics by **C. Kittel**
2. Solid State Physics : Structure and Properties of Material by **M. A. Wahab**
3. Solid State Theory by **W. A. Harrison**
4. Solid State Physics by **H. E. Hall**.

B.Sc.(Hons) Physics

Electronics Devices : Physics and Applications-II

Phy-605 (Semester-VI)

Max. Marks : 40
Internal Assessment: 10
Time : 3 Hrs.

NOTE :

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

Unit- I

Amplifiers – Only bipolar junction transistor, CB, CE and CC configurations. Single stage CE amplifier (biasing and stabilization circuits, Q-point, equivalent circuit, input impedance, output impedance, voltage and current gain). Class A, B. C amplifiers (definitions) RC coupled amplifiers (frequency response, Bode plot, amplitude and phase) Class B push-pull amplifier.

Feedback in amplifiers – Voltage feedback and current feedback Effect of negative voltage series feedback on input impedance, output impedance and gain, stability distortion and noise.

Unit -II

Oscillators – barkhausen criterion, Colpitts, Phase shift and Crystal oscillators.
Multivibrators and sweep circuits, Basic circuits of astable, bistable and monostable multivibrators, Details of astable multivibrators (Derivation of time period). Sweep circuit using transistor as a switch and UJT (derivation of time period).

Book Prescribed

1 Introduction to Semiconductor Devices by **M. S. Tyagi, Tyal Wiley and Sons.**
2 Semiconductor Electronics by **A. K. Sharma, New Age International Publisher (1996)**
3 Optical Electronics by **Ajay Ghatak and K. Thygarajan, Cambridge Univ. Press**
4 Semiconductor Device- Physics and Technology by **S. M. Sze, Wiley (1985**)
5 Measurement, Instrumentation and Experimental Design, in Physics and Engineering by **M. Sayer and A. Mansingh, Prentice Hall, India (2000**)

B.Sc.(Hons) Physics

Phy-606 (a) (Semester-VI) Nano Technology

Max. Marks : 40
Internal Assessment: 10
Time : 3 Hrs.

NOTE :

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

Unit 1

Determination of particle size, Increase in width of XRD peaks of nanoparticles, Shift in photoluminescence peaks, Variations in Raman spectra of nano-materials.

Unit II

Different methods of preparation of nanomaterials, Bottom up : Cluster beam evaporation, Ion beam deposition, Chemical bath deposition with capping techniques and Top down : Ball Milling.

Text and Reference Books :

1. Nanotechnology Molecularly designed materials by **Gan -Moog Chow, Kenneth E. Gonsalves, American Chemical Society**

2 Quantum dot heterostructures by **D. Bimerg, M. Grundmann and N.N. Ledenstov, John Wiley & Sons, 1988.**

3 Nano technology: molecular speculations on global abundance by **B.C. Crandall, MIT Press 1996.**

4 Physics of low dimensional semiconductors by **John H. Davies, Cambridge Univ. Press 1997.**

5 Physics of Semiconductors nano structures by **K.P. Jain, Narosa 1997.**

6 Nano fabrication and bio system: Integrating materials science engineering science and biology by **Harvey C. Hoch, Harold G. Craighead and Lynn Jelinskii, Cambridge Univ. Press 1996.**

7 Nano particles and nano structured films ; Preparation characterization and applications Ed. J.H. **Fendler, John Wiley & Sons 1998**.

B.Sc.(Hons) Physics

Phy-606 (b) (Semester-VI) Environmental Physics

Max. Marks : 40
Internal Assessment: 10
Time : 3 Hrs.

NOTE :

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

Unit -I Environmental Pollution and Degradation

Elementary fluid dynamics. Diffusion, turbulence and turbulent diffusion. Factors governing air, water and noise pollution, Air and water quality standards, Waste disposal, Heat island effect, Land and see breeze, Puffs and plumes, Gaseous and particulate matters, Wet and dry deposition.

Unit -II Environmental Changes and Remote Sensing

Energy source and combustion processes, Renewable sources of energy, Solar energy, wind energy, bioenergy, hydropower, fuel cells, nuclear energy. Forestry and bioenergy.

Elements of weather and climate, Stability and vertical motion of air, Horizontal motion of air and water. Pressure gradient forces, Viscous forces, Inertia forces, Reynolds number, Enhanced Greenhouse Effect, Energy balance, Zero dimensional Greenhouse model, Global climate models.

Text and Reference Books

1. **Egbert Boeker & Rienk Van Groundelle** : Environmental Physics (John Wiley).
2 **J.T. Hougtion** : The Physics of Atmosphere (Cambridge University Press 1977).
3 **J. Twidell and J. Weir, Reneabl**e Energy Resources (Elbs, 1988).
4 **Sol Wieder**. An introduction to Solar Energy for Scientists and Engineers (John Wiley, 1982)
5 **R.N. Keshavamurthy and M. Shanker Rao** : The Physics of Monsoons (Allied Publishers, 1992).
6 **G.J. Haltiner and R.T. Williams** : Numerical Weather Prediction (John Wiley , 1980)

B.Sc.(Hons) Physics

Phy-607 (Semester-VI) Physics Laboratory VII

Max. Marks : 75
Time per week : 6 Hrs.
Time : 3 Hrs.

Laboratory report	15
Viva	20
Practical	40

Unit- I: Determination of Fundamental Constants:

1. Determination of Boltzmann constant by studying forward characteristics of a diode.
2. Determination of e/m by method of magnetic focusing or bar magnet.
3. Determination of Stefan's constant.

Unit -II: Measurements in Solid State Physics.

1. Measurement of resistivity as a function of temperature for a Ge crystal using four probe method (from room temperature to 200 C) and determination of energy gap.
2. Determination of Hall coefficient of a given sample.
3. Determination of PE hysteresis of a ferroelectric crystal.
4. Measurement of magnetic susceptibility.
5. Ultrasonic grating.
6. Determination of wavelength of H-alpha emission line of hydrogen atom.
7. Determination of absorption lines in the rotational spectrum of iodine vapour.

B.Sc.(Hons) Physics

Phy-608 (Semester-VI) Physics laboratory –VIII & Project

Max. Marks : 75
Time per week : 6 Hrs.
Time : 3 Hrs.

Laboratory report	15
Viva	20
Practical	40

Unit -I: Modulation.

1. To study amplitude modulation using transistor.
2. To study a crystal rectifier.
3. To study pulse width/pulse position and pulse amplitude modulation using Ics.

Multivibrators and Sweep Circuits.

1. To study the characteristics of a UJT and design a single relaxation oscillator.
2. To design an astable multivibrator of given time period.
3. To design a sweep of given amplitude and true.

Unit -II

Transducers.

1. To determine the coupling coefficient of a piezo-electric crystal.
2. To determine the characteristics of p-n junction of a solar
3. To study the characteristics of a photo-diodes.

Networks.

1. To verify the Thevenin, Norton and maximum power transfer theorems.
2. Measurement of input and output impedance of an unknown network and making equivalent T and P circuit