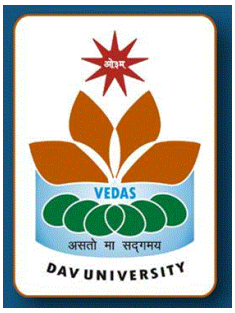
DAV UNIVERSITY JALANDHAR



Scheme & Syllabus

For

B.Sc. (HONS) PHYSICS
(Program ID-7)

1st TO 6th SEMESTER
Examinations 2014–2015 Session

Syllabi Applicable For Admissions in 2014

Instruction for candidates (Theory Paper)

- The question paper for end-semester examination will have a weightage of 25%. It will consist of 100 objective questions of equal marks. All questions will be compulsory.
- Two preannounced test will be conducted having a weightage of 25% each. Each preannounced test will consist of 20 objective type, 5 short questions/problems on the UGC-NET (objective type) pattern as well as one long answer type question. The student is expected to provide reasoning/solution/working for the answer. The candidates will attempt all question. Choice will be given only in long answer type. The question paper is expected to contain problems to the extent of 40% of total marks.
- Four objective/MCQ type surprise test will be taken. Two best out of four objective/MCQ type surprise test will be considered towards final each of 12.5% weightage to the final. Each surprise test will include 20-25 questions.
- The books indicated as text-book(s) are suggestive However, any other book may be followed.

* Wherever specific instructions are required these are given at the starting of that particular subject/paper

Instruction for candidates (Practical Paper)

- Total marks of practical will include 20% weightage of Continuous Assessment and 80% end semester exam including Notebook / Viva / Performance/ written test**.**

This syllabus has been designed as per national syllabus suggested by UGC and covers 20% extra syllabus as per requisite of honors degree.

Scheme of Courses B. Sc.-2014-2015
Semester 1

S. No	Subject	Sub Code	L	T	P	C	Contact Hours	% Weightage				Marks
								A	B	C	D	
1	Mechanics	PHY101	4	1	0	4	5	25	25	25	25	100
2	Electricity and Magnetism	PHY102	4	1	0	4	5	25	25	25	25	100
3	Thermal and Statistical Physics	PHY103	4	1	0	4	5	25	25	25	25	100
4	Physics Lab-I	PHY104	_	_	4	2	4	0	0	0	0	50
5	organic Chemistry	CHE153	4	0	0	4	4	25	25	25	25	100
6	organic Chemistry Lab	CHE154	_	_	3	2	3	0	0	0	0	50
7	Matrices and infinite series	MTH155	4	0	0	4	4	25	25	25	25	100
8	Environment Education	EVS102	3	0	0	2	3	25	25	25	25	50
9	General Knowledge and current affairs	SGS102	2	0	0	2	2	25	25	25	25	50
			25	3	7	**28**	35					**700**

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type and Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type and Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

Note:

1. If a course is being taught by two teachers, they should coordinate among themselves for assessment and material being taught.
2. Internal assessment in all the papers will be as per university rules.
3. The pass marks is 40% in each subject

Scheme of Courses B. Sc.-204-2015
B.Sc.(HONOURSCHOOL)PHYSICS

Semester 2

S. No.	Subject	Sub Code	L	T	P	C	Contact Hours	% Weightage A	B	C	D	Marks
1	Vibrations and Waves	PHY111	3	1	0	3	4	25	25	25	25	75
2	Optics	PHY112	3	1	0	3	4	25	25	25	25	75
3	Physics Lab-II	PHY113	0	0	4	2	4	0	0	0	0	50
4	Spectroscopy	CHE155	4	0	0	4	4	25	25	25	25	100
5	Calculus and Geometry	MTH156	4	0	0	4	4	25	25	25	25	100
6	Chemistry Lab	CHE156	0	0	3	2	3	0	0	0	0	50
7	Basic Communications Skills	ENG151	4	0	0	3	4	25	25	25	25	75
8	Basic Communications Skills Lab	ENG152	0	0	2	1	2	0	0	0	0	25
9	Human Values & ethics	SGS101	2	0	0	2	2	25	25	25	25	50
10	Road Safety and Legal Awareness	EVS103	2	0	0	2	2	25	25	25	25	50
11	Stenography	SGS104	3	0	0	1	3	25	25	25	25	25
12	Stenography Lab	SGS105	0	0	1	1	1	0	0	0	0	25
			25	2	10	**27**	37					**700**

Scheme of Courses B. Sc.-2014-2015
B.Sc.(HONOURSCHOOL)PHYSICS

Semester 3

S. No	Subject	Sub Code	L	T	P	C	Contact Hrs	% Weightage				Marks
								A	B	C	D	
1	Electronics-I	PHY201	4	1	0	4	5	25	25	25	25	100
2	Numerical Methods	PHY202	4	1	0	4	5	25	25	25	25	100
3	Numerical Methods Lab	PHY203	0	0	4	2	4	0	0	0	0	50
4	Physics Lab-III	PHY204	0	0	4	2	4	0	0	0	0	50
5	Introduction to life Sciences	ZOO151	2	0	0	2	2	25	25	25	25	50
6	Differential equations and Fourier Series	MTH255	4	0	0	4	4	25	25	25	25	100
7	Inorganic Chemistry	CHE253	4	0	0	4	4	25	25	25	25	100
8	Inorganic Chemistry Lab	CHE254	0	0	3	2	3	0	0	0	0	50
9	English	ENG180	4	0	0	4	4	25	25	25	25	100
			22	2	11	**28**	35					**700**

Scheme of Courses B. Sc.
B.Sc.(HONOURSCHOOL)PHYSICS

Semester 4

S. No	Subject	Sub Code	L	T	P	C	Contact Hours	% Weightage				Marks
								A	B	C	D	
1	Electronics-II	PHY211	4	1	0	4	5	25	25	25	25	100
2	Quantum Mechanics	PHY212	4	1	0	4	5	25	25	25	25	100
3	Special Theory of Relativity	PHY213	4	1	0	4	5	25	25	25	25	100
4	Atomic and Molecular Physics	PHY214	4	1	0	4	5	25	25	25	25	100
5	Physics Lab-IV	PHY216	0	0	4	2	4	0	0	0	0	50
6	Programming in C	CSA255	4	0	0	3	4	25	25	25	25	75
7	Programming in C Lab	CSA256	0	0	2	1	2	0	0	0	0	25
8	Electromagnetic Theory	PHY215	4	1	0	4	5	25	25	25	25	100
			24	5	6	**26**	35					**650**

Scheme of Courses B. Sc.
B.Sc.(HONOURSCHOOL)PHYSICS

Semester 5

Sr	Subject	Sub Code	L	T	P	C	Contact Hr	% Weightage				Marks
								A	B	C	D	
1	Nuclear Physics	PHY301	4	1	0	4	5	25	25	25	25	100
2	Mathematical Physics	PHY302	4	1	0	4	5	25	25	25	25	100
3	Solid State Physics	PHY303	4	1	0	4	5	25	25	25	25	100
4	Physics Lab-V	PHY304	0	0	4	2	4	0	0	0	0	50
5	Integral Transforms and Complex Analysis	MTH351	4	0	0	4	4	25	25	25	25	100
6	Physical Chemistry	CHE353	4	0	0	4	4	25	25	25	25	100
7	Physical Chemistry Lab	CHE354	–	–	3	2	3	0	0	0	0	50
8	Academic Activity	PHY316	0	0	0	2		0	0	0	0	50
			20	3	7	**26**	30					**650**

Semester 6

Sr	Subject	Sub Code	L	T	P	C	Contact Hrs	% Weightage				Marks
								A	B	C	D	
1	Particle physics	PHY311	4	1	0	4	5	25	25	25	25	100
2	Vacuum Science and Low Temperature Physics	PHY312	4	1	0	4	5	25	25	25	25	100
3	Laser Physics	PHY313	4	1	0	4	5	25	25	25	25	100
4	Technical Skills	PHY314	1	0	0	1	1	25	25	25	25	25
5	Technical Skills Lab	PHY315	0	0	6	3	6	0	0	0	0	75
6	Matlab	MTH310	0	0	4	2	4	0	0	0	0	50
7	Academic Activity	PHY316	0	0	0	2	-	0	0	0	0	50
			13	3	10	**20**	26					**500**

SUBSIDIARY FOR STUDENTS OF HONS. SCHOOLINCHEMISTRY, COMPUTER SCIENCE, GEOLOGYANDMATHEMATICS

Semester	Subject	Sub Code	L	T	P	C	Contact Hours	Marks
First	Optics and Lasers	PHY153	4	0	0	4	4	100
First	Optics Lab	PHY154	0	0	3	2	3	50
Second	Modern Physics	PHY155	4	0	0	4	4	100
Second	Modern Physics Lab	PHY156	0	0	3	2	3	50
Third	Electricity, Magnetism and Electronics	PHY253	4	0	0	4	4	100
Third	EM & Electronics Lab	PHY254	0	0	3	2	3	50
Fifth	Waves and Mechanics	PHY353	4	0	0	4	4	100
Fifth	Waves and Mechanics Lab	PHY354	0	0	3	2	3	50

SUBSIDIARYFORSTUDENTS OFHONS. SCHOOLINBIOCHEMISTRY, BIOPHYSICS, BIOTECHNOLOGYANDMICROBIOLOGY

Semester	Subject	Sub Code	L	T	P	C	Contact Hours	Marks
First	Optics and Lasers	PHY153	4	0	0	4	4	100
First	Optics Lab	PHY154	0	0	3	2	3	50
Second	Modern Physics	PHY155	4	0	0	4	4	100
Second	Modern Physics Lab	PHY156	0	0	3	2	3	50

SUBSIDIARYFORSTUDENTS OFENIVRONMENT SCIENCE

Semester	Subject	Sub Code	L	T	P	C	Contact Hours	Marks
Second	Introductory Physics	PHY157	4	0	0	4	4	100
Second	Introductory Physics Lab	PHY158	0	0	3	2	3	50

SUBSIDIARY FOR STUDENTS OF B.Tech. ALL BRANCHES

Semester	Subject	Sub Code	L	T	P	C	Contact Hours	Marks
First	Engineering Physics	PHY151	4	0	0	3	3	75
First	Engineering Physics Lab	PHY152	0	0	2	1	2	25

PHYSICS COURSES FOR B.Sc. (Physics) Hons

(FIRST SEMESTER)

PHY101MECHANICS

L	T	P	Marks
4	1	0	100

Total Lecture-60

AIM

The aim and objective of this course **Mechanics** is to familiarize the students of the B.Sc. (H.S.) to the various topics viz. conservation laws, elastic and inelastic scattering, dynamics of rigid bodies and inverse square law of forces in the framework of Newtonian Mechanics.

UNIT-I

COORDINATE SYSTEMS AND CENTRAL FORCES (15):

Coordinate Systems, Cartesian and spherical polar coordinate systems, displacement, velocity, acceleration, area and volume in these systems. Solid angle, Various forces in nature, Centre of mass, equivalent one body problem, central forces, equation of motion under central force, equation of orbit and turning points, Kepler's laws.

UNIT-II

CONSERVATION LAWS AND REFERENCE FRAMES (15):

Space time symmetries and **c**onservative laws, Reference frames, Inertial frames; Galilean transformations; Galilean invariance, No inertial frames, Centrifugal force, Coriolis force and its applications, Variation of acceleration due to gravity with latitude, Foucault's pendulum.

UNIT-III

KINEMATICS OF COLLISIONS (15):

Elastic and inelastic collisions: Centre of Mass and Laboratory frames; velocities, angles, and energies in elastic collisions in CM and laboratory frames; cross section for elastic scattering; Rutherford scattering.

UNIT-IV

ROTATIONAL DYNAMICS (15):

Angular momentum of a particle and system of particles. Torque, Principle of conservation of angular momentum, Rotation about a fixed axis, Moment of Inertia, Calculation of moment of inertia for rectangular, cylindrical, and spherical bodies, Euler's equations, Precessional motion, Elementary Gyroscope.

Suggested Books:

1. Kleppner D. and Kolenkow R. J. *An Introduction to Mechanics.* New York: McGrawHill Publishing, 1973.
2. Hans H.S. and Puri S.P. *Mechanics*. New Delhi: Tata McGraw Hill Education, 2003.
3. Mathur D.S. *Mechanics*. New Delhi: S.Chand and Company Limited, 2000.
4. Tayal D.C. *Mechanics*. Mumbai: Himalaya Publishing House, 2013.
5. Fowles G.R. and Cassiday G.L. *Analytical Mechanics.* New Delhi*:* Cengage Learning, 2005.
6. Kittel C., Knight W., et.al. *Mechanics Berkeley Physics course*, *Vol.1*. New Delhi: Tata McGraw Hill Education, 2007.
7. Feynman R. P., Leighton R.B., Sands M. *Feynman Lectures, Vol. I*. New Delhi: Pearson Education, 2008

COURSE CODE: PHY102
ELECTRICITY AND MAGNETISM

L	T	P	Marks
4	1	0	100

Total Lecture-60

AIM

The course on Electricity **and Magnetism** has been framed to teach the students the elements of vector algebra and vector calculus, Electrostatics, Magnetostatics, Electromagnetic induction and magnetic fields in matter.

Unit-I

Vector Algebra and Vector Calculus **(15)**

Introduction to Vector algebra, Differentiation of vectors, Scalar and Vector fields, Gradient of a scalar field, Divergence of a vector field and divergence theorem, Curl of a vector field and its physical significance, Useful relations involving gradient, divergence and curl, Conservative fields and potentials, line integrals, Stoke's theorem, Green's theorem in plane**.**

Unit-II

Electrostatics **(16)**

Conservation and quantization of charge, Coulomb's Law, Gauss's law and its applications, Electric potential difference and Electric Potential(Line integral), Conservative nature of Electrostatic field, Relation between Electric field and Electric potential, Electrostatic potential energy of system of charges, differential form of Gauss's law, Laplace's equation and Poisson's

Equation, Potential Energy of charged sphere, Method of electric images, Dielectric, Polarization vector, Dielectric constant, Capacitor with a dielectric, Electric Susceptibility, Gauss's law in dielectrics, Displacement Vector, Energy Stored in capacitor, Electromagnetic energy density, Boundary Conditions.

Unit-III

Magnetostatics **(16)**

Magnetic field, Magnetic force on a current carrying wire, Torque acting on a current loop placed in a uniform magnetic field, Biot Savart's law and its applications, Ampere's Circuital law and its applications to infinite hollow cylinder, solenoid and toroid, Force on parallel current carrying wires, Curl and Divergence of magnetic field, Magnetic vector potential and its expression.

Electromagnetic Induction

Faraday's law (Differential and integral form), Mutual inductance, Reciprocity theorem, Self inductance, Energy stored in a Magnetic field. A circuit containing self inductance, Displacement current and Maxwell's equations.

Unit-IV

Magnetic fields in matter **(13)**

Magnetism of matter, Response of various substances to magnetic field, Gauss's law of magnetism(Integral and differential forms), Magnetization Current, Relative permeability of a magnetic material, Magnetic Susceptibility, Magnetization Vector, Magnetic intensity, Stored magnetic energy in matter, Magnetic circuit, Energy loss in Hysteresis.

Suggested Books:

1. *Electricity and Magnetism* by Edward M. Purcell, New York: McGraw Hill Education, 1986.
2. Kip, Arthur F. *Fundamentals of Electricity and Magnetism*. New York: McGraw Hill, 1968
3. Mahajan A.S. & Rangwala A.A , *Electricity and Magnetism*. New Delhi:Tata McGraw Hill, 1988.
4. Tayal D. C. *Electricity and Magnetism,* New Delhi*:* Himalaya Publishing House.
5. *Electricity and Magnetism* by J.H.Fewkes & John Yarwood. Vol. I, UK:Oxford Univ. Press, 1991.
6. David J. Griffiths, *Introduction to Electrodynamics*, Benjamin Cummings, 3rd Edn, 1998.

COURSE CODE: PHY103
THERMAL AND STATISTICAL PHYSICS

L	T	P	Marks
4	1	0	100

Total Lecture60

AIM

The aim and objective of the course on Thermal and Statistical Physics for the student of B.Sc. (Hons.) Physics is to equip them with the knowledge of Basic thermodynamic laws, Maxwell equations and statistical physics.

UNIT-I. Basic Thermodynamics (15):

Laws of Thermodynamics, The zeroth law, indicator or PV diagrams, work done, internal energy, Carnot cycle, Carnot's engine. Entropy as a thermodynamic variable; reversible and irreversible processes, Principle of increase of entropy, Statistical basis of entropy, Thermodynamic scale of temperature; its identity with perfect gas scale, impossibility of attaining absolute zero.

UNIT-II.

Maxwell Relations (15):

Thermodynamic potentials and equilibrium of thermodynamic systems, Maxwell's equations, Clausius Clapeyron equation, Joule Thomson effect, Use of Joule Thomson effect in liquefaction of gasses, Low temperatures: Production and measurement of very low temperatures, adiabatic demagnetization, Phase transitions of first and second orders, phase diagrams of Helium, Gibbs phase rule and its applications.

UNIT-III.

Statistical Physics (17):

Scope of statistical physics, micro and macrostates, thermodynamic probability distribution of n particles in two compartments, deviation from the state of maximum probability; equilibrium state of dynamic system, distribution of distinguishable particles in compartments and cells, phase space and its division into cells, Boltzmann statistics for ideal gas, Bose Einstein statistics and its applications to photon gas, FermiDirac statistics and its application to electron gas, comparison of the three statistics.

UNIT-IV.

Theory of Thermal Radiation (13):

Properties of Thermal Radiation, Blackbody Radiation, Spectral distribution of Blackbody radiation, Kirchhoff's Law and applications, Radiation Pressure, Stefan Boltzmann Law Thermodynamical proof, Planck's Quantum Postulates, Planck's Law of Blackbody Radiation, Rayleigh Jeans Law, Stefan Boltzmann Law, Wien's displacement Law from Planck's Law.

Suggested Books:

1. Swendsen, R.H. *An Introduction to Statistical Mechanics & Thermodynamics.* Oxford:Oxford University Press, 2012.
2. Helrich, C. S. *Modern Thermodynamics with Statistical Mechanics.* Berlin: Springer, 2009.
3. Bhatia, V.S. *Statistical Physics and Thermodynamics*. New Delhi: Vishal Publication, 1986.
4. Zemansky,M.W., and Dittman, R.H. *Heat and Thermodynamics*. New York: McGraw-Hill, 1996.
5. Lokanathan, S.and Gambhir, R.S. *Statistical and Thermal Physics*. New Delhi: Prentice Hall, 1991.

PHY 104: PHYSICS LABORATORYI

(60 hrs.) **Max. Marks: 50**

Objective: The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipments.

Note:

- Students are expected to perform at least eight-ten experiments out of following list. The experiments performed in first semester cannot be repeated in second Semester.
- The examination for both the courses will be of 3 hours duration.

List of Experiments:

Experimental skills: General Precautions for measurements and handling of equipment, representation of measurements, Fitting of given data to a straight line, and Error analysis, Significant figures and interpretation of results.

1. Use of Vernier callipers, Screw gauge, Spherometer, Barometer, Sphygmomanometer, Light meter, dry and wet thermometer, TDS/conductivity meter and other measuring instruments based on applications of the experiments. Use of Plumb line and Spirit level.
2. To analyse the given experimental Data by using the least squares curve fitting and the knowledge of straight line fitting of the experimental data. Also determine the standard deviation and their use in expressing the experimental results. (Note: To achieve these objectives on a sample data of some experiment to be decided by the teacher concerned.)
3. To study the variation of time period with distance between centre of suspension
   And centre of gravity for a bar pendulum and to determine:
   (i) Radius of gyration of bar about an axis through its C.G. and perpendicular toits length.
   (ii) The value of g in the laboratory.
4. Determination of acceleration due to gravity ‘g’ by Kater's pendulum method.
5. To study moment of inertia of a flywheel.
6. Determination of height (of inaccessible structure) using sextant.
7. To determine the Young's modulus by (i) bending of beam using traveling microscope/laser, (ii) Flexural vibrations of a bar.
8. To study one dimensional collision using two hanging spheres of different materials.
9. To study the magnetic field produced by a current carrying solenoid using a pick up coil/Hall sensor and to find the value of permeability of air.
10. To determine the frequency of A.C. mains using sonometer.
11. To study C.R.O. as display and measuring device by recording sines and square waves, output from a rectifier, verification (qualitative) of law of electromagnetic induction and frequency of A.C. mains.
12. To measure thermo e.m.f. of a thermocouple as a function of temperature and find in version temperature.
13. Determination of given inductance by Anderson's bridge.
14. To determine the value of an air capacitance by deSauty Method and to find permittivity of air. Also, determine the dielectric constant of a liquid.
15. Study of R.C. circuit with a low frequency a.c. source.
16. Studies based on LCR Board: Impedance of LCR circuit and the phase and between voltage and current.
17. To measure low resistance by Kelvin’s double bridge/ Carey Foster’s bridge.
18. To study the basic ideas of equal a priori probability, law of two independent events, and probability distribution of identical particles in two compartments for a two option system using coloured dice.

(SECOND SEMESTER)

COURSE CODE: PHY111
WAVES AND VIBRATIONS
Lecture-45

L	T	P	Marks
3	1	0	75

The aim and objective of this course on **vibration and wave** is to equip the students of B.Sc. (H.S.) class to know the different aspects of the simple harmonic motion, waves in physical media and wave motion in general..

UNIT-I
HARMONIC MOTION **(11):**
Damped S.H.M., Logarithmic decrement, Relaxation time, The quality factor, q value of a simple harmonic oscillator, Superposition of two simple harmonic motions of the same frequency along the same line, interference, superposition of two mutually perpendicular simple harmonic vibrations of the same frequency, Lissajous figures, case of different frequencies.

UNIT-II
FORCED AND COUPLED OSCILLATOR **(12):**
The Forced Oscillator: Transient and steady behaviour of forced oscillator, Displacement and velocity variation with driving force frequency, Variation of phase with frequency, Power supplied to an oscillator and its variation with frequency, Q value and band width, Q value as an amplification factor (Phasor treatment to be followed). Coupled Oscillators: Stiffness coupled pendulums, Normal coordinates and normal modes of vibration, Inductance coupling of electrical oscillators, Masses on string coupled oscillators.

UNIT-III
WAVES IN PHYSICAL MEDIA **(10):**
Wave motion in one dimension, Transverse and longitudinal waves, progressive harmonic waves and their energy, Transverse waves on a string, longitudinal waves on a rod, Electrical transmission lines, characteristic impedance of a string and a transmission line, waves in an absorbing medium, spherical waves.

UNIT-IV
WAVE MOTION **(12):**
Type of waves, The wave equation and its solution, Characteristic impedance of a string, Impedance matching, Reflection and transmission of energy, Reflected and transmitted energy coefficients, Standing waves on a string of fixed length, Energy of a vibrating string, Wave and group velocity their measurements, transmission of no monochromatic waves, Bandwidth theorem.

Suggested Books:

1. Puri S.P. *Text Book of Vibrations and Waves*, New Delhi: Macmillan India, 2004.
2. Pain H.J. *The Physics of Vibrations and Waves.*West Sussex, England: John Wiley and Sons, 2005.
3. Puri S.P. *Fundamentals of Vibration and Waves*. New Delhi: Tata McGraw Hill Company, 1992
4. Crawford Jr. F. S. *Waves Berkeley Physics course Vol. III*, New York: McGraw Hill Book Company,1968.
5. Arora C.L. and Hemne P.S. *Physics for degree students*, New Delhi: S. Chand Company, 2010.
6. Tayal D.C. *Mechanics.* Mumbai: Himalayan Publishing House, 2013.

COURSECODE: PHY112

OPTICS

L	T	P	Marks
3	1	0	75

Total Lecture-45

AIM

The aim and objective of this course on **Optics** is to equip the B.Sc.(H.S.) student with the various optical phenomena observed with the light as well as the fiber optics.

UNIT-I

INTERFERENCE (15):

Light vector, coherence, theory of interference. Young's double slit experiment, Fresnel's Biprism, displacement of fringes, fringes with white light, Stoke's law, Interference in uniform and wedge shaped films, nonreflecting films, Newton's rings and applications, Michelson's interferometer principle, theory and applications, Intensity distribution in multiple beam interference, Fabry Perot interferometer and etalon, Interference filters.

UNIT-II

DIFFRACTION (10):

Huygen's principle, Huygen's Fresnel theory, Kirchoff's diffraction integral, Fresnel and Fraunhaufer diffraction, Fresnel diffraction at a single slit and circular aperture, Cornu spiral, Fresnel's half period zones, zone plate, Explanation of rectilinear propagation, Fraunhoffer diffraction at single slit, circular aperture, diffraction grating, Rayleigh's criterion for resolution, dispersive power of diffraction grating, resolving power of a diffraction grating, telescope and microscope.

UNIT-III

POLARIZATION (10):

Polarised and unpolarised light, production of polarized light, Polarization of transmission Malus' law, polarization by reflection and refraction, Brewster's law, Birefringence, anisotropic crystals, Nicol prism, Phase retardation plates, theory of circularly and elliptically polarized light, Rotation of plane of polarization, origin of optical rotation in liquids and in crystals, Polarimeter.

UNITIV

FIBRE OPTICS (10):

Principle and structure of optical fibers, acceptance angle and cone, numerical aperture, types of optical fibers, fabrication of optical fibers, loses, fiber optical communication, splicing, light sources for fibre optics, photodetectors, fiber optical sensors, and classification of optical sensors, fibre endoscope, and other applications of optical fibers.

Suggested Books:

1. Puri S.P. *Text Book of Vibrations and Waves*. New Delhi: Macmillan India, 2004.
2. Pain H.J. *The Physics of Vibrations and Waves.* West Sussex, England: John Wiley and Sons, 2005.
3. Ghatak A.K. Optics. New Delhi: TataMcGraw Hill Publishing, 1992.
4. Jenkins F.A. and White H.E. *Fundamentals of Optics*New York: McGraw Hill Publishing, 1981.

COURSE CODE: PHY 113
PHYSICS LAB II
(60hrs) **Max Marks:50**

Objective: The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipments.

Note:

- Students are expected to perform at least eight-ten experiments out of following list. The experiments performed in first semester cannot be repeated in second Semester.
- The examination for both the courses will be of 3 hours duration

List of Experiments:

Experimental skills: General Precautions for measurements and handling of equipment, representation of measurements, Fitting of given data to a straight line, and Error analysis, Significant figures and interpretation of results.

List of Experiments: Students are expected to perform at least eight experiments out of following list.

1. To determine the Refractive Index of the Material of a given Prism using Sodium Light.
2. To determine the Dispersive Power of the Material of a given Prism using Mercury Light.
3. To determine the Resolving Power of a Prism.
4. To determine wavelength of sodium light using Fresnel Biprism.
5. To determine wavelength of sodium light using Newton's Rings.
6. To determine the Thickness of a Thin Paper by measuring the Width of the Interference Fringes produced by a Wedge Shaped Film.
7. To determination Wavelength of Sodium Light using Michelson's Interferometer.
8. To determine the wavelength of Laser light using Diffraction of Single Slit.
9. To determine the wavelength of (1) Sodium and (2) Mercury Light using Plane Diffraction Grating.
10. To determine the Dispersive Power of a Plane Diffraction Grating.
11. To determine the Resloving Power of a Plane Diffraction Grating.
12. To determine the (1) Wavelength and (2) Angular Spread of HeNe Laser using Plane Diffraction Grating.
13. To study the wavelength of spectral lines of sodium light using plane transmission grating.
14. To study the specific rotation of sugar solution Laurent's half shade polarimeter method
15. To study the numerical aperture and propagation losses using He-Ne laser Optical fiber set up .
16. To compare the focal length of two lenses by Nodal slide method.
17. To determine the frequency of a tuning fork using a sonometer.
18. To verify the laws of transverse vibrations of stretched strings using a sonometer.
19. To determine the frequency of an electrically maintained tuning fork by Melde's experiment.
20. To determine the frequency of AC mains using a sonometer and an electromagnet.
21. To find the velocity of sound in the material of the given rod with a Knudt's tube.
22. To determine the velocity of ultrasonic waves in a given liquid.
23. To measure the logarithmic decrement, coefficient of damping, relaxation time and quality factor of a simple damped pendulum.

(THIRD SEMESTER)

COURSE CODE: PHY201
ELECTRONICS-I

L	T	P	Marks
3	1	0	75

AIM

The aim and objective of the course on Electronics-I for the student of B.Sc. (Hons.) Physics is to equip them with the knowledge of circuit analysis, semiconductor materials and pn junctions and electronic devices.

UNIT-I.

Circuit Analysis (10):

Series and parallel addition of VI characteristics, Kirchhoff's Law; KCL and KVL, Mesh and Node analysis, Superposition theorem, Thevenin's and Norton's theorem, reciprocity theorem, Linear resistive 2ports and interconnections, Star (T) and delta (π) networks, Miller's theorem, Wheatstone Bridge and its Applications to Wein Bridge and Anderson Bridge.

UNIT-II.

Semiconductor Materials and pn Junctions (13):

Intrinsic and Extrinsic semiconductor, Fermi level, Band diagram, Charge carries in semiconductors, Mobility and conductivity, pn junctions, depletion region, Transition and diffusion capacitance, current components in pn junction, Characteristic of pn junction diode, pn junction as rectifier, characteristics and applications of Zener diode, Photodiode, LED and photocells.

UNIT-III. Electronic Devices (12):

Bipolar junction transistor, current components in transistors, CB, CE, CC configuration, h parameters, transistor biasing, transistor as an amplifier, Transistor biasing circuits fixed bias, emitter stabilized biasing, Voltage divider biasing, Stability of I_{CO}, V_{BE} and beta, characteristics and applications of FET, MOSFET.

UNIT-IV.

Transistor Circuits (10):

Feedback amplifiers; classification of amplifiers, feedback concept, Sinusoidal oscillations; phase shift oscillators, Wien Bridge Oscillator, Crystal oscillator, Basic idea about AM modulation and demodulations, Oscilloscope.

Suggested Books:

1. Millman, J. and Halkias, C.C. *Integrated Electronics.* New Delhi: Tata McGraw-Hill, 1972.
2. Millman, J. and Halkias, C.C. *Electronic Devices and Circuits*. New Delhi: Tata McGraw Hill, 1983.
3. Chua, L. O., Desoer, C. A., and Kuh, E. S. *Linear and Non-linear Circuits*. New York: Tata McGraw, 1987.
4. Ryder, J.D. *Electronic Fundamentals and Applications.* New Delhi: Prentice Hall, 2004.
5. Budak, A.*Circuit theory fundamentals and applications.* New Delhi: Prentice Hall, 1987.

COURSE CODE: PHY202:

Numerical Methods

L	T	P	Marks
4	1	0	100

Total Lecture60

AIM

The course on **Numerical Methods** has been framed to teach the students of B.Sc (Physics) Solution of Algebraic and Transcendental Equations, Matrices and Linear System of Equations, Interpolation and Curve Fitting, Numerical Differentiation and integration, and Solution of Ordinary Differential Equations.

Unit-1 **(15)**

Solution of Algebraic and Transcendental Equations

Fixed-point Iteration Method, Bisection Method, Secant Method, Newton Raphson Method, and Generalized Newton's Method, Comparison and Error Estimation.

Matrices and Linear System of Equations

Solution of Linear Equations: Gauss Elimination Method, Gauss Seidel Iterative
Method, Computation of Eigen values and Eigenvectors of Matrices by using Iterative Methods.

Unit-II **(15)**

Interpolation and Curve Fitting

Interpolation: Forward and Backward Differences. Symbolic Relation, Differences of a polynomial, Newton' Forward and Backward Interpolation Formulas, Divided Differences, Newton's General Interpolation Formula, Curve Fitting, Polynomial least squares and cubic spline fitting.

Unit-III **(15)**

Numerical Differentiation and integration:

Numerical Differentiation using Newton's Interpolation Formulas and Cubic Spline method, Errors in Numeric differentiation, Numerical integration General Quadrature Formula, Trapezoidal Rule, Simpson's 1/3 and 3/8 Rules, Weddle's Rule.

Unit-IV **(15)**

Solution of Ordinary Differential Equations

Euler's Method, Modified Eulers's Method, Runge Kutta Method of Second Order with Error Estimation, Solution of 2Point Boundary Value Problems. Finite Difference approximation of Derivatives, Finite difference method.

Suggested Books:

1. Sastry S.S. *Introductory Methods of Numerical Analysis*. New Delhi: PHI Learning Pvt. Ltd., 4th Ed, 2006.
2. Scarborough, James D. *Numerical Mathematical Analysis*. Oxford & IBH Publishing, sixth Edition, 1966
3. Atkinson Kendall E. *Elementary Numerical Analysis* New York: Wiley, 1985
4. Hamming , Richard Wesley. *Numerical Methods for Scientists and Engineers* . Courier Dover Publications, 1986
5. Press. William H *Schaum's Outline of Programming with C++*, New York: McGrawHill; 2nd Edition, 2000.
6. Hubbard, John *Numerical Recipes in C++: The Art of Scientific Computing* , Cambridge University Press; 2nd Edition. 2000

PHY 203 NUMERICAL METHODS LAB
(60hrs) **Max Marks: 50**

Objective: The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying experimental problems using FORTRAN 77 and C.

Note:

- Students are expected to perform at least eight-ten experiments out of following list. The experiments performed in first semester cannot be repeated in second Semester.
- The examination for both the courses will be of 3 hours duration

List of Experiments:

Experimental skills:
General Precautions for measurements and handling of equipment, representation of measurements, Fitting of given data to a straight line, and Error analysis, Significant figures and interpretation of results.

1. **Determination of Roots of algebraic equations:**
   a) Biseciton Method
   b) Newton Raphson Method
   c) Secant Method

2. **Roots of linear equations:**
   a) Gauss Elimination Method.
   b) Gauss Seidal Iterative Method.

3. **Eigen Value problem:**
   a) Eigen value and Eigenvector of a Matrix by Iterative Method.

4. **Integration:**
   a) Trapezoidal Rule
   b) Simpson 1/3 and Simpson 3/8 rules
   c) Gauss quadrature formula

5. **Differential Equations:**
   a) Euler's method
   b) Modified Euler's method
   c) Range Kutta Method(2^{nd} order and 4^{th} order)

6. **Interpolation:**
   a) Newton's Forward interpolation,
   b) Newton's Backward interpolation
   c) Lagrange's interpolation

PHY204 PHYSICS LAB – III
(60hrs) **Max Marks: 50**

Objective: The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipments.

Note:

- Students are expected to perform at least eight-ten experiments out of following list. The experiments performed in first semester cannot be repeated in second Semester.
- The examination for both the courses will be of 3 hours duration

List of Experiments:

Experimental skills: General Precautions for measurements and handling of equipment, representation of measurements, Fitting of given data to a straight line, and Error analysis, Significant figures and interpretation of results.

1. To verify the Thevenin, Norton, Superposition, and Maximum Power Transfer Theorem.
2. To measure the Input and Output Impedance of an Unknown Network and to convert it into Equivalent T and π Circuits.
3. To study (a) Halfwave Rectifier and (b) Fullwave Bridge Rectifier and investigate the effect of C, L and π filters.
4. To study the characteristics of pn junction diode.
5. To study the Forward and Reverse characteristics of a Zener Diode and to study its use as a Voltage Regulator.
6. To study the Characteristics of a Photodiode.
7. To determine the Characteristics of pn junction of a Solar Cell.
8. To study the CE Characteristics of a Transistor.
9. To study the various Transistor Biasing Configurations.
10. To study the Frequency Response of Voltage Gain of a RC Coupled Amplifier.
11. To design an Oscillator of given specifications using Transistors.
12. To study the characteristics of Junction Field Effect Transistor.
13. To study the characteristic of Metal Oxide Semiconductor Field Effect Transistor

(FOURTH SEMESTER)

COURSE CODE: PHY211
ELECTRONICS-II

L	T	P	Marks
4	1	0	75

Total Lecture 60

AIM

The aim and objective of the course on Electronics-II for the student of B.Sc. (Hons.) Physics is to equip them with the knowledge of circuit analysis, semiconductor materials and pn junctions and electronic devices.

UNIT-I.

Digital Circuits (15):

Introduction of Digital Circuits, Binary numbers, Decimal to Binary and Binary to Decimal conversion, Hexadecimal numbers and their conversion to binary and decimal numbers, Logic Gates (AND, OR, NOT, NAND, NOR, Exclusive OR and Exclusive NOR Gates). Boolean algebra, De Morgan's theorems, Boolean Laws, Simplification of Logic Circuit using Boolean Algebra, Conversion of a Truth Table into an Equivalent Logic Circuit by (1) Sum of Products Method and (2) Karnaugh Map.

UNIT-II.

Arithmetic Circuits (15):

Binary Addition, 2's complement, Binary Subtraction using 2's Complement Method, Half Adders, Full Adders, a 2's complement adder and subtractor, Data processing circuits; Multiplexers, Demultiplexers, Decoders, Encoders, Parity Checkers.

UNIT-III.

Sequential Logic Circuits (18):

RS Latches, NOR Latches, NAND Latches and D Latches, Level Clocking, positive clocking and negative clocking and Edge Triggered clocking, Racing, Timing Diagram, D and JK Flip Flops, Preset and Clear Operations, Race around Conditions in JK Flip Flops, Master Slave JK Flip Flop. Shift registers; Serial in Serial out, Serial in Parallel out, Parallel in Serial out, and Parallel in Parallel out Shift Registers, Counters; Asynchronous and Synchronous Counters, Ring Counters, Decade Counter, Memories; Read only memories (ROM), PROM, EPROM

UNIT-IV.

Communication (12):

Electronic communication system, Radio wave propagation, AM, FM Modulation and detection, Radio transmitter and receiver, TV receiver, Pulse Modulation, Modem.

Suggested Books:

1. Malvino, A.P.and Leach, D.P. *Digital Principles and Applications.* New Delhi: Tata McGraw Hill, 1986.
2. Malvino, A.P. *Digital Computer Electronics*. New Delhi: Tata McGraw Hill, 1986.
3. Gothmann, W.H. *Digital Electronics*. New Delhi: Prentice Hall, 1980.
4. Millman, J. and Taub, H. *Pulse, Digital and Switching Waveforms.* New Delhi: Tata McGraw Hill, 1992.
5. Mottershead, A. *Electronic Devices and Circuits*. New Delhi: Prentice Hall, 1977.

COURSE CODE: PHY212:
QUANTUM MECHANICS

L	T	P	Marks
4	1	0	100

Total Lecture 60

The aim and objective of the course on **Quantum Mechanics** is to teach the students the basics of the subject and make them understand the concept of quantum using Schrödinger picture and matrix approach etc. so that they cause these in various branches of physics as per requirement of the subject.

UNIT-I **(17)**

Origin of the Quantum Theory: Black body radiation, the photoelectric effect, theFranck-Hertz experiment, the correspondence principle, the Bohr atom, quantization of the phase integral, the particle in a box, the rigid rotator, the harmonic oscillator. Photons as particles: the Compton effect, particle diffraction, elements of Fourier Analysis, Parseval's formula and the Fourier integral theorem, examples of Fourier transforms, superposition of plane waves and time dependence, wave packets and the Einstein-de Broglie relations, wave functions for a free particle and the Schrodinger equation (time dependent and time independent),physical interpretation of the Schrodinger wave function

UNIT-II **(15)**

Shrödinger Equation: Interaction among particles, analogy between optics and mechanics, superposition principle, probability current, motion of wave packets, Ehrenfest's theorem.

Problems in onedimension: Potentialstep,potentialbarrier,rectangularpotentialwell,degeneracy, linear in dependence, Sturm's theorem, bound states, orthogonality, linear harmonic oscillator, oscillator wave function,parity.

UNIT-III **(13)**

Operators formulation: Linear operators, eigen value and eigen functions, product of two operators, Commuting and Non commuting operators, Hermitian and Hermitian adjoint operators, orthogonal systems, expectation value of operator, uncertainty principle, equation of motion, parity operator.

Application of operator method, Simple harmonic oscillator, step up and down function, eigen values and function of ground and excited state, Zero point energy, probability density and orthogonality of wave function

UNIT-IV **(15)**

Spherically Symmetric System: Schrodinger equation for spherically symmetric potentials, spherical harmonics, degeneracy, angular momentum, eigen values of L_Z and L^2, three-dimensional harmonic oscillator, Hydrogen atom. Angular momentum and magnetic moment of electron due to orbital motion, Stern Gerlach Experiment, Uhlenbleck and Goldsmith hypothesis of electron spin, Pauli's Method of Spin variable, Eigen function and Eigen value of spin operator, Pauli Spin operator and commutation relation

Suggested Books:

1. Powell, J.L. and Crasemann, B. *Quantum Mechanics.* NewDelhi: Narosa. 1995.Print.
2. Griffiths, D.J. *Introduction to Quantum Mechanics.* UK:Pearson, 2005. Print.
3. Merzbacher, E. *Quantum Mechanics*. New York:Wiley.1970. Print.
4. Gasiorowicz, S. *Quantum Physics*. New York:Wiley. 2000
5. Schwabl, F. *Quantum Mechanics* NewDelhi: Narosa. 1992

COURSE CODE: PHY213
SPECIAL THEORY OF RELATIVITY

L	T	P	Marks
4	1	0	100

Total Lecture60

AIM

The aim and objective of the course on Special Theory of Relativity for the student of B.Sc. (Hons.) Physics is to equip them with the knowledge of Galilean and Lorentz Transformation, relativistic dynamics and structure of space time.

Unit-I

Newton's Laws of Motion and Galilean Transformation (15):

Forces and equations of motion, Lorentz force, Motion of a charged particle in a uniform constant electric field, Charged particle in a uniform alternating electric field. Charged particle in a uniform magnetic field, Inertial reference frames, absolute and relative accelerations and velocity, Galilean Transformation, Foucault's pendulum, Conservation of Momentum, Fictitious Forces, Collisions, Velocity and Acceleration in Rotating coordinate systems.

Unit- II.

Lorentz Transformations (15):

Michelson Morley Experiment, Basic postulates of special theory of relativity, Lorentz transformations, Simultaneity and causality in relativity, Length contraction, Time dilation, Velocity Transformation, Space like and time like intervals, Invariance of Maxwell's equations, Einstein's velocity addition rule, transformation of acceleration, Aberration of light, relativistic Doppler effect, Twin paradox and its resolution.

Unit- III.

Relativistic Dynamics (15):

Variation of mass with velocity, mass energy equivalence, relativistic formulae for momentum and energy, transformation of momentum, energy and force. Transformation of electromagnetic fields, Magnetism as a relativistic phenomenon

Unit-IV.

Structure of Space time and Principle of Equivalence (15):

Concept of Minkowski space, geometrical interpretation of Lorentz transformations of space & time; simultaneity; contraction and dilation. Space like, time like and light like intervals, four vectors, concept of world lines, Principle of Equivalence, gravitational and inertial mass, gravitational mass of photons, gravitational red shift, Precession of the perihelion of Mercury.

Suggested Books:

1. Hans, H.S. and Puri, S.P. *Mechanics*. New Delhi: Tata McGraw Hill, 2003.
2. Banerji,S. and Banerji, A. *The Special Theory of Relativity.* New Delhi: Prentice Hall, 2004.
3. Takwale, R.G. and Puranik, P.S. *Introduction to Classical Mechanics*. New Delhi: Tata McGraw-Hill, 2000.
4. Resnick, R. *Introduction to Special Relativity*. New Delhi: Wiley Eastern India Pvt. Ltd. 1979.
5. French, A.P. *Special Relativity*. New York: N.W. Norton & Company Inc., 1968.

COURSE CODE: PHY214
ATOMIC AND MOLECULAR PHYSICS

L	T	P	Marks
4	1	0	100

Total Lecture-60

AIM

The aim and objective of the course on Atomic and Molecular Physics for the student of B.Sc. (Hons.) Physics is to equip them with the knowledge of atomic models, atomic spectra, Xray spectra and molecular spectra.

.

UNIT-I.

Atomic Models **(15):**

Thomson's model, Rutherford's nuclear model of an atom, Electron orbits, Atomic spectra, Inadequacy of Planetary model, Bohr's theory of atom, correction for finite nuclear mass, Atomic energy states, interpretation of the quantization rules, Sommerfeld's model of atom, Franck Hertz experiment, The correspondence Principle, Limitation of old quantum theory.

UNIT-II.

Spectra of one and two valance electron systems **(15):**

Schrödinger's wave equation for Hydrogen, Physical interpretation of quantum numbers, Spinning Electron and the Vector model of Atom, Spin orbit interaction and fine structure, Magnetic dipole moment due to orbital, spin and total motion, Spectroscopic notations for LS and JJ couplings, Spectra of alkali and alkaline earth metals, Interaction energy in LS and JJ coupling for two electron systems, Selection and Intensity rules for doublets and triplets, Effect of an external magnetic field on atom, Normal and Anomalous Zeeman effect.

UNIT-III.

X-rays Spectra **(15):**

Production of X-rays, Origin of X-rays from electromagnetic theory, X-ray diffraction, Bragg's law, Laue Spots, Bragg's spectrometer, Reflection and refraction of X-rays, X-ray scattering, Continuous X-ray spectrum, Characteristics absorption and emission Spectra, comparison of optical and X-ray Spectra, Moseley's law, Applications of Moseley's law.

UNIT-IV.

Molecular Spectra **(15):**

Spectra of diatomic molecules; Pure rotational spectra, selection rules, The vibrating diatomic molecule as a simple harmonic and an harmonic oscillator, VibrationalRotational spectra, selection rules, P, Q and R branches, Electronic band systems, sequence and progressions, FrankCondom Principle.

Suggested Books:

1. White, H.E. *Introduction to Atomic Spectra*. London: McGraw Hill, 1934.
2. Banwell, C.B. *Fundamentals of molecular spectroscopy*. New Delhi: Tata McGraw Hill, 1986.
3. Barrow, G.M. *Introduction to Molecular spectroscopy*. New York: McGraw Hill, 1962.
4. Herzberg, G.*Spectra of diatomic molecules.* New York: Van Nostr and Reinhold, 1950.
5. McHale,J. L.*Molecular spectroscopy*. New Jersey: Prentice Hall, 1999.

COURSE CODE: PHY 215
ELECTROMAGNETIC THEORY

L	T	P	Marks
4	1	0	100

Total Lecture-60

The aim and objective of the course on **Electromagnetic theory**is to equip the student of B.Sc. (Hons.) with the knowledge of Maxwell's equations, Electromagnetic waves and their polarization, reflection and refraction, Dispersion and Scattering

Unit-I **(15)**

Maxwell's Equations & Electromagnetic Waves

Maxwell's Equations, Maxwell's correction to Ampere's law, Displacement Current, Plane Wave solutions, Energy and momentum relations in electromagnetic fieldPoynting's theorem, Scalar and Vector potentials, Gauge transformation, Maxwell's equations in linear isotropic media, Wave equation, Transverse nature, Boundary conditions, Wave equation in conducting media.

Unit-II **(15)**

Reflection and Refraction of Electromagnetic Waves

Reflection and transmission coefficients, Fresnel's formula, Change of phase on reflection, Polarization on reflection and Brewster's law, total internal reflection. Reflection and transmissionn at metal lic surface skin effect and skin depth, propagation of EM waves between parallel and conducting plates – wave guides (rectangular only).

Unit-III **(15)**

Dispersion & Scattering

Equation of motion of an electron in a radiation field: Lorentz theory of dispersion – normal andanomalous; Sellmeier's and Cauchy's formulae, absorptive and dispersive mode, half power frequency, band Width, Scattering of radiation by a bound charge, Rayleigh's Scattering and blueness of the sky.

Unit-IV **(15)**

Polarization of Electromagnetic Waves

Description of Linear, Circular and Elliptical Polarization. Propagation of Electromagnetic Waves in Anisotropic Media, Symmetric Nature of Dielectric Tensor, Fresnel's Formula. Uniaxial and Biaxial Crystals, Light Propagation in Uniaxial Crystal, Double Refraction, Polarization by Double Refraction, Nicol Prism, Ordinary and Extraordinary Refractive Indices. Production and Detection of Plane, Circularly and Elliptically Polarized Light. Phase Retardation Plates: Quarter Wave and Half Wave Plates. Analysis of Polarized Light.

Rotatory Polarization: Optical Rotation. Biot's Laws for Rotatory Polarization. Fresnel's Theory of Optical Rotation. Calculation of Angle of Rotation. Experimental Verification of Fresnel's Theory. Specific Rotation. Laurent's half shade polarimeter.

Suggested Books:

1. Griffiths, D. *Introduction to Electrodynamics* NewDelhi: Prentice Hall, India Pvt. Ltd.
2. Reitz, Milford & Christy *Foundations of electromagnetic theory*, New Delhi*:*Narosa.
3. Capriand, A.Z. Panat, P.V. *Introduction to Electrodynamics*, New Delhi*:*Narosa Publishing Company.
4. Edminister, Joseph A *Electromagnetics*. New Delhi*:* Tata McGraw Hill .
5. Miah M.A.W. *Fundamentals of electromagnetic*. New Delhi*:*Tata McGraw Hill.
6. Jackson, J. D. *Classical Electrodynamics*. New York: John Wiley, 3rd edition 1998.

PHY216 PHYSICS LAB – IV
(60hrs) **Max Marks: 50**

Objective: The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

Note:

- Students are expected to perform at least eight-ten experiments out of following list. The experiments performed in first semester cannot be repeated in second Semester.
- The examination for both the courses will be of 3 hours duration

List of Experiments:

Experimental skills: General Precautions for measurements and handling of equipment, representation of measurements, Fitting of given data to a straight line, and Error analysis, Significant figures and interpretation of results

1. To verify and design AND, OR, NOT and XOR gates using NAND gates.
2. To design a combinational logic system for a specified Truth Table.
3. To convert a Boolean Expression into Logic Gate Circuit and assemble it using logic gate ICs.
4. To minimize a given Logic Circuit.
5. Half Adder, Full Adder and 4bit Binary Adder.
6. Half Subtractor, Full Subtractor, AdderSubtractor using Full Adder I.C.
7. Parity generator and checker.
8. To study D/A and A/D convertors.
9. To build Flip-flop Circuits using elementary gates (RS, Clocked RS, Dtype, and JK FlipFlop).
10. To build a 4bit Counter using Dtype/JK FlipFlop.
11. To make a Shift Register from Dtype/JK FlipFlop.
12. Serial and parallel shifting of data.

Spectroscopy:

1. To determine the value of Boltzmann Constant by studying Forward Characteristics of a Diode.
2. To determine the value of Planck's constant by using a Photoelectric Cell.
3. To determine the value of e/m by (a) Magnetic Focusing or (b) Bar Magnet. To determine the wavelengths of Hydrogen spectrum and hence to determine the value of Rydberg's Constant.
4. To determine the Wavelength of Halpha Emission Line of Hydrogen Atom.
5. To determine the value of Stefan's Constant.
6. To determine the Absorption Lines in the Rotational Spectrum of Iodine Vapor.

(FIFTH SEMESTER)

COURSE CODE: PHY 301
NUCLEAR PHYSICS

L	T	P	Marks
4	1	0	100

Total Lectures-60

AIM

The aim and objective of the course on **Nuclear Physics** is to acquaint the students of **B.Sc. (Hons)** with the basics of nuclear properties, decay, reactions and nuclear models.

Unit-I

Nuclear Properties (15):

Historical overview of nuclear physics, Constituents of nucleus, non-existence of electrons in nucleus, Nuclear charge and mass, nuclear radius, spin, parity, angular momentum, magnetic moment, electric quadrupole moment, binding energy, binding energy per nucleon and its observed variation with mass number of the nucleus, explanation of the binding energy curve, qualitative discussion of two-body nuclear forces.

Unit-II

Radioactive decays (18):

Radioactive decay law, decay constant and half life; methods of measurement of half life, Type of decays, Natural radioactivity, chart of nuclides and domain of instabilities, radioactive dating, units for measuring radiations, constituents of Cosmic rays. Beta decays : β-, β+ and electron capture decays, Fermi's theory, angular momentum and parity selection rules, neutrino and antineutrino, parity violation in β-decay and its experimental verification. Alpha decay : Stability of heavy nuclei against break up, Geiger-Nuttal law, Gamow's explanation, angular momentum and parity in a decay, energy release in alpha decay. Gamma transitions : Excited levels, isomeric levels, gamma transitions, multipole moments, selection rules, transition probabilities, internal conversion.

Unit-III

Nuclear reactions and Nuclear Models (13):

Rutherford's experiment of nuclear transmutation, Types of nuclear reactions, reactions cross section, conservation laws, Kinematics of nuclear reaction, Q-value and its physical significance. Nuclear fission, neutron reactions, Fermi and trans uranic elements, chain reactions, Nuclear reactor, reactor criticality, moderators. Liquid drop model, semi-empirical mass formula, condition of stability, evidence for nuclear magic numbers.

Unit-IV

Interaction and Detection of radiation (14):

Energy loss of electrons and positrons, Positron annihilation in condensed media, Stopping power and range of heavier charged particles, interaction of gamma rays with matter: Basis of detection of nuclear radiations, Gas-filled detectors, Geiger-Muller counters, Scintillation detectors, solid-state detectors, solid state nuclear track detectors.

Suggested Books:

1. Burcham,W.E. and Jobes,M. *Nuclear and Particle Physics,*United Kingdom : Pearson 1995.
2. Mittal, V. K. Verma, R. C. and S.C. Gupta, *Introduction to Nuclear and Particle Physics*. New Delhi: Prentice Hall of India, 2013.
2. Krane K.S. *Introductory Nuclear Physics*, John Wiley & Sons, 1988.
3. Hyde,K. *Basic Ideas and Concepts in Nuclear Physics*United Kingdom: Institute of Physics 2004.
4. Enge, Herald.*Introduction to Nuclear Physics,* London: Addison-Wesley 1971.
5. Kaplan Irving *Nuclear Physics,*New Delhi: Narosa 2002.

COURSE CODE: PHY302:
MATHEMATICAL PHYSICS

L	T	P	Marks
4	1	0	100

Total Lecture 60

AIM

The course on **Mathematical Physics** has been framed to teach the students of B.Sc(Physics) the elements of Vector space and linear algebra, Determinants and matrices, infinite series, multiple integrals, statistics and probability.

.

Unit-I **(15)**

Vector Spaces and Linear Algebra: Determinants for linear algebraic equations, Laplace development, Cramer's rule, anti-symmetry, Gauss elimination. Matrices – basic definitionsand operations, orthogonal matrices, Hermitian matrices, unitary matrices, eigen values and eigenvectors. Diagonalisation of matrices, Spectral decomposition of Hermetian matrix.

Uni-II **(15)**

Determinants and Matrices: Determinants for linear algebraic equations, Laplace development, Cramer's rule, antisymmetry, Gauss elimination. Matrices – basic definitions and operations, orthogonal matrices, Hermitian matrices, unitary matrices, diagonalisation of matrices, normal matrices.

Infinite Series: Fundamental concepts, convergence tests, alternating series, algebra of series, power series, Taylor series.

Unit-III **(15)**

Differential Equations: Review of differential equations, selfadjoint differential equations,eigenfunctions, eigenvalues, boundary conditions, Hermitian operators and their properties.

Multiple Integrals: Double and triple integrals, application of multiple integrals, change ofvariables in integrals, general properties of Jacobians, surface and volume integrals.

Unit-IV **(15)**

Statistics and Probability: Statistical distributions, second moments and standard deviations, definition of probability, fundamental laws of probability, discrete probability distributions, combinations and permutations, continuous distributions – expectation, moments and standard deviation, Binomial, Poisson and Gaussian distributions, applications to experimental measurement.

Suggested Books:

1. Arfken, G. and Weber, H.J. *Mathematical Methods for Physicists*. San Diego: Academic Press, 7th edition, 2012
2. Boas, M.L. *Mathematical Methods in the Physical Sciences* Wiley, 2002.
3. Pipes, L.A. & Harvill, L.R. *Applied Mathematics for Engineers and Physicists* NY: McGraw Hill, 1971
4. K.F. Hobson, M.P. and Bence, S.J *Mathematical Methods for Physics and Engineering* Riley,. UK: Cambridge University Press, 1998.

COURSE CODE: PHY303:
SOLID STATE PHYSICS

L	T	P	Marks
4	1	0	100

Total Lecture-60

AIM

The aim and objective of the course on Solid State Physics is to equip the students of B.Sc. (Hons.) Physics with the elementary ideas of the solid state viz. crystal structure, Lattice vibrations, free electron theory and band theory of solids

Unit-I

Crystal Structure (15):

Lattice translation, vectors and lattices, symmetry operations, basis and crystal structure, Miller indices, unit cell, two dimensional lattice, three dimensional lattices, hexagonal close packed structure. FCC and BCC structure, simple crystal structure, diffraction of xrays according to law of Bragg and diffraction conditions. Reciprocal lattice, Brillouin zone, Reciprocal lattice to SC, BCC and FCC lattice, Atomic form factor, geometrical structure factor, experiment methods of x-rays diffraction.

Unit-II

Crystal Binding and lattice Vibrations (14):

Various types of binding, crystals of inert gases, VanderWaalsLondon interactions. LenardJones potential, Ionic crystals, Madelung constant, Bulk Modulus, calculation of repulsive exponent. BornHaber cycle, quantization of Lattice vibrations, phonon momentum, inelastic scattering by phonons. Wave motion on a lattice, one dimensional line of atoms, linear diatomic lattice, optical and acoustical branch.

Unit-III

Free Electron Theory (16):

DrudeLorentz theory, Sommerfeld model, the Fermi Dirac distribution, Effect of temperature on fd distribution, electronic specific heat, the electrical conductivity and Ohm's Law, the thermal conductivity of metals. WiedemannFrenz law, Hall Effect.

Unit-IV

Band Theory (15):

Nearly free electron model, origin and magnitude of energy gap, Density of states, K space, Bloch theorem, Kronig Penney model of an infinite one dimensional crystal, classification of insulators, semiconductors and metals. The tight binding approximation in evaluating the energy levels for an electron in a solid. The Weigner Seitg approximation and the cohesive energy of metals.

Suggested Books:

1. Kittel, C. *Introduction to Solid State Physics.* NewYork: Wiley 8thed. 2005.Print.
2. Kittel, C. *Quantum Theory of Solids.* NewYork: Wiley 1987.Print.
3. Ziman, J. *Principles of the Theory of Solids* .Cambridge University Press,1972.Print.
4. Ibach, H. and Luth, H. *Solid State Physics.* Belin:Springer. 3rd.ed. 2002. Print. Harrison,
5. Walter A. *Solid State Theory.* NewDelhi :TataMcGraw-Hill 1970. Print.

PHY 304: PHYSICS LAB –V
PHYSICS LABORATORY **Max. Marks:50**

(60 hrs.)

Objective: The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipments.

Note:

- Students are expected to perform at least eight-ten experiments out of following list. The experiments performed in first semester cannot be repeated in second Semester.
- The examination for both the courses will be of 3 hours duration

List of Experiments:

Experimental skills: General Precautions for measurements and handling of equipment, representation of measurements, Fitting of given data to a straight line, and Error analysis, Significant figures and interpretation of results.

1. To study BH curves for different ferromagnetic materials using C.R.O. and qualitatively discussing their distinguished features.
2. To study temperature coefficient of resistance of Cu.
3. To study Photoelectric effect using Photocell and verify the inverse square law (concept of solid angle).
4. To study IV characteristics of different diodes Ge, Si, LED and Zener. Use constant current source for Zener.
5. To measure the thermal conductivity and thermal diffusivity of a conductor.
6. To determine the value of Stefan's Constant of radiation.
7. To measure magnetic volume susceptibility of liquid $FeCl_2/MnSO_4$ solution by Quincke's method.
8. To determine the Hall coefficient and mobility of a given semiconductors.
9. To find conductivity of given semiconductor crystal using four probe method.
10. To measure dielectric constant of a non-polar liquid and its applications.
11. To study the characteristics of silicon and GaAs solar cells.
12. To study the characteristics of light emitting diode (LED) and photodiode.
13. To study the variation of the magnetoresistance of a sample with the applied magnetic field.
14. To study the stopping potential and Plank's constant by suing the Photoelectric effect kit.
15. To study the reverse saturation current to a PN junction diode at various temperatures and to find out the approximate value of the energy gap.
16. To determine the coefficient of thermal conductivity of a disc of bad conductor using method of lees.
17. Verification of Rutherford Soddy nuclear decay formula mechanical analogue.
18. To find halflife period of a given radioactive substance using GM counter. Characteristics of GM Counter

(SIXTH SEMESTER)

COURSE CODE: PHY 311
PARTICLE PHYSICS

L	T	P	Marks
4	1	0	100

Total Lectures60

The aim and objective of the course on **Particle Physics** is to acquaint the students of **B.Sc. (Hons)** with the basics of interaction and detection of radiation, accelerators, cosmic rays and elementary particles.

I Accelerators (15) Need of accelerators, Cockroft, Walton, Van de Graff, cyclic accelerators, cyclotron, High energy Cyclotrons, synchrocyclotron, variable energy cyclotron, phase stability, superconducting magnets, and colliding beam machines. Calorimetry and multilayer detection.

II Cosmic rays (15): Discovery of cosmic rays: hard and soft components, discovery of muon, pion, heavy mesons and hyperons, mass and life time determination for muon and pion. Primary Cosmic Rays: Extensive air showers, solar modulation of primary cosmic rays, effect of earth's magnetic field on the cosmic ray trajectories.

III Elementary particles-I (15): Historical introduction to elementary particles, fermions and bosons, particles and antiparticles, Classification of particles, leptons, hadrons, gauge quanta, types of interactions, electromagnetic, weak, strong interactions, gravitational interactions, isospin, Strangeness, conservation of strangeness in particle interactions, introduction to quarks and qualitative idea of quark model.

IV Elementary particles-II (15) High energy physics units, high energy electron scattering from protons, basic interactions of quark and leptons, quantum numbers of elementary paticles, determination of properties of leptons, conservation laws governing particle decay, interrelation between particle physics and cosmology

Suggested Books:

1. Burcham,W.E. and Jobes, M. *Nuclear and Particle Physics,*United Kingdom : Pearson 1995.
2. Mittal, V. K. Verma, R. C. and S.C. Gupta, *Introduction to Nuclear and Particle Physics*. New Delhi: Prentice Hall of India, 2013
3. Enge, Herald. *Introduction to Nuclear Physics,* London: Addison-Wesley 1971
4. Perkins, D.H. *Introduction to High Energy Physics* United Kingdom: Cambridge University Press, 4th ed. 2001.
5. Hyde, K. *Basic Ideas and Concepts in Nuclear Physics*United Kingdom: Institute of Physics 2004.
6. Hughes I.S. *Elementary Particles*. Cambridge University, 3rd ed. 1991

COURSE CODE: PHY312

VACUUM SCIENCE AND LOW TEMPERATURE PHYSICS

Total Lecture60

L	T	P	Marks
4	1	0	100

AIM

The aim and objective of the course on Vacuum science and Low temperature physicsfor the student of B.Sc. (Hons.) Physics is to equip them with the knowledge of vacuum science, production and applications of low temperature physics.

Unit-I

Vacuum Techniques (15):

Introduction, classification of vacuum ranges, throughput, Pump speed, speed of exhaust, conductance, ultimate pressure, viscous flow, molecular flow, Production of Low Pressures; Pump types, Gaedeoilsealed rotating vane pump, Diffusion pump, Cryogenic pumps, Types of gauges, Mcleod gauge, Pirani gauge, Measurement of ultrahigh vacuum

Unit-II

Production and Measurement of Low Temperatures (15):

Adiabatic throttling of gases, liquefaction of H_2 and He, Solidification of He, Phase diagram of He, Liquid He II, Thermodynamics of λ-transition, Adiabatic demagnetization, Temperatures below 0.01K, BoseEinstein Condensation in atomic clouds, LASER cooling and trapping of atoms, Superconductivity.

Unit-III

Measurement of low temperatures (15):

Primary thermometers; gas thermometers and corrections, secondary thermometers resistance thermometers, thermocouple thermometers, vapor pressure thermometers, magnetic thermometers.

Unit-IV

Practical application of low temperature (15):

Principle of refrigeration, vapour compression type, Working of refrigerator and Air conditioning machines, super fluidity; application of super fluidity, elementary ideas and applications, Superconductivity Type I and II superconductors, Meissner effect, applications of superconductors, superconducting magnets, Effects of Chloro and Fluro Carbons on Ozone layer.

Suggested Books:

1. Saha, M.N. and Srivastava, B.N. *A Treatise on Heat.*Allahabad: The Indian Press Pvt. Ltd., 1965.
2. Dewitt, C., Dreyfus, B., and de-Gennes, P.G. *Low Temperature Physics*.New York: Gordon & Breach, 1962.
3. Pethick, C.J. and Smith, H. *Bose-Einstein Condensation in Dilute Gases*. Cambridge:Cambridge University Press, 2008.
4. Roth, A. *Vacuum Technology*. Oxford: Pergamon Press Ltd., 1998.
5. O'Hanlon, J. F.*A User's Guide to Vacuum Technology*. New York: John Wiley & Sons, 1989.

Course Code: PHY313
LASER PHYSICS

L	T	P	Marks
4	1	0	100

Total Lecture60

AIM: The aim and objective of this course on **Laser Physics** is to expose the B.Sc. (H.S.) students to the basics about the theory of lasers, laser types and applications in various fields.

.

UNIT I

QUANTUM THEORY OF RADIATION (15):

Light waves and photons, optical directionality, interactivity, monochromaticity and coherence, quantum transitions in absorption and Emission of light, The active medium, creating population inversion, Laser gain curve, Einstein's quantum theory of Radiation, Einstein coefficients and their relationship momentum transfer and possibility of amplification, kinetics of optical absorption, shape and width of spectral lines, line broadening mechanism, natural, collision and Doppler broadening.

UNIT II

DYNAMICS OF LASER PROCESSES (15):

Optical resonators of various kinds and their role in confinement of laser beam. Control of laser output: Interactivity, control of spectral characteristics, method of Q switching, Pulsed Lasing, mode locking for ultra-short pulses, modifying the spatial structure of laser output, Frequency transformations in nonlinear media, wave front correction of laser output, Light beam manipulation.

UNIT III

TYPES OF LASERS (15):

Type of Lasers on the basis of pumping methods: solid state laser, organic dye laser, photo dissociation lasers, Ion and Atomic lasers, Molecular Lasers , Electro ionization Lasers, Gas Dynamic Lasers, Chemical Lasers, Plasma Lasers, Semiconductor Lasers.

UNIT IV

APPLICATIONS OF LASERS (15):

Nonlinear optics: harmonic generation, second harmonic generation, phase matching and optical mixing, brief qualitative description of some experiments of fundamental importance, Lasers in optical communications, ranging and measurement, thermonuclear fusion, basics of holography its applications.

Suggested Books:

1. Laud B.B. *Lasers and Nonlinear optics* (2nd Edn.). New Delhi: New Age International (P) Limited, 2005.
2. Thyagarajan K., Ghatak A.K., *Lasers: Theory and Applications*. New Delhi: Macmillan India Ltd, 1981.
3. Tarasov L.V. *Laser Physics.* Moscow: Mir Publishers, 1983.
4. Tarasov L.V. *Laser Age in Optics.* Moscow: Mir Publishers, 1981.
5. Allen L. *Essentials of Lasers.* Oxford: Pergamon Press, 1969.
6. Tarasov L. *Laser Physics and Applications.* Moscow: Mir Publishers, 1986.
7. Kock W.E. *Lasers and Holography*. New York: Dover Publications, 1981.

COURSE CODE: PHY314

TECHNICAL SKILL

L	T	P	Marks
1	0	0	25

Total Lecture 13

AIM

The aim and objective of this course on **Technical Skill is** to equip the B.Sc. (Hons.) Physics students with techniques that will help them to use the skills of physics in daily life. It will also enable them to prepare presentation of their work and will develop confidence on them

UNIT-I **(3)**

Preparation and presentation of scientific reports, need, method and approaches for formatting and writing of science reports, case studies of science reports, examples to be taken from pure science, applied science and technical reports, use of computer for word processing, Oral presentation skill.

UNIT-II **(3)**

Machine practice, carpentry, welding and electrical skill

UNIT-III **(3)**

Glass Blowing, vacuum system and their use in industry and research, practical knowledge of measurement of temperature, pressure, electrical electronic optical and magnetic parameters. Use of sensors/transducers, gauges and gadgets needed for the above measurements.

UNIT-IV **(4)**

Electronic skill. Designing of electrical circuits, selection of electronic components, testing of components, making of printed circuit board, relevant practical information on technical specification and selection of different board materials, techniques of designing and layout of complex PCBs, Soldering skills, modern approaches for automation of design and making of electronic circuits, testing of circuits for appropriate and predefined functioning, fault finding and repair

COURSE CODE: PHY315:
TECHNICAL SKILL LAB
(90hrs) **Max Marks 75**

Objective: The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

Note:

- Students are expected to perform at least eight-ten experiments out of following list. The experiments performed in first semester cannot be repeated in second Semester.
- The examination for both the courses will be of 3 hours duration

List of Experiments:

Experimental skills: General Precautions for measurements and handling of equipment, representation of measurements, Fitting of given data to a straight line, and Error analysis, Significant figures and interpretation of results

UNIT-I **(15 marks)**

Case studies of science reports, Oral presentation skill, appropriate way of presentation of scientific materials, skill for group discussion

UNIT-II **(25 marks)**

Machine practice, carpentry, welding and electrical skill (Scope: Job for the purpose of practice should be given to students)

UNIT-III **(20 marks)**

Glass Blowing, vacuum system and their use in industry and research, practical knowledge of measurement of temperature, pressure, electrical electronic optical and magnetic parameters. Use of sensors/transducers, gauges and gadgets needed fo r the above measurements. (Students should be exposed to limits, advantages and handling mechanism of these equipments.)

UNIT-IV **(15 marks)**

Electronic skill. Designing of electrical circuits, selection of electronic components, testing of components, making of printed circuit board, relevant practical information on technical specification and selection of different board materials, techniques of designing and layout of complex PCBs, Soldering skills, modern approaches for automation of design and making of electronic circuits, testing of circuits for appropriate and predefined functioning, fault finding and repair

CHEMISTRY COURSES FOR B.Sc. (Physics) Hons

(FIRST SEMESTER)

Course Title: Organic Chemistry
Course Code: CHE153
Time: 04 Hours

L	T	P	Credits	Marks	Pass Marks
4	1	0	4	100	40

Course Objectives:
This course is intended to learn the basic concepts of Organic Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:
This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of Organic chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

Instruction for candidates (Theory Paper)

PART A

Compounds of Carbon **(8 Hrs)**
Differences in chemical and physical behavior as consequences of structure. Discussion (with mechanism) of reactions of hydrocarbons' ranging from saturated acyclic and alicyclic, unsaturated dienes and aromatic systems. Huckel rule; as applied to 4n+2 systems. Industrial sources and utility of such compounds in daily life for medicine clothing and shelter.

PART B

Stereochemistry **(15 Hrs)**
Structure, reactivity and stereochemistry. Configuration and conformation. Optical activity due to chirality; d, l, meso and diasteroisomerism, sequence rules. Reactions involving stereoisomerism. Geometrical isomerism – determination of configuration of geometric isomers. E & Z system of nomenclature. Conformational isomerism – conformational analysis of ethane and n-butane; conformations cyclohexane, axial and equatorial bonds, conformations of monosubstituted cyclohexane derivatives. Newman projection and Sawhorse formula, Fischer and flying wedge formulae.

PART C

Alkyl Halides **(8 Hrs)**
Structure of alkyl halides and their physical properties. Preparation from alcohols, hydrocarbons, alkenes and by halide exchange method.
Reactions : (i) Nucleophilic substitution (SN2 and SN1) kinetics, mechanism, stereochemistry, steric and electronic factors, reactivity of alkyl halides, rearrangement, dependence on nucleophile, role of solvent (ii) Elimination E2 and E1 mechanism, stereochemistry, kinetics, rearrangement.

Alcohols **(4 Hrs)**
Structure, physical properties (Hydrogen bonding), Methods of preparation: Grignard synthesis (scope and limitations),
Reactions: Reactions with hydrogen halides. Mechanism and rearrangement, Reaction with Phosphorous trihalides, mechanism of Dehydration rearrangement.

PART D

Ethers **(2 Hrs)**

Structure, Physical properties, preparation (Williamson synthesis). Reactions: Cleavage, by acids, Electrophilic substitution in ethers.

Aldehydes and Ketones **(8 Hrs)**

Structure, Physical Properties; Methods of Preparation: Oxidation of Primary and secondary alcohols, Oxidation of methylbenzenes, Reduction of acid chlorides, Friedel- Crafts Acylation, Reactions; Nucleophilic addition, Addition of Grignard reagents, Addition of cyanide. Addition of Bisulphite, Addition of derivatives of ammonia. Acetal Formation, Cannizzaro reaction, Aldol Condensation.

Suggested Books:

1. Morrison R.N. and Boyd, R.N. *Organic Chemistry,* Pearson Education, Dorling Kindersley (India) Pvt. Ltd.
2. Finar,I.L. *Organic Chemistry*(Volume 1), Pearson Education,Dorling Kindersley (India) Pvt. Ltd.
3. Eliel,E.L. andWilen,S.H. *Stereochemistry of Organic Compounds,*London:Wiley, 1994.
4. March, Jerry.*Advanced Organic Chemistry: Reactions, Mechanism and Structure,*John Wiley, 6th edition, 2007.

Course Title: ORGANIC CHEMISTRY LAB
Course Code: CHE154
Time: 04 Hours

Course Objectives:

L	T	P	Credits	Marks
0	0	4	2	50

This course is intended to learn the basic concepts of Organic Chemistry Laboratory. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various experiments have been designed to enhance laboratory skills of the undergraduate students.

Expected Prospective:
The students will be able to understand the basic objective of experiments in organic chemistry, properly carry out the experiments, and appropriately record and analyze the results through effective writing and oral communication skills. They will know and follow the proper procedures and regulations for safe handling and use of chemicals and solvents.

1. Calibration of Thermometer
80-82^{o} (Naphthalene), 113-114^{o} (acetanilide).
132.5-133^{o} (Urea), 100^{o} (distilled Water)

2. Determination of melting point
Naphthalene 80-82^{o}, Benzoic acid 121.5-122^{o}
Urea, 132.5-133^{o}, Succinic acid 184-185^{o}
Cinnamic acid 132.5-133^{o}, Salicylic acid 157-5-158^{o}
Acetanilide 113-5-114^{o}, m-Dinitrobenzene 90^{o}
P-Dichlorobenzene 52^{o}. Aspirin 135^{o}.

3. Determination of boiling points
Ethanol 78^{o}, Cyclohexane 81.4^{o}, Toluene 110.6^{o}, Benzene 80^{o}.

4. Mixed melting point determination
Urea-Cinnamic acid mixture of various compositions (1:4, 1:1, 4:1)

5. Distillation
Simple distillation of ethanol-water mixture using water condenser,
Distillation of nitrobenzene and aniline using air condenser.

6. Crystallization
Concept of induction of crystallization
Phthalic acid from hot water (using fluted filter paper and stemless funnel), Acetanilide from boiling water,
Naphthalene from ethanol,
Benzoic acid from water.

7. Decolorisation and crystallization using charcoal
Decolorisation of brown sugar (sucrose) with animal charcoal using gravity filtration.
Crystallization and Decolorisation of impure naphthalene (100g of naphthalene mixed with 0.3g of Congo Red using 1g decolorising carbon) from ethanol.

8. Sublimation (Simple and Vacuum)
Camphor, Naphthalene, Phthalic acid and Succinic acid.

9. Extraction: the separatory funnel, drying agent:
Isolation of caffeine from tea leaves

10. Steam distillation

Purification of aniline/nitrobenzene by steam distillation.

Suggested Books:

1. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. and Smith, P.W.G. *Vogel's Text Book of Practical Organic Chemistry,* 5th edition, ELBS, 1989.
2. Pavia, D.L., Lampanana, G.M. and Kriz, G.S. Jr.*Introduction to Organic Laboratory Techniques,* Thomson Brooks/Cole, 3rd edition,2005.
3. Mann, F.G. and Saunders. P.C.*Practical Organic Chemistry,* London: Green & Co. Ltd., 1978.
4. Svehla, G.*Vogel's Qualitative Inorganic Analysis (revised),* Orient Longman, 7th edition, 1996.
5. Bassett, J., Denney, R.C., Jeffery, G.H. and Mendham, J.*Vogel's Textbook of Quantitative Inorganic Analysis (revised),* Orient Longman, 4th edition, 1978.

(SECOND SEMESTER)

Course Title: Spectroscopy
Course Code: CHE155

L	T	P	Credits	Marks	Pass Marks
4	1	0	4	100	40

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic of spectroscopy. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the spectroscopy and its applications. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

PART A

Pure Rotational Spectra (12 Hrs)

Classification of molecules according to their moment of inertia. Rotational energy levels of hydrogen chloride. Determination of molecular geometry by rotational spectrum, isotopic substitution effects. Stark effect, Estimation of molecular dipole moments, Selection rules, Rotational Raman Spectra, anisotropic polarizabilty, specific selection rule in Raman Spectra, Stokes and anti – Stokes lines.

PART B

Vibrational Spectra (12 Hrs)

Diatomic molecules, Force constants, Fundamental vibration frequencies, anharmonicity of molecular vibrations and its effect on vibrational frequencies, second and higher harmonies. Frequencies of the vibrational transitions of HCl. Vibrational rotation spectra of CO. P, Q and R branches.

PART C

Infrared and Raman Spectra (9 Hrs)

Vibrations of polyatomic molecules. Examples of CO_2, H_2O.Mechanics of measurement of infrared and Raman spectra absorption of common functional groups. Their dependence on chemical environment (bond order, conjugation, hydrogen bonding), the number of active infrared and Raman active lines. Fermi resonance, combination bands and overtones, complications due to interactions of vibrations of similar frequency. Application of IR in structure elucidation of organic compounds.

PART D

UV and Visible Spectroscopy (12 Hrs)

Measurement technique, Beer – Lambert's Law, molar extinction coefficient, oscillator strength and intensity of the electronic transition, Frank Condon Principle, Ground and first excited electronic states of diatomic molecules, relationship of potential energy curves to electronic spectra. Chromophores, auxochromes, electronic spectra of polyatomic molecules. Woodward rules for

conjugated dienes, unsaturated carbonyl groups, extended conjugation. Red shift, blue shift, hypo and hyperchromic effects.

Suggested Books:

1.Silverstein,R.M. and Webster, F.X. *Spectrometric Identification of Organic Compounds*, Wiley, 6th edition, 2007.
2. Kemp, W. *Organic Spectroscopy*, ELBS, 1996.
3. Banwell,C.N. *Fundamentals of Molecular Spectroscopy,* Tata McGraw Hill, 4th edition, 1995.
4. Sharma, Y.R. *Elementary Organic Spectroscopy; Principle and Chemical Applications,* S. Chand & Company Ltd., 2005.

Course Title: Spectroscopy Lab
Course Code: CHE156

L	T	P	Credits	Marks	Pass marks
0	0	2	2	50	20

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic concepts of Chemistry Laboratory. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various experiments have been designed to enhance laboratory skills of the undergraduate students.

Expected Prospective:

The students will be able to understand the basic objective of experiments in chemistry, properly carry out the experiments, and appropriately record and analyze the results through effective writing and oral communication skills. They will know and follow the proper procedures and regulations for safe handling and use of chemicals and solvents.

1. Determine the strength of HCl solution by titrating against NaOH solution conductometerically.
2. Determination of total hardness of water (tap) using standard EDTA solution and Eriochrome black T indicator.
3. Determination of alkalinity of water.
4. Determination of surface tension of given liquid by using Stalagmometer.
5. Determination of residual chlorine in a water sample.
6. To determine the specific and molecular rotations of an optically active substance by using polarimeter.
7. To determine the composition of an unknown solution with a polarimeter.
8. Determination of the viscosity of given lubricating oil by using Redwood Viscometer.
9. Determination of distribution coefficient of I_2 between CCl_4 and Water.
10. To study the kinetics of hydrolysis of methyl acetate in the presence of hydrochloric acid.

Suggested Books:

1. Levitt, B.P.*Findlays Practical Physical Chemistry,*London & New York: Longman Group Ltd.8th edition, 1978.

2. Khosla, B.D., Garg, V.C. and Gulati, A. *Senior Practical Physical Chemistry,*New Delhi: R.Chand& Co., 11thedition, 2002.

3.Das, R.C. and Behra, B., *Experimental Physical Chemistry,* Tata McGraw Hill Publishing Co. Ltd., 1983.

4.*Vogel's Textbook of Quantitative Chemical Analysis* (revised by Jeffery, Bassett, Mendham and Denney), 5th edition, ELBS, 1989.

5.Svehla, G.*Vogel's Qualitative Inorganic Analysis (revised),* 6th edition,New Delhi:Orient Longman, 1987.

6.Christian G.D.*Analytical Chemistry,*John Wiley & Sons Inc.

THIRD SEMESTER

Course Title: Inorganic Chemistry
Course Code: CHE253
Time: 04 Hours

L	T	P	Credits	Marks
4	1	0	4	100

Course Objectives:
This course is intended to learn the basic concepts of Inorganic Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:
This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of Inorganic chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

PART A

Atomic Structure and periodic properties (12 Hrs)

Wave mechanical model of Hydrogen atom, The de Broglie relationship, The uncertainty principle, Schrodinger wave equation and its derivation, Significance of Ψ and Ψ^2, Quantum numbers, Normal and orthogonal wave functions, Pauli's exclusion principle, Hund's rule of maximum multiplicity, Aufbau principle and its limitations. Concept of extra stability of half and completely filled electronic configuration, Electronic configuration of elements, Penetration and shielding (The Slater's rules). The origin and distribution of the elements, The structure of the periodic table, Atomic parameters and their variation in periodic table, Electronegativity and various scales.

PART B

Ionic Compounds (Bonding and structures) (12 Hrs)

Properties of ionic substances, Occurrence of ionic bonding, The radius ratio rules, Efficiency of packing, Hexagonal close packing, Cubic close packing, Structures of different crystal lattices, Sodium chloride, Cesium chloride, Wurtzite, Zinc blende, Fluorite, Rutile, Cristobalite, Nickel arsenide, Calcium carbide, Lattice energy, Born-Haber cycle, The calculations of the lattice energy on the basis of Born-Lande equation, Covalent character in predominantly ionic compounds, Imperfections of crystals, Polarizing power and polarizabilty of ions, Fajan's rule.

PART C

Covalent Bond (12 Hrs)

The Lewis theory, Valence bond theory - A mathematical approach, Resonance, Valence Shell Electron Pair Repulsion Model (VSEPR theory), Prediction of structures and variation of bond angles on the basis of VSEPR theory, Shortcomings of VSEPR theory. Concept of hybridization, Rules for obtaining hybrid orbitals, Extent of d-orbital participation in molecular bonding (SO_2, PCl_5, SO_3), Molecular orbital theory (LCAO method), Symmetry of molecular orbitals, Applications of MOT to homo- and hetero-nuclear diatomic molecules, Molecular orbital energy level diagrams (Be_2, N_2, O_2, F_2, NO, CO, HCl, NO_2, BeH_2).

PART D

Coordination chemistry **(8 Hrs)**

Werner's theory, nomenclature of coordination complexes, isomerism in coordination complexes, chelating agents, metal chelates and chelate effects, names and abbreviations of important ligands, polydenate ligands, polypyarzolyborates, macrocylic ligands, macrocylic effect, ketoenolates, troplonates, tripod ligands, conformation of chelate rings, factors determining kinetic and thermodynamic stability.

Suggested Books:

1. Shriver,D.F.C.,Atkins,P.W. and Langford,C.H. *Inorganic Chemistry,* ELBS Oxford, 1991.
2. Huheey,J.E. Keiter,E.A. and Keiter, R.L. *Inorganic Chemistry,* 4th edition, Singapore:Pearson Education, 1999.
3. Lee, J.D. *Concise Inorganic Chemistry,* ELBS, Oxford, 1994.

Course Title: Inorganic Chemistry Lab
Course Code: CHE254
Time: 04 Hours

L	T	P	Credits	Marks
0	0	2	2	50

Course Objectives:
This course is intended to learn the basic concepts of Inorganic Chemistry Laboratory. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various experiments have been designed to enhance laboratory skills of the undergraduate students.

Expected Prospective:
The students will be able to understand the basic objective of experiments in inorganic chemistry, properly carry out the experiments, and appropriately record and analyze the results through effective writing and oral communication skills. They will know and follow the proper procedures and regulations for safe handling and use of chemicals and solvents.

Qualitative Analysis
Identification of cations and anions in a mixture which may contain combinations of acid ions. These must contain interfering acid anions and one, the insoluble.

a) Special Tests for Mixture of anions

I. Carbonate in the presence of sulphate.
II. Nitrate in the presence of nitrite
III. Nitrate in the presence of bromide and iodide.
IV. Nitrate in the presence of chlorate.
V. Chloride in the presence of bromide and iodide.
VI. Chloride in the presence of bromide.
VII. Chloride in the presence of iodide.
VIII. Bromide and iodide in the presence of each other and of chloride.
IX. Iodate and iodide in the presence of each other.
X. Phosphate, arsenate and arsenite in the presence of each other.
XI. Sulphide, sulphite, thiosulphate and sulphate in the presence of each other.
XII. Borate in the presence of copper and barium salts.
XIII. Oxalate in the presence of fluoride.
XIV. Oxalate, tartrate, acetate, citrate in the presence of each other.

b) Separation and identification of cations in mixtures

i) Separation of cations in groups.
ii) Separation and identification of Group I, Group II (Group IIA and IIB), Group III, Group IV, Group V and Group VI cations.

Suggested Books:

1. Svehla, G. andSivasankar, B. *Vogel's Qualitative Inorganic Analysis (revised),*Pearson, 7th edition, 1996.
2. Bassett, R. C., Denney, G. H. and Jeffery, J. Mendham, *Vogel's Textbook of Quantitative Inorganic Analysis (revised),* 4th edition, Orient Longman, 1978.

FIFTH SEMESTER

Course Title: PHYSICAL CHEMISTRY
Course Code: CHE353

L	T	P	Credits	Marks	Pass Marks
4	1	0	4	100	40

Time: 04 Hours
Course Objectives:
This course is intended to learn the basic concepts of Physical Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:
This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of physical chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

PART A

Chemical Thermodynamics (15Hrs)
Objectives and limitations of Chemical Thermodynamics, State functions, thermodynamic equilibrium, work, heat, internal energy, enthalpy.
First Law of Thermodynamics: First law of thermodynamics for open, closed and isolated systems. Reversible isothermal and adiabatic expansion/compression of an ideal gas. Irreversible isothermal and adiabatic expansion, .Enthalpy change and its measurement, standard heats of formation and absolute enthalpies. Kirchhoff's equation.
Second and Third Law: Various statements of the second law of thermodynamics. Efficiency of a cyclic process (Carnot's cycle), Entropy, Entropy changes of an ideal gas with changes in P,V, and T, Free energy and work functions, Gibbs-Helmholtz Equation., Criteria of spontaneity in terms of changes in free energy, Third law of thermodynamics, Absolute entropies.

PART B

Chemical Equilibrium (5 Hrs)
General characteristics of chemical equilibrium, thermodynamicderivation of the law of chemical equilibrium, Van't Hoff reaction isotherm. Relation between Kp, Kc and Kx. Temperature dependence of equilibrium constant-Van't Hoff equation, homogeneous & heterogeneous equilibrium, Le Chetalier's principle.

PART C

Chemical Kinetics (15 Hrs)
Rates of reactions, rate constant, order and molecularity of reactions.Chemical Kinetics: Differential rate law and integrated rateexpressions for zero, first, second and third order reactions. Half-lifetime of a reaction, Methods for determining order of reaction, Effect of temperature on reaction rate and the concept of activation energy, Reaction mechanism, Steady state hypothesis
Catalysis
Homogeneous catalysis, Acid-base catalysis and enzyme catalysis (Michaelis-Menten equation). Heterogeneous catalysis, Unimolecular surface reactions.

PART D

Electro-Chemistry (5 Hrs.)
Specific conductance, molar conductance and their dependence on electrolyte concentration, Ionic Equilibria and conductance, Essential postulates of the Debye-Huckel theory of strong electrolytes,

Mean ionic activity coefficient and ionic strength, Transport number and its relation to ionic conductance and ionic mobility, Conductometry titrations, pH scale, Buffer solutions, salt hydrolysis, Acid-base indicators.

Electrochemical cells (5Hrs.)

Distinction between electrolytic and electrochemical cells, StandardEMF and electrode potential, Types of electrodes, Reference electrode, Calculation of NG, NH, NS and equilibrium constant from EMF data, Potentiometric determination of pH, Potentiometric titrations.

Suggested Books:

1. Atkins,P.W. *Physical Chemistry,*Oxford University Press, 8th edition, 2006 (Indian Print).
2. Engel,T. and Reid,P. *Physical Chemistry,*Pearson Education, 1st edition, 2006.
3 Castellan,G. W. *Physical Chemistry,*Wisley/Narosa, 3rd edition, 1985 (Indian Print).
4. Barrow,G. M. *Physical Chemistry,* New York: McGraw Hill, 6th edition, 1996.
5. Silbey,R. J.,Albert,R. A. andBawendi,Moungi G. *Physical Chemistry,* 4th edition, New York: John Wiley, 2005.

This syllabus has been designed as per national syllabus suggested by UGC and covers 20% extra syllabus as per requisite of honors degree.

Course Title: PHYSICAL CHEMISTRY LAB
Course Code: CHE354

L	T	P	Credits	Marks	Pass marks
0	0	2	2	50	20

Time: 04 Hours

Course Objectives:
To teach the fundamental concepts of Physical Chemistry and their applications. The syllabus pertaining to B.Sc. (Other branches.) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance is given to requisite intellectual and laboratory skills.

Expected Prospective:
The students will be able to understand the basic objective of experiments in organic chemistry, properly carry out the experiments, and appropriately record and analyze the results through effective writing and oral communication skills. They will know and follow the proper procedures and regulations for safe handling and use of chemicals and solvents.

1. Treatment of experimental data
Recording of experimental data. Significant number, accuracy and precision, error analysis.

2. Liquids and Solutions
(i) To determine relative viscosities of aqueous solutions of glycerol at different concentrations. (ii) Calculate partial molar volume of glycerol at infinite dilution from density measurement.
(ii) To determine viscosity-average molecular weight, number-average molecular weight and mean diameter of polyvinyl alcohol molecule from intrinsic viscosity data.

3. Thermochemistry
(i) To determine heat capacity of a calorimeter and heat of solution of a given solid compound.
(ii) To determine heat of solution of Solid calcium chloride and calculate lattice energy of calcium chloride using Born-Haber cycle.
(iii) To determine heat of hydration of copper sulphate.

4. Distribution Law
(i) To determine distribution (i.e. partition) coefficient of a solute between water and a non-aqueous solvent.

5. Surface Phenomena
To study the adsorption of acetic acid/oxalic acid from aqueous solution on charcoal. Verify Freundlich and Langmuir adsorption isotherms.

6. Colorimetery
(i) To verify Lambert-Beer law.

7. pH-metry
(i) To titrate a strong acid against a strong base pH-metrically.
(ii) To titrate a weak acid against a strong base and determine the ionization constant of the weak acid.

Suggested Books
1. Levitt, B.P.*Findlays Practical Physical Chemistry,*London & New York:Longman Group Ltd., 8th edition,1978.
2. Khosla, B.D., Garg, V.C. and Gulati, A.*Senior Practical Physical Chemistry,*New Delhi: R. Chand & Co., 11thedition, 2002.

3.Das, R.C. and Behra, B.*Experimental Physical Chemistry,* Tata McGraw Hill Publishing Co. Ltd. 1983.
4.*Vogel's Textbook of Quantitative Chemical Analysis* (revised by Jeffery, Bassett, Mendham and Denney), ELBS, 5th edition,1989.
5. Svehla, G.*Vogel's Qualitative Inorganic Analysis (revised),* 6th edition, New Delhi:Orient Longman, 1987.
6. Christian, G.D.*Analytical Chemistry,* Wiley, 6th edition.

MATHEMATICS COURSES FOR B.Sc. (Physics) Hons
(FIRST SEMSTER)

Course Title: Matrices and Infinite series
Paper Code: MTH 155

L	T	P	Credits	Marks
4	0	0	4	100

Objective:

This Course is a requirement for majors in other sciences because study of matrices and infinite series provides abasis for advanced studies not only in Mathematics but also in other branches like engineering,physics and computers etc.

UNIT-A **12HOURS**

Vector Spaces and Linear Algebra: Matrices – basic definitions and Operations, Determinants for linear algebraic equations, Cramer's rule, Gauss elimination, orthogonal matrices, Hermitian matrices, unitary matrices.

UNIT-B **15HOURS**

Cayley-Hamilton Theorem. Characteristic roots and characteristic vectors of a square matrix. Nature of roots of different types of matrices. Minimal polynomial of a matrix. Similarity of matrices, similarity reduction to a diagonal form, diagonalizable matrix, Spectral decomposition of Hermitian matrix.

UNIT-C **13HOURS**

Linear transformations. Rank and Nullity of a linear transformation, Inverse of a Linear Transformation. Rank and Nullity Theorem and its consequences. Matrix of a linear transformation with respect to a given basis

UNIT-D **14HOURS**

Infinite Series: Sequence, Infinite series, Fundamental concepts, Geometric series, Convergence tests (Comparison test, D'Alembert's ration test, Logarithmic test, Cauchy's root test, Cauchy's integral test etc.), Alternating series, Absolute convergence of a series, algebra of series, power series, Taylor series.

Suggested Books:

1. Narayan, Shanti andMittal P. K. *A textbook of Matrices*. New Delhi: S. Chand & Co., 2010.
2. Boas,M.L. *Mathematical Methods in the Physical Sciences*. New Delhi: Wiley, 2002.
3. Pipes, L.A. and HarvillL.R. *Applied Mathematics for Engineers and Physicists*. New Delhi: McGraw- Hill, 1971.
4. Grewal, B.S. *Higher Engineering Mathematics*. New Delhi: Khanna Publication, 2009.

(SECOND SEMSTER)

Course Title: Calculus & Geometry
Paper Code: MTH-156

L	T	P	Credits	Marks
4	0	0	4	100

Objective:
The objective of the course is to equip the students with the knowledge of basic concepts of partial derivatives, multiple integration and their applications in geometry.

UNIT-A **14 HOURS**

Coordinate Geometry: Polar & Cartesian co-ordinates in plane, different forms of straight lines. Angle between two straight lines. Conditions of parallelism and perpendicularity. Standard equations of circle, parabola, ellipse and hyperbola (without proof) and simple problems.

UNIT-B **14 HOURS**

Solid Geometry: Sphere, Cone, Cylinder, Equation of paraboloid, ellipsoid and hyperboloid in standard forms. Simple properties of these surfaces. Equation of tangent planes to the above surfaces.

UNIT-C **13 HOURS**

Functions of two and more variables: Vector-valued function and space curves. Arc length and unit tangent vector. Limit and continuity of multivariable function. Partial derivatives. Directional derivatives, gradient vectors and tangent planes.

UNIT-D **14HOURS**

Multiple Integrals and Integral in vector fields: Double and triple integrals. Fubini's TheoremWithout proof, Change of order of integration in double integrals, volume of a region in space, Triple integrals in spherical and cylindrical coordinates, substitution in multiple integrals. Line integrals vector fields. Path independence and surface integrals. Divergence and Stoke's theorem (Applications only).

Suggested Books:

1. Thomas, George B. and Finney Ross L. *Calculus and Analytic Geometry*. New Delhi Addison Wesley, 1995.
2. Mohindru, J. P. and Gupta,Usha and DograA. S.,*New Pattern Vector Algebra and Geometry*. International Publishers, New Edition, 2004.
3. Grewal, B.S. *Higher Engineering Mathematics*. New Delhi: Khanna Publication, 2009

(THIRD SEMSTER)

Course Title: Differential Equations and Fourier series
Paper Code: MTH-255

Objective:
The objective of the course is to enable the students to understand the basic concepts related to ordinary differential, partial differential equations and Fourier series and their applications.

UNIT-A **14 HOURS**

Ordinary Differential Equations: Exact First Order Differential Equations, Linear second order equations. Homogeneous equation with constant coefficients, Characteristic equation and their roots. Non-homogeneous equations of second order. Particular integrals, method of variation of parameters.

UNIT-B **14 HOURS**

Solution in series of second order linear differential equations with variable coefficients (in particular, solutions of Legendre's and Bessel's equations.) Bessel functions, Legendre functions, their recurrence and orthogonal relations, Gamma and Beta functions.

UNIT-C **15 HOURS**

Fourier Series and Partial Differential Equations: Fourier Series; Periodic functions. Fourier series and Fourier coefficients. Functions having arbitrary period. Sine and Cosine series. Half-range expansions. Exponential and complex form of Fourier series. Differentiation and integration of Fourier series. Fourier integrals.

UNIT-D **13 HOURS**

Formation of first and second order partial differential equations and their classification, solution of first order equation, Lagrange's equation. Solution of Laplace, diffusion and wave equations by method of separation of variables. D'Alembert's solution of wave equation.

Suggested Books:

1. Grewal, B.S. *Higher Engineering Mathematics*. New Delhi: Khanna Publication, 2009
2. Kreyszig, Erwin.*Advanced Engineering Mathematics*. New Delhi: Wiley Eastern Ltd., 2003.
3. Jain, R K, and K Iyengar S R.*Advanced Engineering Mathematics*, New Delhi: Narosa Publishing House, 2003.
4. Thomas, George B. and Finney Ross L. *Calculus and Analytic Geometry*. New Delhi Addison Wesley, 1995

L	T	P	Credits	Marks

(FIFTH SEMESTER)

4	**1**	**0**	**4**	**100**

Course Title: Integral Transforms and Complex Analysis
Paper Code: MTH-351
Objective:
To acquaint the students with the application of Laplace transforms to solve ordinary differential equations. Moreover, basics of Complex Analysis are also included in this course.

UNIT-A **15 HOURS**

Laplace Transforms: Laplace transforms: definition, elementary transforms. Transforms of derivatives and integrals. Transforms of periodic functions. Convolution theorem. Inverse Laplace transforms. Application to ordinary differential equations.

UNIT-B **15 HOURS**

Complex Analysis: Complex numbers, absolute value, argument. Functions e^z, sin z, cos z, log z and hyperbolic functions. Analytic functions, Cauchy-Riemann equations. Harmonic functions and their conjugates.

UNIT-C **14 HOURS**
Integration of complex functions, Cauchy's theorem (statement only), Cauchy's theorem for multiply connected domains (statement only). Cauchy's integral formula (statement only) and simple consequences.

UNIT-D **12 HOURS**

Expansion into Laurent series, singularities, Residues, Cauchy residue theorem (statem*ent only).* Evaluation of definite integrals using contour integration

Suggested Books:

1. Grewal, B.S. *Higher Engineering Mathematics*. New Delhi: Khanna Publication, 2009
2. Kreyszig, Erwin.*Advanced Engineering Mathematics*. New Delhi: Wiley Eastern Ltd., 2003.
3. Jain, R K, and K Iyengar S R.*Advanced Engineering Mathematics*, New Delhi: Narosa Publishing House, 2003.
4. Thomas, George B. and Finney Ross L. *Calculus and Analytic Geometry*. New Delhi Addison Wesley, 1995
5. Churchill, R. V, and Brown J. W. *Complex Variables and Application*. New Delhi: McGraw-Hill, 2008.

(SIXTH SEMESTER)

Course Title: MATLAB
Paper Code: MTH 309

L	T	P	Credits	Marks
0	0	4	2	50

Course Objectives

The objective of this course is to teach the basics of computer and computer programming so that one can develop the computer program in MATLAB at their own. For the purpose of learning programming skill, some Numerical methods which are extremely useful in scientific research are included. This is all Laboratory work.

UNIT A **14 HOURS**

Starting and Quitting MATLAB, Basic Operations of MATLAB: Input/output data, The Colon Operator ,Graphics, Types of files, mathematical functions, operations on vectors and matrices, random number generators. Error computation: absolute/relative, avoiding large errors.

UNIT B **14 HOURS**

Expressions **,** Variables, Numbers, Operators, Functions, Examples of Expressions, About Matrices, Entering Matrices, sum, transpose, the magic Function Types of matrices, Eigen values and Eigen vectors, computing inverse of matrices

UNIT C **13 HOURS**

Looping statements: if, else, and elseif, for, while, switch and case, break , return, Developing algorithms using nested loops, Sorting and Searching, Tracing a program/algorithm step-by-step, Commands for Parsing Input and Output, User Input and Screen Output, Evaluation, Debugging

UNIT D **15 HOURS**

Plotting Process, Graph Components, Figure Tools, Arranging Graphs within a Figure, Selecting Plot Types. Plotting Two Variables, Changing the Appearance, Adding More Data to the Graph, Changing the Type of Graph, Modifying the Graph Data Source, Working with Images.

Suggested Books:

1. Chapman, S., *MATLAB Programming for Engineers, 4th Edition*, Cengage Learning, Engineering, 1120 Birchmount Rd, Toronto, ON, M1K5G4, Canada. 2008.
2. Duffy, D.G., *Advanced engineering mathematics with MATLAB*, Boca Raton, FL: CRC Press, 2003.
3. Register, A.H., *A guide to MATALB object-oriented programming*, Boca Raton, FL: CRC Press, 2007.
4. Kalechman, M., *Practical MATALB applications for engineers*, Boca Raton, FL: CRC Press, 2009.
5. Poularikis, A.D., *Discrete random signal processing and filtering primer with MATLAB*, Boca Raton, FL: CRC Press, 2009.

Other Interdisciplinary courses for B.Sc (Physics) Hons

(FIRST SEMESTER)

Course Title: Environment Education
Paper Code: EVS102

L	T	P	Credits	Marks
3	0	0	2	50

Course Objective: This course aims at understanding the students in aspects of environmental problems, its potential impacts on global ecosystem and its inhabitants, solutions for these problems as well as environmental ethics which they should adopt to attain sustainable development.

Unit 1

The multidisciplinary nature of environmental studies **(2 Hours)**
Definition, scope and importance, Need for public awareness

Natural Resources: Renewable and non-renewable resources: **(8 Hours)**
Natural resources and associated problems.
(a) **Forest resources:** Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
(b) **Water resources:** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
(c) **Mineral resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
(d) **Food resources:** World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
(e) **Energy resources:** Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
(f) **Land resources:** Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Ecosystem: **(4 Hours)**

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)

Unit II

Biodiversity and its conservation **4 Hours**

- Introduction – Definition: Genetic, Species and Ecosystem Diversity

- Bio-geographical classification of India
- Value of biodiversity: Consumptive use, Productive use, Social, Ethical, Aesthetic and Option values
- Biodiversity at global, national and local levels
- India as a mega-diversity nation
- Hot-spots of biodiversity
- Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity, global and national efforts.
- Genetically modified crops
- Cartagena Protocol
- Biodiversity Act

Environmental Pollution **8Hours**

- Definition, causes, effects and control measures of:
  a. Air pollution
  b. Water pollution
  c. Soil pollution
  d. Marine pollution
  e. Noise pollution
  f. Thermal pollution
  g. Nuclear pollution
- Solid waste management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides

Indoor Pollution: **2 Hours**

- Practical tips on how to save the self from self-inflicted pollution.
- Basics of toxicity.
- Problems of lifestyle based diseases.
- Solutions needed for safety.

Unit III

Social Issues and the Environment **7 Hours**

- Population growth, variation among nations, Population explosion – Family Welfare Programmes.
- Environment and human health,
- From unsustainable to sustainable development
- Urban problems and related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- Environmental ethics: Issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation
- Consumerism and waste products

- Environmental Laws: The Environment Protection Act, 1986; The Air (Prevention and Control of Pollution) Act, 1981; The Water (Prevention and control of Pollution) Act 1974; The Wildlife Protection Act, 1972; Forest Conservation Act, 1980.
- Issues involved in enforcement of environmental legislation
- Public Awareness

Unit IV

Human Population and Environment5 Hours

- Population Growth and Variations among Nations
- Population Explosion
- Human Rights
- Value Education
- HIV / AIDS
- Women and Child Welfare
- Role of Information Technology in Environment and Human Health
- Case Studies

Global environmental issues **5 Hours**

- Stockholm Conference
- Brundtland Commission
- Montreal Protocol
- Kyoto protocol
- Earth Summit
- World Summit

Field Work **5 Hours**

- Visit to a local area to document environmental assets river/ forest/ grassland/hill/mountain
- Visit to a local polluted site – Urban / Rural / Industrial / Agricultural
- Study of common plants, insects, birds
- Study of simple ecosystems-Pond, river, hill slopes, etc (Field work equal to 5 lecture hours)

Suggested Books:

1. Odum, EP. *Basic Ecology*. Japan : Halt Saundurs, 1983.
2. Botkin, DB, and Kodler EA. *Environmental Studies: The Earth as a living planet.* New York: John Wiley and Sons Inc., 2000.
3. Singh, JS, Singh, SP, and Gupta SR. Ecology, *Environment and Resource Conservation.* New Delhi: Anamaya Publishers, 2006.
4. De, AK. *Environmental Chemistry*. New Delhi: Wiley Eastern Ltd., 1990.
5. Sharma, PD. *Ecology and Environment*. Meerut Rastogi Publications, 2004

This syllabus has been designed as per national syllabus suggested by UGC and cover 20% extra syllabus as per requisite of honour degree.

(SECOND SEMESTER)

Course Title: Road Safety and Legal Awareness
Paper Code: EVS103

L	T	P	Credits	Marks
2	0	0	2	50

Course Objective: This course aims to aware the students about safety measures taken during driving and commuting on roads.

Unit I

Road Safety **15 Hours**

- Road safety: Concept and its importance.
- Attitude of people towards road safety
- Role of traffic police in road safety
- Traffic rules
- Traffic signs
- How to obtain driving license
- Traffic offences, penalties and procedures
- Common driving mistakes
- Significance of first-aid in road safety
- Role of civil society in road safety and Traffic police-public relationship
- Motor Vehicle Act 1998 (2010)

Unit II

Legal Awareness **10 Hours**

- Legal literacy
- Child labour
- Domestic Violence
- Right to Education

Suggested Books:

1. Botkin, DB, and Kodler EA. *Environmental Studies: The Earth as a living planet.* New York: John Wiley and Sons Inc., 2000.
2. Singh, JS, Singh, SP, and Gupta SR. Ecology, *Environment and Resource Conservation.* New Delhi: Anamaya Publishers, 2006.
3. Sharma, PD. *Ecology and Environment*. Meerut Rastogi Publications, 2004

This syllabus has been designed as per national syllabus suggested by UGC and cover 20% extra syllabus as per requisite of honour degree.

(FIRST SEMESTER)

Course Title: General Knowledge and Current Affairs
Course Code: SGS-102

L	T	P	Credits	Marks
2	0	0	2	50

Course Objectives

The study of General Knowledge and Current Affairs has become even more important today. It is not only a major constituent of most competitive examinations but also aids in acquiring general awareness.

The objectives of this course are:

- To introduce students with the course and contents of various competitive examinations
- To prepare a foundation for appearing in various competitive examinations
- To sensitize the students about the current issues and events of national and international importance
- To provide opportunity to the students to study inter disciplinary subjects like Geography, Science, Economy, Polity, History, International Relations etc.

Learning Outcomes:

- Students would get an opportunity to aspire, plan and prepare for various competitive examinations in advance.
- It would polish their personalities and sharpen the skills of debates, group discussions, communication, interview etc.
- Students would acquire general awareness of National and International Events.

Unit — A

General Geography

World Geography:

The Universe, The Solar System, The Earth, Atmosphere, The World **3 hours** we live in, Countries rich in Minerals, Wonders of the World, Biggest and Smallest.

Indian Geography:

Location, Area and Dimensions, Physical Presence, **3 hours**
Indian States and Union Territories,
Important sites and Monuments, Largest-Longest and Highest in India.

General History

Glimpses of India History, Ancient Indian, Medieval India, Modern India, **3 hours**
Various Phases of Indian National Movement, Prominent Personalities. Glimpses of Punjab history with special reference to period of Sikh Gurus.

Glimpses of World History

Important Events of World History, Revolutions and Wars of Independence, **3 hours**
Political Philosophies like Nazism, Fascism,
Communism, Capitalism, Liberalism etc.

Unit — B

General Polity **3 hours**

World Politics – Major Actors and their political relations, UNO and other organizations viz: WTO, EU, SAARC, ASEAN, BRICS, WTO, OIC, OAU, OPEC, GCC etc.

Indian Polity : Constitution of India : **3 hours**

Important Provisions, Basic Structure, Union Government, Union Legislature and Executive, State Government: State Legislature and Executive, Indian Judiciary, The Election Commission, Panachayati Raj System, RTI etc.

General Economy :

The process of liberalization, privatization, globalization and Major World Issues. Indian Economy, Indian Financial System, Major Economic Issues, Economic Terminology. **3 hours**

Unit — C

General Science :

General appreciation and understandings of science including the matters of everyday observation and experience. Inventions and Discoveries. **3 hours**

Sports and Recreation : **3 hours**

The World of Sports and recreation. Who's Who is sports, Major Events, Awards and Honours. Famous personalities, Festivals. Arts and Artists.

Current Affairs :

National and International Issues and Events in News. Governments Schemes and Policy Decisions. **3 hours**

India and Neighbours:

Current phase relations with China, Pakistan, Bangladesh, Nepal, Sri Lanka and Afghanistan **3 hours**

Unit — D

Miscellaneous Information

Who is who **2 hours**

Books and Authors, Persons in News, Awards and Honours, Abbreviations and Sports

Total: 35 Hours

Suggested Books:

1. Aggarwal, R. S. *Advance Objective General Knowledge*, S. Chand Publisher (2013)
2. Sen, S. *Concise General Knowledge Manual 2013*, Unique Publishers,2013
3. Verma, R P. *Encyclopedia of General Knowledge and General Awareness,* Penguin Books Ltd (2010)
4. Thorpe, Edgar. And Thorpe, Showick. *General Knowledge Manual 2013-14*, the Pearson, Delhi.
5. Mohanty, Muktikanta. *General Knowledge Manual 2013-14*, Macmillan Publishers India Ltd., Delhi.

6. India 2013, *Government of India (Ministry of Information Broadcasting*), Publication Division, 2013.
7. Methew, Mammen. *Manorama Year Book 2013-14*, Malayalam Manorama Publishers, Kottayam, 2013.
8. *Spectrum's Handbook of General Studies – 2013-14*, Spectrum Books (P) Ltd., New Delhi
9. *Unique Quintessence of General Studies – 2013-14*, Unique Publishers, New Delhi.

Current Affairs

Magazines
Economic and Political Weekly, Yojna, the Week, India Today, Frontline, Spectrum.
Competition Success Review, Competition Master, Civil Services Chronicle, Current Affairs, World Atlas Book

Newspapers the Hindu, Times of India, the Hindustan Times, the Tribune

(SECOND SEMESTER)

Course Title : Human Values and Ethics
Course Code : SGS - 101

L	T	P	Credits	Marks
2	0	0	2	50

Course Objectives

- To sensitize students about the role and importance of human values and ethics in personal, social and professional life.
- To encourage students to read and realize the values of enlightened human beings.
- To enable students to understand and appreciate ethical concerns relevant to modern lives.

Learning Outcomes*:*
Students becoming responsible citizens and better professionals who practise Values and Ethics in every sphere of life.

Unit - A

Human Values

1. **Concept of Human Values:** Meaning, Types and Importance of Values. **2 hours**
2. **Human Values :** Lessons from the lives and teachings of great thinkers. 3 **hours**
3. **Value Education :** The content of value education **2 hour**
4. **Value crisis and its redressal.** **1 hour**

Unit - B

Being Good and Responsible

1. Self Exploration and Self Evaluation **2 hour**
2. Acquiring Core Values for Self Development **2 hour**
3. Living in Harmony with Self, Family, Society and Nature **3 hours**
4. Values enshrined in the Constitution : Liberty, Equality Fraternity and Fundamental Duties. 3 **hours**

Unit - C

Value – based living

1. Vedic values of life **2 hour**
2. *Karma Yoga* and *Jnana Yoga* **2 hours**
3. *Ashta Marga* and *Tri-Ratna* **2 hours**
4. Truth, Contentment and Wisdom **2 hours**

Unit - D

Ethical Living:

Ethics: Difference between Ethics and Values

1. Personal Ethics **2 hours**
2. Professional Ethics **3 hours**
3. Ethics in Governance **2 hours**
4. Ethics in Education **2 hours**

Total = 35 hours

Suggested Books:

1. Sreedharan,E. and Wakhlu,Bharat. Ed. *Restoring Values.* New Delhi: Sage Publications Ltd., 2010.
2. Nagarajan, K. *Indian Ethos and Values*.New Delhi: Tata McGraw Hill, 2011
3. Tripathi, A N. *Human Values*. New Delhi: New Age International Publishers, 2009
4. Sankar. *Indian Ethos and Values in Management*. New Delhi: Tata McGraw Hill Education Pvt. Ltd.
5. Osula.*Values and Ethics.* New Delhi: Asian Books, 2001.
6. Surbiramanian, R. *Professional Ethics*. New Delhi: Oxford University Press, 2013.
7. Anand, Rishabh. *Human Values and Professional Ethics,* New Delhi: Satya Prakashan, 2012
8. Bhalla, Sanjeev. *Human Values and Professional Ethics*.New Delhi: Satya Prakashan, 2012.
9. Soryan, Ritu. *Human Values and Professional Ethics*. New Delhi: Dhanpat Rai & Co. Pvt. Ltd., 2010.
10. Jayshree, Suresh, and B S, Raghavan. *Human Values and Professional Ethics.* New Delhi: S Chand & Co. Ltd.,2007.
11. Shukla, Dr. R K, Misra, Anuranjan. *Human Values and Professional Ethics*, A B Publication, 2010.
12. Sharma,Vayu. *Human Values and Professional Ethics*. New Delhi: Education of India Language publishers, 2012.
13. Kannan,S, and Srilakshmi,K. *Human Values and Professional Ethics*.New Delhi: Taxmann Publication, Pvt. Ltd., 2009
14. Srivastava, Smriti. *Human Values and Professional Ethics*. New Delhi: S K Kataria & Sons, 2001
15. Singh, Yogendra, and Garg, Ankur. *Human Values and Professional Ethics*. New Delhi: Aitbs publishers, 2011.
16. Kumar, Vrinder. *Human Values and Professional Ethics*. Ludhiana: Kalyani Publishers, 2013.
17. Gaur,R R, Sangal, R. Bagaria, GP. *Human Values and Professional Ethics*. New Delhi: Excel Books, 2010.
18. Osula, Dr. Bramwell and Upadhyay, Dr. Saroj. *Values and Ethics*, New Delhi : Asian Books Pvt. Ltd., 2011.
19. *Complete works of Swami Vivekanand*, Calcutta: Advaita Ashram, 1931.
20. Radhakrishnan, S. *Indian Philosophy*, George Allen & Unwin Ltd., New York: Humanities Press INC, 1929.
21. Dwivedi, A N. *Essentials of Hinduism, Jainism and Buddhism,* New Delhi: Books Today– 1979
22. Saraswati, Maharishi Dayanand. *Light of Truth: Satyarth Parkash*. New Delhi: Arya Swadhyay Kendra, 1975.

23. Bhan, Suraj. *Dayanand : His life and work.* New Delhi : DAVCMC, 2001.
24. Raghavan, V, and Iyer, N. *Moral and Political Thoughts of Mahatma Gandhi.* New Delhi : Oxford University Press India, 2000.
25. Singh, Narain. *Guru Nanak Dev's view of life*. Amritsar: Bhagat Puran Singh All India Pingalwara Society, 2010.
26. Dwivedi, Kapil Dev. *Esence of Vedas*. Hoshiarpur : Katyayan Vedic Sahitya Prakashan,1990.
27. Chaubey,B B. *Vedic* Concepts. Hoshiarpur : Katyayan Vedic Sahitya Prakashan, 1990.
28. Radhakrishnan, Saravapalli. *Mahatma Gandhi : Essays and Reflections on his life*. Mumbai: Zaico Publication, 1977.
29. Hardayal, Lala. *Hints for Self Culture*, Mumbai:Jaico Publishing House, 1961.
30. Saraswati Dayanand, *The Light of Truth (The Satyartha Prakashan)*.New Delhi:
31. Krishnamurti J. *The First and Last Freedom*
32. Maharishi, Sri Raman. *Who Am I.*
33. Balsekar, Ramesh S. *Peace and Harmony in Daily Living*. New Delhi: Yogi Impressions.

(SECOND SEMESTER)

Course Title: Basic Communication Skills

Course Code: ENG151

No. Of Lectures: 60

L	T	P	Credits	Marks
4	0	0	3	75

Course Objective:

- To enhance students' vocabulary and comprehensive skills through prescribed texts.
- To hone students' writing skills.

Learning Outcomes: Students will be able to improve their writing skills as well as will enrich their word power.

Unit – A Applied Grammar (Socio-Cultural Context)	
• Parts of Speech: Noun, Pronoun, Adjective, Verb, Adverb, Preposition, Conjunction, Interjection	5 hours
• Tenses (Rules and Usages in Socio-cultural contexts)	6 hour
• Modals: Can, Could, May, Might, Will, Would, Shall, Should, Must, Ought to	5hours
• Passives	5 hours
• Reported/Reporting Speech	5hour
Unit – B Reading (Communicative Approach to be Followed)	
• J M Synge: Riders to the Sea (One Act Play)	7 hours
• Anton Chekhov : Joy (Short Story)	rs
• Swami Vivekanand : The Secret of Work (Prose)	7 hours
Unit – C Writing	
• Paragraph and Essay Writing	lours
• Letter Writing: Formal and Informal	5
• Notice and Email	5ho

References:

a. Books

1. Kumar, Sanjay and PushpLata. *Communication Skills*. India: OUP, 2012.
2. Vandana, R. Singh. *The Written Word* by. New Delhi: Oxford University Press, 2008.

b. Websites

1. www.youtube.com (to download videos for panel discussions)
2. www.letterwritingguide.com
3. www.teach-nology.com
4. www.englishforeveryone.org
5. www.dailywritingtips.com
6. www.englishwsheets.com
7. www.mindtools.com

Course Title: Basic Communication Skills
Course Code: ENG 152

L	T	P	Credits	Marks
0	0	2	1	30

No. Of Lectures: 30
Course Objective:

- To improve fluency in speaking English.
- To promote interactive skills through Group Discussions and role plays.

Learning Outcomes:

Unit – A Speaking/Listening	
• Movie-Clippings	10 hours
• Role Plays	10 hours
• Group Discussions	10 hours

References:

Books

1. Gangal, J. K. *A Practical Course In Spoken English.* India: Phi Private Limited, 2012.
2. Kumar, Sanjay and PushpLata. *Communication Skills*. India: OUP, 2012.

Websites

1. www.youtube.com (to download videos for panel discussions)
2. www.englishforeveryone.org
3. www.talkenglish.com
4. www.mindtools.com

(SECOND SEMESTER)

Course Title: Stenography
Course Code: SGS104

Course Objective: The course is to inculcate writing and listening skills among the students. This would act as building blocks for the learner to begin the study of stenography. As the learners are from the senior secondary background the course has been created keeping in mind their requirements for the future.

Learning Outcome:

After going through this course the participant would have understood the basic concepts of shorthand language and would be able to apply them in daily life. Completion of the course will improve their speed of writing and typing. They would be able to pronounce the English words correctly and can use effective Englishcommunication.

Unit A I. The Consonants II. The Vowels III. Intervening Vowels and Position Grammalogues, Punctuation IV. Alternative Signs for r and h V. Diphthongs Abbreviated w. VI. Phaseography Tick the VII. Circle s and z—Left and Right Motion VIII. Stroke s and z IX. Large Circles sw and ss or sz X. Loops st and str.	12 hours
Unit B XI. Initial Hooks to Straight Strokes and Curves XII. Alternative Forms for fr, vr, etc. Intervening Vowels XIII. Circle or Loop Preceding Initial Hook XIV. n and f Hooks XV. Circles and Loops to Final Hooks.XVI The shun hook. XVII. The Aspirate. XVIII. Upward and Downward r.XIX. Upward and downward l and sh. XX. Compound consonants XXI. Vowel indication**.**	12 hours
Unit C XXII. The halving principle (section 1). XXIII. The halving principle (section 2). XXIV. The Doubling principle. XXV.Diphonic or two vowel signs. XXVI. Medial semicircle. XXVII. Prefixes negative words. XXVIII. Suffixes and terminations. XXIX. Contractions. XXX. Figures, etc .proper names.	11 hours
Unit D XXXI.Note taking, transcription, etc. XXXII. Essentials vowels. XXXIII. Special contractions. XXXIV. Advanced pharseography. XXXV. Intersections. XXXVI. Business phrases. XXXVIII. Banking and stockbroking phrases. XXXIX. Insurance and shipping phrases. XL. Technical and railway phrases. XLI. Legal phrases. XLIII. Special list of words. XLIV. Shorthand in practice.	10hours
Total	**45 hours**

Suggested Books:

Pitman. *Pitman Shorthand Instructor and Key*, New Delhi: Pearson publisher. 2001.

Course Title: Stenography Lab
Course Code: SGS105

Course Objective: The course is to inculcate writing and listening skills among the students. This would act as building blocks for the learner to begin the study of stenography. As the learners are from the senior secondary background the course has been created keeping in mind their requirements for the future.

Learning Outcome:

After going through this course the participant would have understood the basic concepts of typing and would be able to apply them in daily life. Completion of the course will improve their speed of typing and typing skills.

Unit A Beginner : Basics-fjdk, sla;,ghty,vmbn,ruei,woqp,cx. .	04 hours
Unit B Shift keys, numeric pad, Digits and symbols	03 hours
Unit C Intermediate- Syllables and words.	04 hours
Unit D Expert- Paragraphs and Stories	04 hours
Total	**15 hours**

(THIRD SEMESTER)

Course Title: ENGLISH
Course Code: ENG180

L	T	P	Marks
4	0	0	100

Total Lectures: 60

Course Objective: To familiarize students of non-literary programmes with some of the basics of literary studies through a critical study of the prescribed texts
Learning Outcomes:

Unit – A *Never Never Nest* by Cedric Mount	
• Consumerist Lifestyle	3 hours
• Bank Loans and Modern Times	3 hours
• Character Analysis	5 hours
• Stylistic Analysis	4 hours
Unit – B *Guide* by R. K. Narayana	
• Interpersonal Relationships	4 hours
• Religious Beliefs/Rituals in Rural India	4 hours
• Character Analysis	4 hours
• Stylistic Analysis	3 hour
Unit – C *Twelfth Night* by Shakespeare	
• Salient Features of Shakespearean Comedy	5
• Character Analysis	5
• Stylistic and Thematic Analysis	5
Unit – D *Animal Farm* by George Orwell	
• Marxist Principles	5 hours
• As a Progressive Text	5 hours
• Symbolic Analysis	5 hours

Suggested Books:

1. Falvey,Peter ,Peter Kennedy. *Learning Language Through Literature: A Sourcebook for Teachers of English in Hong Kong.* HKU:Hong Kong University Press, 1997.
2. www.britishcouncil.com
3. Kumar, Sukrita Paul. *Language, Literature And Creativity*. New Delhi: Orient BlackswanPvt Ltd, 2010.
4. Swann, Joan , Robert Pope and Ronald Carter. *Creativity in Language and Literature: The State of the Art.* USA : Palgrave MacMillan, 2011.

(FOURTH SEMESTER)

Course Title: Programming in C
Course Code: CSA255
Course Duration: 45 Hours

L	T	P	Credits	Marks
4	0	0	3	75

Course Objective: The objective of this course is to help the students in finding solutions to various real lifeproblems and converting the solutions into computer program using C language(structured programming). Students will learn to write algorithm for solutions to various real-life problems. Converting the algorithms into computer programs using C language.

UNIT-A

Logic Development and Program Development Tools

- Data Representation, Flowcharts, Problem Analysis
- Decision Trees/Tables, Pseudo Code and Algorithms,
- Program Debugging, Compilation and Execution.

Fundamentals

- Character Set, Identifiers and Key Words, Data Types
- Constants, Variables, Expressions, Statements, Symbolic Constants.

Operations and Expressions

- Arithmetic Operators, Unary Operators, Relational Operators,
- Logical Operators, Assignment and Conditional Operators, Library functions.

UNIT-B

Data Input and Output

- Single Character Input, Single Character Output, Entering Input Data
- More About Scan Functions, Writing Output Data, More About Print Functions
- Gets and Puts Functions, Interactive Programming.

Control Structures

- Introduction, Decision Making with If – Statement, If Else and Nested If,
- While And Do-While, For Loop.
- Jump Statements: Break, Continue, Goto, Switch Statement.

Functions

- Introduction To Functions, Function Declaration, Function Categories
- Standard Functions, Parameters And Parameter Passing, Pass – By Value/Reference
- Recursion, Global and Local Variables, Storage Classes.

UNIT-C

Arrays

- Introduction to Arrays, Array Declaration, Single and Multidimensional

Array, Memory Representation, Matrices, Strings, String Handling Functions.

Structure and Union

- Declaration of Structure, Accessing Structure Members, Structure Initialization, Arrays of Structure, Nested Structures, Unions.

UNIT-D

Pointers

- Introduction To Pointers, Address Operator And Pointers, Declaring and Initializing Pointers,
- Assignment through Pointers, Pointers and Arrays.

Files

- Introduction, Creating a Data File, Opening and Closing a Data File, Processing a Data File.

Suggested Books:

1..Gottfried and Byron S.,*Programming with C*, New Delhi:Tata McGraw Hill, 1992.
2. Balagurusamy E., *Programming in ANSI C*, New Delhi: McGrawHill, 2011.
3 .HanlyR. Jeri andKoffman Elliot P., *Problem Solving and Program Design in C*, India: Addison Wesley, 2011.
4.KanetkerYashwant*, Let us C*, New Delhi: BPB Publications, 2011.

Course Title: Programming in C Laboratory
Course Code: CSA256

L	T	P	Credits	Marks
0	0	2	1	25

Implementation of C programming concepts:

- Control Structures, Loops, Arrays, Strings
- Functions, Structures, Union, Files, etc.

SUBSIDARY COURSES

FIRST SEMESTER FOR CHEMISTRY/MATHEATICS AND MICROBIOLOGY

L	T	P	Marks
4	0	0	100

COURSE CODE: PHY153

OPTICS AND LASERS

Total Lecture-60

AIM: The aim and objective of the course on **Optics and Lasers** for the students of B.Sc. (Hons) Chemistry, Mathematics, Microbiology is to enable them to understand the different phenomenon exhibited by the light as well as the basics of the laser light.

UNIT- I

INTERFERENCE (15):

Young's double slit experiment, Coherent Source, Theory of interference fringes, Types of interference, Fresnel's biprism, thickness of thin transparent sheet, Interference in thin films, Newton's rings and their application, Michelson Interferometer, Application of thin film interference; Anti reflection coatings; dielectric mirrors; interference filters; Holography.

UNIT- II

DIFFRACTION (15):

Difference between Fresnel and Franunhoffer diffraction, Franunhoffer diffraction at a single slit and its discussion, Fraunhoffer diffraction at double slit, missing orders in a double slit, Diffraction of N slits and its discussion, Diffraction grating, Missing orders, dispersive power, Rayleigh Criterion for resolving power, resolving power of a diffraction grating.

UNIT- III

POLARIZATION (15):

Polarised light and its production; polarisers and analyzers; anisotropic crystals; Polarization by transmission and reflection, Malus Law, Brewster's Law, Polarization by refraction, anisotropic crystals, Theory of double refraction, Elliptically and circularly polarized light, Quarter wave and half wave plates, Production and detection of polarized light, Optical activity, specific rotation. Half shade polarimeter; LCD's.

UNIT- IV

LASERS (15):

Attenuation of light in an optical medium; thermal equilibrium; interaction of light with matter; Einstein relations; light amplification; population inversion; active medium, pumping; metastable states; principle pumping schemes; optical resonant cavity; axial modes; gain curve and laser operating frequencies, transverse modes; types of lasers; Q-switching; laser beam characteristics and applications.

Suggested Books:

1. Subramanayam, N., Lal,B.& Avadhamulu, M. N. *Textbook of Optics*. New Delhi: S. Chand & Company, 2006.
2. Jenkins, F.A., White, H.E. *Fundamentals of Optics.*USA: McGraw Hill Publication, 1976.
3. Ghatak,A.,*Optics*. New Delhi: Tata McGraw Hill Publication, 2008.

COURSE CODE: PHY 154
PHYSICS LAB II
(60hrs) **Max Marks: 50**

Objective: The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipments.

Note:

- Students are expected to perform at least eight-ten experiments out of following list. The experiments performed in first semester cannot be repeated in second Semester.
- The examination for both the courses will be of 3 hours duration

List of Experiments:

Experimental skills: General Precautions for measurements and handling of equipment, representation of measurements, Fitting of given data to a straight line, and Error analysis, Significant figures and interpretation of results.

List of Experiments: Students are expected to perform at least eight experiments out of following list.

1. To determine the Refractive Index of the Material of a given Prism using Sodium Light.
2. To determine the Dispersive Power of the Material of a given Prism using Mercury Light.
3. To determine the Resolving Power of a Prism.
4. To determine wavelength of sodium light using Fresnel Biprism.
5. To determine wavelength of sodium light using Newton's Rings.
6. To determine the Thickness of a Thin Paper by measuring the Width of the Interference Fringes produced by a Wedge Shaped Film.
7. To determination Wavelength of Sodium Light using Michelson's Interferometer.
8. To determine the wavelength of Laser light using Diffraction of Single Slit.
9. To determine the wavelength of (1) Sodium and (2) Mercury Light using Plane Diffraction Grating.
10. To determine the Dispersive Power of a Plane Diffraction Grating.
11. To determine the Resloving Power of a Plane Diffraction Grating.
12. To determine the (1) Wavelength and (2) Angular Spread of HeNe Laser using Plane Diffraction Grating.
13. To study the wavelength of spectral lines of sodium light using plane transmission grating.
14. To study the specific rotation of sugar solution Laurents half shade polarimeter method
15. To study the numerical aperture and propagation losses using He-Ne laser Optical fibre set up.
16. To compare the focal length of two lenses by Nodal slide method.

FIRST/SECOND SEMESTER FOR B.Tech ALL BRANCHES

COURSE CODE: PHY151
ENGINEERING PHYSICS
Total Lecture-60

L	T	P	Marks
4	0	0	100

AIM. The aim of this course on physics is to make the student of engineering understand the basic concepts of physics which will form the basis of certain concept in their respective fields.

Unit-1

PHYSICAL OPTICS: (18)

Interference: Division of wave front, Fresnel's biprism, division of amplitude, Newton's rings and applications.

Diffraction:
Difference between Fraunhofer and Fresnel diffraction, Fraunhofer diffraction through a slit, plane transmission diffraction grating, its dispersive and resolving power.
Polarization: Polarised and unpolarised light, double refraction, Nicol prism, quarter and half wave plates.

Unit-II (15)

LASER: Spontaneous and stimulated emission, Laser action, Characteristics of laser beam, concept of coherence, HeNe laser, Semiconductor lasers and applications
FIBRE OPTICS: Propagation of light in fibres, numerical aperture, single mode and multimode fibres, applications

Unit-III (13)

DIELECTRICS:
Molecular Theory, polarization, displacement, susceptibility, dielectric coefficient, permittivity, relations between electric vectors, Gauss's law in the presence of a dielectric, energy stored in an electric field, Behaviour of dielectric in alternating field and Claudius Messotti equation.

Unit-IV (14)

QUANTUM MECHANICS: Difficulties with Classical physics, Introduction to quantum mechanics simple concepts, Black Body radiation, Planck's Law of radiation and its limitations, Group velocity and phase velocity, Schrodinger's wave equations and their applications.

SUPER CONDUCTIVITY: Introduction (experimental survey), Meissner effect, Type I and type II superconductors, London equation, Elements of BCS theory, Applications of superconductors.

Suggested Books:

1. Sear, F.W. *Electricity and Magnetism.* London: Addison-Wesley, 1962.
2. Resnick and Halliday. *Physics.*New York: Wiley, 2002.
3. Lal,B. and Subramanyam, N.*A Text Book of Optics.* New Delhi: S. Chand and Company Limited, 1982.
4. Jenkins, and White. *Fundamental of Physical Optics*. New York: Tata McGraw-Hill, 1937.
5. Griffiths,D. *Introduction to Electrodynamics,* New Delhi: Prentice Hall, 1998.
6. Beiser, A. *Perspective of Modern Physics.* New Delhi: McGraw Hill Ltd., 2002.

Course Code: PHY152: ENGINEERING PHYSICS LABORATORY

(30 hrs) **Max Marks: 25**

Objective: The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipments.

Note:

- Students are expected to perform at least eight-ten experiments out of following list. The experiments performed in first semester cannot be repeated in second Semester.
- The examination for both the courses will be of 3 hours duration

List of Experiments:

Experimental skills: General Precautions for measurements and handling of equipment, representation of measurements, Fitting of given data to a straight line, and Error analysis, Significant figures and interpretation of results.

1. To determine the Refractive Index of the Material of a given Prism using Sodium Light.
2. To determine the Dispersive Power and resolving power of the Material of a given Prism using Mercury Light.
2. To determine wavelength of sodium light using Fresnel Biprism.
3. To determine wavelength of sodium light using Newton's Rings.
4. To determination Wavelength of Sodium Light using Michelson's Interferometer.
5. To determine the wavelength of Laser light using Diffraction of Single Slit.
6. To determine the wavelength of (1) Sodium and (2) Mercury Light using Plane Diffraction Grating.
7. To determine the (1) Wavelength and (2) Angular Spread of HeNe Laser using Plane Diffraction Grating.
8. To study the wavelength of spectral lines of sodium light using plane transmission grating.
9. To study the specific rotation of sugar solution Laurent's half shade polarimeter method
10. To study the numerical aperture and propagation losses using HeNe laser Optical fibre set up .
11. To compare the focal length of two lenses by Nodal slide method.
12. To find the unknown low resistance by Carey Foster bridge.
13. To determine the beam divergence of the HeNe laser.
14. To study the Meissner's effect in superconducting sample.
15. To study the Faraday law of electromagnetic induction.
16. To study the capacitance by flashing/quenching of Neon bulb kit
17. To compare the two unknown capacitances of two capacitors by using DeSauty's bridge.
18. To find our out the unknown inductance by using the Anderson's bridge method.
19. To study the numerical aperture and propagation losses for He-Ne laser by using the optical fiber set up for
20. To study the Planck's constant by using photoelectric cell method.

SECOND SEMESTER FOR CHEMISTRY/MATHEATICS AND MICROBIOLOGY

L	T	P	Marks
4	0	0	100

COURSE CODE: PHY155

MODERN PHYSICS

Total Lecture 45

The aim and objective of the course on Modern Physics for the student of B.Sc. (Hons.) Physics is to equip them with the knowledge of wave particle duality, quantum mechanics and atomic nucleus and radioactivity

.

Unit-I

Wave Particle Duality (14):

Quantum theory of light, Xrays and their diffraction, Compton effect, pair production, Wave Properties of Particles; de Broglie waves, waves of probability, the wave equation, phase and group velocities, particle diffraction, uncertainty principle and its applications.

Unit-II.

Quantum Mechanics (15):

Difference between classical and quantum mechanics, wave function and wave equations. Schrodinger's equation, time dependent and steady state forms, Expectation values, particle in a box, reflection and transmission by a barrier, tunnel effect, harmonic oscillator.

Unit-III.

Quantum Theory of Hydrogen Atom (15):

Schrodinger's equation for the hydrogen atom, separation of variables, quantum numbers, principal quantum number, orbital quantum number,
magnetic quantum number, electron probability density, radiative transitions, selection rules. Zeeman Effect, Anomalous Zeeman effect, X-ray Spectra.

Unit-IV. Atomic Nucleus and Radioactivity (16):

Nonexistence of electrons in the nucleus, The neutron, stable nuclei, nuclear sizes and shapes, binding energy, liquid drop model, shell model, meson theory of nuclear forces Radioactivity; Radioactive decay, Halflife, radioactive dating, radioactive series, alpha decay and its theory, beta decay, gamma decay, radiation hazards and radiation units.

Suggested Books:

1. Beiser, A. *Concepts of Modem Physics*. New York: McGraw Hill, 1987.
2. Ghatak,A and Loknatham,S. *Quantum Mechanics-Theory and Application*. Netherland: Springer, 2004.
3. Kuhn, H. *Atomic Spectra*: London; Longman Green, 1969.
4. Heyde, K. *Basic ideas and Concepts in Nuclear Physics*.Bristol: Institute of Physics, 2004.

Course Code: PHY156
MODERN PHYSICS LABORATORY
(60) **Max Marks: 50**

Objective: The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

Note:

- Students are expected to perform at least eight-ten experiments out of following list. The experiments performed in first semester cannot be repeated in second Semester.
- The examination for both the courses will be of 3 hours duration

.

List of Experiments:

Experimental skills: General Precautions for measurements and handling of equipment, representation of measurements, Fitting of given data to a straight line, and Error analysis, Significant figures and interpretation of results

1. Determination of Planck's constant using photocell.
2. Study of Solar Cell characteristics
3. To find half life period of a given radioactive substance using GM counter
4. Study of C.R.O. as display and measuring device, Study of Sinewave, square wave signals (half wave and full wave rectification)
5. Determination of ionization potential of mercury.
6. Study of excitations of a given atom by Franck Hertz set up.
7. To determine charge to mass ratio (e/m) of an electron by Thomson method.
8. Study of Arc emission spectrum of given samples (Fe and Cu).
9. To determine the heat capacity of given materials.
10. To find conductivity of given semiconductor crystal using four probe method.
11. To determine the Hall coefficient and mobility of given semiconductors.
12. To determine the operating plateau and dead time of a given G.M. Counter.
13. To find the coefficient of thermal conductivity of a bad conductor by Lee's method.
14. To find the ionization potential of mercury using gas filled diode.
15. To determine the thermionic work function of tungsten using directly heated diode.
16. To determine the speed of light in air.
17. To study the various laws of thermal radiation.
18. To demonstrate diaparaferro magnetism in an inhomogeneous magnetic field.
19. To measure the wave lengths of Balmar series of visible emission line from hydrogen.
20. To determine the electronic charge by Millikan oil drop method.

Course Code: PHY157
Introductory Physics

L	T	P	Marks
4	0	0	100

Total Lectures: 60

AIM

The aim and objective of the course on Introductory Physics for the student of B.Sc. (Hons.) Environment Science is to equip them with the knowledge of electrostatics, quantum mechanics and atomic nucleus and radioactivity

Unit I **(17)**

Electrostatics

Gradient of a scalar, divergence and curl of a vector, Gauss's law and its applications, electric potential and electric field (in vector form); potential due to a monopole, dipole and multipoles, work and energy in electrostatics, dielectrics, polarization, electric displacement, susceptibility and permittivity, Clausius-Mossotti equation

Magnetostatics and Electrodynamics

Lorentz Force Law, Magnetic field of a steady current (Biot Savart law), Ampere's law and its applications, Ampere's law in magnetized materials, Electromotive force, Faraday's law, Maxwell's Equations, Wave Equation.

Unit-II **(17)**

Lasers

Spontaneous and stimulated emission, Elnstein's coefficients, population inversion and optical pumping, three and four level lasers, Ruby, HeNe, Nd: Yag, CO2, semiconductor lasers. Industrial and medical applications of lasers.

Theory of Relativity

Invariance of an equation and concept of ether, Michelson Morley experiment, Einstein's postulates and Lorentz transformation equations, length, time and simultaneity in relativity, Addition of velocity, Variation of mass with velocity, mass energy relation, energy momentum relation.

Unit-III **(13)**

Quantum Theory

The Compton effect, Matter waves, Group and phase velocities, Uncertainty principle and its application, Time independent and time dependent Schrödinger wave equation, Eigen values and Eigen functions, Born's interpretation and normalization of wave function, Orthogonal wave functions, Applications of Schrödinger wave equation (particle in a box and harmonic oscillator).

Unit-IV **(13)**

Radioactivity

Radioactive Decay, Half Life, Radiometric Dating, Radioactive Series, Alpha Decay Beta Decay, Gamma Decay, Radiation Hazards, Uses of Radio Isotopes. Nuclear Fission, Nuclear Fusion, Nuclear reactions, Laws of nuclear reactions, Nuclear energy. Different types of nuclear reactors.

Suggested Books:

1. Griffiths, D. *Introduction to Electrodynamics,* New Delhi: Prentice Hall, 1998.
2. Thyagarajan, K. and Ghatak,A.K. *Lasers, Theroy and Applications* .New Delhi: Macmilan India Ltd., 2000.
3. Beiser, A. *Perspective of Modern Physics.* New Delhi: McGraw Hill Ltd., 2002.

Course Code: PHY158
INTRODUCTORY PHYSICS LABORATORY
(60) **Max Marks:50**

Objective: The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

Note:

- Students are expected to perform at least eight-ten experiments out of following list. The experiments performed in first semester cannot be repeated in second Semester.

The examination for both the courses will be of 3 hours duration

List of Experiments:

Experimental skills: General Precautions for measurements and handling of equipment, representation of measurements, Fitting of given data to a straight line, and Error analysis, Significant figures and interpretation of results

1. To determine the wavelength of Laser light using Diffraction of Single Slit.
2. To determine the (1) Wavelength and (2) Angular Spread of HeNe Laser using Plane Diffraction Grating.
3. To study the numerical aperture and propagation losses using HeNe laser Optical fibre set up .
4. To determine the beam divergence of the HeNe laser.
5. Determination of Planck's constant using photocell.
6. Study of Solar Cell characteristics
7. To find half life period of a given radioactive substance using GM counter
8. Study of C.R.O. as display and measuring device, Study of Sine wave, square wave signals (half wave and full wave rectification)
9. Determination of ionization potential of mercury.
10. Study of excitations of a given atom by Franck Hertz set up.
11. To determine charge to mass ratio (e/m) of an electron by Thomson method.
12. Study of Arc emission spectrum of given samples (Fe and Cu).
13. To determine the heat capacity of given materials.
14. To find conductivity of given semiconductor crystal using four probe method.
15. To determine the Hall coefficient and mobility of given semiconductors.
16. To determine the operating plateau and dead time of a given G.M. Counter.
17. To find the coefficient of thermal conductivity of a bad conductor by Lee's method.
18. To find the ionization potential of mercury using gas filled diode.
19. To determine the thermionic work function of tungsten using directly heated diode.
20. To determine the speed of light in air.
21. To study the various laws of thermal radiation.
22. To demonstrate dia-para-ferro magnetism in an inhomogeneous magnetic field.
23. To measure the wave lengths of Balmar series of visible emission line from hydrogen.
24. To determine the electronic charge by Millikan oil drop method.

THIRD SEMESTER FOR CHEMISTRY/MATHEATICS

Course Code: PHY253:
ELECTRICITY MAGNETISM AND ELECTRONICS

L	T	P	Marks
4	0	0	100

Total Lecture60

AIM
The aim and objective of the course on **Electricity, Magnetism and Electronics** is to equip the students of B.Sc with knowledge of basic features of electricity and magnetism and electronics that can enable them to understand the working of electronic equipments.

Unit I **(16)**
Vector Analysis
Vectors and Vector properties, Components of Vectors, Unit Vectors, Product of Vectors.
Electric Charges and Field
Electric Charges, Conductors, Insulators and Induced Charges,Coulomb Law, Electric Field and Forces, Electric field Calculations, Electric field lines. Electric
Dipoles.
Gauss law
Charges & Electric Flux and calculations, Gauss's Law, Electric Potential Energy and Potential Gradient.

UnitII **(14)**
Magnetism
Magnetism, magnetic field, Magnetic field lines and flux, motion of charges particle in Magnetic field, BioSavart law, Ampere law, Magnetic Materials, Faraday's Law, Maxwell equations
Dielectric: Dielectric and Gauss's Law in Dielectric.
Electromotive Force
Electromotive force & Circuits, Mutual Inductance, Self-Induction and Inductors

Unit-III **(15)**
Conduction in Semiconductors
Electrons and holes in semiconductor, carrier concentration, donor and acceptor impurities, charge densities, Fermi Level in semiconductors, diffusion, carrier lifetimes, continuity equation
Diode Characteristics
Qualitative theory of pn junction, pn diode, band structure of an open circuit diode, current components, qualitative theory of diode currents, VI Characteristics.

Unit-IV **(15)**
Transistors
Junction Transistors, Transistor current components, transistor as an amplifier, CB and CE configuration
Applications
Half Wave rectifier, ripple factor, full wave rectifier, filters, photoconductivity, Photodiode

Suggested books:

1. Young,H. D., and Freedman,R. A.*University Physics with Modern Physics*, Canada: Pearson Education, 2008.
2. Resnick, D., and Halliday, R. *Fundamentals of Physics*.New Delhi: Wiley, 2008.
3. Millman,J. and Halkias,C.C. *Electronic Devices and Circuits*. New Delhi, Tata McGraw-Hill, 1991.

Course Code: PHY 254:
PHYSICS LABORATORY
(60 hrs.) **Max. Marks: 50**

Objective: The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipments.

Note:

- Students are expected to perform at least eight-ten experiments out of following list. The experiments performed in first semester cannot be repeated in second Semester.
- The examination for both the courses will be of 3 hours duration

List of Experiments:

Experimental skills: General Precautions for measurements and handling of equipment, representation of measurements, Fitting of given data to a straight line, and Error analysis, Significant figures and interpretation of results

1. To verify the Thevenin, Norton, Superposition, and Maximum Power Transfer Theorem.
2. To measure the Input and Output Impedance of an Unknown Network and to convert it into Equivalent T and π Circuits.
3. To study (a) Halfwave Rectifier and (b) Full wave Bridge Rectifier and investigate the effect of C, L and π filters.
4. To study the characteristics of pn junction diode.
5. To study the Forward and Reverse characteristics of a Zener Diode and to study its use as a Voltage Regulator.
6. To study the Characteristics of a Photodiode.
7. To determine the Characteristics of pn junction of a Solar Cell.
8. To study the CE Characteristics of a Transistor.
9. To study the various Transistor Biasing Configurations.
10. To study the Frequency Response of Voltage Gain of a RC Coupled Amplifier.
11. To design an Oscillator of given specifications using Transistors.
12. To study the characteristics of Junction Field Effect Transistor.
13. To study the characteristic of Metal Oxide Semiconductor Field Effect Transistor.
14. To study the magnetic field produced by a current carrying solenoid using a pick up coil/Hall sensor and to find the value of permeability of air.
15. To determine the frequency of A.C. mains using sonometer.
16. To study C.R.O. as display and measuring device by recording sines and square waves, output from a rectifier, verification (qualitative) of law of electromagnetic induction and frequency of A.C. mains**.**
1. To measure thermo e.m.f. of a thermocouple as a function of temperature and find inversion temperature.
17. Determination of given inductance by Anderson's bridge.
18. To determine the value of an air capacitance by deSauty Method and to find permittivity of air. Also, determine the dielectric constant of a liquid.
19. Study of R.C. circuit with a low frequency a.c. source.
20. Studies based on LCR Board: Impedance of LCR circuit and the phase and between voltage and current.
21. To measure low resistance by Kelvin's double bridge/ Carey Foster's bridge.
22. To study the basic ideas of equal a priori probability, law of two independent events, and probability distribution of identical particles in two compartments for a two option system using coloured dice.

FIFTH SEMESTER FOR CHEMISTRY/MATHEATICS

PHY 353 MECHANICS AND WAVES
Lecture-60

L	T	P	Marks
4	0	0	100

AIM

The aims and objectives of the course on the **Mechanics and Waves** of the students of B.Sc. (Hons) Chemistry and Mathematics is to acquaint them with the coordinate system, central force problem, simple harmonics motion as well furthering the idea of wave phenomena.

Unit-I

LAWS OF MOTION **(15):**

Inertial reference frame, Newton's laws of motion, motion in uniform field, components of velocity and acceleration in different coordinate systems, uniformly rotating frame, fictitious force, Coriolis force and its applications.

Unit-II

CENTRAL FORCES **(15):**

Conservative and Non conservative forces, Two particle central force problem, reduced mass, equation of motion, conservation of linear and angular momenta, conservation of energy, Nature of motion under central force and differential equation of motion under central force, Kepler's laws.

Unit-III

SIMPLE HARMONIC MOTION **(15):**

Simple harmonic motion, differential equation of S.H. M. and its solution, velocity and acceleration of S.H.M., Energy of a simple harmonic oscillator, examples of simple harmonic motion, similarities between electrical and mechanical oscillators.

Unit-IV

WAVE MOTION **(15):**

Type of waves, the wave equation and its solution, Characteristic impedance of a string, Impedance matching, Reflection and transmission of energy, Reflected and transmitted energy coefficients, Standing waves on a string of fixed length, Energy of a vibrating string. Wave and group velocity their measurements.

Suggested Books:

1. Purcell,E.M. *Berkeley Physics Course(Vol. 1), Mechanics*. McGraw-Hill Publication, 2011.
2. Feymman,R. P., Lighton,R. B. and Sands,M.*The Feymman Lectures in Physics (Vol. 1*),Delhi: BI Publications, 1964.
3. Puri,S.P. *Fundamentals of Vibration and Waves.* New Delhi: Tata McGraw Hill Company, 1984.
4. Arora,C. L. and Hemne, P.S. *Physics for degree students*.New Delhi: S. Chand Company, 2010.
5. Tayal,D.C. *Mechanics*,Mumbai: Himalayan Publishing House, 2013.
6. Srivastava,P.K. *Mechanics.* New Delhi: New Age International, 1997.

Course Code: PHY 354:
PHYSICS LABORATORY
(60 hrs.) **Max. Marks: 50**

Objective: The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipments.

Note:

- Students are expected to perform at least eight-ten experiments out of following list. The experiments performed in first semester cannot be repeated in second Semester.

The examination for both the courses will be of 3 hours duration

List of Experiments:

Experimental skills: General Precautions for measurements and handling of equipment, representation of measurements, Fitting of given data to a straight line, and Error analysis, Significant figures and interpretation of results

1. Use of Vernier callipers, Screw gauge, Spherometer, Barometer, Sphygmomanometer, Light meter, dry and wet thermometer, TDS/conductivity meter and other measuring instruments based on applications of the experiments. Use of Plumb line and Spirit level.
2. To analyse the given experimental Data by using the least squares curve fitting and the knowledge of straight line fitting of the experimental data. Also determine the standard deviation and their use in expressing the experimental results. (Note: To achieve these objectives on a sample data of some experiment to be decided by the teacher concerned.)
3. To study the variation of time period with distance between centre of suspension
   And centre of gravity for a bar pendulum and to determine:
   (i) Radius of gyration of bar about an axis through its C.G. and perpendicular toits length.
   (ii) The value of g in the laboratory.
4. Determination of acceleration due to gravity ‘g’ by Kater's pendulum method.
5. To study moment of inertia of a flywheel.
6. Determination of height (of inaccessible structure) using sextant.
7. To determine the Young's modulus by (i) bending of beam using traveling microscope/laser, (ii) Flexural vibrations of a bar.
8. To study one dimensional collision using two hanging spheres of different materials.
9. To study the magnetic field produced by a current carrying solenoid using a pick up coil/Hall sensor and to find the value of permeability of air.
10. To determine the frequency of A.C. mains using sonometer.
11. To study C.R.O. as display and measuring device by recording sines and square waves, output from a rectifier, verification (qualitative) of law of electromagnetic induction and frequency of A.C. mains.
12. To measure thermo e.m.f. of a thermocouple as a function of temperature and find inversion temperature.
13. Determination of given inductance by Anderson's bridge.
14. To determine the value of an air capacitance by deSauty Method and to find permittivity of air. Also, determine the dielectric constant of a liquid.
15. Study of R.C. circuit with a low frequency a.c. source.
16. Studies based on LCR Board: Impedance of LCR circuit and the phase and between voltage and current.
17. To measure low resistance by Kelvin’s double bridge/ Carey Foster’s bridge.
18. To study the basic ideas of equal a priori probability, law of two independent events, and probability distribution of identical particles in two compartments for a two option system using coloured dice.