FIRST YEAR
Distribution of marks for the session 2013-2014 ; 2014-2015

Course Code	Course Title	Marks	Time In hours	Credits
PHYS-101	Mathematical Physics-I and Classical Mechanics-I (3+2) Questions	100	4	4
PHYS-102	Properties of Matter and Sound (3+2) Questions	100	4	4
PHYS-103	Heat and Thermodynamics (2+3) Questions	100	4	4
PHYS-104	Mathematics-I (Algebra, Trigonometry and Geometry) (5+3+2)Questions	100	4	4
PHYS-105	Chemistry-I (Physical Chemistry and Inorganic Chemistry) (3+2) Questions	100	4	4
PHYS-106	Statistics (5 Questions)	100	4	4
PHYS-107	Physics Practical-I	150	12	6
PHYS-108	Statistics Practical	50	6	2
PHYS-109	Sessional	75	-	3
PHYS-110	Viva-Voce	75	-	3
	Total	**950**		**38**

SYLLABUS

PHYS 101: MATHEMATICAL PHYSICS-I AND CLASSICAL MECHANICS-I

(3+2) Questions x 20   100 Marks   4 hours   4 Credits

Mathematical Physics-I

1. Vector Analysis: Vector algebra, scalar and vector product, triple product of vectors; gradient, divergence, curl and their physical significance; Line, surface and volume integration of vectors; Gauss', Stoke's and Green's theorems; Orthogonal curvilinear coordinates, calculation of surface and volume elements and the vector operators in spherical polar and cylindrical coordinates.

2. Matrices and Linear Algebra: Types of matrices, matrix algebra, determinant of a square matrix, adjoint and inverse of a matrix, special matrices: symmetric, unitary, orthogonal, hermitian etc., echelon form and rank of a matrix; System of linear homogeneous and non-homogenous equations and their solutions. Gaussian elimination, Cramer's rule through matrix inversion; Eigenvalues, eigenvector and diagonalization.

3. Fourier series and Integrals: Evaluation of coefficients of Fourier series, sine and cosine series. Applications: square wave function, triangular wave function and other simple functions; Fourier Transform: Fourier integral theorem (statement only), sine and cosine transforms.   **(40 Lectures)**

Classical Mechanics-I

1. Newtonian Mechanics: Application of Newton's laws of motion for static and dynamic cases, Solution of the differential equation of motion including the effect of frictional forces

2. Dynamics of a system of particles: Centre of mass, conservation of linear momentum. Work done by constant and variable forces, Work-energy theorem, Potential energy, Conservative and non-conservative forces, principle of conservation of energy

3. Rotational Dynamics: Angular velocity, angular acceleration, relation between linear and angular velocities in vector form, angular momentum and torque and their relation, conservation of angular momentum, Moment of inertia and its calculation for solids of different shapes, Combined translational and rotational motion

4. Oscillation: Simple harmonic motion, frequency, amplitude, energy consideration of simple harmonic motion, Damped and forced harmonic oscillation, Resonance in a lightly damped system.

5. Variational principle and Lagrangian formulation: Constrained motion, constraints, degrees of freedom, generalized coordinates; Lagrange's equations of motion from Hamilton's principle, from D'Alembert's principle and their applications.   **(20 Lectures)**

REFERENCES
1. Spigel   Vector Analysis
2. Louis A Pipes   Applied Math. for Engineers & Physicists
3. Kitchen   Calculus of One Variable
4. Arfken   Mathematical Methods for Physicists

5. Rajput & Gupta   Mathematical Physics
6. R. Bronson   Modern Introductory Differential Equations
7. Resnick & Halliday   Physics, Part I
8. Kleppner & Kolenkow   Introduction to Mechanics
9. Stephenson   Mechanics & Properties of matter

PHYS 102: PROPERTIES OF MATTER AND SOUND

(3+2) Questions x 20   **100 Marks**   **4 hours**   **4 Credits**

Properties of Matter

1. Gravitation and Gravity: Law of universal gravitation, inertial and gravitational mass, Gravitational potential and potential energy, Gravitational field and potential due to a spherical shell, Intensity and potential of the gravitational field at a point due to a circular disc, Motion of planets and satellites, Energy due to motions of planets and Sattelites.

2. Elasticity: Stress and strain; Hooke's law; Elastic behavior in elastic hysteresis, elastic fatigue, Factors affecting elasticity, relations between elastic constants and their determination, Bending of beams; cantilever; Beam supported at its ends and loaded at the centre; spiral spring, torsion of a cylinder.

3. Surface tension: Molecular forces; Surface energy and surface tension, pressure on curved surfaces; Factors affecting surface tension, Capillarity, Angle of contact, liquid drop on a horizontal plate, Methods of measuring surface tension.

4. Fluid dynamics: General concepts of fluid flow; The equation of continuity; The Euler's equation of motion of a liquid, Bernoulli's theorem and its applications; Viscosity and co-efficient of viscosity, Poiseuille's equation, Measurement of the co-efficient of viscosity (1) capillary tube method (2) revolving cylinder method, The velocity of fall of a sphere through a viscous liquid, Stoke's law, Turbulent motion and Reynold's number, Variation of viscosity with temperature and pressure.

(4**0 Lectures**)

Sound

1. Introduction: Sources and propagation of sound, intensity and loudness

2. Wave Motion: Differential equation for plane progressive wave; progressive wave through elastic medium, Stationary waves, Nodes and Antinodes, Pressure variation at Nodes and Antinodes, Formation of Beats, Doppler effect.

3. Vibrations: Vibrations in strings, Bars and air column, Velocity of Transverse waves along a stretehed string, Laws of transverse vibration of strings-verification, sonometer, Melde's experiment, velocity of sound, its propagation in Solid, Liquid and Gaseous medium, Factors affecting the velocity of sound.

4. Acoustics: Acoustic intensity, Acoustics measurements, Reverberation and building acoustics. Recording and reproduction of sound.

5. Ultrasonic: Ultrasonic sound, Generation of ultrasonic waves, Measurement of velocity of sound by Ultrasonic method, Applications of Ultrasonics. (**20 Lectures**)

REFERENCES
1. Stephenson   Mechanics & Properties of matter

2. Halliday & Resnick   Physics, Part I
3. D. S. Mathur   Elements of Properties of Matter
4. Imran and Ishaque   General Properties of Matter
5. A. B. Wood   A Textbook of Sound
6. Chakraborty & Chowdhury   A Textbook of Sound
7. Rayleigh   Theory of Sound
8. Stephenson   Acoustics & Vibrational Physics
9. Brijlal   A text book of sound
10. Emran, Ishaque & Islam   A text book of sound

PHYS 103: HEAT AND THERMODYNAMICS

(2+3) Questions × 20   **100 Marks**   **4 hours**   **4 Credits**

Heat

1. Thermometry: Temperature, Measurement of low and high temperatures; resistance thermometer; thermoelectric effects and thermoelectricity; gas thermometers.

2. Calorimetry: Specific heats of solids, liquids and gases and their determination, Newton's law of cooling, Radiation correction; Latent heat, Variation of specific heat with temperature.

3. Kinetic theory of gases: Equation of state of ideal gas, equipartition of energy, mean free path, Brownian motion, Van der Waal's equation of real gases, Critical constants and law of corresponding states.

4. Conduction of heat: Thermal Conductivity and its determination for good and bad conductors; Fourier equation of one dimensional heat flow and its solution; heat flow through compound walls; accretion of ice in ponds.

(**25 Lectures**)

Thermodynamics

1. Thermodynamic systems: Thermodynamic equilibrium and Zeroth law of thermodynamics; Concept of internal energy and the first law of thermodynamics and its applications.

2. Second law of thermodynamics: Reversible and irreversible processes; conversion of heat into work; thermodynamic temperature; Clausius inequality; the second law of thermodynamics; entropy, entropy changes in reversible and irreversible processes; Carnot theorem, Carnot's cycle and the efficiency of Carnot's engine; temperature-entropy diagrams; the principle of increase of entropy, applications.

3. Thermodynamic potentials: The thermodynamic potentials; Enthalpy, Gibbs-Helmholtz functions, Maxwell's relations and their applications; the third law of thermodynamics.

4. Change of phase: Equilibrium between a liquid and its vapour; Clausius-Clapeyron theorem; Porous Plug experiment and heat equation; The Gibbs-Helmholtz equation; Thermodynamics of magnetism.

5. Applications of thermodynamics: Thermodynamic cycle; The reciprocating steam engine and the turbine; The Rankine cycle; The Refrigeration cycle; The gas refrigerator. **(35 Lectures)**

REFERENCES
1. Saha & Srivastava   A text book of Heat
2. Zemansky   Heat, Thermodynamics & Radiation
3. Tofazzal Hossain   Text book of Heat
4. Hoare   Thermodynamics
5. Sears   Thermodynamics

PHYS 104: MATHEMATICS-I (ALGEBRA, TRIGONOMETRY AND GEOMETRY)

(5+3+2) Questions x 10   **100 Marks**   **4 hours**   **4 Credits**

Algebra

1. Elements of set theory: Set and subset, set operations, Cartesian product; Relations, order relation, equivalence relation; functions, images and inverse images,; injective, surjective and bijective functions, inverse functions.
2. Theory of equations: Synthetic division, number of roots of polynomial equations, relations between roots and coefficients, Descarte's rule of signs, symmetric functions of roots.
3. Summation of series, convergence and divergence of series, inequalities

(30 Lectures)

Trigonometry
1. De Moivre's theorem and its applications; Gregory's series; hyperbolic functions, summation of series including hyperbolic series. **(20 Lectures)**

Geometry
1. Co-ordinate geometry of two dimensions; general equation of second degree; pair of straight lines, reduction to standard forms of the equation of circle, parabola, ellipse, hyperbola, pole and polars. **(10 Lectures)**

REFERENCES
1. Durall & Robson   Algebra Vol. I, II & III.
2. D.E. Littlewood   University Algebra
3. R.A. Sarder, N.A. Khan & others Text Book of Higher Trigonometry.
4. H. Rashid   Higher Algebra
5. Shahidullah & Bhattacherjee   Text Book Algebra with Trigonometry
6. Mazumder and Safiullah   Elements of Higher Algebra
7. Munlbar Rahman Chowdhury   exR MwYZ (Algebra in Bangla)
8. Khosh Mohammad   Text Book of Geometry

9. Rahman and Bhattacherjee   A Text Book on Coordinate Geometry and Vector Analysis
10. S.L. Loney   Co-ordinate geometry

PHYS 105: CHEMISTRY-I (PHYSICAL CHEMISTRY AND INORGANIC CHEMISTRY)

(3+2) Questions x 20   **100 Marks**   **4 hours**   **4 Credits**

Physical Chemistry

1. Thermodynamics: Laws of thermochemistry, heats of reaction and formation, heat capacities of substances, Kirchoff's equation, Heats of solution & neutralization, bond energies.

2. Colligative properties: Osmotic pressure, Raoult's law lowering of vapor pressure, elevation of boiling point and depression of freezing point, their experimental determination.

3. Phase rule: Simple one component systems, simple two component with and without compound formation, principle of fractional distillation.

4. Chemical kinetics: First and second order reactions and their simple treatment, simple theories for reaction rate (only outline of Arrhenius theory) catalysis (elementary treatment).

5. Electrochemistry: Electrolytic dissociation, electrolytic conductance and its measurement. Ionic migration and transport number, ionic product of water, solubility product communion effect, e.m.f. of cells and their measurements, pH of solution buffer solutions, indicator.   (**35 Lectures**)

Inorganic Chemistry

1. Atomic structure and Electronic configuration: Elementary ideas on Rutherford atom model and Bohr atom model, quantum numbers, Shape of atomic orbitals. Pauli's exclusion principle, electronic configuration of elements and type of elements.

2. Periodic classification: Position of an element in periodic table; Ionization potential, electron affinity and electronegativity.

3. Chemical bonding: Elementary ideas about different bond types, ionic bond, covalent bond, co-ordination bond, properties of ionic and covalent compounds, hydrogen bond, hybridization of orbitals, Bond length and bond angles. Shapes of simple molecules.

4. Principles of qualitative and quantitative analysis.

5. Theoretical principle involved in volumetric analysis: Definition of primary and secondary standard substances, normality and molarity, equivalent weight, oxidizing and reducing agent; preparation of primary standard solution, acid-base titration, acid-base indicator, estimation of iron (II) with $KMnO_4$ and estimation of Copper (III) iodometrically.   (**25 Lectures**)

REFERENCES

1. Daniels and Alberty   Physical Chemistry
2. Atkin   Physical Chemistry
3. Hoque and Nawab   Principles of Physical Chemistry
4. Rakshit   Physical Chemistry
5. Bahl and Tuli   Essentials of Physical Chemistry
6. Sirajul Islam   cÖv_wgK †fŠZ imvqb (Physical Chemistry in Bangla)
7. Paul and Chakraborty   †fŠZ imvqb (Physical Chemistry in Bangla)
8. S.Z. Haider   Introduction to Modern Inorganic Chemistry
9. R.D. Madan   Modern Inorganic Chemistry
10. Cofton & Wilkinson   Basic Inorganic Chemistry
11. S.K.S. Hazari   mœvZK A‰Re imvqb (Inorganic Chem. in Bangla)
12. S. U. Ahmed & Latif Hossain   mœvZK A‰Re imvqb (Inorganic Chem. in Bangla)
13. A.K. S. Ahmed   A‰Re imvqb (Inorganic Chem. in Bangla)

PHYS 106: STATISTICS

5 Questions x 20   **100 Marks**   **4 hours**   **4 Credits**

1. Elementary Statistics: Meaning characteristic features, scope, uses and abuses of statistics. Presentation of statistical data (Graph, Charts and Diagrams) Qualitative and quantitative data. Measures of location (important averages and their comparative study). Measure of dispersion, Moments of frequency distribution, Skewness & Kurtosis.

2. Correlation and Regression: Bivariate universe, Coefficient of correlation. Bivariate frequency distribution, Regression lines with determination for coefficient and correlation coefficient. Rank correlation, Comparison of regression and correlation analysis.

3. Theory of Probability: Meaning of probability, Mathematical and Statistical definition of probability, sample space, Event (simple and compound) marginal and conditional probability, Additive and Multiplicative rules of probability. Bayes theorem of probability and simple problems in probability. Random variable, probability function, probability density function, Distribution function, Marginal and conditional distribution. Joint probability function, Marginal probability density function. Conditional probability density function. Mathematical expectation. Binomial and Normal distribution.

4. Test of significance: Basic idea of a test of significance., Level of significance, Contingency table and test of goodness of fit.   (**60 Lectures**)

REFERENCES
1. Kapoor and Gupta   Fundamental of Mathematical Statistics
2. Croxton & Cowden   Applied General Statistics

3. Yule U.A. and Kendall   Introduction to Theory of Statistics
4. M.G. Mostafa   Method of Statistics
5. Weatherburn   A first course of Mathematical Statistics
6. M.A. Ali   Theory of Stastistics
7. Mostller, Rouks & Thomas   Probability and its application to Stastistics
8. Simpson and Kafka   Basic Stastistics
9. A. M. Mood   Introduction to Theory of Statistics
10. M.K.Roy   ‡gŠwjK cwimsL¨vb cwiwPwZ|

PHYS 107: PHYSICS PRACTICAL-I

150 Marks   **12 hours**   **6 Credits**

Each student is to perform three experiments each of 3-hours duration from physics and one experiment of 3 hours duration from workshop practices during examination.

Marks distribution:
(a) Class performance and lab. note book   = 30
     (Inclusive of assessment of workshop practices)
(b) 3 experiments each of 3 hours duration (3x30)   = 90
(c) Workshop practice 3 hours duration   (1x30)   = 30

Total   **= 150**

Marks distribution for each of the 3-hours experiment:
(i) Theory   = 05
(ii) Procedure + Data Collection (4+6)   = 10
(iii) Calculation + Results   = 06
(iv) Discussion   = 04
(v) Experimental Viva   = 05

Total   **= 30**

Marks distribution for 3-hours workshop practices examination:
(i) Theory diagram   = 05
(ii) Experiment   = 20
(iii) Experimental Viva   = 05
Total   **= 30**

LIST OF EXPERIMENTS

GROUP-A: MECHANICS AND PROPERTIES OF MATTER
1. Determination of `g' by compound pendulum.
2. Determination of Young's and rigidity modulii by dynamic method.
3. Determination of rigidity modulus by static method.
4. Determination of surface tension of water by capillary tube method.

5. Determination of surface tension and angle of contact of mercury by Quinke's method.
6. To determine the spring constant and effective mass of a given spiral spring and hence calculate the rigidity modulus of the material of the spring.
7. To determine the Young's modulus by method of the flexture of a beam (bending method).
8. To determine the moment of inertia of a fly-wheel about its axis of rotation.
9. To determine the coefficient of viscosity of a liquid by capillary tube method.

GROUP -B: HEAT

1. To determine the specific heat of solid by the method of mixture with radiation correction.
2. To determine the specific heat of a liquid by the method of cooling.
3. To determine the ratio between the two specific heats of air by Clement and Desorme's apparatus.
4. To determine the latent heat of condensation of steam with radiation correction.
5. To determine the latent heat of fusion of ice with radiation correction.
6. To determine the thermal conductivity of a bad conductor by Lee's method.
7. To determine the coefficient of thermal conductivity of a metallic bar by searle's apparatus.
8. To determine `J' by electrical method (with radiation correction).

GROUP -C: SOUND

1. To verify the laws of transverse vibration of a string with a sonometer.
2. To determine the mass per unit length and hence density of the material of a wire by a sonometer.
3. To determine the weight (mass) of a given bag or a brick by sonometer.

4. To find the frequency of tuning fork by Melde's experiment.
5. To verify the laws of vibrating string by Melde's experiment.
6. To find the velocity of sound by Kundt's Tube.

7. Determine the Frequency of a Tuning Fork by stroboscopic method.
8. To determine the frequency of ultransonic wave by a receiver.
9. Determine the Echo length from the reflection of sound.

GROUP- D: WORKSHOP PRACTICE

1. To make nut, bolts, etc. by Lathe Machine.
2. To make wooden frame for various purposes
3. To cut glasses of different size by diamond cutter.

REFERENCES
1. Worsnop and Flint   Advanced Practical Physics
2. Giasuddin and Sahabuddin   Practical Physics
3. K. Venkata Reddy   Manual on Workshop Practice.
   K. L. Narayana
   P Kannaiah

PHYS 108 : STATISTICS PRACTICAL

50 Marks   6 hours   2 Credits

Each student is to perform **one experiment of 3-hours duration** during practical examination.

(i) Class performance including Lab. Note Book	= 10
(ii) Two experiments each of 3 hours duration (15X2)	= 30
(ii) Experimental viva	= 10
Total	**= 50**

LIST OF EXPERIMENTS

Representation of data by tables, Graphs and charts. Condensation of data, measures of location, Dispersion, Skewness and Kurtosis, Measures of location by graphical methods. Least square estimation of parameters. Correlation regression- Rank correlation.

ENG: ENGLISH

Eng.001   100 Marks   4 Credits   60 Lectures

1. Reading and comprehension of prose passages especially on scientific topics focussing on:
i) Vocabulary (word class, synonyms, antonyms, idioms and phrasal verbs, etc)
ii) Structure (syntax)
iii) Cohesion.
iv) Content questions a) referential, b) inferential, c) giving suitable title of the passage.
v) Summarization.
2. Meaning of common and important scientific terms.
3. Sentence Structures: (i) basic sentence patterns (ii) completion of sentences (iii) joining sentences (iv) transformation of sentences.
4. Guided writing of paragraphs:
   i) Process paragraphs, ii) situational paragraph.
5. Practical letter writing (i) personal and (ii) formal.
6. Reading and Comprehension of prose passages of scientific interest (advanced level)
7. Rearrangement of sentences in a passage.
8. Interpretation of charts, tables and diagrams in a concise and meaningful way.
9. Translation of passages from English to Bengali and Bengali to English.
10. Writing essays: (i) narrative (ii) descriptive (iii) imaginative (iv) augmentative

Books Recommended:
1. A hand book prepared from "English in Focus" series published by Oxford University Press, 1978 /other suitable books.
2. A Practical English Grammar, by A. Thomas and A. V. Martinet.
3. Grammar & Composition, by Hougliton & Mitllin.
4. Living English Structure by A. Stannard Allen, New Delhi, Orient Lougman.

(60 Lectures)