UNIVERSITY OF DHAKA (For Affiliated Colleges)
PHYSICS DEPARTMENT
Four - Year Honours Courses

Effective from 2017-2018 Session

The B.Sc. (Hons) Degree Program in Physics: The B.Sc.(Hons) degree program in Physics of the affiliated colleges of University of Dhaka is a 4-year program consisting of four academic sessions, each having duration of 12 calendar months;

Definition of a credit
The credit is defined as follows:
i) For theoretical courses, 15 class lectures = 1 credit
ii) Each class is of 50 minutes duration.
iii) For Lab courses, 30 hour lab work = 1 credit
   (Existing / previous full unit course is equivalent to 4 credits.)

Credit requirements for the 4 year B.Sc. (Hons)
1. Total Number of Credits required are from 128 to 145 distributed over 4 years.
2. The 1st year and 2nd Year distribution of credits are as follows:-

	Non-Major	Major				
		Theory	Expt.	Viva	Total	Grand Total
First Year	12	16	8	0	24	36
Second Year	10	15	8	2	25	35

3. Rules regarding examinations,

The rules regarding examinations, fees promotion etc. will remain the same as contained in the ″Rules for Honours Courses under the Integrated Courses System of the University of Dhaka″ relevant to the session and any subsequent changes.

4. Course name, Major Courses and credits.

Major Subject Courses

(A) First Year Honours   **20**

1. PHA 101 : Mechanics and Properties of Matter   3
2. PHA 102 : Thermal Physics   3
3. PHA 103 : Electricity and Magnetism   3
4. PHA 104 : Introduction to Computer and Programming   3
5.   স্বাধীন বাংলাদেশের অভ্যুদয়ের ইতিহাস   4

6. PLA 101 : Practical Laboratory   <u>8</u>
                                 24

Major Subject Courses

(B) Second Year Honours   **25**

1. PHA 201 : Optics   3
2. PHA 202 : Electronics-I   3
3. PHA 203 : Mathematical Physics   3
4. PHA 204 : Atomic and Molecular Physics   3
5. PHA 205 : Waves, Oscillations and Advanced Mechanics   3
6. PLA 201 :   Practical Laboratory   8
7. PVA 202 : Viva-Voce Examination   <u>2</u>
                                                          25

Non-Major Courses:

The division of Non-Major courses for 1st year and 2nd Year are as follows:

(i) First Year :

Mathematics:	**04 Credit**
Math-102 : Calculus-1	(2 Credits)
Math-103 : Analytic & Vector Geometry	(2 Credits)
Chemistry :	**06 Credit**
CM-100 : Fundamentals of Chemistry	(4 Credits)
CHGL-101 : General Chemistry Lab	(2 Credits)
Statistics :	**02 Credit**
Stat-102 : Introduction to Probability	(2 Credits)
	12 Credits

(ii) Second Year:

Mathematics:	**08 Credits**
Math-202 : Calculus-II	(2 Credits)
Math-203 : Ordinary Differential Equation	(2 Credits)
Math-204 : Numerical Analysis -I	(2 Credits)
Math- : Elementary Linear Algebra	(2 Credits)
Statistics:	**02 Credits**
Stat NM-202 : Principles of Statistics	(2 Credits)

Detailed Syllabus of Non-Major Courses will be supplied by the respective Departments.

First Year B.Sc. Courses Major Courses in Physics

PHA-101: Mechanics and Properties of Matter   **(3 Credits)**

1. Preamble:
Measurement of Physical variables, dimensions of Physical Variables and rudimentary dimensional analysis, Scaling.   2 lect

2. Particle Kinematics and Dynamics:
a) Motion in one dimension, x vs. t, v vs. t graphs and their properties.
Motion in two and three dimensions, e.g. projectile motion, circular motion. Notion of force and Newton's laws of motion. Frictional forces.
Application of Newton's laws : Free body diagrams.   6 lect

3. Momentum Conservation and System of Particles:
a) Conservation of momentum : Rocket motion. Center of Mass and its Motion.
b) Collision : Elastic and Inelastic collisions in one dimension. Impulse.   5 lect.

4. Energy Conservation:
Work and Energy. The Work-kinetic energy theorem. Conservative Forces and potential
Energy and their relation. Conservation of Energy.   6 lect.

5. Rotational Motion:
Rotational Kinematics, Moment of Intertia and its calculation, Radius of Gyration, Parallel-axis theorem, Perpendicular- axis theorem. Rolling motion, Motion of a Gyroscope:
Precessions.   6 lect.

6. Gravitation:
Newton's Law of Gravitation. Derivation of Kepler laws of planetary motion from Newton's laws. Gravitational Potential, Escape Velocity, Calculation of Potential and Force in simple cases.   5 lect

7. Elasticity:
Hooke's Law, Elastic Moduli and their interrelation, Bending of a cantilever. Torsion. 4 lect.

8. Surface Tension and Viscosity:
i) Adhesive and Cohesive Forces, Molecular origin of Surface Tension, Excess Pressure due to surface tension at an interface. Capillarity.
ii) Newton's law of Viscosity, Poiseulle's Formula, Stokes Law. Terminal Velocity for
Falling bodies.   7 lect.

9. Rudiments of Fluid Dynamics :
Streamlined Flow, Bernoulli's equation, Equation of Continuity, Euler's Equation.   4 lect.

References :
1. Fundamentals of Physics- Robert Resnick, David Halliday and Jearl Walker, 10th Edition. John Wiley & Sons
2. Physics- R. Resnick, D. Halliday and K. Krane. John Wiley and Sons
3. Properties of Matter-Newman and Searle.
4. Elements of Properties of Matter -Mathur, D. S

PHA-102: Thermal Physics (3 credits)

1. Kinetic theory of Gases I: Basic Assumptions of Kinetic Theory, Calculation of pressure exerted by the gas, Kinetic interpretation of temperature, Root-Mean Square speed, Degrees of freedom, law of equipartition of energy. 4 lect.

2. Kinetic Theory of Gases II: Distribution of molecular velocities in a perfect gas: Maxwell-Boltzmann Distribution law, Determination of average speed, root mean square speed, and most probable speed, Temperature dependence, Energy distribution function of Maxwell-Boltzmann velocity distribution. Mean free path: Expression for mean free path (Zeroth order approximation and first order approximation), Van der waals equation of state: Assumptions in deriving Van der waals equation of state, Critical constant, Law of corresponding states. 6 lect.

3. **Transport phenomena**: Viscosity, diffusion, transport coefficients and size of molecules, relationship between transport coefficients, Brownian motion, vertical distribution of Brownian particles, Einstein's Theory of Brownian motion. 5 lect.

4. **Basic Concepts of Thermodynamics**: Thermodynamic state of a system, Thermal Equilibrium, Zeroth law of Thermodynamics, Internal Energy of System-Concept of heat, Equation of State: The Ideal Gas Equation, Indicator Diagram, First law of Thermodynamics, Thermodynamic Process-Isothermal, Adiabatic, Isobaric, Isochoric, Adiabatic relations of system for perfect gas, Work done during Isothermal and Adiabatic changes, Reversible and Irreversible changes. 6 lect.

5. Second Law of Thermodynamics and Entropy: Conversion of Heat into Work and its converse, Reversible and Irreversible Processes, Examples of Irreversible Processes, Carnot's Cycle and Carnot's Heat Engine and its efficiency, Second law of Thermodynamics: Statements, Carnot Theorem, Entropy, Principle of Increase in Entropy, Generalized form of the First and Second laws: (i) Entropy changes for an Ideal Gas and (ii) Entropy of van der Waals' gas, and Third law of thermodynamics. 7 lect.

6. Heat engines & Refrigerators: Heat Engines: Otto cycle and its efficiency, Diesel cycle and its efficiency, Comparison between Otto and Diesel cycle, Refrigerators: General Principle and Coefficient of performance of refrigerator, The Carnot Refrigerator, Simple structure of vapor compression refrigerator, Air conditioning: principle and its applications. 4 lect.

7. Thermodynamics relations: Thermodynamical functions: Internal energy (U), Helmholtz function (F), Enthalpy (H), Gibbs function (G) and the relations between them, Two mathematical conditions for exact differentials (Properties), derivation of Maxwell thermodynamical relations from thermodynamical functions, Application of Maxwell relations: relations between two specific heats of gas, Internal Energy equations for (i) ideal gas and (ii) Van der Waals gas, Relation between isothermal compressibility and isentropic compressibility, Derivation of Clausius-Clapeyron and Clausius equation, variation of intrinsic energy with volume for (i) perfect gas (ii)Van der waals gas (iii) solids and liquids, T-S diagrams and First, Second and Third TdS relations. 9 lect.

8. Production of low temperature: Adiabatic demagnetization, Joule-Thomson effect (Throttling process for (i) ideal gas and (ii) Van der Waals gas and thermoelectric phenomena; Seebeck, Peltier and Thompson effects. 4 lect.

Recommended Text Books:

1. Fundamentals of Physics- Robert Resnick, David Halliday and Jearl Walker, 10th Edition. John Wiley & Sons
2. Heat and Thermodynamics- Mark W. Zemansky and Richard H. Dittman, 7th ed. McGraw-Hill
3. Heat and Thermodynamics-F. Sears and G.L. Salinger, 3rd. Ed. , Addision- Wesley.
4. An Introduction to Thermal Physics-Daniel V. Schroeder, 1st Edition, Addison-Wesley Publishing Company
5. Fundamentals of Statistical and Thermal Physics-F. Reif, McGraw-Hill.

PHA 103 : Electricity and Magnetism **(3 credits)**

1. Mathematical Preliminaries:
Scalar and Vector Fields. Gradient, Divergence and Curl. Gauss' and Stokes' Theorems- appilications. Grad. Div. Curl and Laplacian in Cartesian, Curvilinear (Spherical Polar and Cylindrical) coordinates. 6 lect.

2. Electric Field:
a) Point charges and Coulomb's law. Definition of the electric field. Superposition principle. Electric field lines. Field due to a dipole. Torque on a dipole in uniform E-field. 3 lect.

b) Gauss' law. Coulomb's law from Gauss' law. Cases with planar, spherical and cylindrical symmetry. Gauss' law in differential form. 3 lect.

c)   Static electric field as a conservative vector field ($\nabla \times \mathbf{E}$=0). Notion of a potential Equipotential surfaces. Potential and potential energy for a system of charges. 4 lect.

d) Capacitance and capacitors. Analogy with springs. Parallel plate capacitors and spherical Capacitors. Energy stored in a capacitor. Capacitors in parallel and in series, Capacitors used as charge accelerators. Concept of electron-volts. Eelectric field as the carrier of electrical evergy and electrical energy density in terms of electric field. 5 lect.

e) Dielectric media. Polarization vector and Displacement vector. Capacitor with a dielectric, Gauss's law with dielectrics. 2 lect.

3. Current and Magnetic Field :
a)   Motion of charge carriers in matter. Current density, drift velocity, the Drude model. Ohmic conductors and Ohm's law. (The laws of resistivity). Resistance and resistivity. Addition of resistances. 2 lect.

b) Electromotive force and potential drop. Kirchhoff's laws : Junction and Loop rules. Their physical basis. Problems involving Multiloop circuits with resistors and batteries, ammeter. Voltmeter and their use. 2 lect.

c) Single loop RC circuit. Charge, Charging and discharging of a capacitor and the Time constant. Energy transformation in the RC circuit. 2 lect.

d) Definition of magnetic field : Lorentz Force. Properties of static magnetic field. Gauss' law for magnetic fields. Absence of magnetic monopoles. Motion of charged particles in magnetic field : Hall effect. 4 lect.

e) Magnetic fields due to currents : Biot-Savart law. Magnetic fields due to current carrying areas and straight lines. Ring current as a magnetic dipole. Ampere's law, comparison between Biot-savart and Ampere law. Field due to an infinite straight wire, ideal solenoid and a toroid. 2 lect.
f) Magnetic properties of matter. paramagnet, diamagnet and ferromagnet. Magnetization vector. Hysteriesis. 2 lect.

4. Time Varying Phenomena:

a) Farady's law of induction. Lenz law. Inductance-self and mutual inductance. Application : Transformers. 2 lect.
b) Inductors. Single loop RL circuit and the Time constant. Energy stored in magnetic fields. Energy transformation in an RL circuit. Analogy of inductor with mass. 2 lect.

c) Induced Electric field from time-varying magnetic fields-closed electric field lines. Synchrotron vs. Cyclotron. 2 lect.

d) RC and LC circuits. Energy transformation in LC circuit. 2 lect.

References :

1. Fundamentals of Physics- Robert Resnick, David Halliday and Jearl Walker, 10th Edition. John Wiley & Sons
2. Physics-R. Resnick, D. Halliday and Krane. 6th ed. John Wiley and Sons.
3. Foundations of Electromagnetic Theory-J. Reitz, F. Milford and R. Christy, Addison Wesley.

PHA-104 : Introduction to Computer and Programming **(3 Credits)**

PART-I: COMPUTING BASICS

Generations of computer. Types of computer, Block diagram of a computer. Functions of the different units: Input unit, Output unit, Memory unit, CPU: ALU, CU. 2 lect.

Input and Output Devices (Basic Idea): Keyboard, Data scanning devices, Card reader, Digitizers, Monitor, Printer, Projector, etc. 1 lect.

Memories (Basic Idea): Registers, Cache memory, Primary memory, Secondary memories. 1 lect.
Software: System software: Operating system and utility software, Application software, Linux operating system: Some basic commands in Linux. 1 lect.

Number System and Codes: Binary number system: Decimal to binary and binary to decimal conversion. Octal number system, Hexadecimal number system. BCD code, Alphanumeric codes: ASCII code, Parity bit. 3 lect.

Digital Arithmetic: Binary addition, Signed numbers, 2's- Complement system, Addition and subtraction in 2's Complement System, BCD addition, Design of a Half and Full Adder. 3 lect.

Logic Gates and Boolean algebra: Boolean constant and variables, Truth tables, *Basic logic operations and gates*: OR, AND, and NOT, Universal gates: NAND and NOR, *Complex gates*: XOR & NOR, Boolean theorems, DeMorgan's theorem. Universality of NAND and NOR Gates. 4 lect.

Flip-Flops: Latch, Clock signals and Clocked Flip-Flops. S-C Flip-Flop, J-K Flip-Flop, D Flip-Flop, Asynchronous inputs, Master-slave Flip-Flop, Data storage and transfer, Shift register. 3 lect.

Counters and Registers: Asynchronous counters, Decade/BCD counters, Synchronous counters, Up/Down counter, Counter applications: Frequency counter. 3 lect.

Part – II: PROGRAMMING (C/C++)

Programming Language Translators: Assembler, Compiler and interpreter. **Computer Languages:** Machine language, Assembly language, High level language. **Flow Chart** and **Algorithms.** 1 lect.

C Fundamentals: An Overview of "C/C++" Programming, Identifiers and keywords, Data Types, Constants, Variable and arrays, Declarations, Expressions, Statements, Symbolic Constants. 4 lect.

Operators and Expressions: Arithmetic operations, Increment and decrement, Unary operators, Relation and logical operators, Assignment operators, Type conversion in assignments, Multiple assignments, Conditional operator, Library functions. 4 lect.

Data Input and Output: Single character input, Single character output, Entering input data, Writing output data. 3 lect.

Control Statements: *if* statement, *if-else* statements, Nested *if* statements, *for* loop, *while* loop, *do-while* loop, Nested loops, *switch* statement, *continue* statement, *break* statement, *goto* statement. 5 lect.

Functions: Defining functions, Accessing functions, Passing argument to functions, Recursion, Function Prototypes. 3 lect.

Arrays and Strings: Declaring arrays, Initializing arrays, Processing arrays, Passing arrays to a function, Multidimensional arrays, String, Building arrays of string. 4 lect.

Books recommended:

1.   Tocci and Widmer. Digital Systems,   Prentice Hall
2.   Morris Mano,Digital Logic & Computer Design
3.   Alvis J. Evans. Basic Digital Electronics
4.   Herbert Schildt. C: The Complete Reference
5.   Herbert Schildt. C++: The Complete Reference
6.   Kernighan B.W. and Ritchie D.M. C Programming Language.
7.   King K. N.C Programming: A Modern Approach.
8.   Greg Perry. Absolute Beginner's Guide To C.
9.   Sinha P.K. Computer Fundamentals

স্বাধীন বাংলাদেশের অভ্যুদয়ের ইতিহাস   **(4 Credits)**

ভূমিকাঃ স্বাধীন বাংলাদেশের অভ্যুদয়ের ইতিহাস-পরিধি ও পরিচিতি

১।   **দেশ ও জনগোষ্ঠির পরিচয়**
     ক) ভূ প্রকৃতির বৈশিষ্ট্য ও প্রভাব

     খ) নৃতাত্ত্বিক গঠন

     গ) ভাষা

     ঘ) সংস্কৃতির সমন্বয়বাদিতা ও ধর্মীয় সহনশীলতা

     ঙ) অভিন্ন বাংলার পরিপ্রেক্ষিতে তৎকালীন পূর্ববঙ্গ ও বর্তমান বাংলাদেশের স্বকীয় সত্তা

২।   **অখণ্ড স্বাধীন বাংলা রাষ্ট্র গঠনের প্রয়াস ও উপমহাদেশের বিভক্তি, ১৯৪৭**
     ক) ঔপনিবেশিক শাসন আমলে সাম্প্রদায়িকতার উদ্ভব ও বিস্তার

     খ) লাহোর প্রস্তাব, ১৯৪০

     গ) অখণ্ড স্বাধীন বাংলা রাষ্ট্র গঠনের উদ্যোগ, ১৯৪৭ ও পরিণতি

     ঘ) পাকিস্তান সৃষ্টি, ১৯৪৭

৩।   **পাকিস্তানঃ রাষ্ট্রীয় কাঠামো ও বৈষম্য**
     ক) কেন্দ্রীয় ও প্রাদেশিক কাঠামো

     খ) সামরিক ও বেসামরিক আমলাতন্ত্রের প্রভাব

     গ) অর্থনৈতিক, সামাজিক ও সাংস্কৃতিক বৈষম্য

৪।   **ভাষা আন্দোলন ও বাঙালির আত্মপরিচয় প্রতিষ্ঠা**
     ক) মুসলিম লীগের শাসন ও গণতান্ত্রিক রাজনীতির সংগ্রাম

     খ) আওয়ামী লীগের প্রতিষ্ঠা, ১৯৪৯

     গ) ভাষা আন্দোলন: পটভূমি ও ঘটনা প্রবাহ

     ঘ) হক-ভাসানী-সোহরাওয়াদীর যুক্তফ্রন্ট, ১৯৫৪ সালের নির্বাচন ও পরিণতি

৫।   **সামরিক শাসনঃ আইয়ুব খান ও ইয়াহিয়া খানের শাসনামল (১৯৫৮-৭১)**
     ক) সামরিক শাসনের সংজ্ঞা ও বৈশিষ্ট্য

     খ) আইয়ুব খানের ক্ষমতা দখল ও শাসনের বৈশিষ্ট্য (রাজনৈতিক নিপীড়ন, মৌলিক গণতন্ত্র, ধর্মের রাজনৈতিক ব্যবহার)

     গ) আইয়ুব খানের পতন ও ইয়াহিয়া খানের শাসন, এক ইউনিট বিলুপ্তিকরণ, সার্বজনীন ভোটাধিকার, এলএফও (Legal Framework Order)

৬।   **জাতীয়তাবাদের বিকাশ ও স্বাধিকার আন্দোলন**
     ক) সাংস্কৃতিক আগ্রাসনের বিরুদ্ধে প্রতিরোধ ও বাঙালি সংস্কৃতির উজ্জীবন

খ) শেখ মুজিবুর রহমানের ৬-দফা আন্দোলন

গ) ৬-দফা আন্দোলনের প্রতিক্রিয়া, গুরুত্ব ও তাৎপর্য

ঘ) আগরতলা মামলা, ১৯৬৮

৭। ১৯৬৯-এর গণঅভ্যুত্থান ও ১১-দফা আন্দোলন

ক) পটভূমি

খ) আন্দোলনের কর্মসূচী, গুরুত্ব ও পরিণতি

৮। ১৯৭০ এর নির্বাচন, অসহযোগ আন্দোলন ও বঙ্গবন্ধুর স্বাধীনতা ঘোষণা

ক) নির্বাচনের ফলাফল এবং তা মেনে নিতে কেন্দ্রের অস্বীকৃতি

খ) অসহযোগ আন্দোলন, বঙ্গবন্ধুর ৭ই মার্চের ভাষণ, অপারেশন সার্চলাইট

গ) বঙ্গবন্ধুর স্বাধীনতা ঘোষণা ও গ্রেফতার

৯। মুক্তিযুদ্ধ ১৯৭১

ক) গণহত্যা, নারী নির্যাতন, শরণার্থী

খ) বাংলাদেশ সরকার গঠন ও স্বাধীনতার ঘোষণাপত্র

গ) স্বত:স্ফূর্ত প্রাথমিক প্রতিরোধ ও সংগঠিত প্রতিরোধ (মুক্তিফৌজ, মুক্তিবাহিনী, গেরিলা ও সম্মুখ যুদ্ধ)

ঘ) মুক্তিযুদ্ধে প্রচার মাধ্যম (স্বাধীন বাংলা বেতার কেন্দ্র, বিদেশী প্রচার মাধ্যম ও জনমত গঠন)

ঙ) ছাত্র, নারী ও সাধারণ মানুষের অবদান (গণযুদ্ধ)

চ) মুক্তিযুদ্ধে বৃহৎশক্তি সমূহের ভূমিকা

ছ) দখলদার বাহিনী, শান্তিকমিটি, আলবদর, আলশামস, রাজাকার বাহিনী, রাজনৈতিক দল ও দেশীয় অন্যান্য সহযোগীদের স্বাধীনতাবিরোধী কর্মকান্ড ও বুদ্ধিজীবী হত্যা

জ) পাকিস্তানে বন্দি অবস্থায় বঙ্গবন্ধুর বিচার ও বিশ্বপ্রতিক্রিয়া

ঝ) প্রবাসী বাঙালি ও বিশ্বের বিভিন্ন দেশের নাগরিক সমাজের ভূমিকা

ঞ) মুক্তিযুদ্ধে ভারতের অবদান

ট) যৌথ বাহিনী গঠন ও বিজয়

ঠ) স্বাধীনতা সংগ্রামে বঙ্গবন্ধুর নেতৃত্ব

১০। বঙ্গবন্ধু শেখ মুজিবুর রহমানের শাসনকাল, ১৯৭২-১৯৭৫

ক) স্বদেশ প্রত্যাবর্তন

খ) সংবিধান প্রণয়ন

গ) যুদ্ধ বিধ্বস্ত দেশ পুনর্গঠন

ঘ) সপরিবারে বঙ্গবন্ধু হত্যা ও আদর্শিক পটপরিবর্তন

সহায়ক গ্রন্থ

১. নীহার রঞ্জন রায়, *বাঙালীর ইতিহাস*, দে' জ পাবলিশিং, কলকাতা ১৪০২ সাল।

২. সালাহ্‌ উদ্দিন আহমেদ ও অন্যান্য (সম্পাদিত), *বাংলাদেশের মুক্তি সংগ্রামের ইতিহাস ১৯৪৭-১৯৭১*, আগামী প্রকাশনী, ঢাকা ২০০২।

৩. সিরাজুল ইসলাম (সম্পাদিত), *বাংলাদেশের ইতিহাস ১৭০৪-১৯৭১*, ৩ খন্ড, এশিয়াটিক সোসাইটি অব বাংলাদেশ, ঢাকা ১৯৯২।

৪. ড. হারুন-অর-রশিদ, *বাংলাদেশ: রাজনীতি, সরকার ও শাসনতান্ত্রিক উন্নয়ন ১৭৫৭-২০০০*, নিউ এজ পাবলিকেশন্স, ঢাকা ২০০১।

৫. ড. হারুন-অর-রশিদ, *বাঙালির রাষ্ট্রচিন্ত্রা ও স্বাধীন বাংলাদেশের অভ্যুদয়*, আগামী প্রকাশনী, ঢাকা ২০০৩।

৬. ড. হারুন-অর-রশিদ, *বঙ্গবন্ধুর অসমাপ্ত আত্মজীবনী পুনর্পাঠ*, দি ইউনিভার্সিটি প্রেস লিমিটেড, ঢাকা ২০১৩।

৭. ড. আতফুল হাই শিবলী ও ড.মোঃ মাহবুবর রহমান, *বাংলাদেশের সাংবিধানিক ইতিহাস ১৭৭৩-১৯৭২*, সূবর্ণ প্রকাশন, ঢাকা ২০১৩।

৮. মুনতাসির মামুন ও জয়ন্ত কুমার রায়, *বাংলাদেশের সিভিল সমাজ প্রতিষ্ঠার সংগ্রাম*, অবসর, ঢাকা ২০০৬।

৯. সৈয়দ আনোয়ার হোসেন, *বাংলাদেশের স্বাধীনতা যুদ্ধে পরাশক্তির ভূমিকা*, ডানা প্রকাশনী, ঢাকা ১৯৮২।

১০. আবুল মাল আবদুল মুহিত, *বাংলাদেশ: জাতিরাষ্ট্রের উদ্ভব*, সাহিত্য প্রকাশ, ঢাকা ২০০০।

১১. শেখ মুজিবুর রহমান, *অসমাপ্ত আত্মজীবনী*, দি ইউনিভার্সিটি প্রেস লিমিটেড, ঢাকা ২০১২।

১২. সিরাজ উদ্‌দীন আহমেদ, *একাত্তরের মুক্তিযুদ্ধ: স্বাধীন বাংলাদেশের অভ্যুদয়*, ইসলামিক ফাউন্ডেশন, ঢাকা ২০১১।

১৩. জয়ন্ত কুমার রায়, *বাংলাদেশের রাজনৈতিক ইতিহাস*, সূবর্ণ প্রকাশন, ঢাকা ২০১০।

১৪. Harun-or-Roshid, *The Foreshadowing of Bangladesh: Bengal Muslim League and Muslim Politics, 1906-1947,* The University Press Limited, Dhaka 2012.

১৫. Rounaq Jahan, *Pakistan: Failure in National Integration,* The University Press Limited, Dhaka 1977.

১৬. Talukder Maniruzzaman, *Radical Politics and the Emergence of Bangladesh,* Mowla, Brothers, Dhaka 2003.

PLA 101 : Practical Laboratory

Updated copy of the list of experiments will be provided by the Physics Department of Dhaka University. Respective teachers from the affiliated colleges are requested to collect it at the beginning of each academic year.

Second Year B.S. (Hons.) Major Courses in Physics

PHA 201: Optics (3 Credits)

1. Optics: Past, present and future   1 lect.

2. Review of wave propagation: Travelling wave; Phase and group velocity, superluminal light; Energy and power of a wave. Velocity of light in vacuum in terms of ϵ_0 and μ_0.Poynting vector and intensity of light.Wavefront and Huygens principle.   2 lect.

3. Geometrical optics and Aberrations: Ray tracing through optical systems; Matrix formulation of geometric optics; Transfer matrices of lenses and mirrors and for free propagation; Examples; Seidel aberrations; Spherical aberration; Coma; astigmatism; Curvature of field; Distortion; Aspherical surfaces; Chromatic aberration; Achromatic doublets; example.   5 lect.

4. Interference of light: General considerations, superposition of vector fields; Conditions of interference; Division of wave front and amplitude; Young's experiment; Fresnel bi-prism; Fringes with quasi-monochromatic and white light, fringes of equal inclination and thickness; Haidinger and Fizeau fringes; Newton's rings; Michelson interferometer; Measurement of wavelength and separation of sodium D1 and D2 doublets; Michelson Stellar Interferometer; Mach-Zehnder interferometer.   7 lect.

5. Multiple-beam Interference: Multiple reflections from a plane-parallel plate; Fabry-perot interferometer; Free spectral range and chromatic resolving power; Antireflection coatings; Interference filter; examples.   5 lect.

6. Fraunhofer diffraction: Huygens-Fresnel principle; Fresnel and Fraunhofer diffraction; Fraunhofer diffraction from a single, double and multiple slits; Circular aperture; Resolution of imaging systems; Diffraction grating; Transmission and reflection gratings; Spectrometer, its resolving power.   7 lect.

7. Diffraction theory and Fresnel diffraction: the integral theorem of Kirchhoff; Fresnel zone plate and Fresnel lens; Rectangular aperture; Fresnel integrals; Cornu spiral; Fresnel diffraction by slit.   6 lect.

8. Polarization : Definition of Polarization ; plane, circular and elliptic polarization; Malus law; Polarization by polarizer and by reflection; Birefringence; Brewster's law; Polarization by scattering; Ordinary and extraordinary rays; Nicol and Wollaston prisms; Birefringent crystal; Optic axis; Birefringence in negative and positive uni-axial crystals, full wave, half-wave and quarter-wave plates ; Optical activity.   8 lect.

9. Dispersion and Scattering : Normal and anomalous dispersion; Cauchy and Sellmeir equation; Rayleigh scattering; The blueness of sky and the redness at the sunset and sunrise; Mie scattering qualitative.   4 lect.

References :
1. E. Hecht, Optics (4th ed.), Pearson Education (2002)
2. F.A. Jenkins and H.E. White, Fundamentals of Optics (4th ed.), Mc Grew-Hill.
3. Born and Wolf, Principles of Optics. (7th ed.), Cambridge Univ. Press (2001).
4. Fundamentals of physics: Halliday- Resnick-Walker. 4th edition
5. Optics – Bruno Rossi

PHA-202: Electronics   (3 credits)

1. Semiconductors Diode: 6 lect.

Semiconductors Materials: Ge, Si, and GaAs, Extrinsic Materials: n-Type and p-Type. Semiconductor Diode: p-n Junction, Forward and Reverse Bias, I-V Curve, Diode Equation, Breakdown: Avalanche and Zener Mechanism, PIV Rating, DC & AC Resistance, Maximum Current and Power Dissipation Rating, Reverse Recovery Time, Diode Testing, Zener Diode, Light Emitting Diodes.

2. Diode Applications: 5 lect.
Load-Line Analysis, Q-point, Diode Logic Circuits (AND, OR and NOT Gates), Half-Wave Rectification, Full-Wave Rectification: Bridge Network, Center-Tapped Transformer, Average Voltage, Capacitor Smoothing, Ripple Voltage & Factor, Zener Voltage Regulator, Diode Clipping and Clamping Circuits.

3. Bipolar Junction Transistor (BJT):   9 lect.
Transistor Construction: npn & pnp Transistor, Transistor Operation, Transistor Configurations: CB, CE & CC Configurations, Alpha and Beta, Input Characteristics, Output Characteristics, Cut-off, Saturation and Active Region, Transistor Amplifying Action, Transistor Switching Networks, Transistor Testing and Terminal Identification Transistor Biasing: Load Line & Operating Point, Fixed Bias, Collector Feedback, Emitter Bias and Voltage Dividers Bias Configurations, Bias Stabilization.

4. Electronic Circuits Analysis: 5 lect.

Constant Voltage and Constant Current Sources, Current Mirror Circuits, Current Source Circuits: BT Constant Current Source, Transistor/Zener Constant Current Source. Thevenin's and Norton's Theorems, Superposition Theorem, Two-Port Network and Hybrid Equivalent Model, Ebers-Moll Model.

5. Field Effect Transistor: 5 lect.
JFETS: Construction, Input and Output Characteristics, Transfer Characteristics, Depletion-Type MOSFET, Enhancement-Type MOSFET, VMOS, CMOS, FET Biasing.

6. BJT and JFET Frequency Response: 4 lect.
Decibels, Low-Frequency Analysis, Bode Plot, Low-Frequency Response: BJT Amplifier and FET Amplifier, Miller Effect Capacitance. High-Frequency Response: BJT and FET Amplifier, Multistage Frequency Effects.

7. Negative Feedback: 3 lect.
Basic Feedback Concepts, Feedback Connection Types, Practical Feedback Circuits, Analysis for Gain, Distortion, Bandwidth, Input Impedance and Output Impedance, Feedback Amplifier- Phase and Frequency.

8. Operational Amplifier: 6 lect.
Op-Amp Basic, Differential Amplifier Circuit (Double Ended Input, Single Ended Output), Differential and Common Mode Operation, Common Mode Rejection Ratio, Equivalent Circuit, Ideal Op-Amp Approximations, Inverting Amplifier, Non-inverting Amplifier, Adder, Subtractor, Comparator, Integrator, Differentiator, Frequency Response, Gain-Bandwidth Product, Active filters, Applications in millivolt Meter and Current Meter.

9. Fabrication of IC: 2 lect.
Monolithic and Hybrid Circuits, Fabrication of Monolithic Circuits, Very Large Scale Integration (VLSI).

References :

1. Robert L. Boylestad, and Louis Nashelsky. Electronic Devices and Circuit Theory. Prentice-Hall, India.
2. David A. Bell. Electronic Devices and Circuits Prentice Hall, India.
3. Malvino, A.P. Electronic Principles, Tata McGraw Hill.
4. Brophy, J. J. Basic Electronics for Scientists, McGraw-Hill.
5. Millman, J. and Halkias, C.C. Electronic Devices and Circuits, McGraw Hill.
6. Ramakant A. Gayakwad. Op-Amps and Linear Integrated Circuits.

PHA-203: Mathematical Physics: (3 Credits)

1. Tensors: 6 Lect.
Definition of Tensor ; Importance of Tensor in Physics ; Rank, Contravariant and Convariant Tensor ; Transformation of Coordinates ; Kronecker Delta and Levi-Civita Tensor ; Einstein Summation Convention ; Direct Product ; Symmetric and Anti-symmetric Tensors ; Contraction ; Tensor Equations ; Matric Tensors and their Determinants ; General Coordinate Transformations and Tensors.

2. Techniques of Complex Variables: 12 lect.
Functions of a Complex Variable ; The Cauchy-Riemann Relations ; Power Series in a Complex Variable ; Elementary Functions ; Multivalued Functions and Branch Cuts; Jordan's Lemma; Singularities and Zeroses of Complex Functions; Complex Integrals; Green's Theorem ; Cauchy's Theorem; Cauchy's Integral Formula; Taylor and Laurent Series ; Residue Theorem; Finding Residues; Evaluation of Definite Integrals Using the Method of Residue ; Integrals of Sinusoidal Functions ; Infinite Integrals.

3. Fourier Series: 4 Lect.
Fourier Series; The Dirichlet Conditions; The Fourier Coefficients; Symmetry Considerations; Discontinuous Functions; Non-periodic Functions; Integration and Differentiation; Application of Fourier Series; Complex Fourier series; Parseval's Theorem.

4. Integral Transforms: 8 Lect.

Fourier Transforms: The Uncertainty Principle; Fraunhofer Diffraction; The Dirac δ-Function; Relation of the δ-Function to Fourier Transforms; Properties of Fourier Transforms; Odd and Even Functions; Convolution and Deconvolution; Correlation Functions and Energy Spectra; Paseval's theorem; Fourier Transforms in Higher Dimensions.

Laplace Transforms: Laplace Transforms of Derivatives and Integrals; Inverse Laplace Transformation; Laplace Transformations of Special Functions; Applications of Laplace Transformations.

5. Gamma and Beta Functions: 3 Lect.

Definitions ; Fundamental Property of Gamma Funtions ; The Value of $\Gamma(1/2)$ and Graph the Gamma Funtion ; Transformation of Gamma Funtion ; Different Forms of Beta Function ; Relation Between Beta and Gamma functions ; Reduction of Definite Integrals to Gamma Functions.

6. Series Solutions of Ordinary Differential Equations: 12 Lect.

Second-order Linear Ordinary Differential Equations; Ordinary and Singular Points; Series Solutions About an Ordinary Point; Series Solutions About a Regular Singular Point; Series Solution of Differential Equations by Frobenius Method; Polynomial Solutions.

Legendre's Differential Equation, Genarating Function for $P_n(x)$, Recurrence Realations for $P_n(x)$, Rodrigue's Formula for Legendre Polynomial, Orthogonality of Legendre's Polynomials, Series of Legendre's Polynomials, Associated-Legendre's Polynomials, Orthogonality of Associated Legendre's Polynomials.

Bessel's Differential Equation, Genarating Function for $J_n(x)$, Recurrence Realations for $J_n(x)$, Integral Representations for $J_n(x)$, Orthogonality pf Bessel's Equation, Bessel's Function of Second Kind.

Hermite's and Laguerre's Differential Equations, Polynomials, Generating Functions, Recurrence Relations and Orthogonality Properties.

References :

1. G.F Arfken: Mathematical Methods for Physicists, Academic Press, NY.
2. L. Pipes and A. Garvill: Applied Mathematics for Engineers and Physicists, McGraw-Hill.
3. K. Riley and M. Hobson: Mathematical Methods for Physics and Engineering, Cambridge.
4. M.R. Spiegel: Complex Variables, McGraw-Hill
5. Mary Boas: Mathematical Physics in the Physical Sceinces

PHA- 204: Atomic and Molecular Physics   **(3 credit)**

1. Radiation:
Blackbody readiation. Thermodynamics of radiation. Stefan's law. Rayleigh-Jeans law and Ultraviolet catastriphe. Wien's displacement law. Planck's distribution law for blackbody radiation and Quantum hypothesis.   9 Lect.

2. Particle Properties of Wave: Photoelectric Effect, Production of X-ray, Origin of X-ray, X-ray spectrum, Compton Effect, Pair Production   5 Lect

3. **Wave Properties of Particles:** Wave Particle Duality, De Broglie Waves, Particle Diffraction, Davission-Germer Experiment. Schrödinger equation (wave mechanics), Particle in a box, Uncertainty Principle and its application.   6 Lect

4. **Atomic Structure**: Rutherford Experiment and Rutherford Nuclear Model, Atomic Spectra and Bohr Atom Model, Energy Levels and Spectra, Atomic Excitation and Franck-Hertz Experiment.   5 Lect.

5. **Many–Electron Atoms:** Electron Spin, Stern- Gerlach Experiment-Pauli's Exclusion Principle, Quantum Number, Principle Quantum Number, Orbital Quantum Number, Magnetic Quantum Number, Spin Quantum Number, Selection rules, allowed and forbidden transition, Symmetric and Anti-symmetric Wave Functions, Periodic Table, Atomic Structures, Vector Atom Model, Explaining the Fine Structure, Hyperfine Structure, Zeeman Effect, (Normal and Anomalous) Stark effect, Paschen-Back Effect.   10 Lect.

6. **Molecules:** Molecules: Molecular Bond, Electron Sharing by Atoms of Molecules, H^{2+} Molecular Ion, H_2 Molecule, Complex Molecules, rotation and Vibration of Molecules and Energy Levels due to Rotation and Vibration. Molecular spectra, Hund's Rule, Raman Effect and Application of Raman Effect.   10 Lect.

References :
1. Beiser, A.: Concepts of Modern Physics, McGraw-Hill Inc.
2. Beiser,A:Perspective of Modern Physics, McGraw-Hill Inc.
3. Theraja B.L. : Modern Physics. S. Chand & Company Ltd. New Delhi.
4. Ghosal S. N. : Atomic Physics. S. Chand & Company Ltd. New Delhi.
5. Tcebeg: Modern Physics

PHA 205: Waves, Oscillations and Advanced Mechanics   **(3 Credits)**

1. Oscillations :
a) Simple Harmonic Motion (SHM). Mass-Spring system, Energy conservation in mass energy system. Damped SHM-Under-damped, over-damped motion. Critical damping.
b) ForcedOscillations, Resonance.
c) Superpositon of Periodic Motion :Beats, Lissajous Figures.   10 lect

2. Time Varying Fields
a) Damped Oscillation in LCR circuits.   2 lect.

b) Alternating Currents ; RMS value, Use of Complex Variables and phasors for Linear circuit analysis. Impedance, reactance, Q-factor and Power factor. Response of RC, LR and LRC circuits to alternating voltage sources. 5 lect.

c) Displacement current. Maxwell's modification of ampere's law. Induced magnetic Field. Equation of continuity. Maxwell's equations. 2 lect.

d) Plane, Transverse Electromagnetic waves and Speed of Light from Maxwell's equations. 3 lect.

3. Waves:
Waves in Elastic Media; transverse and longitudinal waves; amplitude and phase; phase velocity and group velocity; wavefronts; mathematical representation of plane and spherical wavefronts; principle of superposition, standing waves, Huygens' principle. 5 lect

4. Kinematics of Rigid Body Motion : 6 lect
Rotation as orthogonal transformations, Euler Angles, Rotating coordinates. Coriolis Force.

5. Dynamics of Rigid Body Motion : 7 lect
Moment of Inertia, Principles Axis Transformation, Introduction to Euler-Lagrange Equation of of motion, Motion of a heavy symmetrical top.

6. Small Oscillations : 5 lect
Normal Coordinates, Normal Modes, Free vibrations of a linear triatomic molecule.

References :

1. Fundamentals of Physics- Robert Resnick, David Halliday and Jearl Walker, 10th Edition. John Wiley & Sons
2. Physics-R. Resnick, D. Halliday and Krane. 6th ed. John Wiley and Sons.
3. Foundations of Electromagnetic Theory-J. Reitz, F. Milford and R. Christy, Addison Wesley.
4. Classical Mechanics: H. Goldstein, Narosa Publ. New Delhi (3rd Edition)
5. Mechanics – L.D. Landau and E.M. Lifsbitz, Butterworth-Heinemann.
6. Vibrations and Waves - A.P. French

PLA 201 : Practical Laboratory

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FIRST YEAR MINOR COURSES IN PHYSICS

1. PMA- 111, Mechanics and Waves   **2 credits**

(i) Vectors   11 lect.
Addition and Subtraction. Unit Vectors. Scalar and Vector Products.
Scalar Triple Product. Vector Triple Product. Scalar and Vector
Fields. Gradient, Divergence and Curl., Greens theorem, Gauss and
Stoke's Theorems. Curvilinear coordinates.

(ii) Particle Dynamics   4 lect.
Motion in One Dimension, Motion in Two and Three Dimension, Application of Newton's
Law, Conservation of Linear Momentum, Work and Energy. Conservation Laws.
Conservative Force.

(iii) Simple Harmonic Motion   6 lect
Definition. Combination of Two SHM's. Lissajou's Figures. Damped SHM. Forced
Oscillation. Resonance. Power and Intensity of Wave Motion, Principle of Superpositoin

(iv) Wave in Elastic Media
Longitudinal vibration. Vibration of Strings. Beats. Doppler Effect.

(v) Rotational Motion   5 lect
Toque, Neowton's Law of Rotation, Moment of Intertiaof Various Soid Bodies, Parallel Axis
Theorem Radius of Gyration. Angular Momentum, Kater's Pendulum.

References :
1. Physics : R. Resnick and D. Halliday (Wiley Eastern, New Delhi). Bangla translation
1. published by the Bangla Academy is also available.
2. Gases, Liquids and Solids ; D. Tabor, Cambridge University Press, Cambridge.
3. The Mechanical Properties of Matter: M.T. Sprackling.
4. 4.The General Properties of Matter: F.W. Newman and V.H.L. Searle. Edward Arrold
   Publishers London.
5. Properties of Matter : S. Ahmed and A.K. Nath.

2. PMA- 112: Properties of Matter   **2 credits**

(i) Gravitation Theory   7 lect
Newton's Law. Gravitational Potential. Calculation of potential.
Calculation of potential and Force in Simple Cases. Escape
Velocity. PlanckMass.

(ii) Elementary Theory of Elasticity   7 lect
Hooke's Law. Elastic Modulii. Relations between the Modulii.
Bending of Beams, Torsion.

(iii) Surface Tension   5 lect
Adhesive Force. Cohesive Force. Molecular Theory of Surface
Tension.

Capillarity. Surface Tension of a Mercury Drop. Variation of
Surface Tension with Temperature.

(iv) Viscosity   5 lect
Newton's Law of Streamline Flow. Poiseulle's Formula.
Applications.
Variation of Viscosity with Temperature.

(v) Fluid Dynamics   5 lect
Streamline Flow. Turbulence. Reynold's Number. Bernoulli's
Theorem Applications.

References :
1. Physics : R. Resnick and D. Halliday (Wiley Eastern, New Delhi). Bangla translation
1. published by the Bangla Academy is also available.
2. Gases, Liquids and Solids ; D. Tabor, Cambridge University Press, Cambridge.
3. The Mechanical Properties of Matter : M.T. Sprackling.
4. 4.The General Properties of Matter : F.W. Newman and V.H.L. Searle. Edward
   Arrold Publishers London.
5. Properties of Matter : S. Ahmed and A.K. Nath.

2. PMA- 122 : Electricity and Magnetism   **2 credits**

(i) Electrostatics   10 lect
Electric Intensity and Potential. Gauss's Law. Electric Dipole. Density of Charge in a
Polarised Dielectric. Gauss's Law for charges in a Dielectric. Capacitance Co-efficients of
Potential, Capacitance and Induction Energy of Charged Systems. Electrical Images.

(ii) Magnetostatics   2 lect
Gauss's Law. Magnetic Dipole. Energy in a Magnetic Field.

(iii) Direct Current   4 lect
Current and Electromotive Force. Ohm's Law. Combination of Resistances and Kirchhoff's
Law's Wheatstone Bridge.

(iv) Magnetic Field of a Current and Ampere's Law. Biot-Savart Law. Magnetic Fields of
Simple Circuits. Galvanometers. Lorents Force. CRT.   5 lect

(v) Electromagnetic Induction   4 lect
Faraday's Law. Self-Inductance. Mutual Inductance.

(vi) Alternating Current   5 lect
Generation of AC. RMS Value. Power Factor. CR and LR Circuits. Gain, Decible.

References :
1. Physics : R, Resnick and D. Halliday, Wiley Eastern, New Delhi.
2. Principles of Electricity : L. Page and N.L. Adams. D.Van Nostrand Company, N.J.
3. Electricity and Magnetism : S.G. Starling, Longmann-Green and Co., London.
4. Electromagnetic Fields and waves : Paul Lorrain and Dale Corson. D.B. Taraporevala Sons and Co., Bombay.
5. Bidyat O Chumbak, A.M. Harun ar Rashid ; Techno Mission, Gulshan, Dhaka.
6. Fundations of Electromagnetic Theory : John R. Reitz, F.J. Milford and R.W. Christy Addison- Wesley. Mass, U.S.A.
7. Concepts of Electricity and Magnetism, M.S. Huq-A.K. Rafiqullah and A.K.Roy, Students' Publications, Dhaka

SECOND YEAR MINOR COURSES IN PHYSICS

1. PMA-211: Optics   **2 credits**

(i) Geometrical Optics   5 lect
Spherical Aberration. Chromatic Aberration. Astigmatism. Ray Matrices. Applications.

(ii) Coherence   5 lect
First Order Coherence, Spatial and temporal coherence Higher Order Coherence.

(iii) Interference Of Waves   10 lect
Principle of Superposition. Phase Velocity and Group velocity: Huygens Principle. Young's Experiment. Biprism. Newton's Rings Michelson's Interferometer. Shapes and Positions of Fringes.

(iv) Diffraction   10 lect
Diffraction. Fraunhofer Diffraction. Single, Double and Multiple, Slits. Diffraction grating. spectrometer. resolving Power.

References :
1. Optics; E. Hecht and A. Zajac; Addison-Wesley
2. Optics; Rossi.
3. Modern Optics by Guenther
4. Fundamentals of Optics: F.A. Jenkins and H.E. White. McGraw-Hill, Singapore.
5. Vibrations and Waves A.P. French, Nelson, London
6. Principles of Optics; M Born and E. Wolf. Pergamon Press

2. PMA-223: Electricity and Magnetism   **2 credits**

(i) Varying Current
Transients, Decay and Growth of Current. LCR Circuit   4 lect

(ii) Thermo-electricity
Seebeck, Peltier and Thomson effects. Thermo couple.   4 lect

(iii) Magnetic Properties of materials magnetisation. B-H Curve. 3 lect

(iv) Alternating current. 7 lect
Use of Complex variable. LCR Circuits. Series and Parallel circuit. Q-Factor. Transformer.

(v) Semiconductors and rectification. 12 lect
Energy bands (Qualitative). Holes. Intrinsic and Extrinsic Semiconductors. P-N. Junction. Depletion Layer. Diode Equation and Characteristics. Half Wave and Full-Wave rectification.

References :
1. Physics, R. Resniek and D. Halliday; Wiley Eastern, New Delhi.
2. Principles of Electricity; L. Page and N.L. Adams, D. Van Nostrand Company. N.J.
3. Electricity and Magnetism : S.G. Starling; Longman Green and Co. London.
4. Electromagnetic Fields and Waves: Paul Lorrain and Dale Corson. D.B. Taraporevala Sons and Co., Bombay.
5. Foundations of Electromagnetic Theory: John R. Reitz, F.J Milford and R.W. Christy. Addison-Wesley, Mass, U.S.A.

PMA- 224: THERMODYNAMICS **2 credits**

1.Introduction: Application Areas of Thermodynamics, Units, Systems and Control Volumes, Density , State and Equilibrium, Proceses and Cycles, Temperature scales and the Zeroth law of Thermodynamics, Limitations of thermodynamics model.

2. Energy Conversion and General Energy Analysis: Froms of Energy, Some Physical Insight to Internal Energy, Mechanical Energy, Energy Transfer by Heat, The First Law of Thermodynamics, Energy Conversion Efficiencies, Energy and Environment.
3. Properties of Pure Substances: Pure Substance, Phases of a Pure Substance, Phase-Change Processes of Pure Substances, Property Tables, The Ideal-Gas Equation of State, Other Equations of State.
4. Energy Analysis of Closed Systems: Energy Balance for Closed Systems, Internal Energy, Enthalpy and Specific Heats of Ideal Gases, Solids and Liquids, Thermodynamic Aspects of Biological Systems.
5.The Second Law of Thermodynamic: Introduction to the Second Law, Thermal Energy Reservoirs, Heat Engines Reversible and Irreversible Process, The Carnot Cycle, The Carnot Principles, Entropy, The Increase of Entropy Principle, Entropy Change of Pure Substances, Entropy Change of Liquids and Solids.

Reference:
1. Fundamentals of Thermodynamics, 6th Edition, Richard E. Sonntag, Claus Borgnakke, Gordon J. Van Wylen, Wiley.
2. Themodynamics-An Engineering Approach, Yunus A. Cengle & Michael Boles.
3. Thermodynamics of Natural Systems: 2nd Edition, Greg Anderson, Cambridge University Press.
4. Heat and Thermodynamics, Mark W. Zemansky and Richard H. Dittman, McGraw-Hill.
5. Basic and Applied Thermodynamics, PK Nag, McGraw-Hill.

PMLA- 103 : 1st Year Physics Minor Practical   **2 credits**

1. Determination of the Value of g by compound pendulum.
2. Determination of the spring constant and effective mass of a given spiral spring and hence to calculate the rigidity modulus of the material of the spring.
3. Determination of Young's Modulus and Modulus of Rigidity of the material of a wire by (Searle's) dynamic method.
4. Detarmination of surface tension of water at room temperature by capillary tube method.
5. Determination of surface tension of mercury by Quincke's method.
6. Variation of viscosity of water with temperature.
7. Determination of the specific heat of a solid by the method of mixture with radiation correction.
8. Determination of the specific heat of a liquid by the method of cooling.
9. Varification of the laws of transveres vibration of a string. n-1, 1-T curves.

PMLA- 204: 2nd Year Physics Minor Practical   **2 credits**

1. Experiments with a post office box:
   (i) Determination of an unknown resistance
   (ii) verification of the laws of combination of resistances.
2. Determination of the galvanometer resistance by half-deflection method.
3. Determination of the galvanometer resistance by Kelvin's method.
4. Determination of low resistance by the method of fall of potential.
5. Measurement of high resistance by the method of deflection.
6. Comparison of emf of two cells.
7. Measurement of the angle of a prism using a spectrometer and determination of refractive index of the materials of the prism by minimum deviation method.
8. Determination of wavelength of sodium light by means of Newton's rings.
9. Determination of wavelength of sodium light by using a biprism.
10. 10.Determination of wavelength of light using a plane diffraction grating

UNIVERSITY OF DHAKA (For Affiliated Colleges)
PHYSICS DEPARTMENT
Three - Year B.Sc. (Pass) Courses

Effective from 2017-2018 Session

The B.Sc. (Pass) Degree Program: The B.Sc.(Pass) degree program in Physics of the affiliated colleges of University of Dhaka is a 3-year program consisting of three academic sessions, each having duration of 12 calendar months;

Definition of a credit
        The credit is defined as follows:
i) For theoretical courses, 15 class lectures = 1 credit
ii) Each class is of 50 minutes duration.
iii) For Lab courses, 30 hour lab work = 1 credit

Credit requirements for the 3 year B.Sc. (Pass)
1. Total Number of Credits required is 28 distributed over 3 years.
2. The 1st year distribution of credits is as follows:-

	Theory	Expt.	Grand Total
First Year	12	0	12

3. Rules regarding examinations,

The rules regarding examinations, fees promotion etc. will remain the same as contained in the ″Rules for Honours Courses under the Integrated Courses System of the University of Dhaka″ relevant to the session and any subsequent changes.

4. Course name, Major Courses and credits.

(A) First Year B.Sc. (Pass) (8 credits)

1. PHP 101 : Mechanics and Waves	2
2. PHP 102 : Thermal Physics	2
3. PHP 103 : Electricity and Magnetism	2
4. PHP 104 : Introduction to Computer and Programming	2
5. স্বাধীন বাংলাদেশের অভ্যুদয়ের ইতিহাস	4

                                                                    12

1. PHP 101: Mechanics and Waves   2 credits

(i) Vectors   11 lect.
Addition and Subtraction. Unit Vectors. Scalar and Vector Products, Scalar Triple Product. Vector Triple Product. Scalar and Vector Fields. Gradient, Divergence and Curl, Greens theorem, Gauss and Stokes' Theorems. Curvilinear coordinates.

(ii) Particle dynamics   4 lect.
Motion in one dimension, Motion in two and three dimension, Application of Newton's law, Conservation of linear momentum, Work and energy. Conservation laws. Conservative force.

(iii) Simple Harmonic Motion   6 lect
Definition. Combination of Two SHM's. Lissajou's figures. Damped SHM. Forced oscillation. Resonance. Power and intensity of Wave motion, Principle of superpositoin

(iv) Wave in Elastic Media   4 lect.
Longitudinal vibration. Vibration of strings. Beats. Doppler effect.

(v) Rotational Motion   5 lect.
Toque, Neowton's Law of Rotation, Moment of intertia of various Solid bodies, Parallel axis theorem, radius of gyration. Angular momentum, Kater's pendulum.

References :
2. Physics : R. Resnick and D. Halliday (Wiley Eastern, New Delhi). Bangla translation
3. published by the Bangla Academy is also available.
4. Gases, Liquids and Solids ; D. Tabor, Cambridge University Press, Cambridge.
5. The Mechanical Properties of Matter: M.T. Sprackling.
6. The General Properties of Matter: F.W. Newman and V.H.L. Searle. Edward Arrold Publishers London.
7. Properties of Matter : S. Ahmed and A.K. Nath.

2. PHP 102 :Properties of Matter   2 credits

(i) Gravitation Theory   7 lect
Newton's law. Gravitational potential. Calculation of potential, and Force in simple cases. Escape velocity. Planck mass.

(ii) Elementary theory of elasticity   7 lect
Hooke's law. Elastic moduli. Relations between the moduli, Bending of beams, Torsion.

(iii) Surface Tension   5 lect
Adhesive force. Cohesive force. Molecular theory of surface tension, Capillarity. Surface tension of a mercury drop. Variation of surface tension with temperature.

(iv) Viscosity   5 lect
Newton's Law of streamline Flow. Poiseulle's formula. Application, Variation of viscosity with temperature.

(v) Fluid Dynamics   5 lect
Streamline flow. Turbulence. Reynold's number. Bernoulli's theorem applications.

References :
2. Physics : R. Resnick and D. Halliday (Wiley Eastern, New Delhi). Bangla translation published by the Bangla Academy is also available.
3. Gases, Liquids and Solids ; D. Tabor, Cambridge University Press, Cambridge.
4. The Mechanical Properties of Matter : M.T. Sprackling.
5. The General Properties of Matter : F.W. Newman and V.H.L. Searle. Edward Arrold Publishers London.
6. Properties of Matter : S. Ahmed and A.K. Nath.

3. PHP 103 : Electricity and Magnetism   2 credits

(i) Electrostatics   10 lect
Electric intensity and potential. Gauss's law. Electric dipole. Density of charge in a polarised dielectric. Gauss's law for charges in a dielectric. Capacitance co-efficients of potential, Capacitance and induction energy of charged systems. electrical images.

(ii) Magnetostatics   2 lect
Gauss's law. Magnetic dipole. Energy in a magnetic field.

(iii) Direct Current   4 lect
Current and electromotive force. Ohm's law. Combination of resistances and Kirchhoff's Law's wheatstone bridge.

(iv) Magnetic field of a current and Ampere's law. Biot-Savart law. Magnetic fields of simple circuits. Galvanometers. Lorentz force. CRT.   5 lect

(v) Electromagnetic Induction   4 lect
Faraday's law. Self-inductance. Mutual inductance.

(vi) Alternating Current   5 lect
Generation of AC. RMS value. Power factor. CR and LR circuits. Gain, Decibel.

References :
8. Physics : R, Resnick and D. Halliday, Wiley Eastern, New Delhi.
9. Principles of Electricity : L. Page and N.L. Adams. D.Van Nostrand Company, N.J.
10. Electricity and Magnetism : S.G. Starling, Longmann-Green and Co., London.
11. Electromagnetic Fields and waves : Paul Lorrain and Dale Corson. D.B. Taraporevala Sons and Co., Bombay.
12. Bidyat O Chumbak, A.M. Harun ar Rashid ; Techno Mission, Gulshan, Dhaka.
13. Fundations of Electromagnetic Theory : John R. Reitz, F.J. Milford and R.W. Christy Addison- Wesley. Mass, U.S.A.
14. Concepts of Electricity and Magnetism, M.S. Huq-A.K. Rafiqullah and A.K.Roy, Students' Publications, Dhaka

PHP-104: Introduction to Computer and Programming　　　　　　　**2 Credits**

PART-I: COMPUTING BASICS

Generations of computer. Types of computer, Block diagram of a computer. Functions of the different units: Input unit, Output unit, Memory unit, CPU: ALU, CU.　　　　2 lect.

Input and Output Devices (Basic Idea): Keyboard, Data scanning devices, Card reader, Digitizers, Monitor, Printer, Projector, etc.　　　　　　　　　　　　　　1 lect.

Memories (Basic Idea): Registers, Cache memory, Primary memory, Secondary memories.
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　1 lect.
Software: System software: Operating system and Utility software, Application software, Linux operating system: Some basic commands in Linux.　　　　　　　　1 lect.

Number System and Codes: Binary number system: Decimal to binary and Binary to Decimal Conversion. Octal Number System, Hexadecimal Number System. BCD Code, Alphanumeric Codes: ASCII Code, Parity Bit.　　　　　　　　　　　　　2 lect.

Digital Arithmetic: Binary Addition, Signed Numbers, 2's- Complement System, Addition and Subtraction in 2's Complement System, BCD addition, Design of a Half and Full Adder.
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　2 lect.
Logic Gates and Boolean algebra: Boolean Constant and Variables, Truth Tables, *Basic Logic Operations and Gates*: OR, AND, and NOT, Universal Gates: NAND and NOR, *Complex Gates*: XOR & NOR, Boolean Theorems, DeMorgan's Theorem. Universality of NAND and NOR Gates.　　　　　　　　　　　　　　　　　　　　　4 lect.

Part – II: PROGRAMMING (C/C++)

Programming Language Translators: Assembler, Compiler and Interpreter. **Computer Languages:** Machine language, Assembly language, High level language. **Flow Chart** and **Algorithms.**　　　　　　　　　　　　　　　　　　　　　　　　　1 lect.

C Fundamentals: An Overview of "C/C++" Programming, Identifiers and Key words, Data Types, Constants, Variable and Arrays, Declarations, Expressions, Statements, Symbolic Constants.　　　　　　　　　　　　　　　　　　　　　　　　　　　4 lect.

Operators and Expressions: Arithmetic Operations, Increment and Decrement, Unary Operators, Relation and Logical Operators, Assignment Operators, Type Conversion in Assignments, Multiple Assignments, Conditional Operator, Library Functions.　　4 lect.

Data Input and Output: Single Character Input, Single Character Output, Entering Input Data, Writing Output Data.　　　　　　　　　　　　　　　　　　　3 lect.

Control Statements: *if* Statement, *if-else* Statements, Nested *if* Statements, *for* Loop, *while* Loop, *do-while* Loop, Nested Loops, *switch* Statement, *continue* Statement, *break* Statement, *goto* Statement.　　　　　　　　　　　　　　　　　　　　　　　5 lect.

Books recommended:

1. Tocci and Widmer. Digital Systems, Prentice Hall
2. Morris Mano,Digital Logic & Computer Design
3. Alvis J. Evans. Basic Digital Electronics
4. Herbert Schildt. C: The Complete Reference
5. Herbert Schildt. C++: The Complete Reference
6. Kernighan B.W. and Ritchie D.M. C Programming Language.
7. King K. N.C Programming: A Modern Approach.
8. Greg Perry. Absolute Beginner's Guide To C.
9. Sinha P.K. Computer Fundamentals

স্বাধীন বাংলাদেশের অভ্যুদয়ের ইতিহাস   **(4 Credits)**

ভূমিকাঃ স্বাধীন বাংলাদেশের অভ্যুদয়ের ইতিহাস-পরিধি ও পরিচিতি

১। দেশ ও জনগোষ্ঠির পরিচয়

ক) ভূ প্রকৃতির বৈশিষ্ট্য ও প্রভাব

খ) নৃতাত্ত্বিক গঠন

গ) ভাষা

ঘ) সংস্কৃতির সমন্বয়বাদিতা ও ধর্মীয় সহনশীলতা

ঙ) অভিন্ন বাংলার পরিপ্রেক্ষিতে তৎকালীন পূর্ববঙ্গ ও বর্তমান বাংলাদেশের স্বকীয় সত্তা

২। অখণ্ড স্বাধীন বাংলা রাষ্ট্র গঠনের প্রয়াস ও উপমহাদেশের বিভক্তি, ১৯৪৭

ক) ঔপনিবেশিক শাসন আমলে সাম্প্রদায়িকতার উদ্ভব ও বিস্তার

খ) লাহোর প্রস্তাব, ১৯৪০

গ) অখণ্ড স্বাধীন বাংলা রাষ্ট্র গঠনের উদ্যোগ, ১৯৪৭ ও পরিণতি

ঘ) পাকিস্তান সৃষ্টি, ১৯৪৭

৩। পাকিস্তানঃ রাষ্ট্রীয় কাঠামো ও বৈষম্য

ক) কেন্দ্রীয় ও প্রাদেশিক কাঠামো

খ) সামরিক ও বেসামরিক আমলাতন্ত্রের প্রভাব

গ) অর্থনৈতিক, সামাজিক ও সাংস্কৃতিক বৈষম্য

৪। ভাষা আন্দোলন ও বাঙালির আত্মপরিচয় প্রতিষ্ঠা

ক) মুসলিম লীগের শাসন ও গণতান্ত্রিক রাজনীতির সংগ্রাম

খ) আওয়ামী লীগের প্রতিষ্ঠা, ১৯৪৯

গ) ভাষা আন্দোলন: পটভূমি ও ঘটনা প্রবাহ

ঘ) হক-ভাসানী-সোহরাওয়াদীর যুক্তফ্রন্ট, ১৯৫৪ সালের নির্বাচন ও পরিণতি

৫। সামরিক শাসনঃ আইয়ুব খান ও ইয়াহিয়া খানের শাসনামল (১৯৫৮-৭১)

ক) সামরিক শাসনের সংজ্ঞা ও বৈশিষ্ট্য

খ) আইয়ুব খানের ক্ষমতা দখল ও শাসনের বৈশিষ্ট্য (রাজনৈতিক নিপীড়ন, মৌলিক গণতন্ত্র, ধর্মের রাজনৈতিক ব্যবহার)

গ) আইয়ুব খানের পতন ও ইয়াহিয়া খানের শাসন, এক ইউনিট বিলুপ্তিকরণ, সার্বজনীন ভোটাধিকার, এলএফও (Legal Framework Order)

৬। জাতীয়তাবাদের বিকাশ ও স্বাধিকার আন্দোলন

ক) সাংস্কৃতিক আগ্রাসনের বিরুদ্ধে প্রতিরোধ ও বাঙালি সংস্কৃতির উজ্জীবন

খ) শেখ মুজিবুর রহমানের ৬-দফা আন্দোলন

গ) ৬-দফা আন্দোলনের প্রতিক্রিয়া, গুরুত্ব ও তাৎপর্য

ঘ) আগরতলা মামলা, ১৯৬৮

৭। **১৯৬৯-এর গণঅভ্যুত্থান ও ১১-দফা আন্দোলন**

ক) পটভূমি

খ) আন্দোলনের কর্মসূচী, গুরুত্ব ও পরিণতি

৮। **১৯৭০ এর নির্বাচন, অসহযোগ আন্দোলন ও বঙ্গবন্ধুর স্বাধীনতা ঘোষণা**

ক) নির্বাচনের ফলাফল এবং তা মেনে নিতে কেন্দ্রের অস্বীকৃতি

খ) অসহযোগ আন্দোলন, বঙ্গবন্ধুর ৭ই মার্চের ভাষণ, অপারেশন সার্চলাইট

গ) বঙ্গবন্ধুর স্বাধীনতা ঘোষণা ও গ্রেফতার

৯। **মুক্তিযুদ্ধ ১৯৭১**

ক) গণহত্যা, নারী নির্যাতন, শরণার্থী

খ) বাংলাদেশ সরকার গঠন ও স্বাধীনতার ঘোষণাপত্র

গ) স্বতঃস্ফূর্ত প্রাথমিক প্রতিরোধ ও সংগঠিত প্রতিরোধ (মুক্তিফৌজ, মুক্তিবাহিনী, গেরিলা ও সম্মুখ যুদ্ধ)

ঘ) মুক্তিযুদ্ধে প্রচার মাধ্যম (স্বাধীন বাংলা বেতার কেন্দ্র, বিদেশী প্রচার মাধ্যম ও জনমত গঠন)

ঙ) ছাত্র, নারী ও সাধারণ মানুষের অবদান (গণযুদ্ধ)

চ) মুক্তিযুদ্ধে বৃহৎশক্তি সমূহের ভূমিকা

ছ) দখলদার বাহিনী, শান্তিকমিটি, আলবদর, আলশামস, রাজাকার বাহিনী, রাজনৈতিক দল ও দেশীয়
    অন্যান্য সহযোগীদের স্বাধীনতাবিরোধী কর্মকান্ড ও বুদ্ধিজীবী হত্যা

জ) পাকিস্তানে বন্দি অবস্থায় বঙ্গবন্ধুর বিচার ও বিশ্বপ্রতিক্রিয়া

ঝ) প্রবাসী বাঙালি ও বিশ্বের বিভিন্ন দেশের নাগরিক সমাজের ভূমিকা

ঞ) মুক্তিযুদ্ধে ভারতের অবদান

ট) যৌথ বাহিনী গঠন ও বিজয়

ঠ) স্বাধীনতা সংগ্রামে বঙ্গবন্ধুর নেতৃত্ব

১০। **বঙ্গবন্ধু শেখ মুজিবুর রহমানের শাসনকাল, ১৯৭২-১৯৭৫**

ক) স্বদেশ প্রত্যাবর্তন

খ) সংবিধান প্রণয়ন

গ) যুদ্ধ বিধ্বস্ত দেশ পুনর্গঠন

ঘ) সপরিবারে বঙ্গবন্ধু হত্যা ও আদর্শিক পটপরিবর্তন

সহায়ক গ্রন্থ

১। নীহার রঞ্জন রায়, *বাঙালীর ইতিহাস*, দে' জ পাবলিশিং, কলকাতা ১৪০২ সাল।

২। সালাহ্ উদ্দিন আহমেদ ও অন্যান্য (সম্পাদিত), *বাংলাদেশের মুক্তি সংগ্রামের ইতিহাস ১৯৪৭-১৯৭১*, আগামী
    প্রকাশনী, ঢাকা ২০০২।

৩। সিরাজুল ইসলাম (সম্পাদিত), *বাংলাদেশের ইতিহাস ১৭০৪-১৯৭১*, ৩ খণ্ড, এশিয়াটিক সোসাইটি অব বাংলাদেশ,
    ঢাকা ১৯৯২।

৪। ড. হারুন-অর-রশিদ, *বাংলাদেশ: রাজনীতি, সরকার ও শাসনতান্ত্রিক উন্নয়ন ১৭৫৭-২০০০*, নিউ এজ পাবলিকেশন্স,
    ঢাকা ২০০১।

৫। ড. হারুন-অর-রশিদ, *বাঙালির রাষ্ট্রচিন্তা ও স্বাধীন বাংলাদেশের অভ্যুদয়*, আগামী প্রকাশনী, ঢাকা ২০০৩।

৬। ড. হারুন-অর-রশিদ, *বঙ্গবন্ধুর অসমাপ্ত আত্মজীবনী পুনর্পাঠ*, দি ইউনিভার্সিটি প্রেস লিমিটেড, ঢাকা ২০১৩।

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