DEPARTMENT OF PHYSICS

Faculty of Science and Engineering

University of Barishal.

Curriculum for the B.S. (Honors) Program

for Session: 2023-24

(Content for only 2nd Semester)

Credits:19.5

1. **Title of the Program**: Bachelor of Science (B.S)
2. **Name of the University**: University of Barishal.
3. **Vision of the University**: The University of Barishal envisages being a centre of excellence for producing skilled human resources, outstanding researchers and forward-thinking leaders to ensure sustainable development of the country and to meet global challenges.
4. **Mission of the University**:

   UM1: Nurturing a favorable academic environment by maintaining congenial inter-personal and professional relationships among academics, non-academic staffs and learners.

   UM2: Promoting a research based higher education by creating new knowledge complying with humanitarian and ethical values.

   UM3: Producing skilled manpower and resourceful intellectuals to ensure sustainable development of the country and to meet global challenges.

   UM4: Creating global leaders by ensuring a transformative educational experience which will foster creativity, life-long autonomous learning and entrepreneurship.

   UM5: Producing global citizens with moral and ethical values who will uphold national consciousness along with a liberal attitude towards diversities of the society.

   UM6: Expanding the frontiers of knowledge in collaboration with leading universities, research organizations and industries.
5. **Name of the Program Offering Entity:** B.S. (Honors) in Physics
6. **Vision of the Program Offering Entity:** To ensure skilled, qualified and innovative human resources; creating knowledge of technology based smart world.

   Quality Physics Education and Research to explore nature and to meet up the future scientific challenge.
7. **Mission of the Program Offering Entity:** To build skilled human resources by creating and expanding opportunities for higher education, research, modern knowledge practice at the national level and to establish a fully technology-based University.
8. **Objective of the Program Offering Entity:** Physics
9. **Name of the Degree:** B.S. (Honor's) in Physics

10. **Description of the Program:** Bachelor of Science (Honors) in Physics is a 4 (four) academic year program where each academic year is divided into 2 (two) semesters i.e. the whole program is divided into eight semesters. A semester, conducted for a period of 6 (six) months, is named as either 1st semester or 2nd semester in each academic year. Examination shall be held at the end of each semester. A minimum requirement is set up by the university authority for the students for promoting from one year to another year. A credit system is used in this case where a student required clearing all 147-credits course for the program.

11. **Graduate Attributes (based on need assessment):**

Enhanced Disciplinary Knowledge: Students will be able to -

a) Apply the fundamentals and applications of physics related concepts and theoretical knowledge.

b) Exercise on good laboratory practice along with designing, executing and analyzing experimental and theoretical problems.

c) Implement the experimental and computational methods software to analyze sophisticated problems and represent their findings.

Creative Thinking and Problem Solving: Students will be able to –

a) Identify and evaluate scientific issues regarding the discipline and able to integrate concepts, ideas and skills learned to perform qualitative and quantitative analysis and reasoning to solve issues.

b) Use their ability to think creatively to design and perform new to novel research individually and collaboratively as a team which contributes to make smart world.

Communication and IT: Students will be able to –

a) Communicate and exchange relevant knowledge and ideas clearly and effectively to the scientific community.

b) Prepare and present the rational and concise scientific articles or reports in oral, written and/or electronic visual formats.

c) Use modern electronic devices and developed apps for communication.

Independence, Integrity and Morality: Students will be able to –

a) Maintain the academic and professional integrity as well as be able to develop capacity to work independently and confidently.

b) Develop understanding of moral and ethical values of scientific and professional works including research findings, intellectual property and company secrecy.

c) Manage the interactions between one's personal and professional interests in the context of ethical point of view.

12. Program Educational Objectives (PEOs):

PEO1: Knowledge and skills in relevant fields- to provide the students in-depth understanding of major concepts of Physics and scientific methods in a congenial teaching-learning environment.

PEO2: Problem solving skills- pursue lifelong learning through postgraduate education and continued development of technical and managerial skills to make a global citizen.

PEO3: Technical skills- To provide students necessary technical skills for a successful career in Physics and other related fields worldwide. These skills include up to date knowledge in mathematics, computer programming, technology as well as communication skills focusing on global job market.

PEO4: Research and Collaboration- To enhance students research in a preferable research program using resources available in the department and facilitating the use of global resources and expertise through collaboration with the leaders of a particular field and industries.

PEO5: Moral and Ethics- Discharge their professional and societal obligations displaying high moral and ethical standards.

13. Program Learning Outcomes (PLOs):

PLO1: Applying basic principles of Physics to explain and predict a variety of natural phenomena.

PLO2: Employing advanced mathematical techniques in their explanations and predictions of physical phenomena.

PLO3: Measuring physical observables in any experiments and analyzing these results to draw conclusions about the physical systems under investigation.

PLO4: Developing skills in oral and written domain of English language and thereby communicating effectively in the scientific context.

PLO5: Participating group works and contributing efficiently in a shared project.

PLO6: Raising consciousness about the contemporary national and global demands and ethical standard.

14. Mapping Mission of the University with PEOs:

	UM-1	UM-2	UM-3	UM-4	UM-5	UM-6
PEO1	√	√				
PEO2			√	√	√	
PEO3			√	√	√	
PEO4		√				√
PEO5		√			√	

Mission of the University	**PEO1**	**PEO2**	**PEO3**	**PEO4**	**PEO5**	**PEO6**	**PEO7**
To contribute to the development of Bangladesh by producing skilled human resources through ensuring quality and research-based higher education.	√	√	√	√	√	√	√

15. Mapping PLOs with the PEOs:

PLOs	PEO1	PEO2	PEO3	PEO4	PEO5	PEO6	PEO7
PLO1	√	√	√	√			
PLO2	√	√	√		√		
PLO3	√	√	√		√		
PLO4		√	√	√	√	√	
PLO5		√	√		√	√	
PLO6				√	√	√	
PLO7	√						√
PLO8				√		√	√

16. Mapping between CLO's and PLO's:

Course Title: **Electricity & Magnetism**	Credits: **3.0**
Course Code: **0533-PHY-1201**	Marks: **100**

Course Learning Outcomes (CLOs): At the end of the course, the student will be able to-

CLOs	**Statement**
CLO1	Understand and explain the basic concepts of electricity and magnetism.
CLO2	Know the applications of electricity and magnetism in everyday life by investigating and comparing electric and magnetic phenomena.
CLO3	Understand about the electromagnetism.
CLO5	Solve mathematical problems related to electricity and magnetism.

Mapping of CLOs with PLOs:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	✓	✓		✓		
CLO2	✓	✓	✓			✓
CLO3	✓	✓	✓			✓
CLO4	✓	✓	✓			✓

Course Contents:

1. **Electrostatics:**

   Point charges and Coulomb's law; Electric field; Electric field due to a dipole; Dipole in electric field; Gauss's law and its applications; Coulomb's law from Gauss's law; Gauss's law with dielectric; Capacitance and capacitor; Parallel plate capacitors and spherical capacitors; Energy stored in a capacitor; Equivalence Capacitance; Capacitor with a dielectric.

2. **Electric Current:**

   Current density; Drift velocity; Conductors and Ohm's law; Resistance and resistivity; Electromotive force and potential drop; Kirchhoff's law.

3. **Magnetic Field and Interactions:**

   a) Magnetic field; Lorentz force; Hall effect; Magnetic fields due to current; Biot-Savart Law; Magnetic fields due to current-carrying conductors; Ampere's law; Comparison between Biot-Savart law and Ampere's law.

   b) Magnetic properties of matter: Paramagnetism, Diamagnetism and Ferromagnetism; Hysteresis.

4. **Alternating Current:**

   Faraday's law of electromagnetic induction; Lenz's law; Induction: Self and mutual induction; Single-loop RL circuit and the time constant; Energy stored in magnetic fields; Single-loop RC circuit: charging and discharging of a capacitor and the time constant; Resonance and anti-resonance in LCR circuit.

Recommended Books:

a. D. Halliday, R. Resnick & K.S. Krane: Physics Vol. 2

b. A. Kip: Fundamentals of Electricity and Magnetism

c. K.K. Tewari: Electricity and Magnetism with Electronics

d. H.D. Young: University Physics

Course Title: **Vector Analysis**	Credits: **2.0**
Course Code: **0533-PHY-1202**	Marks: **50**

Course Learning Outcomes (CLOs): At the end of the course, the student will be able to-

CLOs	**Statement**
CLO1	Explain the basic concepts of vectors.
CLO2	Compute derivatives of vector-valued functions and apply vector differential operators like gradient, divergence and curl.
CLO3	Interpret the physical significance of vector operators in various physical contexts.
CLO4	Understand and evaluate different vector integrals.
CLO5	Apply fundamental vector theorems such as Gauss', Green's and Stokes' theorems to solve physical problems.

Mapping of CLOs with PLOs

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	✓	✓				
CLO2	✓	✓				
CLO3	✓	✓	✓			
CLO4	✓	✓				
CLO5	✓	✓	✓		✓	✓

Course Contents:

1. **Vectors and Product of Vectors:**

   Introduction to Vectors; Vector space R^n; Scalar and vector products; Scalar triple product; Vector triple product; Reciprocal sets of vectors.

2. **Vector Differentiation:**

   Ordinary derivatives of vector-valued functions; Space curves; Differentiation formulae; Partial derivatives of vectors; Differentials of vectors; Vector differential operator; Gradient, Divergence, Curl and their physical significance.

3. **Vector Integration:**

   Ordinary integrals of vector-valued functions; Line integrals; Surface integrals; Volume integrals.

4. **Theorems:**

   The Divergence Theorem of Gauss; Green's Theorem; Stokes' Theorem; Related integral theorems.

5. **Curvilinear Coordinates:**

   Transformation of coordinates; Orthogonal curvilinear coordinates; Unit vectors in curvilinear systems; Rectangular, Spherical, Polar and Cylindrical coordinates and their relations; Arc length, surface and volume elements in different coordinates.

Recommended Books:

- **a.** Murray R. Spiegel: Vector Analysis and an Introduction to Tensor Analysis
- **b.** H. Lass: Vector and Tensor Calculus
- **c.** S. M. Farid: Introduction to Vectors and Special Functions

Course Title: **Heat and Thermodynamics**	Credits: **3.0**
Course Code: **0533-PHY-1203**	Marks: **100**

Course Learning Outcomes (CLOs): At the end of the course, the student will be able to-

CLOs	**Statement**
CLO1	Explain the kinetic theory of gases, heat and basic thermal concepts.
CLO2	Apply the laws of thermodynamics to physical and theoretical systems.
CLO3	Analyze thermodynamic potentials and classify phase transitions.
CLO4	Evaluate radiation phenomena and interprete Planck's law and quantum hypothesis.

Mapping of CLOs with PLOs:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	✓				✓	
CLO2	✓			✓		✓
CLO3	✓	✓		✓		
CLO4			✓			✓

Course Contents:

1. **Kinetic Theory of Gases and Thermal Concepts:**

   Concept of heat and temperature; Temperature scales and thermometry; Macroscopic vs. microscopic properties; Brownian motion; Mean free path; Deduction of the ideal gas equation; Equipartition of energy; Degrees of freedom.

2. **Fundamental Laws of Thermodynamics:**

   Zeroth law of thermodynamics; Intensive and extensive variables; P-V diagrams; Isotherms and adiabatic processes; Equation of state: Ideal gas vs. real gases; Van der Waals equation and critical

parameters; First law of thermodynamics; Difference between heat and work; Internal energy; Reversible and irreversible processes; Quasistatic processes; Work, heat and internal energy in different processes; Second law of thermodynamics; Carnot's theorem; Concept of entropy as a state function; Entropy changes in reversible and irreversible processes; Entropy as a measure of microscopic states; Boltzmann entropy formula; Third law of thermodynamics.

3. **Thermodynamic Potentials and Phase Transitions:**

   Thermodynamic potentials: Enthalpy; Helmholtz free energy; Gibbs free energy; Cooling of gases: Free expansion; Throttling (Joule-Thomson process); Seebeck, Peltier and Thomson effects; Classification of phase transitions; First-order and second-order phase transitions; Clausius-Clapeyron equation; Chemical potential; Gibbs phase rule.

4. **Thermodynamics of Radiation:**

   Blackbody radiation; Thermodynamics of radiation; Stefan's law; Rayleigh-Jeans law and ultraviolet catastrophe; Wien's displacement law; Planck's displacement law; Planck's distribution law and quantum hypothesis.

Recommended Books:

- **a.** Brijlal & N. Subrahmanyam: Heat, Thermodynamics and Statistical Physics
- **b.** D.S. Mathur: Heat and Thermodynamics
- **c.** Meghnad Saha & B.N. Srivastava: A Treatise on Heat
- **d.** S.C. Garg, R.M. Bansal & C.K. Ghosh: Thermal Physics
- **e.** K.C. Gupta & B. Saxena: Thermal Physics
- **f.** M. Wali Khan: Advanced Thermodynamics

Course Title: **Chemistry-II**	Credits: **2.0**
Course Code: **0531-PHY-1204**	Marks: **50**

Course Learning Outcomes (CLOs): At the end of the course, the student will be able to-

CLOs	**Statement**
CLO1	Explain atomic models and the quantum basis of electronic configurations.
CLO2	Correlate periodic properties with element classification and behavior.
CLO3	Identify and describe the chemical behavior of specific elemental groups.
CLO4	Apply nomenclature rules and explain reactions of common aliphatic and aromatic compounds.

Mapping of CLOs with PLOs:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	✓		✓		✓	
CLO2			✓			✓

CLO3		✓	✓			
CLO4		✓	✓			✓

Course Contents:

1. **Atomic Structure:**

   Elementary ideas of atomic structure; Rutherford atomic model; quantum numbers; atomic orbitals and their energies, shapes and orientation; Pauli exclusion principle; Aufbau principle; Hund's rule; electronic configurations.

2. **Periodic Classification of Elements:**

   Modern periodic table; Periodic classification of elements; Correlation of periodic classification with electronic configuration; Investigation on some periodic properties; Ionization potential; Electron affinity; Electro negativity.

3. **Group Study of Elements:**

   Alkali metals; Alkaline earth metals; Halogens; Inert gases and transition elements.

4. **Aliphatic Compounds:**

   Nomenclature of organic compounds; Preparation and properties of alcohols; Halides; Aldehydes; Ketones and carboxylic acids.

5. **Aromatic Compound:**

   Aromaticity; Orientations; Preparations and properties of benzene, phenol, nitrobenzene and aniline; Alicyclic and heterocyclic compounds.

Recommended Books:

- **a.** M. Ahmed & A. Jabbar: Organic Chemistry
- **b.** I.M. Finer: Organic Chemistry
- **c.** E. Gilreath: Fundamental Concepts of Inorganic Chemistry
- **d.** D.K. Seberra: Electronic Structure and Chemical Bonding
- **e.** B.S. Bahl and A. Bahl: Advanced Organic Chemistry

Course Title: **Mathematics-II**	Credits: **2.0**
Course Code: **0541-PHY-1205**	Marks: **50**

Course Learning Outcomes (CLOs): At the end of the course, the student will be able to-

CLOs	**Statement**
CLO1	Solve systems of linear equations using matrices and determinants.
CLO2	Demonstrate understanding of vector spaces and linear transformations.
CLO3	Analyze and compute eigenvalues, eigenvectors and apply diagonalization.

CLO4	Apply coordinate transformations and interpret the geometry of conic sections.

Mapping of CLOs with PLOs:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	✓	✓				
CLO2	✓	✓				
CLO3	✓	✓				
CLO4	✓	✓				

Course Contents:

1. **System of Linear Equations:**
   System of linear equations (homogeneous and non-homogeneous) and their solutions; Application of matrices and determinants for solving system of linear equations.
2. **Vector Spaces:**
   Notions of groups and fields; Abstract vector space, subspace; Linear independence of vectors; Basis and dimension of vector spaces; rank of matrices; Solution spaces of systems of linear equations.
3. **Linear Transformations:**
   Linear transformations; Kernel and image of a linear transformation and their properties; Matrix representation of linear transformations; Change of bases.
4. **Eigenvalues and Eigenvectors:** Eigenvalues and eigenvectors; Diagonalization; Cayley-Hamilton theorem and its applications.
5. **Transformation of Coordinates and Pair of Lines:**
   Transformation of Coordinate Axes and Its Uses; Pair of Straight Lines: Homogeneous Equations of Second Degree; Angle Between a Pair of Straight Lines; Pair of Lines Joining the Origin to the Point of Intersection of Two Given Curves; System of Circles: Circles; Orthogonal Circles; Radical Axis, Radical Center, Properties of Radical Axes; Coaxial Circles and Limiting Points.
6. **Conic Sections and Their Properties:**
   Equation of Conics and Their Reduction to Standard Forms: Equation of Parabola; Equation of Ellipse; Equation of Hyperbola (in Cartesian and Polar Coordinates); Tangents and Normals: Pair of Tangents; Chord of Contact; Chord in Terms of Its Middle Points; Pole and Polar; Parametric Coordinates; Diameters and Conjugate Diameters and Their Properties; Director Circles and Asymptotes.

Recommended Books:

- **a.** Askwith: Coordinate Geometry
- **b.** Rahman & Bhattacharjee: Coordinate Geometry
- **c.** Smith: Coordinate Geometry

d. Chaki, M. C: Coordinate Geometry

e. Loney, S. L: Coordinate Geometry

f. Bamside and Pantion: Theory of Equations

g. Bemard and Child: Higher Algebra

h. Hall, HS and Knight, SR: Higher Algebra

Course Title: **Bangladesh Studies**	Credits: **2.0**
Course Code: **0222-PHY-1206**	Marks: **50**

Course Learning Outcomes (CLOs): At the end of the course, the student will be able to-

CLO Code	**Statement**
CLO1	Describe the geography, natural resources and environmental issues of Bangladesh.
CLO2	Explain and interpret the historical and political developments of Bangladesh's independence.
CLO3	Identify and evaluate the structure and functions of constitutional bodies and governance systems.
CLO4	Examine the goals and challenges of Bangladesh's foreign policy and its response to globalization.

Mapping of CLOs with PLOs:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	✓					✓
CLO2	✓			✓	✓	✓
CLO3	✓	✓		✓		
CLO4			✓	✓	✓	✓

Course Contents:

1. **Geography, Environment and Natural Resources**

   Geography of Bangladesh, covering topographical features of various areas and regions and their developments over time; Environmental challenges and prospects with a focus on conservation, preservation and sustainability; Sustainable management and harnessing of Bangladesh's natural resources.

2. **History of Bangladesh**

   History of Bangladesh, from ancient times to recent developments; Language Movement (1952); 1954 Election; Six-Point Movement (1966); Mass Upsurge (1968–69); General Elections (1970); Non-cooperation Movement (1971); Bangabandhu's Historic Speech on 7th March; Formation and functions of Mujibnagar Government; Liberation War; Role of major powers and UN during war; Surrender of Pakistani Army; Return of Bangabandhu; Withdrawal of Indian armed forces.

3. Constitution and Governance

Constitution of People's Republic of Bangladesh (preamble, features, directive principles of state policy and amendments); Three organs of government (legislature, executive and judiciary): their structures, powers and functions; Legislative representation, law-making, financial responsibilities and oversight functions; Executive powers and responsibilities of President and Prime Minister, Cabinet, Council of Ministers; Bureaucracy; Law enforcement agencies and administrative setups at national and local levels; Judicial structure and organization (Supreme Court, High Court and subordinate courts); Separation from executive.

4. Foreign Policy and Globalization

Foreign policy of Bangladesh, its goals, determinants and formulation process; Geo-political considerate and environmental diplomacy; Participation in international organizations (UN, SAARC, OIC, BIMSTEC and D-8); Engagement with global economic institutions (WTO, World Bank, IMF, ADB and IDB); Impact of globalization on Bangladesh's economic and political landscape.

Recommended Books:

a. Haroun Er Rashid: Geography of Bangladesh

b. মোহাম্মদ আবদুল ওয়াহিদ: বাংলাদেশের ভূগোল

c. Willem Van Schendel: A History of Bangladesh

d. আনিসুজ্জামান: একুশে ফেব্রুয়ারি থেকে স্বাধীনতা

e. Ali Riaz: Bangladesh: A Political History since Independence

f. মো. মুনীরুজ্জামান: বাংলাদেশের রাজনীতি ও সরকার

g. Muhammad A. Hakim: Bangladesh Foreign Policy: Realities, Priorities and Challenges

h. গওহর রিজভী: বাংলাদেশের পররাষ্ট্রনীতি: সম্ভাবনা ও চ্যালেঞ্জ

Course Title: **Computer Fundamentals and Programming**	Credits: **2.0**
Course Code: **0611-PHY-1207**	Marks: **50**

Course Learning Outcomes (CLOs): At the end of the course, the student will be able to-

CLOs	**Statement**
CLO1	Explain the basic architecture, components and types of computer systems.
CLO2	Demonstrate the understanding of number systems and logic gates in computer operations.
CLO3	Identify, describe and use various types of software, operating systems and utility programs.
CLO4	Apply word processing, spreadsheet and presentation tools to academic and scientific tasks.
CLO5	Describe the fundamentals of computer networking and internet-based services.

CLO6	Write, debug and execute the C programs for solving basic statistical and physical problems.

Mapping of CLOs with PLOs:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	✓			✓		
CLO2		✓	✓	✓		
CLO3				✓	✓	
CLO4				✓	✓	
CLO5	✓			✓	✓	✓
CLO6	✓	✓	✓	✓		✓

Course Contents:

1. **Computer Fundamentals:** Evolution of computers; Elements of a computer system; Types of computers; Basic computer architecture; Applications of computer, Number systems and fundamental logic gates.
2. **Personal Computer Hardware:** Processor; Main memory; Input and output devices; Storage devices; Modem.
3. **Software:** Categories of software; System software; Functions of an operating system; Types of processing; Language translators; Utility programs; PC operating systems; Computer viruses: categories and preventions.
4. **Application Software:** Word-processing: creating, editing and formatting features; Spreadsheet: creating and editing worksheets; Spreadsheet analysis: formula, functions and charting features; Multimedia presentations.
5. **Networking and Internet:** Different types of networks; Network topologies; Communication media; Internet services: e-mail and e-commerce.
6. **C as Programming Language:** Different type of Computer Languages; Principles of programming; Structured programming concepts; Programming algorithms and flow charts construction; Introduction of C programming language; Basic structure of C program; Writing, Debugging and Running programs using C; Variables; Arithmetic expressions; Data types; Operators and expressions; Character and Logical Data; Control flow; Loops and Logical Expressions; Functions and program structures; Pointers and arrays; Structures; Input/output systems in C; File Processing; Applications to Various Statistical and Physical Problems; Introduction to Simple structures in C++, Introduction to object oriented programming using C++.

Recommended Books:

- **a.** V. Rajaraman : Fundamentals of Computers
- **b.** S. K. Sarkar and A. K. Gupta : Elements of Computer Science
- **c.** Peter Norton and John Goodman : Inside the PC

d. Peter Norton : Introduction to Computers

e. M. Lutfar Rahman : Computer Fundamentals

f. ITL Education Solutions Limited : Introduction to Computer Science

g. Norton, P : Peter Norton's Introduction to Computers

h. SE Hutchinson & SE Sawyer : Computer and Information System

i. Taylor, G G CSE : Computer Studies

Course Title: **Computer Fundamentals and Programming Lab**	Credits: **1.0**
Course Code: **0611-PHY-1208**	Marks: **50**

Course Learning Outcomes (CLOs): At the end of the course, the student will be able to-

CLOs	**Statement**
CLO1	Create and format academic and scientific documents using word processors.
CLO2	Analyze and visualize data using spreadsheets and charts.
CLO3	Design and deliver multimedia presentations for academic use.
CLO4	Write and debug basic C/C++ programs using loops, conditionals, arrays and file operations.

Mapping of CLOs with PLOs:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1				✓		
CLO2	✓	✓	✓			
CLO3				✓		
CLO4	✓	✓	✓			

Lab Modules:

1. **Word Processing**

   Create, edit and format text documents; Insert tables, charts, images and hyperlinks; Utilize templates and advanced features like headers, footers and citations.

2. **Spreadsheet Applications**

   Create and manage worksheets for data analysis; Perform statistical calculations using formulas and built-in functions; Visualize data through graphs and charts; Explore data sorting, filtering and pivot tables.

3. **Presentation Design**

   Design multimedia presentations with animations and transitions; Integrate images, videos and audio files; Create effective and visually appealing slide decks for academic and professional use.

4. **Introduction to Programming Concepts**

Algorithms and Flowcharts: Understand problem-solving techniques and construct flowcharts; C Programming Basics: Writing and debugging simple programs, Handling variables, operators and data types, implementing control structures like loops and conditionals, using arrays and pointers; File Processing: Writing programs to handle file input/output; Introduction to C++: Learn object-oriented concepts like classes and objects.

Recommended Software and Tools:

a. Word Processor: Microsoft Word or LibreOffice Writer.

b. Spreadsheet Tool: Microsoft Excel or Google Sheets.

c. Presentation Software: Microsoft PowerPoint or Canva.

d. Programming IDEs: Code::Blocks, Dev-C++, or Visual Studio Code.

e. Logic Gate Simulation: Logicly or Tinkercad Circuits.

Course Title: **Physics Lab-II**	Credits: **1.5**
Course Code: **0533-PHY-1209**	Marks: **50**

Course Learning Outcomes (CLOs): At the end of the course, the student will be able to-

CLOs	**Statement**
CLO1	Develop the skills for using Instruments.
CLO2	Determine electrical and magnetic properties.
CLO3	Acquire knowledge about different methods.
CLO4	Determine the specific heat and thermal conductivity.

Mapping of CLOs with PLOs:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	✓		✓			
CLO2	✓	✓	✓			
CLO3	✓	✓	✓			
CLO4	✓	✓	✓			

List of Experiments:

1. To determine the specific resistance of a wire using Meter Bridge.
2. To determine the internal resistance of a cell by using Potentiometer.
3. To determine the resistance of a galvanometer by Half Deflection Method.
4. To determine the value of unknown resistance and to verify the laws of series and parallel resistances by means of a Post Office Box.
5. To determine the horizontal component of the earth's magnetic field and the magnetic moment of a magnet by employing Magnetometer.

6. To determine the specific heat of a liquid by the Method of Cooling.
7. To determine the co-efficient of thermal conductivity of a metal using Searle's Apparatus.
8. To determine the value of J the mechanical equivalent of heat by Electrical Method.

Recommended Books:

a. Ahmed, G and Uddin, MS: Practical Physics.

b. Din, K and Matin, MA: Practical Physics.

c. Squires, GL: Practical Physics.

d. C.L. Arora: B.Sc. Practical Physics.

e. Harnam Singh: B.Sc. Practical Physics.

f. Kalimuddin: B.Sc. Practical Physics.

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Course Title: **VIVA-II**	Credits: **1.0**
Course Code: **0533-PHY-1210**	Marks: **50**
