**KURUKSHETRA UNIVERSITY KURUKSHETRA**

**(Established by the State Legislature Act-XII of 1956)**

**(‘A+’ Grade, NAAC Accredited)**

1. 
2. **Scheme of Examination and Syllabus for Undergraduate Programmes**
3. **Course: Physics**
4. Framed in accordance with the National Education Policy (NEP-2020)

(Multiple Entry-Exit, Internships and Choice Based Credit System-LOCF)

1. (Effective from the Academic Session 2022-23)
2. **Department of Physics**
3. **INSTITUTE OF INTEGRATED & HONORS STUDIES**
4. **Kurukshetra University**
5. **Kurukshetra - 136 119**
6. **Haryana (INDIA)**

**KURUKSHETRA UNIVERSITY KURUKSHETRA**

**(Established by the State Legislature Act-XII of 1956)**

**(‘A+’ Grade, NAAC Accredited)**

1. **Scheme of Examination and Syllabus for Undergraduate Programme**
2. **Course: Physics**
3. **(1st and 2nd semester)**

**As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based Credit System-LOCF)**

(w. e. f. from the Academic Session 2022-23)

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| **Semester** | **Course Type** | **Course Code** | **Course Nomenclature**  | **Credits****(L+T+P)** | **Teaching Hours per week** | **Maximum Marks** | **Duration of Examination****(Hrs.)** |
| Internal Assessment | End-semester Examination | Total |
| **1st**  | CC-I/CC-1A | B-Phy-N-101 | Mechanics | 4+0+0 | 4 | 50 | 50 | 100 | 3 |
| B-Phy-N-102 |  Physics Practical-I | 0+0+2 | 4 | 25 | 25 | 50 | 3 |
| **2nd**  | CC-II/CC-1B | B-Phy-N-201 | Electricity, Magnetism and Electromagnetic waves | 4+0+0 | 4 | 50 | 50 | 100 | 3 |
| B-Phy-N-202 |  Physics Practical-II | 0+0+2 | 4 | 25 | 25 | 50 | 3 |

1. Internship @10 credits (450 hrs) after 2nd semester (only for exit option)

**Semester-I**

**Course: Physics**

**(Course Type- Core Course, Course Code: B-PHY-N-101)**

**Nomenclature: Mechanics**

**No. of credits: 4**

**Max. Marks: 100**

**End-semester Examination: 50**

**Internal Assessment: 50**

**Time: 3 hrs.**

**Note:-**

1. Nine questions will be set in total.
2. Question no. 1 will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 5 parts and the answer should be in brief but not in Yes/No.
3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.
4. 20% numerical problems are to be set.
5. Use of scientific (non-programmable) calculator is allowed.

**UNIT-I**

**Fundamentals of Dynamics**: Reference frames. Inertial frames; Review of Newton’s Laws of Motion. Galilean transformations; Galilean invariance. Momentum of variable-mass system: motion of rocket. Motion of a projectile in Uniform gravitational field. Conservation of Energy, Conservative forces, Dynamics of a system of particles. Centre of Mass. Principle of conservation of momentum.

**Non-Inertial Systems:** Non-inertial frames and fictitious forces. Uniformly rotating frame. Laws of Physics in rotating coordinate systems. Centrifugal force. Coriolis force and its applications. Components of Velocity and Acceleration in Cylindrical and Spherical Coordinate Systems.

(Minimum 12 hrs.)

**UNIT-II**

**Rotational Dynamics:** Angular momentum of a particle and system of particles. Torque. Principle of conservation of angular momentum. Rotation about a fixed axis. Moment of Inertia. Calculation of moment of inertia for rectangular, cylindrical and spherical bodies. Kinetic energy of rotation. Motion involving both translation and rotation. Cylinder on an accelerated rough plane, Behaviour of angular momentum vector, Principal axes and Euler’s equations, Elementary Gyroscope, Symmetrical Top.

**Central Force Motion**: Motion of a particle under a central force field. Two-body problem and its reduction to one body problem and its solution. The energy equation and energy diagram. Kepler’s Laws. Satellite in circular orbit and applications. Geosynchronous orbits. Weightlessness.

(Minimum 12 hrs.)

**UNIT-III**

**Oscillations:** Simple Harmonic Oscillations. Differential equation of SHM and its solution. Kinetic energy, potential energy, total energy and their time-average values. Damped oscillation. Forced oscillations: Transient and steady states; Resonance, sharpness of resonance; power dissipation and Quality Factor

**Elasticity:** Elasticity, Stress and Strain, Hooks law, Elastic constants and their relations, Poisson’s ratio, Torsion of cylinder and twisting couple, bending of beam (Bending moment and its magnitude), Cantilever and Centrally loaded beam.

(Minimum 12 hrs.)

**UNIT-IV**

**Special Theory of Relativity:** Michelson-Morley Experiment and its outcome. Postulates of Special Theory of Relativity. Lorentz Transformations. Simultaneity and order of events. Lorentz contraction. Time dilation. Relativistic transformation of velocity, frequency and wave number. Relativistic addition of velocities. Variation of mass with velocity. Massless Particles. Mass-energy Equivalence. Relativistic Doppler effect. Relativistic Kinematics. Transformation of Energy and Momentum, Transformation of Force, Four vectors. Problems of Relativistic Dynamics: Acceleration of charged particle by constant electric field, transverse Electric field.

(Minimum 12 hrs.)

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| **CO No.** | **Course code (B-PHY-N-101): Mechanics** |
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|  **After successfully completing the course, student will be able to:** |

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| CO-1 | Understand the dynamics of system of particles, conservation of energy and momentum; different frame of references, cylindrical and spherical coordinates.  |
| CO-2 | Understand the application of both translational and rotational dynamics motions simultaneously in analyzing rolling with slipping. Analyze the two body Central Force problem and its application.  |
| CO-3 | Explain the properties of systems executing S.H.M. motions. Also, understand the principles and basic terms related to elasticity.  |
| CO-4 | Appreciate the concepts and Applications of special theory of relativity. |

**REFERENCES**

1. Mechanics “Berkeley Physics Course Vol. I”, Charles Kittel, Tata McGraw-Hill
2. Mechanics, D.S. Mathur, S. Chand and Company Limited, 2000
3. Elements of Properties of Matter, D.S. Mathur, S .Chand & Com. Pt. Ltd., New Delhi
4. Physics, Resnick, Halliday & Walker, Wiley
5. Physics for scientists and Engineers with Modern Phys., J.W. Jewett, R.A. Serway, 2010, Cengage Learning
6. An introduction to mechanics, D. Kleppner, R.J. Kolenkow, 1973, McGraw-Hill.
7. Properties of Matter, R. Murgeshan, S. Chand & Com. Pt. Ltd., New Delhi
8. Classical Mechanics, J.C. Upadhyaya, Himalaya Publishing House.

**Semester-I**

**(Course Type- Core Course, Course Code: B-PHY-N-102)**

**Nomenclature: Physics Practical-I**

**No. of credits: 2**

**Max. Marks: 50**

**End-semester Examination: 25**

**Internal Assessment: 25**

**Time: 3 hrs.**

**Special Note: -**

1. Do any eight experiments from the given list of experiments.
2. The students are required to calculate the error involved in a particular experiment.
3. The Practical examination will be held in a single session of 3 hours.

**Distribution of Marks:**

Experiment 15 marks

Viva- voce 10 marks

Internal Assessment 25 marks

Total 50 marks

**List of Experiments:**

1. Measurement of length (or diameter) using vernier caliper, screw gauge and travelling microscope.
2. To study the random error in observations.
3. To determine the area of window using a sextant.
4. Moment of Inertia of a Fly Wheel
5. Moment of Inertia of irregular body using a Torsion Pendulum.
6. Young Modulus by Bending of Beam.
7. Young’s modulus by Koenig’s method.
8. Modulus of rigidity of material of wire by Maxwell’s Needle.
9. Elastic constant by Searle’s method.
10. To determine the value of ‘g’ by using Bar pendulum.
11. To determine the value of ‘g’ by using Kater’s pendulum.
12. To verify the law of parallel axis for moment of inertia.
13. To find the Poisson ratio of rubber.
14. To study the Motion of spring and calculate Spring constant & value of Acceleration due to Gravity.
15. To compare Moment of Inertia of a solid Sphere, Hollow Sphere and solid Disc of same mass with the help of Torsion Pendulum.
16. To study (i) the law of conservation of linear momentum (ii) the law of conservation of kinetic energy and (iii) to calculate the restitution using one dimensional collision apparatus of two hanging spheres.
17. To determine the bending moment of a cantilever beam with uniformly distributed load, uniformly varying load and point load.

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| **CO No.** | **Course code (B-PHY-N-102) : Physics Practical-I** |
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|  **After successfully completing the course, student will be able to:** |

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| CO-1 | Hands on experience with different instruments and appreciate the beauty of different concepts and related experiments in Physics. |
| CO-2 | Verify some fundamental principles, effects and concepts of physics through Experiments. |
| CO-3 | perform experiments related to mechanics (compound pendulum), rotational dynamics (Flywheel), elastic properties (Young Modulus and Modulus of Rigidity) and fluid dynamics (verification of Stokes law, Searle method) etc. |
| CO-4 | Learn to present observations, results and analysis in suitable and presentable form. |

**REFERENCES**

1. B.Sc. Practical Physics, C.L. Arora, S. Chand Publisher, New Delhi
2. Advanced Level Practical Physics, M. Nelkon and Ogborn, Henemann Education Books Ltd., New Delhi
3. Practical Physics, S.S. Srivastava and M.K. Gupta, Atma Ram & Sons, Delhi
4. Practical Physics, S.L. Gupta and V. Kumar, Pragati Prakashan Meerut
5. Modern Approach to Practical Physics, R.K. Singla, Modern Publishers, Jalandhar
6. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, Asia Publishing House.

**Semester-II**

 **(Course Type- Core Course, Course Code: B-PHY-N-201)**

**Nomenclature: Electricity, Magnetism and Electromagnetic waves**

**No. of credits: 4**

**Max. Marks: 100**

**End-semester Examination: 50**

**Internal Assessment: 50**

**Time: 3 hrs.**

**Note:-**

1. Nine questions will be set in total.
2. Question no. 1 will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 4 parts and the answer should be in brief but not in Yes/No.
3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.
4. 20% numerical problems are to be set.
5. Use of scientific (non-programmable) calculator is allowed.

**UNIT-I**

**Basics of Vector** **Calculus:** Gradient of a scalar and its physical significance, Line, Surface and Volume integrals of a vector and their physical significance, Flux of a vector field, Divergence and curl of a vector and their physical significance, Gauss’s divergence theorem, Stoke’s theorem.

**Electric** **Field**: Conservative nature of Electrostatic Field, Electrostatic Potential, Potential as line integral of field, potential difference, Derivation of the field from the potential. Differential form of Gauss’s law, Laplacian and Laplace’s equation, Poisson’s equation.

**Dielectric Properties of Matter:** Dielectrics, Moments of a charge distribution, Potential and field of a dipole, Atomic and molecular dipoles, Induced dipole moments, Permanent dipole moments, electric field caused by polarized matter, field of a polarized sphere, dielectric sphere in a uniform field, Gauss’s law in a dielectric medium, Electrical susceptibility and atomic polarizability, Energy changes in polarization, Polarization in changing fields, Displacement vector D, Relations between E, P and D, Boundary conditions for E and D.

(Minimum 12 hrs.)

**UNIT-II**

**Magnetic Field:** Biot-Savart law and its simple applications: straight wire and circular loop, Current Loop as a Magnetic Dipole and its Dipole Moment, Ampere’s Circuital Law and its applications to (1) Solenoid and (2) Toroid, properties of B: curl and divergence, Vector potential, Lorentz force, Hall Effect in a conductor.

**Magnetic Properties of Matter:** Force on a dipole in an external field, Electric currents in Atoms, Electron spin and Magnetic moment, types of magnetic materials, Magnetization vector (M), Magnetic Intensity (H), Magnetic Susceptibility and permeability, Relation between B, H and M, Electronic theory of dia and paramagnetism, Domain theory of ferromagnetism (Langevin’s theory), Cycle of Magnetization- B-H curve and hysteresis loop: Energy dissipation, Hysteresis loss and importance of Hysteresis Curve.

(Minimum 12 hrs.)

**Unit-III**

**DC current Circuits:** Electric currents and current density, Electrical conductivity and Ohm’s law (Review), Kirchhoff’s laws for D.C. networks, Network theorems: Thevenin’s theorem, Norton theorem, Superposition theorem and the maximum power transfer theorem, Transient currents in RC, LR and LCR circuits.

**Alternating Current Circuits:** A resonance circuit, Kirchhoff’s laws for A.C. networks. Phasor, Complex Reactance and Impedance. Skin effect, Power and Energy in A.C. circuits, Anderson’s Bridge, Instantaneous Power, Average Power, Reactive Power, Power Factor, Sinusoidal Circuit Analysis for RL, RC and RLC Circuits, Series LCR Circuit: (1) Resonance, (2) Power Dissipation (3) Quality Factor and (4) Band Width, Parallel LCR Circuit.

(Minimum 12 hrs.)

**UNIT-IV**

**Time varying electromagnetic fields:** Electromagnetic induction, Faraday’s laws of induction and Lenz’s Law, Mutual inductance, Reciprocity theorem, Self inductance, Energy stored in a Magnetic field, Displacement current and Maxwell’s equations in differential and integral form and their physical significance.

**Electromagnetic Waves:** Electromagnetic waves,Transverse nature of electromagnetic wave, energy transported by electromagnetic waves, Poynting vector, Poynting’s theorem. Plane electromagnetic waves and their Propagation in free space in Lossy & lossless Dielectrics and good conductors. Reflection of a Plane Wave at Normal Incidence.

(Minimum 12 hrs.)

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| **CO No.** | **Course code (B-PHY-N-201): Electricity, Magnetism & Electromagnetic waves** |
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|  **After successfully completing the course, student will be able to:** |

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| CO-1 | Explain and differentiate the vector and scalar formalisms of electrostatics. Also be able to understand the important dielectric properties of materials.  |
| CO-2 | Describe the important properties of magnetic field. Understand the properties and theories of dia-, para- & ferromagnetic materials. |
| CO-3 | Analyze DC/AC circuits consisting of parallel and/or series combinations of voltage sources and resistors and to describe the graphical relationship of resistance, capacitor and inductor. |
| CO-4 | Derive Maxwell equations and understand the role of displacement current, scalar and vector potentials and boundary conditions at the interface between different media. The students will also be able to have basic idea about the propagation of electromagnetic waves |

**REFERENCES**

1. Electricity and Magnetism (Berkley, Phys. Course 2), Edward M. Purcell, 1986 McGraw-Hill Education
2. Electricity and Magnetism: A.S. Mahajan & A.A. Rangwala (Tata- McGraw Hill), 1988.
3. Electricity, Magnetism & Electromagnetic Theory, S. Mahajan and Choudhury, 2012, Tata McGraw
4. Introduction to Electrodynamics, D.J. Griffiths, 3rd Edn., 1998, Benjamin Cummings.
5. Feynman Lectures Vol.2, R.P. Feynman, R.B. Leighton, M. Sands, 2008, Pearson Education
6. Elements of Electromagnetics, M.N.O. Sadiku, 2010, Oxford University Press.
7. Electricity and Magnetism, J.H.Fewkes & J.Yarwood. Vol. I, 1991, Oxford Univ. Press.
8. Field and Wave Electromagnetics (2nd Edn.), David K. Cheng , Addison-Wesley Publishing Company.

**Semester-II**

 **(Course Type- Core Course, Course Code: B-PHY-N-202)**

**Nomenclature: Physics Practical-II**

**No. of credits: 2**

 **Max. Marks: 50**

**End-semester Examination: 25**

**Internal Assessment: 25**

**Time: 3 hrs.**

**Special Note: -**

Do any eight experiments from the given list of experiments.

The students are required to calculate the error involved in a particular experiment.

* + - 1. The Practical examination will be held in a single session of 3 hours.

**Distribution of Marks:**

Experiment 15 marks

Viva- voce 10 marks

Internal Assessment 25 marks

Total 50 marks

**List of Experiments:**

1. Use of Multimeter for measuring Resistance, A.C. and D.C. Voltage and Current, checking of electrical fuses.
2. Low resistance by Carey Foster’s bridge with calibration.
3. Determination of Impedance of an A.C. circuit and its verification.
4. Frequency of A.C. mains using an electromagnet.
5. Frequency of A.C. mains Electrical vibrator.
6. High resistance by substitution method.
7. To compare capacitances using De’Sauty’s bridge.
8. To study the Characteristics of a Series RC Circuit.
9. To study a series LCR circuit LCR circuit and determine its (a) Resonant frequency, (b) Quality factor.
10. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q.
11. To verify the Thevenin and Norton theorems.
12. To verify the Superposition, and Maximum Power Transfer Theorems.
13. Self-inductance by Anderson's bridge.
14. Verification of laws of electromagnetic induction.
15. Study of B-H curves of various materials using C.R.O, and determination of various parameters.

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| **CO No.** | **Course code (B-PHY-N-202) : Physics Practical-II** |
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| **After successfully completing the course, student will be able to:** |

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| CO-1 | Hands on experience with the uses of multimeter. |
| CO-2 | Study different series and parallel resonant circuits.  |
| CO-3 | Perform the experiments to determine the values of frequency of A.C. mains, values of low and high resistances using different methods, Network theorems and be able to appreciate the concepts of physics involved in these experiments. |
| CO-4 | Learn to present observations, results and analysis in suitable and presentable form. |

**REFERENCES**

1. B.Sc. Practical Physics, C.L. Arora, S. Chand Publisher, New Delhi
2. Advanced Level Practical Physics, M. Nelkon and Ogborn, Henemann Education Books Ltd., New Delhi
3. Practical Physics, S.S. Srivastava and M.K. Gupta, Atma Ram & Sons, Delhi
4. Practical Physics, S.L. Gupta and V. Kumar, Pragati Prakashan Meerut
5. Modern Approach to Practical Physics, R.K. Singla, Modern Publishers, Jalandhar
6. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, Asia Publishing House
7. **Programme Outcomes (POs) for Undergraduate Programme**
8. **Course: Physics**

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| PO1 | Knowledge | Capable of demonstrating comprehensive disciplinary knowledge gained during course of study. |
| PO2 | Communication | Ability to communicate effectively on general and scientific topics with the scientific community and with society at large. |
| PO3 | Problem Solving | Capability of applying knowledge to solve scientific and other problems. |
| PO4 | Individual and Team Work | Capable to learn and work effectively as an individual, and as a member or leader in diverse teams, in multidisciplinary settings. |
| PO5 | Investigation of Problems | Ability of critical thinking, analytical reasoning and research based knowledge including design of experiments, analysis and interpretation of data to provide conclusions. |
| PO6 | Modern Tool usage | Ability to use and learn techniques, skills and modern tools for scientific practices. |
| PO7 | Science and Society | Ability to apply reasoning to assess the different issues related to society and the consequent responsibilities relevant to the professional scientific practices. |
| PO8 | Life-Long Learning | Aptitude to apply knowledge and skills that are necessary for participating in learning activities throughout the life. |
| PO9 | Environment and Sustainability | Ability to design and develop modern systems which are environmentally sensitive and to understand the importance of sustainable development. |
| PO10 | Ethics | Apply ethical principles and professional responsibilities in scientific practices. |
| PO11 | Project Management | Ability to demonstrate knowledge and understanding of the scientific principles and apply these to manage projects.  |

1. **Programme specific outcomes for Undergraduate Programme**
2. **Course: Physics**

After successful completion of the programme, the students will be able to:

**PSO1**: Acquire an in-depth understanding and knowledge of the basic concepts of physics and be able to appreciate how diverse phenomena observed in nature follow from a small set of fundamental laws through logical reasoning.

**PSO2**: Be capable of understanding the core physical laws to understand the basic concepts, latest progress and applications of certain sub fields such as nuclear physics, spectroscopy of atoms & molecules, solid state physics, computational physics & electronics.

**PSO3:** Gain hands-on skills for carrying out basic experiments as well as experiments related to different fields of Physics and attain abilities of critical thinking, problem mapping & solving using fundamental principles of Physics, systematic analysis & interpretation of results.

**PSO4**: Have a new perspective to look at everything from ‘Scientific’ point of view that enabling them to pursue higher studies at postgraduate & research level

**PSO5**: Have awareness of the impact of Physics in social, Economical and environmental issues.

**Mapping of CO with PO’s and PSO’s**

**Mapping of CO with PO’s and PSO’s**

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| **Course code B-PHY-N-101** |
|  **COs** | **PO1-** K**nowledge** | **PO2-** **Communication** | **PO3-** **Problem Solving** | **PO4-** **Individual and Team Work** | **PO5-** **Investigation of Problems** | **PO6-** **Modern Tool usage** | **PO7-** **Science and Society** | **PO8-** **Life-Long Learning** | **PO9-** **Environment and Sustainability** | **PO10-** **Ethics** | **PO11-** **Project Management** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** |
| **B-PHY-N-101.1** | 3 | 2 | 2 | - | - | 2 | 2 | 2 | 2 | - | 2 | 3 | 3 | - | 3 | 2 |
| **B-PHY-N-101.2** | 3 | 2 | 2 | - | - | 2 | 2 | 2 | 2 | - | 2 | 3 | 3 | - | 3 | 2 |
| **B-PHY-N-101.3** | 3 | 2 | 2 | - | - | 2 | 2 | 2 | 2 | - | 2 | 3 | 3 | - | 3 | 2 |
| **B-PHY-N-101.4** | 3 | 2 | 2 | - | - | 2 | 2 | 2 | 2 | - | 2 | 3 | 3 | - | 3 | 2 |
| **Average** | 3 | 2 | 2 | - | - | 2 | 2 | 2 | 2 | - | 2 | 3 | 3 | - | 3 | 2 |
| **Note: 3-Strong, 2-Medium, 1-Weak** |

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| **Course code B-PHY-N-102** |
|  **COs** | **PO1-** K**nowledge** | **PO2-** **Communication** | **PO3-** **Problem Solving** | **PO4-** **Individual and Team Work** | **PO5-** **Investigation of Problems** | **PO6-** **Modern Tool usage** | **PO7-** **Science and Society** | **PO8-** **Life-Long Learning** | **PO9-** **Environment and Sustainability** | **PO10-** **Ethics** | **PO11-** **Project Management** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** |
| **B-PHY-N-102.1** | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | - | - | 2 | 3 | 2 | 3 | 3 | 2 |
| **B-PHY-N-102.2** | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | - | - | 2 | 3 | 2 | 3 | 3 | 2 |
| **B-PHY-N-102.3** | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | - | - | 2 | 3 | 2 | 3 | 3 | 2 |
| **B-PHY-N-102.4** | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | - | - | 2 | 3 | 2 | 3 | 3 | - |
| **Average** | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | - | - | 2 | 3 | 2 | 3 | 3 | 1.5 |
| **Note: 3-Strong, 2-Medium, 1-Weak** |

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| **Course code B-PHY-N-201** |
|  **COs** | **PO1-** K**nowledge** | **PO2-** **Communication** | **PO3-** **Problem Solving** | **PO4-** **Individual and Team Work** | **PO5-** **Investigation of Problems** | **PO6-** **Modern Tool usage** | **PO7-** **Science and Society** | **PO8-** **Life-Long Learning** | **PO9-** **Environment and Sustainability** | **PO10-** **Ethics** | **PO11-** **Project Management** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** |
| **B-PHY-N-201.1** | 3 | 2 | 3 | - | - | 2 | 2 | 2 | 2 | - | 2 | 3 | 3 | - | 3 | 2 |
| **B-PHY-N-201.2** | 3 | 2 | 3 | - | - | 2 | 2 | 2 | 2 | - | 2 | 3 | 3 | - | 3 | 2 |
| **B-PHY-N-201.3** | 3 | 2 | 3 | - | - | 2 | 2 | 2 | 2 | - | 2 | 3 | 3 | - | 3 | 2 |
| **B-PHY-N-201.4** | 3 | 2 | 3 | - | - | 2 | 2 | 2 | 2 | - | 2 | 3 | 3 | - | 3 | 2 |
| **Average** | 3 | 2 | 3 | - | - | 2 | 2 | 2 | 2 | - | 2 | 3 | 3 | - | 3 | 2 |
| **Note: 3-Strong, 2-Medium, 1-Weak** |

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| **Course code B-PHY-N-202** |
|  **COs** | **PO1-** K**nowledge** | **PO2-** **Communication** | **PO3-** **Problem Solving** | **PO4-** **Individual and Team Work** | **PO5-** **Investigation of Problems** | **PO6-** **Modern Tool usage** | **PO7-** **Science and Society** | **PO8-** **Life-Long Learning** | **PO9-** **Environment and Sustainability** | **PO10-** **Ethics** | **PO11-** **Project Management** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** |
| **B-PHY-N-202.1** | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | - | - | 2 | 3 | 2 | 3 | 3 | 2 |
| **B-PHY-N-202.2** | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | - | - | 2 | 3 | 2 | 3 | 3 | 2 |
| **B-PHY-N-202.3** | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | - | - | 2 | 3 | 2 | 3 | 3 | 2 |
| **B-PHY-N-202.4** | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | - | - | 2 | 3 | 2 | 3 | 3 | - |
| **Average** | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | - | - | 2 | 3 | 2 | 3 | 3 | 1.5 |
| **Note: 3-Strong, 2-Medium, 1-Weak** |