Sant Gadge Baba Amravati University, Amravati

Department of Physics

Programme Outcomes, Programme Specific Outcomes and Course Outcomes

2.6 Student Performance and Learning Outcomes
2.6.1 Program outcomes, program specific outcomes and course outcomes for all programs
Program outcome: MSc (Physics): This program imparts an advanced teaching, theoretically and practically, on laws of nature. Students learn basic to advance concepts in Physics so that they can prepare themselves to serve society by teaching and doing further research, removing shortcomings of prevalent theories and understandings, and contribute to the subject Physics. Course outcomes: 1PHY-2 Classical Mechanics Compulsory: This paper enables the students to understand the Lagrangian and Hamiltonian approaches in classical mechanics; the classical background of Quantum mechanics and get familiarized with Poisson brackets and Hamilton -Jacobi equation; Kinematics and Dynamics of rigid body in detail and ideas regarding Euler's equations of motion; Theory of small oscillations in detail along with basis of Free vibrations etc. 1PHY-3 Quantum Mechanics-I Compulsory : After successful completion of this paper, the student will be well-versed in Linear vector spaces, Hilbert space, concepts of basis and operators and bra and ket Notation; Both Schrödinger and Heisenberg formulations of time development and their applications; Theory of angular momentum and spin matrices, orbital angular momentum and Clebsh-Gordan Coefficient; Space-time symmetries and conservation laws, theory of identical particles; Theory of scattering and calculation of scattering cross section, optical theorem, Born approximation, partial wave analysis etc. 1PHY-4 Computational Methods and Programming Compulsory : The students should be able to have a strong base in Python language regarding different data type such as list, sets, dictionary etc. It helps to understand the arrays and matrices and enables data visualization. It gets a wide knowledge of numerical methods in computational Physics that can be used to solve many problems which does not have an analytic solution. 2PHY-1 Electrodynamics-I Compulsory : Students will be able to understand the relationship between electrical charge, electrical field, electrical potential, and magnetism. Calculate the magnitude and direction of the magnetic field for symmetric current distributions using the Law of Biot-Savart and Ampere's Law. Students have gained a clear understanding of Maxwell's equations and electromagnetic boundary conditions. 2PHY-2 Quantum Mechanics-II Compulsory : This course will enable the student to have basic knowledge about advanced techniques like approximation methods for time-independent problems like

the WKB approximation; the variational equation and its application to ground state of the hydrogen and Helium atom; Perturbation theory and Interaction of an atom with the electromagnetic field; Relativistic Quantum Mechanics using Dirac equation, Dirac matrices. The Klein Gordon equation etc.

2PHY-3 Solid State Physics Compulsory: After successful completion of the course, the student is expected to have a basic knowledge of crystal systems and spatial symmetries. Also able to account for how crystalline materials are studied using diffraction, including concepts like reciprocal lattice and Brillouin zones It is able to calculate thermal and electrical properties in the free-electron model; Bloch's theorem and what energy bands are and know the fundamental principles of semiconductors; Dulong and Petit Law, Lattice Specific Heat etc.

2PHY-4 E/GIC i.Net work Theorems and Solid State Devices : On completion of this course the student will learn about Field Effect Transistors, their principles and applications
Also, learn about LVDT, photodetectors, PV cells etc and their working in detail. They will learn about Amplifiers: Classification of amplifiers, Class-A, B, AB and C Amplifiers, Cascading of amplifiers, RC Coupled amplifiers; properties of amplifiers etc.

2PHY-4 E/GIC ii.Lasers & Laser Applications Elective Interdisciplinary: On successful completion of the course students will be able to describe the requirements for a system to act as a laser. Also, differentiate the various types of lasers and their means of excitation. It includes the structure and properties of lasers to their performance and intended applications.

3PHY-1 C Electrodynamics -II (Radiation & Plasma Physics): After successful completion of the course, the student is expected to have gained a clear understanding of laws of reflection, refraction are outcomes of electromagnetic boundary conditions. They have grasped the idea of electromagnetic wave propagation through plasma. It extends their understanding of special theory of relativity by including the relativistic electrodynamics. They understand the rather complex physical phenomena observed in plasma.

3PHY-2 C Statistical Mechanics The students should be able to explain statistical physics and thermodynamics as logical consequences of the postulates of statistical mechanics. Also, apply the principles of statistical mechanics to selected problems. They will grasp the basis of ensemble approach in statistical mechanics to a range of situations. They learn the fundamental differences between classical and quantum statistics and learn about quantum statistical distribution laws and study important examples of ideal Bose systems and Fermi systems.:

3PHY-3 C Atomic & Molecular Physics: After successful completion of the course, the student is expected to know about different atom model and will be able to differentiate different atomic systems, different coupling schemes and their interactions with magnetic and electric fields. They have gained ability to apply the techniques of microwave and infrared spectroscopy to elucidate the structure of molecules. It is able to apply the principle of Raman spectroscopy and its applications in the different field of science & Technology. They will become familiar with different resonance spectroscopic techniques and its applications and to find solutions to problems related different spectroscopic systems.

3PHY-4 ES/GIC i.Digital Techniques Specialization: The student who opt this specialization will study the Fundamental Digital Devices like the transistor as a switch Basic logical operation like OR, AND and NOT, Ex-OR, NAND, NOR etc. They learn about Combinational Logic Design; Devices and converters; Sequential Logic Design; Memory Devices.

3PHY-4 ES/GIC ii. Condensed matter Physics-I Specialization: The student who opt this specialization will study the Band Structure - Electron levels in periodic potential Kronig Penny Model), Bloch theorem; Magnetism: Atomic Magnetic Moment, Larmor Precession, Diamagnetism: Classical and Quantum Theory; Ferromagnetism: Weiss Theory, Heisenberg Model of
Molecular Field Theory, Spin Waves And Magnons; superconductivity.

3PHY-4 ES/GIC iv. Photonics-I Specialization: The student who opt this specialization will study the Maxwell's equations, Maxwell's wave equations for a vacuum, solution of the general wave equation; Fundamentals of Modern Optics: Wave propagation, wave particle duality; Fourier Optics; Near Field optics; Radiation pressure of laser light.

4PHY-1 Nuclear & Particle Physics Compulsory : Upon completion of the course Students will have understanding of basic properties of nucleus and nuclear models to study the nuclear structure properties; various aspects of nuclear reactions will give idea how nuclear power can be generated. They also learn about Nuclear fission and fusion and basic of elementary particles.

4PHY-2 OPAMP theory and applications: At the end of the course the student should be able to understand and analyze the IC 741 operational amplifier and its characteristics and also, design the solution for linear & non-linear applications using IC741 It includes Elucidate and design the active filters and oscillators, identify the needs of voltage regulators and timers and comprehend & differentiate the working principle of various data converters.

4PHY-3 E i.Micro-processor Programming and Interfacing
Specialization: The student who opt this specialization will study the Organization and internal architecture of the Intel 8085, learn assembly language programming and arithmetic
They will aware of Memory interfacing, and different Data transfer schemes, They will learn interfacing with peripheral I/O devices; also learn common applications of microprocessors like E Analog to Digital convert,7 segment LED displays,; Temperature measurement and control using a microprocessor etc

4PHY-3 ii.Condense Matter Physics-II Specialization : The student who opt this specialization will study the Imperfections in Crystal: Mechanisms of plastic deformation in solid, Dislocations; Interacting electron gas, Hartee & Hartee-Fock approximation; Point Defects: Types of point defects, concentration of point defects; Lattice disorders.

4PHY-3 iv. Photonics-II Specialization : The student who opt this specialization will study the optical fibers; linearly polarized modes; graded index fibre; propagation constant; optical Communications; optical signal processing; optical transducer; optical switches; electronic devices, diode laser; wide band gap semiconductors.

4PHY-4 ES/GIC ii. Nano-science and Nanotechnology Elective Interdisciplinary : After completing this course student will be able to learn about the background on nanoscience, understand the synthesis of nanomaterials and their application and the impact of nanomaterials on environment. They learn about different methods for measuring the properties of nanomaterials, structure determination etc and size dependent properties, quantum size effect, quantum dot, quantum wire and quantum well. They apply their learned knowledge to develop nanomaterial's.