Proposed Curriculum Framework

Bachelor of Science (B.Sc.) in Physics

University of Engineering & Management (UEM), Jaipur

(NEP 2020 Aligned | Industry & Research Integrated | Effective from Academic Session 2026–27)

Programme Overview

Duration: 4 Years (8 Semesters)

Total Credits: 160 Credits (20 Credits/Semester)

Eligibility: 10+2 with Physics and Mathematics (Chemistry/Computer Science preferred)

Award:

* After 1 Year – Certificate in Physical Sciences

* After 2 Years – Diploma in Physics

* After 3 Years – B.Sc. Physics

* After 4 Years – B.Sc. Physics (Honours/Research)

The curriculum is designed in accordance with the philosophy of NEP 2020 and benchmarks widely adopted Physics programmes covering Mechanics, Electricity & Magnetism, Thermodynamics, Quantum Mechanics, Electronics, Nuclear Physics, Computational Physics, and interdisciplinary learning.

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Programme Educational Objectives (PEOs)

Graduates will be able to:

* Build strong conceptual understanding of fundamental and modern physics.

* Apply mathematical and computational tools to solve scientific problems.

* Perform laboratory experiments with precision and scientific ethics.

* Use simulation, AI and programming in scientific investigations.

* Undertake interdisciplinary research and innovation.

* Prepare for higher studies (M.Sc., Integrated Ph.D., Ph.D.), competitive examinations (IIT-JAM, GATE, CSIR-NET), and careers in research, industry, education, and technology.

Semester I (20 Credits)

Course	Credits
Mathematical Physics-I	4
Mechanics & Properties of Matter	4
Physics Laboratory-I	2
Mathematics for Physicists-I (Calculus & Linear Algebra)	4
Communication Skills	2
Environmental Science / Value Added Course	2
Yoga & Wellness	2

Course Outline

Mathematical Physics-I

* Vector Algebra
* Differential Calculus
* Integral Calculus
* Differential Equations
* Partial Differentiation
* Multiple Integrals

Mechanics

* Newtonian Mechanics
* Rotational Dynamics
* Gravitation
* Oscillations

* Elasticity

* Fluid Mechanics

Laboratory

* Vernier & Screw Gauge

* Compound Pendulum

* Flywheel

* Young's Modulus

* Surface Tension

* Viscosity

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Semester II (20 Credits)

Course	Credits
Electricity & Magnetism	4
Thermal Physics	4
Physics Laboratory-II	2
Programming for Physicists (Python)	4
Ability Enhancement Course	2
Minor Course	2
Community Engagement	2

Topics

* Electrostatics

* Capacitors

* Magnetic Fields

* Maxwell's Equations (Introduction)

* Kinetic Theory

* Laws of Thermodynamics

* Heat Transfer

* Entropy

Programming

* Python

* NumPy

* Matplotlib

* Scientific Computing

* Data Visualization

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Semester III (20 Credits)

Course Credits

Waves & Oscillations 4

Optics4

Electronics-I 4

Physics Laboratory-III 2

Skill Enhancement Course 3

Internship-I 3

Topics

* SHM

* Coupled Oscillations

* Wave Motion

* Interference

* Diffraction

* Polarization

* Optical Fibres

* Semiconductor Devices

* Diodes

* Transistors

Semester IV (20 Credits)

Course	Credits
Quantum Mechanics-I	4
Mathematical Physics-II	4
Electronics-II	4
Physics Laboratory-IV	2
Research Methodology	3
Minor Project	3

Topics

* Wave Function

* Schrödinger Equation

* Operators

* Eigen Values

* Matrix Algebra

* Fourier Series

* Operational Amplifiers

* Digital Electronics

Semester V (20 Credits)

Course	Credits
Quantum Mechanics-II	4
Atomic & Molecular Physics	4
Solid State Physics	4
Physics Laboratory-V	2

Elective-I 3

Internship-II 3

Topics

* Hydrogen Atom
* Perturbation Theory
* LASER
* Crystal Structure
* Band Theory
* Semiconductors
* Superconductivity
* Nanomaterials

Semester VI (20 Credits)

Course Credits

Nuclear & Particle Physics 4

Statistical Physics 4

Computational Physics 4

Physics Laboratory-VI 2

Elective-II 3

Industry Project 3

Topics

* Radioactivity
* Nuclear Reactions
* Particle Accelerators
* Bosons & Fermions
* Monte Carlo Simulation

* Numerical Methods

* MATLAB/Python Applications

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Semester VII (20 Credits)

Course	Credits
Electromagnetic Theory	4
Advanced Quantum Physics	4
AI & Machine Learning for Physics	4
Elective-III	2
Research Project-I	3
Industrial Internship	3

Topics

* Maxwell’s Equations

* Electromagnetic Waves

* Quantum Computing Basics

* Machine Learning

* Scientific AI

* Data Analysis

* Computational Modelling

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Semester VIII (20 Credits)

Course	Credits
Astrophysics & Cosmology	4
Advanced Experimental Physics	4
Dissertation / Research Thesis	8
Seminar	2

Viva Voce 2

Suggested Electives

Electronics

* Embedded Systems
* Internet of Things
* VLSI Fundamentals

Photonics

* Optical Communication
* Laser Technology
* Fibre Optics

Materials Science

* Nanotechnology
* Thin Films
* Advanced Materials

Space Science

* Satellite Physics
* Remote Sensing
* Astronomy

Computational Physics

* Artificial Intelligence
* Machine Learning
* Data Science

Renewable Energy

* Solar Energy

* Energy Storage

* Hydrogen Energy

Laboratory Courses

Students will perform more than 80 experiments across the programme, including:

* Mechanics

* Electricity

* Magnetism

* Electronics

* Optics

* Quantum Physics

* Nuclear Physics

* LASER Experiments

* Semiconductor Devices

* Fibre Optics

* FPGA & Microcontroller Basics

* Sensors and Instrumentation

* Computational Physics Simulations

Software & Computational Training

Students will receive hands-on training in:

* Python

* MATLAB

* Mathematica

* OriginPro

* LabVIEW
* COMSOL Multiphysics
* Scilab
* Arduino IDE
* Raspberry Pi
* AI Tools for Scientific Computing
* Jupyter Notebook
* Git & GitHub

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Internship Structure

Semester III: School/Industry Laboratory Exposure (4 Weeks)

Semester V: Research Laboratory Internship (6 Weeks)

Semester VII: Industrial/Research Internship (8–10 Weeks)

Suggested Collaborations

* DRDO
* ISRO
* BARC
* CSIR Laboratories
* IISERs
* IITs
* National Physical Laboratory (NPL)
* Semiconductor industries
* Optics and photonics companies
* Renewable energy industries

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Skill Enhancement Certifications

Students are encouraged to earn certifications in:

* Python Programming
* Scientific Computing
* MATLAB
* LabVIEW
* AI & Machine Learning
* Data Analytics
* Embedded Systems
* Internet of Things
* Scientific Writing
* Research Ethics

Assessment Pattern

* Continuous Internal Assessment – 40%
* End Semester Examination – 60%

Evaluation components include:

* Laboratory performance
* Viva voce
* Assignments
* Numerical problem-solving
* Programming exercises
* Mini projects
* Research reports
* Presentations
* Seminar participation
* Internship assessment

Career Opportunities

Graduates will be well prepared for careers as:

* Research Scientist

* Physicist

* Data Scientist

* Semiconductor Engineer

* Optics & Photonics Engineer

* Electronics Design Engineer

* Instrumentation Engineer

* AI & Computational Scientist

* Renewable Energy Analyst

* Scientific Programmer

* Quality Assurance Engineer

* Science Educator

* Technical Consultant

* Research Associate

They will also be competitive for M.Sc. Physics, Integrated Ph.D., Ph.D., IIT-JAM, GATE Physics, CSIR-UGC NET, SET, UPSC, ISRO, BARC, DRDO, and other research and public-sector opportunities.

Distinctive Features for UEM Jaipur

To position the programme among the leading undergraduate Physics degrees in India, UEM Jaipur can incorporate:

* AI & Computational Physics Laboratory with GPU-enabled computing.

* Photonics and Optoelectronics Research Lab.

* Semiconductor Devices and Embedded Systems Laboratory aligned with India's semiconductor mission.

* Annual UEM International Physics Symposium featuring researchers from academia and industry.

* Mandatory research internship every year with national laboratories and industries.

* Integration of coding, AI, simulation, and data science from the first year.

* Participation in national hackathons, innovation challenges, and undergraduate research conferences.

* Collaboration with premier institutes such as IITs, IISERs, NPL, DRDO, ISRO, and CSIR laboratories for internships, expert lectures, and joint research initiatives.

This curriculum provides a rigorous balance of theoretical physics, advanced laboratory training, computational methods, emerging technologies, and research, making it suitable for students aiming for higher education, scientific research, and high-technology industries in India and abroad.