

WELCOME, FIRST-YEAR STUDENTS

Your Physics journey starts here

Courses, learning outcomes and applications across engineering

04

COURSES

SEM I & II

Physics at a glance

For Semester I & II offerings in the choice-based Basic Science curriculum

COURSES OF 03 CREDITS

Engineering Physics

Theory + Laboratory

BSC · Applied Sciences I

Quantum Physics

Theory + Tutorial

BSC · Applied Sciences I

COURSES OF 01 CREDIT

Semiconductor Physics

Theory

BSC · Applied Sciences II

Electromagnetism

Theory

BSC · Applied Sciences II

BSC – Basic Science Course, Applied Sciences choice-based curriculum

Physics skills developed for Engineering Applications

A shared foundation for study, projects and technical problem-solving

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|-----------|---------------------------------|---|
| 01 | Analytical reasoning | Use physics principles and mathematics to solve engineering problems. |
| 02 | Experimental measurement | Observe, measure and evaluate physical systems. |
| 03 | Data interpretation | Connect results and characteristic curves with underlying behaviour. |
| 04 | Physical modelling | Represent materials, devices, fields and quantum systems. |

Engineering Physics

BSC · Applied Sciences I

3

credits

COURSE DETAILS

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EVALUATION SCHEME

MSE 30

TA 20

ESE 50

KEY LEARNING

- Matter waves and quantum mechanics
- Solid state physics and energy bands
- Interference and diffraction
- Lasers and fiber optics
- Measurement and optics experiments

IMPORTANCE

- Apply Physics principles to solve engineering problems.
- Develop analytical thinking and quantitative reasoning.
- Measure, interpret data, and communicate results.
- Helps in interdisciplinary projects, R & D in technologically driven industries

APPLICATION AREAS

- **Electrical / ENTC/Instrumentation :** devices, sensors and photonics.
- **Computer / AI/ML:** Foundation for quantum technologies.
- **Metallurgy & Materials :** solid state physics and characterization.
- **Mechanical & Manufacturing:** lasers and precision measurement.
- **Civil:** sensing and non-destructive evaluation.

Quantum Physics

BSC · Applied Sciences I

3

credits

COURSE DETAILS

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EVALUATION SCHEME

MSE 30

TA 20

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KEY LEARNING

- Hilbert space, Dirac notation and operators
- Quantum postulates and measurement
- Harmonic oscillator and ladder operators
- Spin- $\frac{1}{2}$ systems and density matrices
- Qubits and quantum gates

IMPORTANCE

- Build mathematical models of quantum systems.
- Develop logical and abstract reasoning.
- Build quantum circuits with qubits, quantum gates and entanglement.
- Prepare for quantum technologies and interdisciplinary research.

APPLICATION AREAS

- **Computer / AI/ML:** quantum computing and gates.
- **Electrical / ENTC:** quantum devices and communication.
- **Instrumentation:** quantum sensing and measurement.
- **Metallurgy & Materials:** electronic and material behaviour.
- **Mechanical / Civil/ Manufacturing:** emerging precision sensing.

Semiconductor Physics

BSC · Applied Sciences II

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credit

COURSE DETAILS

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EVALUATION SCHEME

MSE 30

TA 20

KEY LEARNING

- Conductivity, diffusion and carrier lifetime in semiconductors
- Hall effect
- Diode equation and I–V characteristics

IMPORTANCE

- Explain semiconductor device behavior.
- Connect carrier transport with electrical performance.
- Build a foundation for electronics, sensors and microelectronics.

APPLICATION AREAS

- **Electrical / ENTC:** Electronic devices.
- **Computer / AI/ML:** chips and computing hardware.
- **Instrumentation:** semiconductor sensors.
- **Metallurgy & Materials:** electronic properties.
- **Mechanical/ Manufacturing / Civil:** automation and structural sensing.

Electromagnetism

BSC · Applied Sciences II

1

credit

COURSE DETAILS

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EVALUATION SCHEME

MSE 30

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KEY LEARNING

- Vector calculus and integral theorems
- Maxwell's equations
- Electromagnetic waves in free space

IMPORTANCE

- Model electric and magnetic fields.
- Develop spatial reasoning and analytical problem-solving.
- Relate physical laws to engineering systems.

APPLICATION AREAS

- **ENTC/Electrical:** antennas and wireless communication.
- **Instrumentation:** electromagnetic sensing.
- **Mechanical / Materials:** actuators and processing.
- **Civil:** surveying and non-destructive inspection.

FOUR COURSES. ONE FOUNDATION.

Physics for engineering

Quantum mechanics, materials, optics and electromagnetism

Applied Sciences and Humanities

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