



Shri Shivaji Education Society Amravati's

# Science College, Congress Nagar, Nagpur



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## Department of Physics

### Vision

To be the best known science college to provide a value-based education, foster a scientific temperament, and instill scientific ideals.

### Mission

To cultivate modern scientific knowledge via extracurricular, co-curricular, and academic activities.

### Quality Policy

Committed to provide high-quality education by continuously enhancing research, teaching, learning, moral and ethical principles.

### Science graduate attributes

- Be effective global citizens who recognize and challenge inequality.
- Professional, ethical, and social responsibility
- Digitally Fluent, Innovation, Creativity, Incubation
- Research, inquiry, and critical thinking

## **Program Outcomes:**

- PO-1. Demonstrate a solid understanding of key concepts across all branches of physics.
- PO-2. Employ critical thinking and scientific knowledge to design, conduct, record, and analyze the results of physics experiments.
- PO-3. Solve the problem and also think methodically, and independently and draw a logical conclusion
- PO-4. Create an awareness of the impact of Physics on society, and development outside the scientific community.
- PO-5. To acquaint with modern techniques and decent equipment.

## **Program Specific Outcomes**

- PSO-1. Gain knowledge of Physics through theory and practicals.
- PSO-2. Understand good laboratory practices and safety.
- PSO-3. Develop research-oriented skills.
- PSO-4. Make aware and handle the sophisticated instruments/equipment.

## **Course-level Learning Outcome: Physics (Semester-wise)**

### **Semester 01**

Paper – I (101) : Properties of Matter and Mechanics

Paper -II (102) : Electrostatics, Time varying fields & Electric Currents

Practical - (103) (Based on Paper I (101) & II (102))

**The prime objective of paper I (101) and Paper II (102) is to provide fundamental concepts of properties of matter based on Newtonian mechanics and electrostatics to generate curiosity among the students.**

1. To make students familiar basics of elasticity, viscosity and surface tension to revise the relearned concept in more depth.
2. To understand the Newton's laws of motion in different co-ordinate system and related conservative quantities in specific conditions
3. To learn the basics of electrostatic forces, their origin and related parameters.
4. To understand the concept of polarization in any molecule and working of capacitor that are used in day to day life to aware student about real devices
5. To impart the basic knowledge of effect of flow of charges in varying electric field, its related effect in LR, CR and LCR circuits

6. To make the student practically aware about the basic instrument like vernier caliper, screw gauge, traveling microscope, spectrometer used for measurement of physical quantities and methods of minimization of error
7. The measurements of elastic quantities, viscosity and surface tension are also incorporated to know the Newton law's applications practically.
8. To aware the students about handling and measurement of electrical quantities.

## **Semester 02**

Paper - I (201) : **Oscillations, Kinetic theory of gases and Thermodynamics**

Paper - II (202) : **Gravitation, Astrophysics, Magnetism and Magnetostatics**

Practical - (203) (Based on Paper I (201) & II (202))

**The prime objective of Paper I (201) and Paper II (202) is to provide fundamental knowledge of oscillation, thermodynamics magnetism and gravitation-related concepts.**

1. To make students familiar with gravitation fantasy used in daily life.
2. To reach out concepts of oscillation types and kinetic theory of gases based on the laws of thermodynamics
3. To understand the concepts of magnetism and magnetostatics
4. To technically/scientifically make students capable to know-how of gravitation through practicals like  $g$  due to different types of pendulum
5. To expose students to the thermal conductivity measurement to understand the basics of thermodynamics via live demonstrations.
6. To expose students about vibration magnetometer to know the basics of magnetism and magnetostatics.

## **Semester 03**

Paper - I (301) : **Sound waves, Applied acoustic, Ultrasonic and Power supply**

Paper - I (302) : **Physical optics and Electromagnetic waves**

Practical - (303) (Based on Paper I (301) & II (302))

**The prime objective of Paper I (301) and Paper II (302) is to provide fundamental knowledge of mechanical and electrical wave properties and applications.**

1. To make students familiar with the various types of mechanical waves and their applications.

2. To understand the basic concepts of wave theory of light and wave properties like interference, diffraction and polarization
3. To impart the basic knowledge of electromagnetic waves and Maxwell's equation in different media.
4. To technically/scientifically make the students able to understand the concepts of mechanical waves via sound speed measurement practical.
5. To know the wave properties of light in live, practicals like dispersive power, resolving power of optical devices, Lloyd mirror, Refractive index are put.

## **Semester 04**

Paper - I (401) : **Solid state physics, X-ray and Laser**

Paper - II (402) : **Solid state electronics, and Molecular physics**

Practical - (403) (Based on Paper I (401) & II (402))

**The prime objective of paper I (401) and Paper II (402) is to provide fundamental knowledge of crystallography and analogue electronics for higher learning of**

1. To make students familiar with solid state physics and x ray crystallography for materials insights.
2. To get awareness about LASER basics and applications in students.
3. To understand the principle, construction and working of electronic devices like diodes, transistors.
4. To have the elementary knowledge of molecular physics that includes spectral energy levels distribution and Raman spectra analysis
5. To technically/scientifically make students able to crystal structure, semiconductor devices, practicals like lattice parameters, energy gaps, and dielectric constant determination are included. Element identification using IR spectra is also incorporated.

## **Semester 05**

Paper - I (501) : **Atomic physics, free electron theory and Statistical physics**

Paper - I (502) : **Quantum mechanics, Nanomaterials and Nanotechnology**

Practical - (503) (Based on Paper I (501) & II (502))

**The prime objective of paper I (501) and Paper II (502) is to provide fundamental knowledge of molecular interaction using atomic physics and statistical physics. The more advanced topics like quantum mechanics and nanotechnology is also introduced at introductory level.**

1. To explore the basic concepts of molecular interaction to help the student's generosity.
2. To make students know about distribution of particles on the basis of interaction via statistical mechanics.
3. To make students know about the another advanced applied aspects of physics by studying quantum mechanics and recent fields like nanotechnology
4. To make them practically aware about the interactions present in materials, SEM, TEM, BET analysis are taught with live demonstration
5. To make more in depth of behavior of materials in electric and magnetic fields, experiments like  $e/m$ , determination of Planck constant, Hall coefficient measurement are introduced.
6. To expose students to the various research-labs/-institutions if any in and around city.

## **Semester 06**

Paper - I (601) : **Relativity, Nuclear physics and Bio Physics**

Paper - I (602) : **Electronics, Fiber optics, Communication and Digital electronics**

Practical - (603) (Based on Paper I (601) & II (602))

**The prime objective of paper I (601) and Paper II (602) is to provide fundamental knowledge of Nuclear interactions, Bioinstrumentation and communication electronics.**

1. To learn the concepts such as length contraction and time dilation for better understanding of special theory of relativity.
2. To create further interest into research, students are practically exposed to nuclear interactions present in elementary particles and principles of bio instruments used in medical fields.
3. To make students know about the principles and applications of communication electronics and digital electronics used in day to day life.
4. To expose students to the communication, nuclear and bioinstrumentation via practical demonstration and seminar activities.