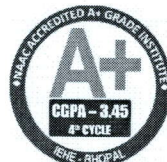


Department of Physics & Electronics

**Institute for Excellence in Higher Education (IEHE),  
Bhopal (MP)**



**NAAC Re-accredited (Fourth Cycle) Autonomous College  
Under the UGC Scheme with 'A+' Grade (CGPA-3.45)**

**Program Outcomes (POs),  
Program Specific Outcome (PSOs)  
&  
Course Outcomes (COs)  
of  
Department of Physics & Electronics**

**B.Sc./B.Sc. (Honours)/B.Sc. (Honours with Research)  
Physics  
&  
M.Sc. (Physics)**

**(Session: 2023-2024)**

## Programmes offered in the Institute

### Under Graduate Programmes

- B.Com. (4-Year UG programme under NEP-2020)
- B.Com. Honours (Management/Account) (3-Year UG programme under old pattern)
- B.A. (Major: Economics/History/Psychology/Sociology/Political-Science/English-Literature/Hindi-Literature/Geography/Fashion Designing) (4-Year UG programme under NEP-2020)
- B.A. Honours (Economics/History/Psychology/Sociology/Political Science/English-Literature/Hindi-Literature/Geography/Fashion-Designing) (3-Year UG programme under old pattern)
- **B.Sc. (Major: Physics/Chemistry/Computer-Science/Mathematics/Electronics/Biotechnology/Geography/Forensic-Science/Clinical Nutrition and Dietetics) (4-Year UG programme under NEP-2020)**
- **B.Sc. Honours (Physics/Chemistry/Computer-Science/ Mathematics/Electronics/Biotechnology/Geography/Forensic-Science) (3-Year UG programme under old pattern)**
- B.B.A. (4-Year UG programme under NEP-2020) (New)
- B.P.E.S. (3-Year UG programme) (New)

### Post Graduate Programmes

- MA (Economics)
- MA (English)
- MA (Hindi) (New)
- MA (History)
- MA (Political Science)
- MA (Psychology) (New)
- MA (Public Administration)
- MA (Sociology) (New)
- MA (Social Work)
- M.Sc. (Biotechnology)
- M.Sc. (Chemistry)
- M.Sc. (Mathematics)
- **M.Sc. (Physics)**
- M.Com. (Marketing Management)



## **Courses offered by Vocational Cell (IEHE)**

### **Diploma Courses (16)**

1. Diploma in Financial Services (DFS)
2. Diploma in Human Resources Development (DHRD)
3. Diploma in Communicative English (DCE)
4. Diploma in Guidance and Counselling Psychology (DGC)
5. Diploma in Industrial Work & Management System (DIWMS)
6. Diploma in Statistical Analysis (DSA)
7. Diploma in Taxation (DIT)
8. Diploma in Creative Arts (DCrA)
9. Diploma in Computer Application (DCA)
10. Diploma in Tourism & Hospitality Management (DTHM)
11. Diploma in Forensic Science (DFSc.)
12. Diploma in Remote Sensing & GIS (DRSG)
13. Diploma in Hostel Management (DHM) \*
14. Diploma in Retail Marketing Management (DRMM)
15. Diploma in Banking Financial Services and Insurance (DBFSAI)
16. Diploma in Data Science and Analysis (DDA) – NEW

### **Certificate Courses (16)**

1. Certificate Courses in English Creative Writing (CECW)
2. Certificate Courses in Research Methodology (CRM)
3. Certificate Courses in Instrumentation & Electronic Maintenance (CIEM)
4. Certificate Courses in Cyber Security (CCS)
5. Certificate Courses in Spoken English (CSE)
6. Certificate Course in Intellectual Property Right (CIPR)
7. Certificate Courses in French Language (CFL)
8. Certificate Courses in Hostel Management (CHM)
9. Certificate Courses in Retail Marketing Management (CRMM)
10. Certificate Courses in Banking Financial Services and Insurance (CBFSAI)
11. Certificate Course in Advance Excel (CCAEE) – NEW
12. Certificate Course in Psychological Assessment and Tool Development (CPATD) – NEW
13. Certificate Course in Basics in Geogebra (CCBG) – NEW
14. Certificate Course in Cooking and Baking (CCCB) – NEW
15. Certificate Course in Emotional Intelligence (CCEI) – NEW
16. Certificate Course in Packaging and Designing (CCPD) - NEW

### **Training Courses (06)**

1. 45 Hours Training Programme in Food Processing & Preservation (FPP)
2. 30 Hours Training Programme in (MATLAB)
3. 30 Hours Training Programme in (SPSS)
4. 30 Hours Training Programme in Tally
5. 30 Hours Training Programme in Traditional Art (TPTA)
6. CII-IWN-IEHE Finishing School

### **Special Courses**

- Foundation Course in Civil Services Examinations (FCCSE)
- Joint Admission Test for M.Sc. (JAM)



**Program Outcomes (PO) of the Under-Graduate Courses Offered**

- PO1: Domain Knowledge:** Capable of demonstrating comprehensive knowledge & understanding of one or more other disciplines that form a part of an undergraduate programme of study.
- PO2: Critical Thinking:** Critically evaluate practices, policies and theories by following scientific approach to knowledge development. Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
- PO3: Problem Solving and Analytical Skills:** Ability to think rationally, analyse situations and solve problems adequately.
- PO4: Information and Digital Literacy:** Capability to use ICT in a variety of learning situations. Demonstrate ability to access, evaluate and use a variety of relevant information sources; and use appropriate software for analysis of data.
- PO5: Communication Skills:** The capacity to communicate effectively using appropriate media, to present complex information in a clear & concise manner. Acquire the learning abilities by focusing on LSRW (Listening, Speaking, Reading & Writing skill, which provide a stage to the students to sharpen their capacity to learn more.
- PO6: Social Interaction and sensitivity towards the societal issues:** Work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group and act together as a group or a team in the interests of a common cause. Elicit views of others, mediate disagreements and help reach conclusions in group settings.
- PO7: Self-directed & Life-long Learning:** Acquire the potential to engage in independent & life-long learning in the broadest context socio-technological changes. Critical sensibility to live experiences, with self-awareness and reflexivity of both and society.
- PO8: Environment and Sustainability:** Understand the issues of environmental contexts & sustainable development.
- PO9: Moral and Ethical Awareness:** Ability to embrace moral/ ethical values in conducting one's life, possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.
- PO10: Effective Citizenship:** Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
- PO11: Research-related skills:** A sense of inquiry and capability for asking relevant/appropriate questions, problematizing, synthesizing and articulating; Ability to recognize cause and effective relationships, define problems, formulate hypotheses, interpret and draw conclusions from data, ability to plan, execute and report the results of an experiment or investigation. Efficiency to apply one's learning to real life situations or in interdisciplinary areas.
- PO12: Leadership and Management Skills:** Competence to use skills in organizing for people to reach a shared goal. During leading a project, ability to motivate others to complete a series of tasks, often according to a schedule.
- PO13: Employability and Entrepreneurial Skill:** Ability to develop employability skills such as, positive attitude, good business sense, willingness to learn, resilience, ability to work under pressure, optimism, adaptability, perseverance and motivation, and a host of similar skills.



## Department of Physics & Electronics

### PROGRAMME OUTCOMES (PO): B.Sc.

Predefined Programme Outcomes	<i>Students taking admission to this program of B.Sc. get equipped with following outcomes:</i>
<b>PO1</b>	<b>Domain Knowledge:</b> Acquiring knowledge of fundamentals, basic Mathematics, domain knowledge of proper scientific models and Computing Specialization from defined problems and explaining the basic scientific principles and methods.
<b>PO2</b>	<b>Scientific thinking:</b> Inculcating scientific thinking and awareness, getting an ability to use necessary current techniques, skills, and modern tools.
<b>PO3</b>	<b>Problem Analysis:</b> Identifying, formulating, & analysing complex problems, reaching substantiated conclusions using first principles of Mathematics, natural sciences and electronic sciences.
<b>PO4</b>	<b>Communication:</b> Communicate concepts, designs, and solutions of scientific activities effectively and professionally with society at large.
<b>PO5</b>	<b>Information &amp; Digital Literacy:</b> Capability to use ICT in a variety of learning situations. Demonstrate ability to access, evaluate and use a variety of relevant information sources; and use appropriate software for analysis of data.
<b>PO6</b>	<b>Ethical Awareness:</b> Ability to embrace moral/ ethical values in conducting one's life, possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to support the values required for collaborative work such as mutual trust & fairness.
<b>PO7</b>	<b>Environment &amp; Sustainability:</b> Understanding the impact of scientific solutions on societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
<b>PO8</b>	<b>Self-directed and Life-long Learning:</b> Acquire the ability to engage in independent and life- long learning in the broadest context socio-technological changes. Critical sensibility to live experiences, with self-awareness and reflexivity of both and society.
<b>PO9</b>	<b>Research-related skills:</b> <ul style="list-style-type: none"> <li>• Acquiring familiarity with emerging areas of different subjects in science and their applications in various spheres of sciences and getting appraise of its relevance in future studies.</li> <li>• Getting ability to apply various statistical tools to research problems and ability to build statistical knowledge and knowing the statistical organization in India and abroad.</li> <li>• Developing scientific intuition, ability and techniques to tackle problems either theoretical or experimental in nature.</li> </ul>
<b>PO10</b>	<b>Employability Skill:</b> Ability to develop employability skills such as, positive attitude, good business sense, willingness to learn, resilience, ability to work under pressure, optimism, adaptability, perseverance and motivation, and a host of similar skills.



## Department of Physics & Electronics

### Programme Specific Outcomes (PSO): PHYSICS (Honours/Major Subject)

Programme Specific Outcomes	<i>The students taking up this program of BSc with Physics (Honours/Major) as a special subject of study, receive the following outcomes:</i>
<b>PSO-1</b>	Acquire a fundamental/systematic or coherent understanding of the academic field of physics, its different learning areas and applications in basic physics like material science, nuclear and particle physics, condensed matter physics, atomic and molecular physics, mathematical physics, and its linkages with related disciplinary areas/subjects like chemistry, mathematics, life sciences, environmental sciences, atmospheric physics, computer science, information technology.
<b>PSO-2</b>	Acquire a procedural knowledge that creates different types of professionals related to the Disciplinary/subject area of Physics, including professionals engaged in research and development, teaching and apart from this student can opt for government/public service
<b>PSO-3</b>	To equip students to handle the apparatus used in our daily life. To prepare students for a variety of carrier options in the field of Physics by accompanying all the Theory papers with appropriate Lab work including both performing practical's and preparing projects.
<b>PSO-4</b>	Demonstrate the ability to use skills in physics and its related areas of technology for formulating and tackling physics-related problems and identifying & applying appropriate physical principles & methodologies to solve a wide range of issues associated with physics in day-to-day life.
<b>PSO-5</b>	Recognize the importance of mathematical modelling simulation and computing, and the role of approximation and mathematical approaches to describing the physical world.
<b>PSO-6</b>	Plan and execute physics-related experiments or investigations, analyse and interpret data/information collected using appropriate methods, including the use of appropriate software such as programming languages and purpose-written packages, and report accurately the findings of the experiment/investigations while relating the conclusions/findings to relevant theories of physics.
<b>PSO-7</b>	To familiarize the students with the emerging areas of Physics such as Nanotechnology, Superconductivity, Condensed matter physics, LASER technology, Fibre Optics, Astrophysics, Space science etc. and their applications in various areas of Physical Sciences and to expose the students to use different processes used in the industry according to the pre-set requirement.
<b>PSO-8</b>	To develop communication skills involving the ability to listen carefully, to read texts and research papers analytically and to present complex information in a concise manner to different groups/audiences of technical or popular nature.
<b>PSO-9</b>	To encourage students to demonstrate professional behaviour such as being objective, unbiased and truthful in all aspects of work and avoiding unethical, irrational behaviour such as fabricating, falsifying or misrepresenting data or committing plagiarism.

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## Department of Physics & Electronics

### Mapping of PSO's BSc. Physics (Honours/Major) with POs of Under-Graduate

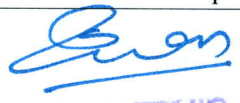
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
PSO-1	*	--	--	--	*	--	*	*	--	*
PSO-2	--	--	--	--	--	--	*	--	*	*
PSO-3	--	--	*	*	--	--	--	--	--	*
PSO-4	--	--	*	*	--	--	*	*	*	*
PSO-5	*	*	--	--	*	--	--	--	*	--
PSO-6	*	*	*	--	*	*	--	*	*	*
PSO-7	--	--	--	--	--	--	--	--	*	*
PSO-8	--	--	*	*	--	*	--	*	*	*
PSO-9	--	*	*	--	--	*	--	*	--	*

### Course Outcomes (COs)

#### Semester: I

#### Thermal Physics (Paper Code: MJS-171) (Major)

Course Outcomes	<i>The students taking up this course of BSc with Physics (Major) as a special subject of study receive the following outcomes:</i>
CO-1	<b>Define, state and comprehend</b> the basic concepts of thermodynamics, the first and second law of thermodynamics, the concept of entropy and the associated theorems, the thermodynamic potentials and their physical interpretations.
CO-2	<b>Perceive</b> the basic aspects of kinetic theory of gases, Maxwell-Boltzman distribution law, equipartition of energies, mean free path of molecular collisions, viscosity, thermal conductivity, diffusion and Brownian motion.
CO-3	<b>Describe</b> about the real gas equations, Vander Waal equation of state, the Joule-Thompson effect.
CO-4	In the laboratory course, the students are expected to do some basic <b>experiments</b> in thermal Physics, viz., <b>determinations</b> of coefficient of thermal conductivity, temperature coefficient of resistance, variation of thermo-emf of a thermocouple with temperature difference at its two junctions and calibration of a thermocouple.

  
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 गीतानंद

## Department of Physics & Electronics

### Semester: I


#### Mechanics (Paper Code: MNS-172) (Minor)

Course Outcomes	<i>The students taking up this course of BSc with Physics (Minor) as a special subject of study receive the following outcomes:</i>
CO-1	<b>Illustrate</b> laws of motion and their application to various dynamical situations, notion of inertial frames and concept of Galilean invariance. He / she will be able to recall the concept of conservation of energy, momentum, angular momentum and apply them to basic problems.
CO-2	<b>Associate</b> the analogy between translational and rotational dynamics, and application of both motions simultaneously in analysing rolling with slipping.
CO-3	<b>Perceive</b> the concept of moment of inertia about the given axis of symmetry for different uniform mass distributions. Understand the phenomena of collisions and idea about centre of mass and laboratory frames and their correlation.
CO-4	<b>Perceive</b> simple principles of fluid flow and the equations governing fluid dynamics.
CO-5	<b>Explain</b> the phenomena of simple harmonic motion and the properties of systems executing such motions.

### Semester: I

#### Mechanics (Paper Code: GES-171) (Generic Elective)

Course Outcomes	<i>The students taking up this course of BSc with Physics (Generic Elective) as a special subject of study receive the following outcomes:</i>
CO-1	<b>Recall</b> the laws of motion and their application to various dynamical situations. He / she will illustrate the concept of conservation of energy, momentum, angular momentum and apply them to basic problems.
CO-2	<b>Illustrate</b> the concept of moment of inertia about the given axis of symmetry for different uniform mass distributions.
CO-3	<b>Perceive</b> the phenomena of collisions and idea about centre of mass and laboratory frames and their correlation.
CO-4	<b>Describe</b> the principles of elasticity through the study of Young Modulus and modulus of rigidity.

  
 प्रिन्सिपल ऑफ फिजिक्स  
 कोटवाडी एवं इलेक्ट्रॉनिक्स  
 वरुण शिवा उस्तुष्टता संस्था  
 कोटा



## Department of Physics & Electronics

### Semester: II

#### Core-Mechanics (Paper Code: MJS-271) (Major)

Course Outcomes	<i>The students taking up this course of BSc with Physics (Major) as a special subject of study receive the following outcomes:</i>
CO-1	<b>Explain</b> laws of motion and their application to various dynamical situations, notion of inertial frames and concept of Galilean invariance. He / she will be able to recall the concept of conservation of energy, momentum, angular momentum and apply them to basic problems.
CO-2	<b>Associate</b> the analogy between translational and rotational dynamics, and application of both motions simultaneously in analysing rolling with slipping.
CO-3	<b>Perceive</b> the concept of moment of inertia about the given axis of symmetry for different uniform mass distributions. Understand the phenomena of collisions and idea about centre of mass and laboratory frames and their correlation.
CO-4	<b>Classify</b> simple principles of fluid flow and the equations governing fluid dynamics.
CO-5	<b>Explain</b> the phenomena of simple harmonic motion and the properties of systems executing such motions.

### Semester: II

#### Thermal Physics (Paper Code: MNS-272) (Minor)

Course Outcomes	<i>The students taking up this course of BSc with Physics (Minor) as a special subject of study receive the following outcomes:</i>
CO-1	<b>Comprehend</b> the basic concepts of thermodynamics, the first and the second law of thermodynamics, the concept of entropy and the associated theorems, the thermodynamic potentials and their physical interpretations.
CO-2	<b>Define</b> the basic aspects of kinetic theory of gases, Maxwell-Boltzman distribution law, equipartition of energies, mean free path of molecular collisions, viscosity, thermal conductivity, diffusion and Brownian motion.
CO-3	<b>Describe</b> about the real gas equations, Vander Waal equation of state, the Joule-Thompson effect.
CO-4	In the laboratory course, the students are expected to do some basic <b>experiments</b> in thermal Physics, viz., <b>determinations</b> of coefficient of thermal conductivity, temperature coefficient of resistance, variation of thermo-emf of a thermocouple with temperature difference at its two junctions and calibration of a thermocouple.

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कोयाम

## Department of Physics & Electronics

### Semester: II

#### Thermal Physics & Statistical Mechanics (Paper Code: GES-271) (Generic Elective)


(Not opted by the students in the session 2022-2023)

Course Outcomes	<i>The students taking up this course of BSc with Physics (Generic Elective) as a special subject of study receive the following outcomes:</i>
CO-1	<b>Comprehend</b> the basic concepts of thermodynamics, the first and the second law of thermodynamics, the concept of entropy and the associated theorems, the thermodynamic potentials and their physical interpretations.
CO-2	<b>Describe</b> the basic aspects of kinetic theory of gases, Maxwell-Boltzman distribution law, equitation of energies, mean free path of molecular collisions, viscosity, thermal conductivity, diffusion and Brownian motion.
CO-3	<b>Explain</b> about the real gas equations, Vander Waal equation of state, the Joule-Thompson effect.
CO-4	<b>Explain</b> the black body radiation, Stefan's Boltzmann Law, Rayleigh Jeans Law, Planck's Law and their significance, quantum statistical distributions.
CO-5	In the laboratory course, the students are expected to do some basic <b>experiments</b> in thermal Physics, viz., <b>determinations</b> of coefficient of thermal conductivity, temperature coefficient of resistant, variation of thermo-emf of a thermocouple with temperature difference at its two junctions and calibration of a thermocouple.

### Semester: III

#### Wave & Optics (Paper Code: MJS-371) (Major)

Course Outcomes	<i>The students taking up this course of BSc with Wave &amp; Optics (Major) as a special subject of study receive the following outcomes:</i>
CO-1	<b>Recognize</b> and use mathematically oscillator equation and wave equation and derive these equations for various systems.
CO-2	<b>Apply</b> basic knowledge of principles and theories about the behaviour of light and the physical environment to conduct experiments.
CO-3	<b>Perceive</b> the principle of superposition of waves, so they can describe the formation of standing waves.
CO-4	Use the principles of wave motion and superposition to <b>explain</b> the physics of polarization, interference and diffraction.
CO-5	<b>Explain</b> the working of selected optical instruments like biprism, interferometer, diffraction grating and holograms.

  
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## Department of Physics & Electronics

### Semester: III

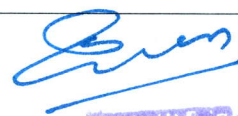
#### Electricity, Magnetism & Electromagnetic Theory (Paper Code: MNS-372) (Minor)

Course Outcomes	<i>The students taking up this course of BSc with Electricity, Magnetism &amp; Electromagnetic Theory (Minor) as a special subject of study receive the following outcomes:</i>
CO-1	<b>Demonstrate</b> Gauss Law, Coulombs Law for the electric field and apply it to systems of point charges as well as line, surface volume distribution of charges.
CO-2	<b>Explain</b> and <b>differentiate</b> the vector (electric field's, Coulomb's Law) and scalar (electric potential, electric potential energy) formalism of electrostatics.
CO-3	<b>Apply</b> the knowledge of electric current, resistance and capacitor in terms of electric field and electric potential.
CO-4	<b>Explain</b> Faraday-Lenz and Maxwell laws to <b>articulate</b> the relationship between electric and magnetic fields.
CO-5	<b>Perceive</b> the dielectric properties, magnetic properties of materials and the phenomenon of electromagnetic induction
CO-6	<b>Apply</b> Kirchoff's rules to <b>analyse</b> AC circuits consisting of parallel and/or series combinations of voltage sources and resistors and to <b>describe</b> the graphical relationship of resistance, capacitor and inductor.

### Semester: III

#### Electricity & Magnetism (Paper Code: GES-371) (Generic Elective)

Course Outcomes	<i>The students taking up this course of BSc with Electricity &amp; Magnetism (Generic Elective) as a special subject of study receive the following outcomes:</i>
CO-1	<b>Demonstrate</b> Gauss Law, Coulombs Law for the electric field and apply it to systems of point charges as well as line, surface volume distribution of charges.
CO-2	<b>Explain</b> and <b>differentiate</b> the vector (electric field's, Coulomb's Law) and scalar (electric potential, electric potential energy) formalism of electrostatics.
CO-3	<b>Apply</b> the knowledge of electric current, resistance and capacitor in terms of electric field and electric potential.
CO-4	<b>Explain</b> Faraday-Lenz and Maxwell laws to <b>articulate</b> the relationship between electric and magnetic fields.
CO-5	<b>Perceive</b> the dielectric properties, magnetic properties of materials and the phenomenon of electromagnetic induction

  
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## Department of Physics & Electronics

### Semester: III

#### Physics Workshop Skill (Paper Code: Voc/SEC-371) (Voc/SEC)

Course Outcomes	<i>The students taking up this course of BSc with Physics Workshop Skill (Voc/SEC) as a special subject of study receive the following outcomes:</i>
CO-1	<b>Recall</b> measuring units, meter scale and perform measurement of dimension of a solid block, volume of cylinder beaker, thickness of metal sheet.
CO-2	<b>Make</b> use of sextant to measure height of buildings, mountains etc.
CO-3	<b>Classify</b> different properties of matter.
CO-4	<b>Analyse</b> ideal and viscous fluids and explain Bernoulli's theorem through applications
CO-5	<b>Operate</b> multimeter, ICs on PCB, oscilloscope.

### Semester: IV

#### Magnetism & Electromagnetic Theory (Paper Code: MJS-471) (Major)

Course Outcomes	<i>The students taking up this course of BSc with Magnetism &amp; Electromagnetic Theory (Major) as a special subject of study receive the following outcomes:</i>
CO-1	<b>State and describe</b> Maxwell's Equation for EMT radiation.
CO-2	<b>Compare</b> the basic aspect of dispersion of EM radiations in various medias.
CO-3	<b>Demonstrate</b> the building concept of EM vector and EM potentials, concept of Gauge, i.e Lorentz's and Coulomb's gauge. Apply the gauges in solving the EM wave propagation.
CO-4	<b>Illustrate</b> basic concepts of Fourier analysis and solutions in homogeneous wave equation using Fourier analysis, Lienard- wiechert potentials and their use in studying movement of point charge. Mathematical formulation of moving point charge and EM wave field associated with moving charge.
CO-5	<b>Identify</b> Introduction to waveguides and propagation of EM waves with different modes in rectangular wave guides, Analysis of waveguides with determination of cutoff wavelength and guide wave length in circular and rectangular waveguides.
CO-6	<b>Discuss and explain</b> Introduction to Optical Fibre Communication system and the concept building of optical fibre transmission theory, Fabrication techniques and applications of Optical fibre. Introduction to various sources related to Optical Fibre communication.



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कोराड



## Department of Physics & Electronics

### Semester: IV

#### Wave & Optics (Paper Code: MNS-472) (Minor)

Course Outcomes	<i>The students taking up this course of BSc with Wave &amp; Optics (Minor) as a special subject of study receive the following outcomes:</i>
CO-1	<b>Recognize</b> and use mathematically oscillator equation and wave equation and derive these equations for various systems.
CO-2	<b>Apply</b> basic knowledge of principles and theories about the behaviour of light and the physical environment to conduct experiments.
CO-3	<b>Perceive</b> the principle of superposition of waves, so they can describe the formation of standing waves.
CO-4	<b>Use</b> the principles of wave motion and superposition to explain the physics of polarization, interference and diffraction.
CO-5	<b>Explain</b> the working of selected optical instruments like biprism, interferometer, diffraction grating and holograms

### Semester: IV


#### Wave & Optics (Paper Code: GES-471) (Generic Elective)

Course Outcomes	<i>The students taking up this course of BSc with Wave &amp; Optics (Generic Elective) as a special subject of study receive the following outcomes:</i>
CO-1	<b>Recognize</b> and use mathematically oscillator equation and wave equation and derive these equations for various systems.
CO-2	<b>Apply</b> basic knowledge of principles and theories about the behaviour of light and the physical environment to conduct experiments.
CO-3	<b>Perceive</b> the principle of superposition of waves, so they can describe the formation of standing waves.
CO-4	<b>Use</b> the principles of wave motion and superposition to explain the physics of polarization, interference and diffraction.
CO-5	<b>Explain</b> the working of selected optical instruments like biprism, interferometer, diffraction grating and holograms

### Semester: IV

#### Basic Instrumentation Skill (Paper Code: Voc/SEC-471) (Voc/SEC)

Course Outcomes	<i>The students taking up this course of BSc with Basic Instrumentation Skill (Voc/SEC) as a special subject of study receive the following outcomes:</i>
CO-1	<b>Validate</b> voltage and current using multimeter.
CO-2	<b>Measure</b> amplitude and frequency using CRO.
CO-3	<b>Measure</b> passive elements using CRO.

  
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 कोटा



## Department of Physics & Electronics

**Semester: V**

**Quantum, Atomic and Molecular Physics (Paper Code: MJS-571)**

Course Outcomes	<i>The students taking up this course of BSc with Physics (Honours-I) as a special subject of study receive the following outcomes:</i>
CO-1	<b>Know</b> the quantum mechanics and its applications.
CO-2	<b>Explain</b> the atomic structures and X-rays.
CO-3	<b>Analyse</b> the molecular spectra such as electronic, rotational and vibrational.
CO-4	<b>Identify</b> the various materials using Raman spectroscopic techniques.

**Semester: V**

**Digital Systems and Applications: (Paper Code: DSE-a)**

Course Outcomes	<i>The students taking up this course of BSc (Honours) with Electronics (Honours-II/Subsidiary) as a special subject of study receive the following outcomes:</i>
CO-1	<b>Understand</b> the digital logic circuit and their use in logic circuit design.
CO-2	<b>Imparts</b> information about the basic architecture, memory and microprocessor system.

**Semester: V**

**Mathematical Physics – I: (Paper Code: DSE-b)**

Course Outcomes	<i>The students taking up this course of BSc (Honours) with Electronics (Honours-II/Subsidiary) as a special subject of study receive the following outcomes:</i>
CO-1	<b>Revise</b> the knowledge of calculus, vectors, vector calculus, probability and probability distributions. These basic mathematical structures are essential in solving problems in various branches of Physics as well as in engineering.
CO-2	<b>Learn</b> about the curvilinear coordinates which have applications in problems with spherical and cylindrical symmetries.
CO-3	<b>Learn</b> about the Dirac delta function its properties, which have applications in various branches of Physics, especially quantum mechanics.

**Semester: V**

**Computation and Visualization with Scilab: (Paper Code: SEC-a)**

Course Outcomes	<i>The students taking up this course of BSc (Honours) with Electronics (Honours-II/Subsidiary) as a special subject of study receive the following outcomes:</i>
CO-1	<b>Implement</b> the concept of vectors & matrices in Scilab programming.
CO-2	Able to <b>apply</b> the programming concept like branching, iteration & functions in a Scilab program.
CO-3	Use the inbuilt functions of Scilab for trigonometric & statistical <b>calculations</b> .
CO-4	<b>Analyze</b> and <b>visualize</b> the data through various 2-D and 3-D plots
CO-5	<b>Apply</b> Scilab tools in modelling and simulations
CO-6	Use Scicos visual editor (Xcos) in various <b>simulations</b> of scientific importance.



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## Department of Physics & Electronics

### Semester: V

#### Electrical Circuits and Network Skills: (Paper Code: SEC-b)

Course Outcomes	<i>The students taking up this course of BSc (Honours) with Electronics (Honours-II/Subsidiary) as a special subject of study receive the following outcomes:</i>
CO-1	<b>Familiarize</b> with the type of devices/components that may be mounted on PCB
CO-2	<b>Familiarize</b> with TINA (Toolkit for Interactive Network Analysis) Software and effectively use it for circuit designing and simulations.
CO-3	<b>Understand</b> the PCB layout techniques for optimized component density and power saving.
CO-4	<b>Perform design</b> and printing of PCB with the help of various image transfer and soldering techniques.
CO-5	<b>Understand</b> the trends in the current PCB industry.

### Semester: VI

#### Solid State Physics and Electronics: (Paper Code: MJS-671)

Course Outcomes	<i>The students taking up this course of BSc (Honours) with Electronics (Honours-I) as a special subject of study receive the following outcomes:</i>
CO-1	<b>Understand</b> the structures of solids, space lattices and bonding of atoms in crystals.
CO-2	<b>Develop basic understanding</b> of physical properties of matter such as specific heat, electrical conductivity and lattice vibrations in Crystals.
CO-3	<b>Understand</b> the principles related to energy bands in solid-state devices, operation of diodes and their applications.
CO-4	<b>Develop the theoretical understanding</b> on operation of transistor, amplifiers and oscillators and their applications to electronic devices.
CO-5	<b>Understand</b> basic concepts of modulation and demodulation

### Semester: VI

#### Mathematical Physics – II: (Paper Code: DSE-a)

Course Outcomes	<i>The students taking up this course of BSc (Honours) with Electronics (Honours-II/Subsidiary) as a special subject of study receive the following outcomes:</i>
CO-1	<b>Learn</b> about the Fourier analysis of periodic functions and their applications in physical problems such as vibrating strings etc.
CO-2	<b>Learn</b> about the special functions, such as the Hermite polynomial, the Legendre polynomial, the Laguerre polynomial and Bessel functions and their differential equations and their applications in various physical problems such as in quantum mechanics which they will learn in future courses in detail.
CO-3	<b>Learn</b> the beta, gamma and the error functions and their applications in doing integrations.
CO-4	<b>Know</b> about the basic theory of errors, their analysis, estimation with examples of simple experiments in Physics.
CO-5	<b>Acquire</b> knowledge of methods to solve partial differential equations with the examples of important partial differential equations in Physics.

## Department of Physics & Electronics

### Semester: VI

#### Astronomy and Space Physics: (Paper Code: DSE-b)

Course Outcomes	<i>The students taking up this course of BSc (Honours) with Electronics (Honours-II/Subsidiary) as a special subject of study receive the following outcomes:</i>
CO-1	<b>Know</b> the basic concepts of astronomy and space physics.
CO-2	<b>Know</b> about physical processes in stars and evolution of stars
CO-3	<b>Understand</b> the structure and dynamics of galaxies.
CO-4	Become aware with the working principle of astronomical tools and <b>observations</b> .

### Semester: VI


#### Nuclear and Particle Physics: (Paper Code: DSE-c)

Course Outcomes	<i>The students taking up this course of BSc (Honours) with Electronics (Honours-II/Subsidiary) as a special subject of study receive the following outcomes:</i>
CO-1	<b>Understand</b> the structure of nucleus and nuclear energy.
CO-2	<b>Understand</b> the different forms of radioactivity and decay process.
CO-3	<b>Develop the understanding</b> for fission and fusion processes. Nuclear power Generation.
CO-4	<b>Develop the understanding</b> elementary particles and their properties.

### Semester: VI

#### Introduction to Instrumentation: (Paper Code: DSE-d)

Course Outcomes	<i>The students taking up this course of BSc (Honours) with Electronics (Honours-II/Subsidiary) as a special subject of study receive the following outcomes:</i>
CO-1	<b>Describe</b> the working principle of different measuring instruments.
CO-2	<b>Choose</b> appropriate measuring instruments for measuring various parameters in their laboratory courses.
CO-3	<b>Correlate</b> the significance of different measuring instruments, recorders and oscilloscopes.

  
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बोवा



### A brief note on Bloom's Taxonomy:

According to the revised version of Bloom's Taxonomy there are six levels of cognitive learning. Each level is conceptually different. The six levels are (1) remembering, (2) understanding, (3) applying, (4) analyzing, (5) evaluating, and (6) creating. We follow the Bloom's Taxonomy in deciding the course outcome & the levels (1/2/3/4/5/6) are displayed in the mapping table of COs with the PSOs of each program of NEP-2020. Details of the terms used in the levels are as follows:

Level-1: **REMEMBER** - this level include:

*cite, define, describe, identify, label, list, match, name, outline, quote, recall, report, reproduce, retrieve, show, state, tabulate, and tell.*

Level-2: **UNDERSTAND** - this level include:

*abstract, arrange, articulate, associate, categorize, clarify, classify, compare, compute, conclude, contrast, defend, diagram, differentiate, discuss, distinguish, estimate, exemplify, explain, extend, extrapolate, generalize, give examples of, illustrate, infer, interpolate, interpret, match, outline, paraphrase, predict, rearrange, reorder, rephrase, represent, restate, summarize, transform, and translate.*

Level-3: **APPLY** - this level include:

*apply, calculate, carry out, classify, complete, compute, demonstrate, dramatize, employ, examine, execute, experiment, generalize, illustrate, implement, infer, interpret, manipulate, modify, operate, organize, outline, predict, solve, transfer, and use.*

Level-4: **ANALYZE** - this level include:

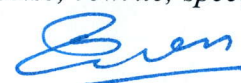
*analyze, arrange, break down, categorize, classify, compare, contrast, deconstruct, detect, diagram, differentiate, discriminate, distinguish, divide, explain, identify, integrate, inventory, order, organize, relate, separate, and structure.*

Level-5: **EVALUATE** - this level include:

*appraise, apprise, argue, assess, compare, conclude, consider, contrast, convince, criticize, critique, decide, determine, discriminate, evaluate, grade, judge, justify, measure, rank, rate, recommend, review, score, select, standardize, support, test, and validate.*

Level-6: (highest level): **CREATE** - this level include:

*arrange, assemble, build, collect, combine, compile, compose, constitute, construct, create, design, develop, devise, formulate, generate, hypothesize, integrate, invent, make, manage, modify, organize, perform, plan, prepare, produce, propose, rearrange, reconstruct, reorganize, revise, rewrite, specify, synthesize, and write.*



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बोयाल



# Department of Physics & Electronics

**Programme: BSc (Major)**

**Subject: Physics**

**Mapping of COs with PSOs for Semester-I (Major)**

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
<i>Paper Title: Thermal Physics</i>	CO1	1									
	CO2	2									
<i>Paper Code: MJS-171</i>	CO3	1									
	CO4			5			5				

**Mapping of COs and PSOs for Semester-II (Major)**

<i>Paper Title: Core Mechanics</i>	CO1	1									
	CO2	2									
<i>Paper Code: MJS-271</i>	CO3	2									
	CO4	4									
	CO5	1									

**Mapping of COs and PSOs for Semester-III (Major)**

<i>Paper Title: Wave &amp; Optics</i>	CO1	1									
	CO2	3									
<i>Paper Code: MJS-371</i>	CO3	2									
	CO4		4								
	CO5		5	5				5			

**Mapping of COs and PSOs for Semester-IV (Major)**

<i>Paper Title: Magnetism &amp; Electromagnetic Theory</i>	CO1	1									
	CO2	2									
	CO3	3			3						
	CO4	3									
<i>Paper Code: MJS-471</i>	CO5			4				4			
	CO6							4			

**Mapping of COs and PSOs for Semester-V (Major)**

<i>Paper Title: Quantum, Atomic and Molecular Physics</i>	CO1	1									
	CO2	2									
	CO3	3									
	CO4	4		4							
<i>Paper Code: S-571</i>											

**Mapping of COs and PSOs for Semester-VI (Major)**

<i>Paper Title: Solid State Physics and Electronics</i>	CO1	1									
	CO2			2							
<i>Paper Code: S-671</i>	CO3	3	3								
	CO4		4								
	CO5	5									



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# Department of Physics & Electronics

**Programme: BSc (Minor)**

**Subject: Physics**

**Mapping of COs with PSOs for Semester-I (Minor)**

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
<b>Paper Title:</b> <b>Mechanics</b> <b>Paper Code: MNS-172</b>	CO1	1									
	CO2	2									
	CO3	2									
	CO4	4									
	CO5	1									

**Mapping of COs and PSOs for Semester-II (Minor)**

<b>Paper Title: Thermal Physics</b> <b>Paper Code: MNS-272</b>	CO1	1									
	CO2	2									
	CO3	1									
	CO4			5			5				

**Mapping of COs and PSOs for Semester-III (Minor)**

<b>Paper Title:</b> <b>Electricity, Magnetism &amp; Electromagnetic Theory</b> <b>Paper Code: MNS-372</b>	CO1	1									
	CO2	2									
	CO3	3			3						
	CO4	3									
	CO5			4				4			
	CO6							4			

**Mapping of COs and PSOs for Semester-IV (Minor)**

<b>Paper Title: Wave &amp; Optics</b> <b>Paper Code: MNS-472</b>	CO1	1									
	CO2	3									
	CO3	2									
	CO4		4								
	CO5		5	5				5			

**Programme: BSc (Discipline Specific Elective)**

**Subject: Physics**

**Mapping of COs with PSOs for Semester-V (DSE-a)**

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
<b>Paper Title:</b> <b>Digital Systems Applications:</b> <b>(Paper Code: DSE-a)</b>	CO1			1							
	CO2						2				

**Mapping of COs and PSOs for Semester V (DSE-b)**

<b>Paper Title:</b> <b>Mathematical Physics – I:</b> <b>(Paper Code: DSE-b)</b>	CO1	1									
	CO2	2				2					
	CO3				3						



## Department of Physics & Electronics

### Mapping of COs and PSOs for Semester VI (DSE-a)

<i>Paper Title:</i> <b>Mathematical Physics – II:</b> (Paper Code: <b>DSE-a)</b>	CO1	1									
	CO2	2									
	CO3	3									
	CO4			4							
	CO5	5									

### Mapping of COs with PSOs for Semester-VI (DSE-b)

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
<i>Paper Title:</i> <b>Astronomy and Space Physics:</b> (Paper Code: DSE-b)	CO1	1									
	CO2							2			
	CO3	3						3			
	CO4				4						

### Mapping of COs and PSOs for Semester VI (DSE-c)

<i>Paper Title</i> <b>Nuclear and Particle Physics</b> (Paper Code: DSE-c)	CO1	1									
	CO2		2								
	CO3				3						
	CO4							4			

### Mapping of COs and PSOs for Semester VI (DSE-d)

<i>Paper Title:</i> <b>Introduction to Instrumentation:</b> (Paper Code: DSE-d)	CO1	1	1	1	1	1	1	1			
	CO2		2	2	2		2				
	CO3			3							

**Programme: BSc (Generic Elective/Vocational)**

**Subject: Physics**

### Mapping of COs with PSOs for Semester-I (Generic Elective)

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
<i>Paper Title: Mechanics</i> <i>Paper Code: GES-171</i>	CO1	1									
	CO2	2									
	CO3	2									
	CO4	4									
	CO5	1									

### Mapping of COs and PSOs for Semester-II (Generic Elective)

<i>Paper Title: Thermal Physics &amp; Statistical Mechanics</i> <i>Paper Code: GES-271</i>	CO1	1									
	CO2	2									
	CO3	1									
	CO4			5			5				



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कोटा



## Department of Physics & Electronics

### Mapping of COs and PSOs for Semester-III (Generic Elective)

<b>Paper Title: Electricity &amp; Magnetism</b> <b>Paper Code: GES-371</b>	CO1	3									
	CO2	1									
	CO3	3		3							
	CO4	1,4									
	CO5	2									

### Mapping of COs and PSOs for Semester-IV (Generic Elective)

<b>Paper Title: Waveguides &amp; Optics</b> <b>Paper Code: GES-471</b>	CO1	1									
	CO2	3									
	CO3	2									
	CO4		4								
	CO5		5	5				5			

### Mapping of COs and PSOs for Semester-III (Voc/SEC) (Vocational)

<b>Paper Title: Physics Workshop Skill</b> <b>Paper Code: Voc/SEC-XXX</b>	CO1	1									
	CO2						6				
	CO3	4									
	CO4	4									
	CO5			5		5					

### Mapping of COs and PSOs for Semester-IV (Voc/SEC) (Vocational)

Course		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
<b>Paper Title: Basic Instrumentation Skill</b> <b>Paper Code: Voc/SEC-XXX</b>	2										2
		5									
		5									

### Mapping of COs and PSOs for Semester V (Voc/SEC)

<b>Paper Title: Computation and Visualization with Scilab: (Paper Code: SEC-a)</b> <b>Paper Code: Voc/SEC-XXX</b>	CO1		1								
	CO2		2	2						2	
	CO3		3	3						3	
	CO4			4	4					4	
	CO5		5	5						5	
	CO6		6	6						6	



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कोयंबटूर



# Department of Physics & Electronics

## Mapping of COs and PSOs for Semester V (Voc/SEC)


<b>Paper Title:</b> <b>Electrical</b> <b>Circuits and</b> <b>Network Skills:</b> (Paper Code: SEC-b)  <b>Paper Code:</b> <b>Voc/SEC-XXX</b>	CO1		1							
	CO2			2	2	2				2
	CO3		3							
	CO4			4	4	4				4
	CO5		5							

  
(IQAC Coordinator)



  
(Convenor, Academic Committee)

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(Dr Pragyesh Kumar Agrawal)  
Director