

GDC Memorial College, Bahal (BHIWANI)

Department of Physics

Session 2018-19 (Odd)

Learning Objective & Outcomes

M.Sc.(Physics) 1st Sem.

Subject: Mathematical Physics

Subject Code: MSP-101

Learning Objective

This Course Enables the Student to

1. Understand the linear equations, vector spaces, matrices, linear transformations, determinants, eigenvalue, eigenvectors, etc.
2. Learn to use Laplace transform methods to solve differential equations.
3. Introduce the Fourier series and its application to the solution of partial differential equations

Learning Outcomes

Upon successful completion of this course it is intended that a student will be able to:

1. Students will demonstrate competence with the basic ideas of linear algebra including concepts of linear systems, independence, theory of matrices, linear transformations, bases and dimension, eigenvalues, eigenvectors and Diagonalization.
2. Use the method of Laplace transforms to solve initial-value problems for linear differential equations with constant coefficients.
3. Solve a Cauchy problem for the wave or diffusion equations using the Fourier Transform.

GDC Memorial College, Bahal (BHIWANI)

Department of Physics

Session 2018-19 (Odd)

Learning Objective & Outcomes

M.Sc.(Physics) 1st Sem.

Subject: Classical Mechanics

Subject code: MSP-102

Learning Objective

This Course Enables the Student

1. To distinguish between 'inertia frame of reference' and 'non-inertial frame of reference'
2. To know how to impose constraints on a system in order to simplify the methods to be used in solving physics problems
3. To know what central, conservative and central-conservative forces mathematically understand the conservative theorems of energy, linear momentum and angular Momentum.
4. To know the importance of concepts such as generalized coordinates and constrained motion
5. To establish that Kepler's laws are just consequences Newton's laws of gravitation and that of motion
6. understand Poisson brackets, understand canonical transformations
7. To find the linear approximation to any dynamical system near equilibrium and also know how to derive and solve the wave equation for small oscillations.

Learning Outcomes

Upon successful completion of this course it is intended that a student will be able to:

1. Students learn about Lagrangian and Hamiltonian formulation of Classical Mechanics.
2. state the conservation principles involving momentum, angular momentum and energy and understand that they follow from the fundamental equations of motion
3. Have a deep understanding of Newton's laws,
4. Students learn about motion of a particle under central force field.

GDC Memorial College, Bahal (Bhiwani)

Department of PHYSICS

2018-19(Odd)

Learning Objective & Outcomes

M. Sc (Physics) 1st Semester

Subject: Quantum Mechanics- I

Subject Code: MSP-103

Learning objectives

1. The main objective of this course is to make students aware about the basic formulations in quantum mechanics. There are many different types of representations of state and operators that are very useful in studying the subject deeply.
2. The course takes up the responsibility to give information about hermitian operators, their eigenvalues and eigenvectors. It teaches about various commutation and uncertainty relations.
3. Students will be given knowledge about unitary transformations, dirac delta function, matrix representation of operators and their applications.
4. Main focus is on angular momentum operator and their representation in spherical coordinates. Addition of angular momenta is also taught.
5. Students will be given insight to solve Schrodinger wave equation in three dimensions.
6. Basic idea of time independent perturbation theory is provided .

Learning outcomes

1. After taking this course students will be able to appreciate the beauty of quantum mechanics. They will be knowing all types of representations of operators and ways to apply them in different problems.
2. The most important thing students learned form this course was how to solve the hydrogen atom problem by using quantum mechanics.
3. Students learned about time independent degenerate and non degenerate perturbations and to apply them in harmonic oscillator.
4. Students got an idea of Pauli spin matrices which are very important in nuclear and particle physics as well as atomic and molecular physics.

GDC Memorial College, Bahal (Bhiwani)

Department of Physics

Session 2018-19 (Odd)

Learning Objective & Outcomes

M.Sc.(Physics) 1st Semester

Subject: Atomic and Molecular Physics

Subject code: MSP-104

Learning Objective

This Course Enables the Student to

1. study and develop the Bohr theory of the hydrogen atom
2. Observe the fine structure lines of HCl molecule and the Zeeman splitting of one or more of these lines as a function of magnetic field.
3. Outline the selection rules for rotational and vibrational spectra and rationalize the role of the molecular dipole moment in the selection rules.
4. Distinguish between the energy levels of a rigid and a non rigid rotor.

Learning Outcomes

Upon successful completion of this course it is intended that a student will be able to:

1. They should be able to calculate the Zeeman effect and the Lande g-factor
2. They should be able to calculate the effects of an electric field on the energy levels of the hydrogen atom (the Stark effect).
3. They should be able to discuss the rotational spectra of molecules.
4. They should be able to apply the Simple Harmonic Oscillator to determine the vibrational spectrum of diatomic molecules.
5. You will understand how the new theory could explain the fine structure in the spectra of hydrogen and hydrogen-like ions, and how this theory can be extended to atoms which have a single electron in their outermost shell, i.e. the alkali metal atoms.
6. Students learn about fine structure of Hydrogen atoms.
7. Students learn about rotational and vibrational energy levels of diatomic molecules and Raman spectroscopy.

GDC Memorial College, Bahal (Bhiwani)

Department of PHYSICS

2018-19(Odd)

Learning Objective & Outcomes

M.Sc.(PHYSICS) 2nd Semester

Subject : Electronics Devices

Subject Code : MSP-105

Learning Objective

1. The course will provide the students about the electronic Components diode, transistor.
2. This will provide the students the knowledge of IC fabrication.
3. It give an imp. Information about the optoelectronic devices.
4. This course offered a variety of diodes like zener diode .
5. It will give the knowledge of switching circuit.

Learning Outcomes

After the completion of the course, Students will be able to

1. IC fabrication is very imp. For the electronic industry, this will give the knowledge of many circuits.
2. Optoelectronic devices help the students for the conversion of energy, like light to electrical energy.
3. The study of semiconductor devices makes the base of student in the electronic field.
4. Zener diode study tells that it act as a voltage regulator and how to control the voltage.

GDC Memorial College, Bahal (Bhiwani)

Department of Physics

2018-19(Odd)

Learning Objectives & Outcomes

M.Sc. (Physics) 1st Semester

Subject: Communication Skills

Subject Code: MSP-106

Learning Objectives

1. Students will demonstrate competency in research skills related to the use of the field's professional literature and in systematic research design and implementation.
2. Students will demonstrate an understanding of multiple theoretical perspectives and diverse intellectual traditions in Communication.
3. Students will demonstrate competency in human relational interaction.
4. Students will demonstrate competency in the analysis and practice of ethical communication.
5. Students will demonstrate an understanding of the importance of free expression and the responsibilities it entails.
6. Students will demonstrate competency in effective communication with diverse others and an understanding of the impact of culture on communication

Learning outcomes

After completion of the course Students will be able to

1. Demonstrate critical and innovative thinking
2. Display competence in oral, written, and visual communication.
3. Apply communication theories.
4. Show an understanding of opportunities in the field of communication.

GDC Memorial College, Bahal (Bhiwani)

Department of Physics

Session 2018-19 (Even)

Learning Objective & Outcomes

M.Sc.(Physics) 2nd Sem.

Subject: Statistical Mechanics

Subject code: MSP-201

Learning Objective

1. This course provides an introduction to the microscopic formulation of thermal physics, generally known as statistical mechanics.
2. We explore the general principles, from which emerge an understanding of the microscopic significance of entropy and temperature.
3. We develop the machinery needed to form a practical tool linking microscopic models of many-particle systems with measurable quantities.
4. We consider a range of applications to simple models of crystalline solids, classical gases, quantum gases and blackbody radiation.

Learning Outcomes

On completion of this course a student should be able to:

1. define and discuss the concepts of microstate and macrostate of a model system
2. define and discuss the concepts and roles of entropy and free energy from the view point of statistical mechanics
3. apply the machinery of statistical mechanics to the calculation of macroscopic properties resulting from microscopic models of magnetic and crystalline systems
4. define the Fermi-Dirac and Bose-Einstein distributions; state where they are applicable; understand how they differ and show when they reduce to the Boltzmann distribution
5. apply the Fermi-Dirac distribution to the calculation of thermal properties of electrons in metals
6. apply the Bose-Einstein distribution to the calculation of properties of black body radiation

GDC Memorial College, Bahal (Bhiwani)

Department of Physics

2018-19(Even)

Learning Objective & Outcomes

M.Sc.(Physics) 2nd Semester

Subject : Nuclear and particle physics

Subject Code : MSP-202

Learning Objective

1. The objective of the course is to appraise the students about the particles.
2. To learn about the decay phenomenon and the process how they will occur.
3. Knowledge of various model compare to nucleus.
4. Knowledge of scattering process.

Learning Outcomes

After the completion of the course, Students will be able to

1. Students shall learn about the knowledge of particles.
2. Significance of various decays tells the students about the nuclear process..
3. It will teach the students about the spin parity concept & magic no. Related to shell.
4. About the scattering process how it will occur.

GDC Memorial College, Bahal (Bhiwani)

Department of Physics

2018-19(Even)

Learning Objective & Outcomes

M. Sc (Physics) 2nd Semester

Subject : Quantum Mechanics- II

Subject Code : MSP- 203

Learning objectives

1. This is an advanced level course in Quantum mechanics which objects to teach about various approximation methods in physics to calculate the approximate values of energy for various systems.
2. Students will be able to learn the methods to find transition probability for absorption and emission.
3. The objective is to give them ideas about laboratory and center of mass frame and study the scattering phenomena in both these frames.
4. This course will let students appreciate the beauty of quantum mechanics in the form of the Born approximation and its validity.
5. Students will be able to study the wave functions of system of identical particles.

Learning outcomes

1. After studying this course, students can calculate the ground state and excited state energies of various real life systems by using Principle , WKB method and perturbation methods.
2. Students will be knowing about the Einstein's coefficients and relating them to lasers.
3. They know about scattering in two different frames and can easily calculate scattering amplitude and scattering cross section.
4. Students can write total energy and wave function as slater determinant for system of identical fermions.

GDC Memorial College, Bahal (Bhiwani)

Department of Physics

2018-19(Even)

Learning Objective & Outcomes

M.Sc.(Physics) 2nd Semester

Subject : Atomic and Molecular Physics-II

Subject Code : MSP-204

Learning Objective

1. This course will provides an introduction to the knowledge of the different spectroscopy methods.
2. To study Raman spectroscopy: principle, instrumentation and their applications.
3. To study the electronic spectra of diatomic molecules.
4. Explain the IR and Raman spectroscopy in the structure determination of simple molecules.
5. Describe the origin of X-ray and their emission and absorption spectra.

Learning Outcomes

After the completion of the course, Students will be able to

1. Understand the difference between Stokes and anti-Stokes lines in a Raman spectrum.
2. Student will be able to select molecular spectroscopy methods suitable for solving given scientific problem.
3. Student will know basic information on molecular methods (IR, Raman, UV etc.)
4. Student will be able to analyze results of measurements using molecular spectroscopy methods.
5. Understand the concept of origin of X-rays.

GDC Memorial College, Bahal (Bhiwani)

Department of Physics

2018-19(Even)

Learning Objective & Outcomes

M.Sc.(Physics) 2nd Semester

Subject : Condensed Matter Physics

Subject Code : MSP-205

Learning Objective

1. The objective of the paper is to aware the students about the field of Condensed matter physics
2. This paper enable the students to understand about the crystal structure, interaction with X-ray, lattice vibrations, defects, electronic properties and the magnetic properties etc.
3. It also helps the students to understand various properties about crystals.
4. This paper deals with the study of structural properties of solids.

Learning Outcomes

After the completion of the course, Students will be able to

1. Understand the physics behind structural properties of the solids.
2. Tailor the properties of solids with proper understanding.
3. Pursue the research work in the field of material science and nanotechnology.

GDC Memorial College, Bahal (Bhiwani)

Department of Physics

2018-19(Odd)

Learning Objective & Outcomes

M. Sc (Physics) 3rd Semester

Subject: Solis State Electronics

Subject Code: MSP-301

Learning objectives

1. To introduce the electronic properties of semiconductor and semiconductor devices.
2. To introduce about the impurities which are add up in the semiconductor.
3. To introduce about the electron and holes and their mass.
4. It gives the study of integrated circuit and the fabrication of integrated circuit.
5. It gives the knowledge of carrier transport in semiconductor.
6. SSE introduces the microwave devices and types of diodes and transistor.

Learning outcomes

Having successfully completed this module, you will be able to demonstrate knowledge and understanding of:

1. Understanding the nature of semiconductor materials.
2. Understand the physics that influence the presence of charge carrier in a semiconductor.
3. Describe the factors that influence the flow of charge in semiconductor.
4. Describe the operation of semiconductor devices.
5. To calculate the voltage and current changes in semiconductor devices.
6. Develop the analytic approaches to understanding semiconductor devices.

GDC Memorial College, Bahal (Bhiwani)

Department of Physics

2018-19(Odd)

Learning Objective & Outcomes

M. Sc (Physics) 3rd Semester

Subject: Electrodynamics and Wave propagation

Subject Code: MSP-302

Learning objectives

1. One of the objectives of this course is to introduce students with the formulation of four vectors. They are to be introduced by the Lorentz transformations and the invariance of various quantities in four dimensions.
2. Main aim is to feed student's mind by fields and radiations from various types of dipoles and localized sources. They will be taught to calculate power radiated in each case.
3. Students will be introduced by the formation and characteristics of ionosphere and how waves propagate through it.
4. The objective is to introduce them about wave guides and their applications.
5. They will be taught about the transmission lines and propagation of waves through them.

Learning outcomes

1. After taking this course, students are able to appreciate the need and necessity of four vector notation. They have applied it for Lorentz transformation and written the dual field tensor which is one of the major aspects of theoretical physics.
2. They have understood the difference between covariance and invariance of various quantities and applied it.
3. One of the major advantages of this course is that it is very much related to the real life where the ionosphere is playing very important part.
4. Students now know the basics of scattering and absorption and relate them to real life phenomena.
5. They have learnt about wave guides and transmission lines and propagation of waves through them.

GDC Memorial College, Bahal (Bhiwani)

Department of Physics

Session 2018-19 (Odd)

Learning Objective & Outcomes

M.Sc.(Physics) 3rd Sem

Subject: Electronics-I

Subject Code: MSP-303

Learning Objective

1. To learn Number System, Binary Codes and Boolean algebra.
2. Student will learn Boolean function representation and minimization techniques.
3. To learn about Combinational Logic Circuits and Sequential Logic Circuits.
4. Students learn about Counters and their applications.
5. To learn Shift registers and their applications.

Learning Outcomes

After the completion of the course, Students will be able to

1. Understand the fundamentals of converting from one number system to another.
2. Represent signed decimal numbers in 2's complement form, and vice versa.
3. Explain the basic logic operations of NOT, AND, OR, NAND, NOR, and XOR.
4. Apply the laws of Boolean algebra and K-map to simplify circuits and Boolean algebra expressions.
5. Understand the basic electronics of logic circuits, counters, registers and be able to use integrated circuit packages.

GDC Memorial College, Bahal (Bhiwani)

Department of Physics

Session 2018-19 (Odd)

Learning Objective & Outcomes

M.Sc.(Physics) 3rd Sem

Subject: Radiation Physics

Subject code: MSP-304

Learning Objective:

This Course Enables the Student to

1. introduce students to the fundamental principles and concepts governing radiation physics
2. observational aspects of radioactivity, including nuclear radiations
3. Photoelectric effect, Compton Effect and Pair production
4. Ionization chamber, proportional counter, GM counter, scintillation detector
5. The classification of Radiation Therapy and Nuclear Reactions.
6. Burlin's theory for Measurement of Radiation Quantity and radiation protection

Learning Outcomes:

Upon successful completion of this course, the student will be able to:

1. Measure of Radioactivity and Radiation Quantity.
2. Use the Burlin's theory and the law of radioactive decay to describe alpha-decay, beta-decay, fission and fusion, predict decay reactions and calculate the energy release in nuclear decays
3. Explain the experimental evidence for Interaction of Radiation with matter and Radiation Protection
4. Explain Photoelectric effect, Compton Effect and Pair production

GDC Memorial College, Bahal (Bhiwani)

Department of Physics

Session 2018-19 (Odd)

Learning Objective & Outcomes

M.Sc.(Physics) 3rd Sem

Subject: Material Science

Subject code: MSP-305

Learning Objective:

1. This part of the syllabus basically deals with the study of the extended version of Condensed matter physics as we have studied in our previous semester. These applications also help us to understand various phenomenons in Nanotechnology which we are going to learn in our next semester.
2. The **First Unit** basically deals with the study of Symmetry elements and concept groups and their physical contributions in various properties like, Physical, Optical, and Magnetic etc.
3. The **Second unit** describes about various techniques for preparation of various types of Nanomaterials. This chapter basically deals with the Principals of Physics their importance and important contribution in the field of preparing various Nano materials.
4. The **Third Unit** explains the Principle of Powder Diffraction method and its contribution in finding up various Physical structural properties of a crystal in details.
5. The **Fourth Unit** describes the carbon nanotubes based electronic devices. It also describes the various ways of preparing Nanotubes. Special characterization techniques in order to study the nanotubes.

Learning Outcomes:

Finally it can be concluded that, proper study of the paper lead the students to be the leader of Nanotechnology in the future. Then they can precede their further study in the field of Nanotechnology with proper understanding which may lead to some new scientific contributions.

GDC Memorial College, Bahal (Bhiwani)
Department of Physics
2018-19(Even)
Learning Objective & Outcomes
M.Sc. 4th Semester

Subject: Computational Physics

Paper Code: MSP-401

Learning Objective

1. The course will also develop an understanding of the elements of error analysis for numerical methods and certain proofs.
2. The main objective of this course is to provide students with an introduction to the field of numerical analysis.
3. Derive appropriate numerical methods to solve interpolation based problems.
4. Derive appropriate numerical methods to solve probability based problems.
5. Problem solution using FORTRAN language.

Learning Outcomes

After the completion of the course, Students will be able to

1. Understand the theoretical and practical aspects of the use of numerical analysis.
2. Proficient in implementing numerical methods for a variety of multidisciplinary applications.
3. Establish the limitations, advantages, and disadvantages of numerical analysis.
4. Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
5. Understand the syntax of FORTRAN language and to develop the programme using it for the solution of a problem.

GDC Memorial College, Bahal (Bhiwani)
Department of PHYSICS
2018-2019(Even)
Learning Objective & Outcomes
M.Sc.(Physics) 4th Semester

Subject : Laser and its applications

Subject Code : MSP-402

Learning Objective

1. One of the objectives of this course is to introduce students with the highly intense electric field. They are to be introduced by the MASER & LASER.
2. Main aim is to feed student's mind by how the materials and radiations interacts with each other. They will be taught that how Laser and its components work.
3. Students will be introduced by conditions under which laser action is done and Types of losses and gain in the emission processes.
4. The objective is to introduce them about different type of laser systems and their working.
5. They will be taught about different modes of laser beam and their intensity.

Learning Outcomes

1. After taking this course, students are able to appreciate the need and necessity Laser.
2. They have understood the Einstein coefficients in two, three & four level laser systems.
3. One of the major advantages of this course is that the lasers have many application in filed of medicine, communication, industrial etc.
4. Students now know the basics that how radiations interact with material.
5. They have learnt about necessary conditions for occurs of laser.

GDC Memorial College, Bahal (Bhiwani)
Department of Physics
2018-2019(Even)
Learning Objective & Outcomes
M.Sc.(Physics) 4th Semester

Subject : Electronics-II

Subject Code : MSP-403

Learning Objective

1. The objective of the course is to appraise the students about the process which help
In communication
2. About the various devices which are optoelectronic.
3. Circuit analysis of operational amplifier and IC.
4. Knowledge about digital electronics and digital technique.

Learning Outcomes

After the completion of the course, Students will be able to

1. Students shall learn about the significance of communication process which are very
useful in daily life.
2. Significance of various devices which are which are beneficial to understand how
they will operate and use.
3. Due to circuit analysis of IC and OPAMP, it will help in performing the mathematical
operation.
4. The modern world is digital world .It is very useful in this time.

GDC Memorial College, Bahal (Bhiwani)

Department of Physics

2018-19(Even)

Learning Objective & Outcomes

M.Sc.(Physics) 4th Semester

Subject: Physics of Nano-materials

Subject Code: MSP-404

Learning Objective

1. This paper deals with the study of various phenomenons of Nano science and Nano technology.
2. First unit describes the free electron theory which can describe various phenomenons.
3. The second unit describes the physics in quantum well, quantum wire and quantum dot.
4. Third unit gives idea about various characterizations like XRD, PL spectra and Raman spectroscopy.
5. The last unit describes various synthesis techniques like cluster beam deposition, ion beam deposition, chemical bath deposition techniques etc.

Learning Outcomes

After the completion of the course, Students will be able to

1. Explain the Nano science and technology in light of quantum confinement.
2. Understand various phenomenons like quantum dot, quantum wire in light of Schrödinger equation.
3. Synthesis various nonmaterial with various techniques with proper understanding.
4. They can analysis the Nano crystal with Structural and opto electrical properties,.
5. The understanding of the subject leads the students in their research work.

GDC Memorial College, Bahal (Bhiwani)

Department of Physics

Session 2018-19 (Even)

Learning Objective & Outcomes

M.Sc.(Physics) 4th Sem

Subject: Experimental Techniques

Subject code: MSP-405

Learning Objective:

This Course Enables the Student to

1. introduce students to the fundamental principles and concepts governing Experimental Techniques
2. Observational of Surface Analytical Techniques; XPS (ESCA), UV-photo emission etc.
3. Opto-Electronic Devices: Solar Cells, Photo Diodes, Photo-detectors, etc.
4. Spectroscopic and Scanning Probe Techniques; ESR (electron spin resonance) and NMR; Scanning Probe Techniques
5. The classification of Modulation Techniques: Amplitude Modulation, Frequency Modulation
6. Kinematical theory of diffraction contrast and lattice imaging

Learning Outcomes:

Upon successful completion of this course, the student will be able to:

1. Experimental methods of observing dislocations and stacking faults
2. Use the EXAFS, NEAFS, Secondary Ion Mass Spectroscopy (SIMS), to describe surface and structure of the materials
3. Explain the Least Squares fitting. Linear and Non-linear curve fitting
4. Explain AFM (Atomic Force Microscopy), STS (Scanning Tunneling Spectroscopy)