

B.Sc. Physics, Mathematics

Programme Specific Outcomes (PSO)

1. This programme helps learners in building a solid foundation for higher studies in Mathematics and Physics which also leads to proficiency in analytical reasoning. This can be utilised in modelling and solving real life problems.
2. Aims at facilitating the learners to acquire various attributes such as knowledge, understanding skills, attitudes, values and academic achievements, keeping in view of their preferences and aspirations in these subjects.
3. To equip students with valuable cognitive abilities and skills so that they are successful in meeting diverse needs of professional careers in a developing and knowledge-based society.
4. To provide a comprehensive foundation in the subject and to help students develop the ability to successfully continue with further studies and research in the subject while they are equipped with required skills at various stages.
5. Helps learners to answer some of the important questions which arise in the world around them using Physics and translate their ideas into mathematics to find the solutions.
6. Have social, scientific and ethical values in the stages of collecting, interpreting,

SEMESTER I

Course Title: Phy.DSCT1: Mechanics & Properties of Matter

Course Outcomes (CO)

1. Fixing units, tabulation of observations, analysis of data (graphical/analytical).
2. Accuracy of measurement and sources of errors, importance of significant figures.
3. Knowledge of how g can be determined experimentally and derive satisfaction.
4. Understanding the difference between simple and torsional pendulum and their use in the determination of various physical parameters.
5. Knowledge of how various elastic moduli can be determined.
6. Measuring surface tension and viscosity and appreciate the methods adopted.
7. Hands on experience of different equipment's.

Course Title: MATDSCT 1.1: Algebra - I and Calculus – I

Course Outcomes (CO)

This course will enable the students to

1. Learn to solve system of linear equations.
2. Solve the system of homogeneous and non homogeneous linear of m equations in n variables by using concept of rank of matrix, finding Eigen values and Eigen vectors.
3. Sketch curves in Cartesian, polar and pedal equations.
4. Students will be familiar with the techniques of integration and differentiation of function with real variables.
5. Identify and apply the intermediate value theorems and L'Hospital rule.

SEMESTER I -OE

Course Title: - Physics in Everyday life

Course Outcomes (CO)

1. Understand the concept of dispersion, interference and polarisation of light and their application in daily life
2. Learning the fundamental concepts of Bernoulli's principle and its application in Aeroplane wings, Perfume sprayer, etc.
3. To overcome the curiosity of general phenomena like Lunar eclipse, Solar eclipse, remote sensing satellites
4. To know the principle of vibration of strings in various musical instruments
5. To understand the concept of Nuclear reactions, carbon dating etc

Course Title: MATOE 1.1: Financial Mathematics

Course Outcomes (CO)

The students will be able to:

1. Translate the real word problems through appropriate mathematical modelling.
2. Analyze and demonstrate the mathematical skill require in mathematically intensive areas in economics and business.
3. Problem solving techniques for aptitude problems.
4. Prepare themselves for various competitive examinations.
5. Applications of simple formulae

SEMESTER II

Course Title: Phy-DSCT2: Electricity and Magnetism

Course Outcomes (CO)

1. Demonstrate Gauss law, Coulomb's law for the electric field, and apply it to systems of point charges as well as line, surface, and volume distributions of charges.
2. Explain and differentiate the vector (electric fields, Coulomb's law) and scalar (electric potential, electric potential energy) formalisms of electrostatics.
3. Apply Gauss's law of electrostatics to solve variety of problems.
4. Describe the magnetic field produced by magnetic dipoles and electric currents.
5. Explain Faraday-Lenz and Maxwell laws to articulate the relationship between electric and magnetic fields.
6. Describe how magnetism is produced and list examples where its effects are observed.
7. Apply Kirchhoff's rules to analyse AC circuits consisting of parallel and/or series combinations of voltage sources and resistors and to describe the graphical relationship of resistance, capacitor and inductor.
8. Apply various network theorems such as Superposition, Thevenin, Norton, Reciprocity, Maximum Power Transfer, etc. and their applications in electronics, electrical circuit analysis, and electrical machines.

Course Title: MATDSCT 2.1: Algebra - II and Calculus – II

Course Outcomes (CO)

This course will enable the students to

1. Recognize the mathematical objects called Groups.
2. Link the fundamental concepts of groups and symmetries of geometrical objects.
3. Explain the significance of the notions of Cosets, normal subgroups and factor groups.
4. Understand the concept of differentiation and fundamental theorems in differentiation and various rules.
5. Find the extreme values of functions of two variables.

SEMESTER II -OE

Course Title: OE- Astronomy and Astro Physics

Course Outcomes (CO)

1. To learn Ancient Astronomy like Greek Observations, Sumerian Observations, Mayan Observations, Arabic Observations, Chinese Observations, and Indian Astronomy.
2. Identification of constellations using apps, charts and heliocentric parallax methods.
3. To know the classification of stars based on HR diagram.
4. To analyse the phenomena like Red shift – Hubble law-Big bang theory of the universe
5. To understand the formation of stars and various stages of stars

Course Title: MATOET 2.1: Quantitative Mathematics

Course Outcomes (CO)

This course will enable the students to

1. Integrate concept in international business concept with functioning of global trade.
2. Evaluate the legal, social and economic environment of business.
3. Apply decision-support tools to business decision making.
4. Will be able to apply knowledge of business concepts and functions in an integrated manner.

SEMESTER III

Course Title: Phy-DSCT3: Wave motion and Optics

Course Outcomes (CO)

1. Understanding the characteristics of different types of waves, Ripples and Gravity Waves.
2. Observation of superposition of two collinear oscillations and analysis of Lissajous' figures.
3. Application of principle of superposition to interference of light waves by division of wave front and division of amplitude.
4. Study of mechanical waves by using different objects(string, rod, closed and open pipe)
5. Understanding the principle of diffraction (Fresnel and Fraunhofer) and polarization.
6. Hands on experience of different equipment's.

Course Title: MATDSCT 3.1: Ordinary Differential Equations and Real Analysis – I

Course Outcomes (CO)

This course will enable the students to

1. Solve first-order non-linear differential equations and linear differential equations.
2. To model problems in nature using Ordinary Differential Equations.
3. Formulate differential equations for various mathematical models
4. Apply these techniques to solve and analyze various mathematical models.
5. Understand the fundamental properties of the real numbers that lead to define sequence and series, the formal development of real analysis.
6. Learn the concept of Convergence and Divergence of a sequence.
7. Able to handle and understand limits and their use in sequences, series, differentiation, and integration.
8. Apply the ratio, root, alternating series, and limit comparison tests for convergence and absolute convergence of an infinite series.

SEMESTER III-OE

Course Title: OE Medical Physics

Course Outcomes (CO)

1. To understand the basics of human anatomy - cell structure, type of cells and their functions, tissues, organs, and their functions.
2. To understand the concepts of medical diagnostic techniques such as CT scan, X- ray imaging MRI, etc.
3. To study the interaction of sound waves with body tissues, production of ultrasound, transducers, acoustic coupling, image formation, modes of image display and colour Doppler.
4. To understand the principle of radio therapy and bio –imaging

Course Title: MATOET 3.1(B): Business Mathematics

Course Outcomes (CO)

This course will enable the students to:

1. Understand number system and fundamental operations
2. Understand the concept of linear quadratic and simultaneous equations and their applications in real life problems.
3. Understand and solve the problems based on Age.
4. Solve Speed and Distance related problems.

SEMESTER IV

Course Title: Phy-DCST4: Thermal Physics & Electronics

Course Outcomes (CO)

1. Understand the fundamentals of Laws of Thermodynamics, potentials and its practical applications to various life situations
2. Study the fundamentals of Laws of Radiation and its practical applications
3. Study of kinetics of gases using Maxwell Boltzmann distribution law
4. To learn basics of BJT- BJT operation, Introduction, p-n junction diode, Characteristics and Parameters for various applications.
5. Operational amplifiers: Inverting and Non-inverting OP-AMP circuits for practical applications.
6. Basics of Number Systems and their conversion from one system to another.
7. Hands on experience to learn and implement logic gates using just diodes and resistors

Course Title: MATDSCT 4.1: Partial Differential Equations and Integral Transforms

Course Outcomes (CO)

This course will enable the students to

1. Solve the Partial Differential Equations of the first order and second order
2. Formulate, classify and transform partial differential equations into canonical form.
3. Solve linear and non-linear partial differential equations using various methods; and apply these methods to solving some physical problems.
4. Able to take more courses on wave equation, heat equation, and Laplace equation.

SEMESTER V

Course Title: Paper V : Phy.DSCT5- Classical Mechanics and Quantum Mechanics- I

Course Outcomes (CO)

- 1 Helps students learn about Lagrangian and Hamiltonian formulation of Classical Mechanics
- 2 Aims to understand the conservation principles, involving momentum, angular momentum and energy from the fundamental equations of motion
- 3 Helps to apply classical mechanics in understanding motion of a particle under central force field and Newton's laws
- 4 To felicitate students to understand the beauty of quantum mechanics by knowing all types of representations of operators and ways to apply them in different problems.
- 5 This course ables them to solve the hydrogen atom problem by using quantum mechanics.
- 6 Students get an idea about time independent degenerate and non-degenerate perturbations and to apply them in harmonic oscillator.

Course Title: Paper VI: Phy.DSCT6 - Elements of Atomic and

Molecular Physics. Course Outcomes (CO)

1. This course helps the students to get in-depth knowledge about vector atom model for understanding the fine structure of an atom
2. To understand the concept of variation of Rydberg constant with nuclear mass
3. Understand the difference between Stokes and anti-Stokes lines in a Raman spectrum.
4. Student will be able to select molecular spectroscopy methods suitable for solving given scientific problem.
5. Student will learn about Larmor frequency, Zeeman effect, Paschen effect etc.
6. Student will be able to analyze results of measurements using molecular spectroscopy methods.
7. Understand the concept of coherence, different types of lasers and Attenuation in optical fibres

Course Title: Paper V : MATDSCT5.1- Real Analysis-II and Complex Analysis

Course Outcomes (CO)

The students will be able to:

1. Carry out certain computations such as computing upper and lower Riemann sums as well integrals.
2. Describe various criteria for Integrability of functions.
3. Exhibit certain properties of mathematical objects such as integrable functions, analytic functions, harmonic functions and so on.
4. Prove some statements related to Riemann integration as well as in complex analysis.
5. Carry out the existing algorithms to construct mathematical structures such as analytic functions
6. Applies the gained knowledge to solve various other problems.

Course Title: Paper VI :MATDSCT 5.2: Advanced Algebra and Discrete Mathematics

Course Outcomes (CO)

This course will enable the students to:

1. Know the significance of normal subgroups and quotient groups.
2. Understand structure preserving mapping between two algebraic structures of the same type.
3. Know the algebraic structures having the same structure with different elements.
4. Identify and analyse the algebraic structures such as ring, field and integral domain
5. Learn the properties of the above-mentioned algebraic structures.
6. Handle various mathematical operations like rules for counting, arrangements and selections with repetitions.
7. Understand recurrence relation and solving them.
8. Study the graphs which are used to model pair wise relations between the objects which helps in understanding the networking, optimization, matching and operation.

SEMESTER VI

Course Title: Paper VII: Phy.DSCT 7- Elements of Nuclear Physics and Nuclear Instruments

Course Outcomes (CO)

1. To learn the fundamentals of radioactive decays (alpha, beta and gamma).
2. To understand the fundamental principles and concepts of nuclear and particle physics.
3. To acquire knowledge on nuclear applications and techniques for particle accelerators.
4. To know the interactions of radiation with matter and apply in nuclear power generations. .

Course Title: Paper VIII: Phy.DSCT 8 -Elements of Condensed Matter Physics

Course Outcomes (CO)

1. To describe and classify materials from their crystal structure and atomic arrangements
2. Understanding the concept of electrons and holes behaviour in semiconductors, and analyse their conductivity.
3. To know the basic principles and operation of a range of advanced techniques such as X-ray, SEM, TEM, AFM ,Four-probe techniques, etc.,
4. Apply the skills gained through the course to research on interdisciplinary field

Course Title: Paper VII : MATDSCT 6.1: Linear Algebra and Calculus of Variations

Course Outcomes (CO)

The students will be able to:

1. Understand the concepts of Vector spaces, subspaces, bases dimension and their properties.
2. Become familiar with the concepts Eigen values and eigen vectors, minimal polynomials, linear transformations etc.
3. Learn properties of inner product spaces and determine orthogonality in inner product spaces.
4. Prove various statements in the context of vectors spaces.
5. Realise importance of adjoint of a linear transformation and its canonical form.

Course Title: Paper VIII : MATDSCT 6.2: Numerical Analysis

Course Outcomes (CO)

The students will be able to:

1. Describe various operators arising in numerical analysis such as difference operators, shift operators and so on.
2. Articulate the rationale behind various techniques of numerical analysis such as in finding roots, integrals and derivatives.
3. Reproduce the existing algorithms for various tasks as mentioned previously in numerical analysis.
4. Apply the rules of calculus and other areas of mathematics in justifying the techniques of numerical analysis.
5. Solve problems using suitable numerical technique
6. Appreciate the profound applicability of techniques of numerical analysis in solving real life problems and also appreciate the way the techniques are modified to improve the accuracy.