

Shri Swami Vivekanand Shikshan Sanstha Kolhapur's
Raje Ramrao Mahavidyalaya, Jath
Department of Physics

Program Specific Outcomes:

After successful completion of three year graduate level degree program in Physics a student should be able to;

- Understand the core theories and principles of Physics.
- Learn the concepts of Physics through classical and quantum phenomena.
- Think methodically, independently and draw a logical conclusion of scientific problem.
- Use basic mathematics to describe and analyze physical phenomena.
- Enhance the learning abilities through development of simple laboratory experiments.
- Develop the practical skills and techniques to tackle the scientific problems.

Course Outcomes:

After successful completion of relevant course in Physics a student should be able to attain following outcomes;

B. Sc. I/Semester I/Mechanics I (DSC-1-A)

- Knowledge and applications of vector algebra in Physics.
- Understanding of basic ordinary differential equations.
- Concept of Newton's laws of motion and their applications.
- Basic concept of rotational motion.

B. Sc. I/Semester I/Mechanics II (DSC-2-A)

- Understand law of Gravitation.
- Use of Satellite in Global Positioning System (GPS).
- Concept of elasticity and its use in day to day life.
- Differentiation of hydrophilic and hydrophobic surfaces.

B. Sc. I/Semester II/Electricity Magnetism I (DSC-1-B)

- Knowledge and applications of vector calculus in Physics.
- Understanding of vector integrals.
- Conceptual clarity of electrostatics.
- Concept of polarization in dielectrics.

B. Sc. I/Semester II/Electricity Magnetism II (DSC-2-B)

- Qualitative analysis of AC circuits.
- Magnetism and magnetostatics.
- Concept of electromagnetic induction.
- Idea of Maxwell's equations of electromagnetic waves.

B. Sc. II/Semester III/ Thermal Physics and Statistical Mechanics-I (DSC-1-C)

- Highlight of different velocities of gas molecules.
- Knowledge of Maxwell's distribution of gas molecules.
- Merits and drawbacks of thermometers.
- Basic thermodynamic processes and application to heat engine.

B. Sc. II/Semester III/ Waves and Optics –I (DSC-2-C)

- Knowledge of superposition of harmonic oscillators.
- Theory of coupled oscillations.
- Understanding the ultrasonic waves and their applications.
- Basics of sound in context of acoustics of buildings.

B. Sc. II/Semester IV/ Thermal Physics and Statistical Mechanics-II (DSC-1-D)

- Conceptual clarity of thermodynamic functions and Clausius - Clapeyron equation.
- Understanding the black body radiation spectrum.
- Planck's law of radiation.
- Preliminary knowledge of classical and quantum statistical mechanics.

B. Sc. II/Semester IV/ Waves and Optics –II (DSC-2-D)

- Cardinal points and their graphical representation.
- Rayleigh criterion and resolving power of prism and grating.
- Qualitative study of polarization of light.
- Study of interference for determination of wavelength of light.

B. Sc. III/Semester V/ Mathematical and Statistical Physics (Paper IX)

- Curvilinear coordinates and coordinate systems.
- Understanding of basic partial differential equations.
- Basic concepts in statistical mechanics
- Idea of classical and quantum statistical mechanics.

B. Sc. III/Semester V/ Quantum Mechanics (Paper X)

- Study motion of particles in one and three dimensions

- Study quantum mechanical behavior of the particle
- Differentiation between Classical and Quantum mechanics
- Study different operators in quantum mechanics

B. Sc. III/Semester V/ Classical Mechanics (Paper XI)

- Understanding conservation laws of mechanics of system of particles.
- Lagrange's equations and their applications.
- Hamilton's principle and techniques of calculus of variation
- Understanding the rigid body dynamics.

B. Sc. III/Semester V/Atomic & Molecular Spectra, Astronomy & Astrophysics (Paper XII)

- Optical spectral lines: selection and intensity rules.
- Understanding doublet fine structure.
- Concept of Raman Effect.
- Milky Way Galaxy and Solar system.

B. Sc. III/Semester VI/Nuclear and Particle Physics (Paper XIII)

- Construction and working of different types of nuclear accelerators.
- Construction and working of different types of nuclear detectors.
- Understanding basic nuclear reactions and models.
- Introductory elementary particles.

B. Sc. III/Semester VI/Energy Studies and Material science (Paper XIV)

- Knowledge on different types of renewable energy resources.
- Study of wind energy and its generation by wind turbine.
- Study of solar energy and its generation by solar panel.
- Synthesis of nanoparticles.

B. Sc. III/Semester VI/ Electrodynamics and Electromagnetic Waves (Paper XV)

- Motion of charged particles in fields.
- Understanding the basic laws in electrostatics and magnetostatics.
- Deriving the Maxwell's equations of electromagnetic waves.
- Propagation of electromagnetic waves in free space.

B. Sc. III/Semester VI/ Solid State Physics (Paper XVI)

- Models of different crystal structures
- Analysis of X-ray diffraction patterns

- Applications of IC-555 as different multivibrators
- Difference between metals, semiconductors and insulators.

Shri Swami Vivekanand Shikshan Sanstha Kolhapur's
Raje Ramrao Mahavidyalaya, Jath
Department of Physics

M.Sc. (Physics)

Program Specific Outcomes:

After successful completion of two year post graduate level degree program in Physics a student should be able to;

- Attain substantial knowledge of core theories and principles in various fields of Physics related to classical and quantum phenomena.
- Understand the basic concepts in Solid State Physics and Physics of Materials
- Theoretical understanding of various deposition methods for the preparation of thin films
- Develop research skills which include synthesis, characterization of nanomaterials and their applications in field of Materials Science.
- Develop the ability to do project work in Nanoscience and Technology.

Course Outcomes:

After successful completion of relevant course in Physics, a student should be able to attain following outcomes;

M. Sc. I/Semester I/ Mathematical Physics (CP-I)

- Use of algebraic skills necessary for the study of system of linear equations, matrix algebra, vector spaces eigenvalues and eigenvectors, orthogonality and diagonalization.
- Study of power series method to solve differential equations, significance of special functions.
- Understanding the Fourier series, integral and transform.
- Understanding the approximate numerical methods to solve differential equations.

M. Sc. I/Semester I/ Classical Mechanics (CP-II)

- Understanding of Lagrangian formulation of motion of particles in central force field and its applications to Keplers laws and Rutherford scattering.
- Formulation of Hamiltonian dynamics from canonical equations and its applications
- Canonical transformations and Poissons Brackets
- Clearance of basic concepts of postulates of special theory of relativity, four vectors, Lagrangian and

Hamiltonian formulation for relativistic kinematics.

M. Sc. I/Semester I/ Quantum Mechanics I (CP-III)

- Material particle also need wave description: Schrodinger's equation.
- Understanding bound and unbound states of particle.
- The mathematics of operators.
- Time independent perturbation theory

M. Sc. I/Semester I/ Condensed Matter Physics (CP-IV)

- Understanding of unit cell and Bravais lattice with concept of Brillouin zones.
- Understanding of various types of defects and dislocations in solids.
- Basics of semiconductor and superconductor properties
- Different types of dielectric and magnetic materials.

M. Sc. I/Semester II/ Quantum Mechanics II (CP-V)

- Familiarization of variational method and WKB approximation.
- Theory of time dependent perturbation theory.
- Quantum theory of scattering.
- Introductory relativistic quantum mechanics

M. Sc. I/Semester II/ Statistical Mechanics (CP-VI)

- Connection between thermodynamic and statistical mechanics.
- Basics of classical statistical mechanics: Ensembles
- Idea of quantum gases.
- Understanding phase transitions and critical phenomenon.

M. Sc. I/Semester II/ Electrodynamics (CP-VII)

- Applications of Maxwells equations in different types of waveguides.
- Concept of retarded potentials.
- Understanding radiation from accelerated charges: Larmors formula.
- Contact between relativity and electrodynamics.

M. Sc. I/Semester II/ Atomic and Molecular Physics (CP-VIII)

- Spectrum of hydrogen like atoms.
- Splitting of spectral lines due to external fields.
- Understanding of Molecular spectra
- Knowledge of electronic and nuclear spectra.

M. Sc. II/Semester III/ Nuclear and Particle Physics (CP-IX)

- Students will be able to calculate potential well depth of any nuclei using Schrödinger wave equations and phase shifts in high and low energy scattering.
- Students will grasp necessary skills for calculation of isospin and parity of any nuclei in periodic table. They will have deep understanding of energy levels (shell model, vibrational, rotational) of nuclei in ground state and excited states.
- Theoretical understanding of alpha, beta and gamma decay along with calculation of Q value for any nuclear reaction and half life time of any radioactive element.
- Students can classify any particle in universe and can do mathematical interpolation of quark model (spin, charge, parity, isospin, strangeness) of that elementary particle.

M. Sc. II/Semester III/ Computational Programming using Mathematica (CBP-III)

- Mathematica in a nutshell: essential Mathematica commands.
- Manipulation of mathematical expressions.
- Performing symbolic and numerical calculations.
- Graphical representation using Mathematica.

M. Sc. II/Semester III/ Thin Solid films: Deposition and Properties (SSP-I)

- Understanding of different methods of thin film deposition.
- Knowledge of nucleation and growth mechanism in this films.
- Techniques used to measure thickness of thin films.
- Studies of different properties of thin films.

M. Sc. II/Semester III/ Semiconductor Physics (SSP-II)

- Understanding of basics of semiconductor with the help of energy bands.
- Charge carriers in semiconductors.
- Fabrication of PN junction using different techniques.
- Heterojunctions: Understanding of recombination and generation of holes and electrons.

M. Sc. II/Semester IV/ Experimental Techniques (CP X)

- Understanding Physics of low pressure.
- Low temperature techniques.
- Instrumentation: Atomic Absorption Spectrometry
- Instrumentation: X-ray Fluorescence spectrometry and Mossbauer Spectroscopy.

M. Sc. II/Semester IV/ Electronic Devices (CBP VI)

- Working mechanism of transistors and microwave devices.
- Understanding the functions of BJT, JFET, MOSFET, MESFET etc
- Different types of memories and their working mechanism.

- Knowledge o magneto-optic and piezoelectric devices.

M. Sc. II/Semester IV/ Physical Properties of solids (SSP-III)

- Knowledge of electronic structure of crystals using different models.
- Understanding of transfer properties in metals.
- Detail study of phonons, plasmons, polaritons and polarons.
- Understanding defects in crystals.

M. Sc. II/Semester IV/ Energy conversion and Storage Devices (SSP-IV)

- Understanding of solar photovoltaics.
- Knowledge of dye sensitized and quantum dot sensitized solar cells.
- Detail study of organic and perovskite solar cells
- Acquiring knowledge of energy storage device like supercapacitors and batteries

Shri Swami Vivekanand Shikshan Sanstha Kolhapur's
Raje Ramrao Mahavidyalaya, Jath
Department of Chemistry

Program Specific Outcome (PSO)

On completion of **B. Sc. in Chemistry** the candidate will -

- Achieve the skills required to succeed in graduate school, professional school and the chemical industry like cement industries, agro product, Paint industries, Rubber industries, Petrochemical industries, Food processing industries, Fertilizer industries etc.
- Also they expand the knowledge available opportunities related to chemistry in the government services through public service commission particularly in the field of food safety, health inspector, pharmacist etc.
- Learn the laboratory skills and safely to transfer and interpret knowledge entirely in the working environment.

Class	Course	Semester	Outcomes
B. Sc. I	Inorganic Chemistry	I	1. Understand importance of analysis 2. Aware of qualities & properties of potable water 3. Enhanced learning of chromatographic techniques 4. Acquire knowledge of fertilizer analysis
	Organic Chemistry		
	Physical Chemistry	II	
	Analytical Chemistry		
B. Sc. II	Physical Chemistry	III	1. Learn & Understand the basic concepts in industry 2. Knowledge of Unit operations Indian Paper industry 3. To learn about estimation of hardness of water through complex metric titrations 4. To become familiar with some applications of coordination compounds to be able to predict the geometries of simple molecules
	Industrial Chemistry	IV	
	Inorganic Chemistry		
	Organic Chemistry		
B. Sc. III	Physical Chemistry	V & VI	1. Enriched knowledge helps in the understanding of the study of nanoparticles with ease 2. Develop interest in the analysis of commercial samples 3. Know the study of chemistry as a green approach w.r.t green Chemistry 4. Know the processes used in Industries and their applications.
	Inorganic Chemistry		
	Organic Chemistry		
	Industrial Chemistry		
	Analytical Chemistry		

Shri Swami Vivekanand Shikshan Sanstha Kolhapur's
Raje Ramrao Mahavidyalaya, Jath
Department of Chemistry

PROGRAM SPECIFIC OUTCOMES

On completion of **M. Sc. (Analytical Chemistry)** the candidate will have -

- Global level research opportunities to pursue Ph. D. programme targeted approach of CSIR – NET examination
- Enormous job opportunities at all level of chemical, pharmaceutical , food products ,life oriented material industries
- Specific placements in R & D and synthetic division of polymer industries & Allied Division
- Discipline specific competitive exams conducted by service commission.

Class	Course	Semester	Outcomes
M. Sc. I	Inorganic Chemistry	I & II	1.The students will know the importance of nuclear chemistry and its applications.. 2. Students will transform from memorization to understanding by programmed exposure to integrated problems involving mechanism, multistep synthetic planning, and organic spectroscopy 3.Acquire better knowledge of analytical techniques 4.Use & handling of sophisticated instruments
	Organic Chemistry		
	Physical Chemistry		
	Analytical Chemistry		
M. Sc. II	Advance Analytical Techniques	III & IV	1. Learn & Understand the basic concepts in industry 2.Knowledge of Unit operations Indian Paper industry 3. To learn about estimation of hardness of water through complexometric titrations 4. To become familiar with some applications of coordination compounds to be able to predict the geometries of simple molecules
	Organo Analytical Chemistry		
	Electroanalytical Techniques		
	Organic Industrial Analysis		
	Industrial Analytical Chemistry		

Shri Swami Vivekanand Shikshan Sanstha Kolhapur's
Raje Ramrao Mahavidyalaya, Jath
Department of Botany

Program Specific Outcome (PSOs) and Course Outcome (COs)

Program Specific Outcome (PSOs)

1. They could get knowledge about the different groups of plants
2. They could understand the anatomical and reproductive growth in plants
3. Students could be familiar with different methods used to study the plants
4. They can understand correlation between plants and environment
5. Collect knowledge about applications of plants in daily use
6. They can understand metabolism in plants and their role in plant productivity.
7. They could learn different technology and their applications in Agriculture

Course Outcome (COs)

B. Sc. I, SEM. I

Paper I –DSC-13A, Diversity of microbes, Algae and fungi

1. Understand different groups of organisms
2. Students will be well versed with morphology and reproduction in lower organisms
3. Learn use of lower organisms in daily life
4. Skill development in the methods of study of lower organisms

Paper II –DSC-14A - Biodiversity of archegoniate- Bryophytes, Pteridophytes and Gymnosperms

1. Knowledge will be gathered on general characters and classification of Bryophytes
2. They will understand life cycles of archegoniates
3. Diversity and distribution of Archegoniate
4. Understand role of archegoniate in ecosystem

B.Sc. I , SEM. II

Paper III –DSC-13B, Plant Ecology

1. Understanding various concept of Ecology.
2. They could differentiate role abiotic and biotic factors in Ecology
3. The students can understand the process of plant succession
4. They could study the working mechanism of Ecosystem
5. They get the knowledge of interaction between living and nonliving things

Paper II –DSC-14B – Plant Taxonomy

- 1.They will understand concept of Taxonomy and plant nomenclature.
2. Students will understand about ICNB
3. They can acquire the Knowledge about herbarium techniques
- 4 . They could collect information about Botanical Gardens and their importance
5. They will be trained in plant classification

B.Sc. II , SEM. III**Paper V –DSC-C13 –Embryology of Angiosperms**

1. Understand reproductive structures in plants
- 2.They could learn process of gametogenesis in plants
3. Learn pathway of embryo and endosperm development
- 4.Study different modes of embryo development and their role in plant propagation

Paper VI –DSC-C14 –Plant physiology

1. Learn the process of water and plant relation
- 2.They will understand plant nutrients and their role in plants
3. Learn plant growth process
- 4.Study different types of plant growth regulators and their practical use
5. They get knowledge about process of photosynthesis and its use in agriculture

B.Sc. II , SEM. IV**Paper VII , DSC-D13 –Plant anatomy**

1. Understand anatomical structures in plants
- 2.They could learn methods of anatomical study of plants
3. Learn about anatomical growth and abnormality
- 4.Gather knowledge of tissue systems and their role in plants

Paper VIII –DSC-D14 –Plant Metabolism

1. Learn different metabolic path ways in plants
- 2.They will knowledge about enzymes and its mechanism of action
3. Learn mechanism of nitrogen fixation in plants
- 4.Understand mechanism of respiration in plant
5. They get knowledge about process of seed germination and its use in agriculture

Shri Swami Vivekanand Shikshan Sanstha Kolhapur's
Raje Ramrao Mahavidyalaya, Jath
Department of Computer Science

B. Sc. Computer Science

Program Specific Outcomes

- A] Effectively communicating computing concepts and solutions to bridge the gap between computing industry experts and business leaders to create and initiate innovation.
- B] Ability to use approximately system design notations and apply system design engineering process in order to design, plan and implement software systems.
- C] Preparing for a career in an information technology oriented business or industry or for graduate study in computer science or other scientific or technical fields.
- D] Ability to complete successfully to program small –to-mid-size programs on their own.
- E] Effectively utilizing the knowledge of computing principles and mathematics theory to develop sustainable solutions to current and future computing problems.
- F] Developing and implementing solution based system and/or process that address issues and/or improve existing systems within a computing based industry.

Course Outcomes

B.sc-I program outcomes

Semester –I Computer Science paper no-DSC-11A

Problem Solving Using Computers

1. Ability to develop applications.
2. Creation algorithms and flowcharts to solve simple programming problems.
3. Understanding to design, implement, test, debug a program that uses calculations, loops, array, function, pointers, structure etc.
4. Memory management using C.

Semester –I Computer Science paper no-DSC-12A

Database Management System

1. Knowledge of Database concepts, data model, Relational Algebra.

2. Knowledge of basic SQL queries.

B.sc-II program outcomes

Semester –III Computer Science paper –DSC-11C

PHP and MySQL:

1. Getting the PHP Programming skills needed to successfully build interactive, data driven sites.
2. Understanding working of XAMPP server and working of different array functions to insert, retrieve, display and sort array elements.
3. Understanding how to develop web applications in PHP using MySQL.

Semester –III Computer Science paper –DSC-12C

Object Oriented Programming Using C++

1. Using the characteristics of an object-oriented programming language in a program.
2. Using the basic object-oriented design principles in computer problem solving.
3. Programming with advanced features of the C++ programming language.
4. Using C++ classes for code reuse.

Shri Swami Vivekanand Shikshan Sanstha Kolhapur's
Raje Ramrao Mahavidyalaya, Jath
Department of Mathematics

Program Specific Outcomes

1. Students gain a sound knowledge in foundational subjects related to pure and applied mathematics.
2. Acquire various skills related to computational techniques and related software's.
3. Learn to identify various areas of science , technology , industry etc. where the knowledge and skill imparted to them can be useful.
4. To be able to select a specific problem from real life scenario as per liking of a student and his/her skill sets and knowledge.
5. Being able to analyze the problem and propose a solution method and finalize the solution and the process of solution in consultation with the peer group and faculty.
6. Develop the solution methodology and necessary software if required and prepare the report.

Course Outcomes

B.Sc. Part -I

Semester – I

Theory paper: 5A Differential Calculus

- 1) Students acquaint themselves with the idea of complex numbers.
- 2) Learn algebraic and geometric properties of complex numbers.
- 3) Understand Meaning and significance of Hyperbolic functions and their relation with circular functions
- 4) Learn the process of successive differentiation of standard functions.
- 5) Get to know the significance of Leibnitz's theorem.
- 6) Understand the concept of partial differentiation and learn to apply it for various problems in science and engineering .
- 7) Acquire a skill of using Euler's theorem to various problems related to homogeneous functions.

Theory paper: 6A Calculus

1. Students grasp the concept of mean value theorems and its significance.
2. Acquire the skill of applying Taylor's theorem for computation of power series expansions of functions.
3. Study the special case of Taylor's expansion viz. Maclaurin Series and its practical use in computing values of standard transcendental functions.
4. Learn the meaning and significance of Indeterminate forms and learn to apply it for various indeterminate limiting cases.

B.Sc. Part -I

Semester – II

Theory paper: 5B Differential Equations

1. Understand the meaning, motivation and significance of differential equations.
2. Learn the classification of differential equations.
3. Concept of order and degree is studied with examples.
4. Learn how to form and solve first order first degree ordinary differential equations.
5. Learn the methods of solving equations of first order and higher degree.
6. Getting acquainted with operator formalism. Solving higher order ordinary linear differential equations.
7. Study the homogeneous linear differential equations with constant coefficients and learn the method of solution.

Theory paper: 6B Higher order Ordinary Differential Equations and Partial Differential equations.

1. Study the method of solution of general second order differential equation with variable coefficients.
2. Understand the concept, formation, and method of solution of ordinary simultaneous equations.
3. Understand the concept of total differential equation; learn the method of formation and method of solution of total differential equations.
4. Study the motivation and concept of partial differential equations. Learn methods of solving Lagrange's equation and Charpit's method.

B.Sc. Part -I

Semester – I and II (Combined)

Practical : CML-I (Computational Mathematics Laboratory – I)

1. Students get acquainted with the field of numerical computational methods and various areas covered within the subject of numerical computations with a bird's eye view of applications.
2. Learn to use electronic calculators and computers for simple calculations of algebraic and transcendental functions that are frequently required in science and technology.
3. To carry out supervised learning of problem solving based on theory covered in theory papers .
4. Teacher gets to know student specific queries / difficulties and helps students solve their individual problems with personal attention.

B.Sc. Part -II

Semester -III

Theory Paper: 5C Real Analysis – I

1. Learning basic concepts of set theory.
2. To learn the concept of relation and function and apply it to specific problems.
3. Study the principle of mathematical induction and apply it for proving results.

4. Acquire the concept of countability and determine countable and uncountable sets.
5. Learn the fundamental properties of real numbers.

Theory Paper : 6C Algebra – I

1. Understanding of the concept of Hermitian and Skew-Hermitian Matrix and their properties.
2. Grasp the concept of normal form and convert given matrix to Normal form.
3. Learn the concept of Eigen value and Eigen vector . To find Eigen values and Eigen vectors.
4. Grasp Cayley- Hamilton theorem and use it for finding inverse of a matrix.
5. Learn elements of group theory and be able to determine if given set with given operation is group or not.

Semester -IV

Theory Paper: 5D Real Analysis – II

1. Learn fundamental concept of sequence of real numbers with examples.
2. Study the concept of monotonic and bounded sequences.
3. Understand Epsilon-Delta concept of convergence of a sequence.
4. Learn the concept of series and its convergence.
5. Study the methods of testing convergence of series.

Theory Paper : 6D Algebra – II

1. Understand the concept of Cosets.
2. Learn the meaning of Normal subgroups of a group with examples.
3. Study the concept of a Permutation group with examples.
4. Learn the concept of a Ring structure with examples.

B.Sc. Part -II

Semester – III and IV (Combined)

Practical : CML – II (Computational Mathematics Laboratory – II)

1. Learn to solve linear systems of equations by Gauss-Elimination , Gauss-Jordan , Gauss Jacobi and Gauss-Seidel methods manually with use of electronic calculators .
2. Learn root finding methods viz. Newton-Raphson method , Bisection method.
3. Learn methods for evaluating numerical values of integrations using trapezoidal rule, simpson's 1/3 rd rule , simpson's 3/8 th rule.
4. Learn to solve 1st order ODE with Euler's and modified Euler's method.

Practical : CML – III (Computational Mathematics Laboratory – III)

1. Learn the basic keywords of C programming language and practice them in computer lab.
2. Studying basic data types and input output methods in C and practice it in computer laboratory
3. Learn Basic constructs of C Language programming like comparison ,decision making , loop structures , system and user defined functions and practice based on it in computer laboratory .

4. Apply the knowledge of C programming for preparing C programs for the solution of various numerical methods learned in the paper CML-II

B.Sc. Part -III

Semester -V

Theory Paper: Paper – IX (Real Analysis)

1. Learn the elements of sets , relations and functions .
2. Learn the properties of real numbers , algebra of intervals , infimum and supremum concept.
3. Study the concept of sequence , sub-sequence , convergence of a sequence and tests of convergence.
4. Study the concept of series and various tests of convergence of series.
5. To understand the concept of real valued functions of a single real variable and tests of limits , continuity and differentiability of functions.
6. Understanding and using the concept of improper integrals.

Theory Paper : Paper – X (Modern Algebra)

1. Learn the elements of group theory with examples.
2. Learn the concepts homomorphism , automorphism , commutator element , Kernel of a group .
3. Study various types of groups like cyclic groups , permutation groups , normal subgroups , quotient groups.
4. Learn the concept of ring and examples of ring including a Boolean ring.

Theory Paper : Paper – XI (Partial Differential Equations)

1. Study the classification of partial differential equations.
2. Learn the formation process of partial differential equations.
3. Study the method of solving Lagrange's partial differential equation and apply it to solve problems.
4. Study the charpit's method and apply it to solve the problems.
5. Learn the method of solution of homogeneous partial differential equations and apply it to solve problems.

Theory Paper : Paper – XII (Numerical Methods – I)

1. Study and apply the methods of root finding viz. Newton Raphson method , Bisection method , Secant method , Regula falsi method .
2. Study and apply methods of solving linear system of equations viz. Gauss-Elimination , Gauss-Jordan , Gauss-Jacobi and Gauss-Seidel method.
3. Study and apply the methods of finding Eigen values and Eigen vectors.

B.Sc. Part -III

Semester -VI

Theory Paper : Paper – XIII (Metric Spaces)

1. Understanding the concept of a metric on non-empty set and its properties with examples.
2. Grasping the concept of "closeness" and limit in terms of a given metric.
3. Limit of a function in terms of a metric space.
4. Understanding and applying concept of connectedness, completeness and compactness.
5. To study the properties of continuous functions in the sense of metric spaces.

Theory Paper: Paper – XIV (Linear Algebra)

1. To grasp the concept of a vector space with examples. Understand subspaces, homomorphism , span , basis , dimension , linear dependence and independence .
2. Study the linear transformations. Rank and nullity concepts, Matrix of transformation.
3. Study inner product of vectors, Cauchy-Schwartz , Triangle and parallelogram inequalities.
4. To learn the concept of Eigen – values and Eigen vector in view of vector spaces and solve examples based on it.

Theory Paper: Paper – XV (Complex Analysis)

1. Understand the concept of complex variable and a complex valued function.
2. Learning the significance and applications of harmonic functions.
3. Know the meaning of analytic function and Cauchy-Riemann equations.
4. To derive Cauchy's integral formula for simply and multiply connected domains.
5. To study the development of Laurent series and expansion of functions.
6. Learn about zeros and poles, calculation of residues.
7. Imbibe the concept of Entire and Meromorphic functions.

Theory Paper: Paper – XVI (Numerical Methods - II)

1. Understand the meaning of interpolation. Learn the methods of interpolation for equal and unequal intervals.
2. Study and apply the concept of numerical differentiation and to be able to solve the problems of differentiation.
3. Learn the methods of solving ordinary differential equations and apply them to given problems.

B.Sc. Part -III

Semester – V and VI (Combined)

Practical Paper : Paper CML-IV (Operations Research)

1. To understand the linear programming problem and learn various methods for solving these problems.
2. Learn the nature of transportation problems and solve the examples.
3. Learn the nature of assignment problems and solve the practical problems.
4. Understand the concept of Game theory, its significance and applications to modern industrial engineering, military applications , logistics and solve various problems.

Practical Paper: Paper CML-V (Numerical Methods)

1. To apply the methods of solution for solving linear system of equations that are already studied in theory papers.
2. To apply methods of interpolation for various equally and unequally spaced intervals.
3. Practice the methods of numerical integration to actually evaluate various integrals.
4. Learn to use Runge-Kutta methods for solving first order ordinary methods.

Practical Paper: Paper CML-VI (Numerical Recipes in C++ and Scilab)

1. Learn the skills of using various keywords , data types , expressions and input output in C++
2. Learn and apply decision and loop constructs in C++
3. Study and practice the concept of arrays , inbuilt and user defined functions.
4. Develop various programs to solve the problems using numerical methods and knowledge of C++ previously learned in 1,2,3 above.
5. Learn the basic data types and operations in Scilab.
6. To solve problems of computational mathematics using Scilab.
- 7.** Grasp the idea of visualisation and graph plotting and apply it for plotting graphs of functions.

Practical Paper: Paper CML-VI (Project)

1. To survey and identify various areas related to science , engineering , technology , industrial setups where the application of various skills and theories learned during the course of study can be useful to solve the problems.
2. To select a specific problem from above mentioned fields that is best suited for students knowledge base and aptitude.
3. To motivate students to figure out various solutions under the guidance of faculties and select one of the solutions and design appropriate methodology and plan for solution.
4. To encourage students to work out the solution under the guidance of the faculty . If necessary, develop computer programs for the same.
5. Present the solution in front of the peer group and faculties for discussion and constructive criticism and suggestions.
6. Help student make necessary modifications /changes in solution if required.
7. Make students write a project report on the work carried out which is to be presented at the time of practical

Shri Swami Vivekanand Shikshan Sanstha Kolhapur's
Raje Ramrao Mahavidyalaya, Jath
Department of Statestic

Statistics

Course Outcomes (C.O.) after completion of following courses of Statistics as per existing syllabus of Shivaji University:

Class (Semester)	Course Code	Course Title	Course Outcome (C.O.)
B. Sc. I (I)	DSC – 7A	DESCRIPTIVE STATISTICS – I	<ol style="list-style-type: none"> 1. Understanding of statistical population, sample. Data collection and its representation by tables, diagrams and graphs. 2. Understanding the concept of central tendency, dispersion, skewness and kurtosis of a variable. Measuring to these concepts, its computations and interpretations of these values. 3. Understanding the concept of association between attributes. Measuring of association, its computations and interpretations of these values.
	DSC – 8A	ELEMENTARY PROBABILITY THEORY	<ol style="list-style-type: none"> 1. Understanding the concept of uncertainty. 2. Measuring the uncertainty by using probability measures. 3. Understanding the concept of conditional occurrence of uncertain events. 4. Measuring the conditional occurrence of uncertain events and its interpretations
B. Sc. I (II)	DSC – 7B	DESCRIPTIVE STATISTICS – II	<ol style="list-style-type: none"> 1. Understanding the concept of bivariate data. 2. Measuring correlation between two variables and interpretation of its values. 3. Establishing the linear regression (if exists) between dependent and independent variables. Estimating value of dependent variable for given value of independent variable. 4. Understanding the concept of rise or fall in prices or consumption or values of commodities in current year with respect to base year. 5. Measuring rise or fall in above by using various indices and their interpretations.
	DSC – 8B	DISCRETE PROBABILITY DISTRIBUTIONS	<ol style="list-style-type: none"> 1. Understanding the concept of discrete random variable on finite sample space and its probability distribution.

			<ol style="list-style-type: none"> 2. Study and application of some standard discrete distributions in real life situations. 3. Concept of expectation and variation of random variable and its computation. 4. Understanding the concept of discrete bivariate random variable on finite sample space and its joint probability distribution. 5. Concept of independence, covariance, correlation between two discrete random variables. Its computation and interpretations.
B. Sc. II (III)	DSC – 7C	PROBABILITY DISTRIBUTIONS-I	<ol style="list-style-type: none"> 1. Study and applications of some standard distributions defined on countable infinite support. 2. Understanding the difference between discrete and continuous distributions. 3. Understanding the concept of continuous bivariate random variable and its joint probability density function. 4. Concept of independence, covariance, correlation between two continuous random variables. Its computation and interpretations. 5. Obtaining conditional and marginal probability distributions. 6. Concept of transformation of univariate and bivariate continuous random variables. Obtaining probability densities of transformed random variables.
	DSC – 8C	STATISTICAL METHODS-I	<ol style="list-style-type: none"> 1. Understanding the concept of multiple regression plane. 2. Estimating regression plane of dependent variable on two or more independent variables. Estimating value of dependent variable and for given values of independent variables. 3. Concept of multiple correlation of one variable on the remaining, its computation and interpretation. 4. Concept of partial correlation between two variables, its computation and interpretation. 5. Understanding the basics of sample survey. 5. Awareness about vital statistics. Concept of mortality rate, fertility rate and population growth rates. Its computation and interpretations.
B. Sc. II (IV)	DSC – 7D	PROBABILITY DISTRIBUTIONS-II	<ol style="list-style-type: none"> 1. Study and applications of some standard continuous probability distributions in real life situations. 2. Obtaining various measures for above distributions. 3. Knowing interrelationship between above distributions. 4. Applications of some sampling distributions in real life situations for testing independence of attributes, goodness of fit test for given distribution, equality of means and variances of two populations.
	DSC – 8D	STATISTICAL METHODS-II	<ol style="list-style-type: none"> 1. Understanding the concept of time series, its components. 2. Estimation of secular trend and seasonal index from time series data.

			<p>3. Understanding the concept of chance and assignable cause in production process.</p> <p>4. Application of Statistical Quality Control techniques such as control charts for variables and attributes to monitor assignable cause in a process.</p>
--	--	--	---

Shri Swami Vivekanand Shikshan Sanstha Kolhapur's
Raje Ramrao Mahavidyalaya, Jath
Department of Zoology

Course outcomes

B.Sc. I

1. Student could understand the Animal Diversity of the non- chordates from kingdom Protista to phylum Echinodermata.
2. Student could understand the animal physiology of nerve and muscles, Physiology of Digestion, Physiology of Respiration, Physiology of excretion, and physiology of Cardio vascular system.
3. Students could understand the Cell Biology - cell structure, chromosomes & Evolutionary Biology – History of life, Evolutionary theories & Extinction
4. Students could understand the Genetics – Mendelian genetics, Linkages and Crossing over, mutation & Sex determination.
5. Students acquired the skill to prepare plaster cast model to study fossil evidences.
6. Students learned hematological techniques.
7. Students can use the skills in a pathological laboratories.
8. Decorative coatings of walls, selling as well as moulding and casting.

B.Sc. II

1. Students could understand the Animal Diversity from Protochordates to Mammals.
2. Students could understand the Biochemistry of Nucleic Acids, Carbohydrates, Protein & Lipid Metabolism and Enzymes.
3. Students could understand about the Reproductive Physiology - Male & Female Reproductive Systems & about Reproductive Health

4. Students could understand the Applied Zoology – Diseases, Economic importance of insects, poultry farming.
5. Student could understand the surgical techniques and techniques related with applied zoology i.e. poultry farming.
6. Student can use their knowledge in surgical centers.
7. They can build up their own poultry farms.

B.Sc. III

1. Students could understand the Functional anatomy of Non- Chordates Protozoa up to Echinodermata.
2. Students could understand Biostatistics, Bioinformatics and Medical Zoology
3. Students could understand Molecular Biology, Biotechnology and Bio techniques
4. Students could understand the Endocrinology, Environmental Biology & Toxicology.
5. Students could understand the Comparative anatomy of vertebrates, Developmental biology, Physiology & Applied Zoology.
6. Student can acquired skill of micro techniques.
7. Student can acquired skills related to physiology i.e. Blood pressure, Hemoglobin, ESR and Blood cell count.
8. They use their knowledge in pathological laboratories and clinics.
9. Student can build poultry farming, goat farming.
10. Student can build small scale business in fisheries, dairy and in sericulture.

Programme outcome

1. PO1 - Students gain knowledge and skill in the fundamentals of animal sciences and understands the complex interactions among various living organisms
2. PO2 – Analyze complex interactions among the various animals of different phyla, their distribution and their relationship with the environment.

3. PO3 – Apply the knowledge of internal structure of cell, its functions in control of various metabolic functions of organisms
4. PO4 – Understands the complex evolutionary processes and behavior of animals
5. PO5 – Correlates the physiological processes of animals and relationship of organ systems.
6. PO6 – Understanding of environmental conservation processes and its importance, pollution control and biodiversity and protection of endangered species
7. PO7 – Gain knowledge of Agro based Small Scale industries like sericulture, fish farming, poultry farming and vermin compost preparation.
8. PO8 – Understands about various concepts of genetics and its importance in human health
10. PO10 – Apply the knowledge and understanding of Zoology to one's own life and work
11. PO11 – Develops empathy and love towards the animals.

Program Specific Outcomes:

1. PSO1. Understand the nature and basic concepts of cell biology, genetics, taxonomy, physiology, ecology and applied Zoology.
2. PSO2. Analyse the relationships among animals.
3. PSO3. Perform procedures as per laboratory standards in the areas of Taxonomy, Physiology, Ecology, Cell biology, Genetics, Applied Zoology, Clinical science, tools and techniques of Zoology, Toxicology, apiculture, biochemistry, biotechnology, fisheries ,Understand the applications of biological sciences in Apiculture, Aquaculture.
5. PSO5. Gains knowledge about research methodologies, effective communication and skills of problem solving methods

6. PSO6.Contributes the knowledge for Nation building.