

## DEPARTMENT OF CHEMISTRY

B.Sc. Blended (Chemistry)

This is the degree course of Savitribai Phule Pune University equivalent to the degree course of University of Melbourne

### PROGRAMME OUTCOMES:

#### Objectives of the course:

- To introduce the fundamentals of science education.
- To enrich students' knowledge in all basic sciences.
- To help the students to build the interdisciplinary approach.
- To inculcate the sense of scientific responsibilities, social and environmental awareness.
- To help students to develop a progressive and successful career in the academics and industry.

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After completing B.Sc. Blended Chemistry programme, students will be able

to: Knowledge Outcomes:

Students are expected to

PO1: Understanding of the concepts in basic sciences.

PO2: Create awareness and sense of responsibilities towards environment and apply knowledge to solve the issues concerned to balance the comfortable life style and environmental aspects.

PO3: Apply fundamental knowledge for doing qualitative and quantitative analyses in various fields.

PO4: Development of multidisciplinary approach.

**Skill Outcomes:** It would help students to learn to

PO5: collaborate effectively on team-oriented projects in the field of Chemistry and life sciences.

PO6: communicate scientific information in a clear and concise manner both orally and in writing as per the international standards.

PO7: Explain environmental pollution issues and the remedies thereof.

PO8: know the importance of chemistry in everyday life. They will be able to relate physical and chemical phenomena around us with chemical point of view.

PO9: apply the knowledge to develop the sustainable and eco-friendly technology in Industrial Chemistry.

**Generic Outcomes:**

PO10: Development of critical thinking and effective communication skills.

PO11: Acquisition of a basic knowledge and skillset for becoming employable.

PO12: Enhancement of the scientific temper among the students so as to develop a research interest.

PO13: Ability to work independently as well as in a team.

**COURSE OUTCOMES:**

**F. Y. B Sc. Blended**

F. Y. B Sc.

Course: MTH101

Course Name: Maths1:  
Calculus

CO1: This course enhances the quality and standards of Mathematics Education.

CO2: This course provides a broad common frame work, for exchange, mobility and free dialogue across the Indian Mathematical and associated community.

CO3: This course creates an aptitude for Mathematics in those students who show a promise for higher studies and creative work in Mathematics.

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Course: PHY102

Course Name: Physics 1: Introductory Physics

CO1: Application of Newton's laws of motion to solve various problems related to day today life.

CO2: Concepts like zero work done, conservative forces, mass energy equivalence ( $E = mc^2$ ).

CO3: Effect of force on various types of materials is described and physical properties like elasticity, different moduli etc. along with their relation.

CO4: To understand various thermodynamic processes like Isothermal, isobaric, isochoric and laws of thermodynamics with their real world applications.

CO5: To understand the concept of entropy

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Course: CHM103 :

Course Name: Chemistry 1: General Chemistry – Chemistry of life

CO1: Introduction to the s,p,d,f blocks, trends of atomic size, valency, electro negativities, ionization potentials along the row and periods

CO2: Types of bonds-ionic, covalent coordinate covalent

CO3: Types of acid and bases. Derivation of Hinderson's equation

CO4: Buffer and buffer capacity, choice of indicator

CO5: Writing the balancing of chemical equation.

CO6: Understanding of different types of chemical reactions with mechanism

CO7: Understanding of hybridisation types and bonding

CO8: Numerical problem solving

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Course: BIO104

Course Name: Biology 1: Diversity of life

CO1: To understand life's diversity.

CO2: Understanding of evolutionary relationship about origin of life,

CO3: Understanding the concepts of cell theory and different types of cell.

CO4: Understanding concepts of evolution and origin of multicellularity.

CO5: Understanding classification of plants and animal kingdom.

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Course: PHYLAB105

Course Name: Physics Practical

CO1: Laboratory maintainance

CO2: Use of pendulum

CO3: Use of instruments in physics

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Course: CHMLAB106

Course Name: Chemistry Practical

CO1: Preparation of solution

CO2: Hands on experience of pH meter

CO3: Synthesis of organic molecules

CO4: Laboratory safety and maintenance skill

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Course: BIOLAB107

Course Name: Biology Practical

CO1: Hands on training on biochemical experiments.

CO2: Understanding from field visits about zooplanktons.

CO3: Understanding the world of animal kingdom by visiting zoology museum.

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Course: ENG108

Course Name: English Communication and Critical thinking

CO1: Development of listening ability

CO2: Development of English reading ability

CO3: Development of Critical thinking in English

CO4: Speaking English with proper pronunciation

CO5: Development of proper conversation skill

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Semester II

Course: MTH201

Course Name: Vector Calculus, and Probability and Statistics I

CO1: This course enhances interest of students towards core and basic linear Algebra.

CO2: This course enhances the quality and standards of Mathematical Education.

CO3: This course takes care of fast development in the knowledge of Mathematics.

CO4: Problem solving

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Course: PHY202

Couse Name: Quantum mechanics and Thermodynamic

CO1: To understand matter waves in quantum mechanics.

CO2: To understand expectation values, observables and operators.

CO3: To understand tunnelling phenomenon and hydrogen atom, helium atom in quantum mechanics.

CO4: To learn about the zeroth law of thermodynamics and thermodynamic equilibrium.

CO5: To understand Carnot's cycle, Heat engines and Stirling cycle.

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Course: CHM203

Course Name: Chemistry2: Physical and Inorganic

CO1: Understanding the development of electrochemical cells

CO2: Understanding the concepts and use of quantum chemistry

CO3: Understanding the bonding in coordination compounds and their chemistry

CO4: Application of stereochemistry in biomolecules and understanding the mechanism

CO5: Application of thermodynamics in Bioenergetics

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Course: BIO204

Course Name: Biology2: Diversity of life

CO1: To understand life's diversity.

CO2: Understanding of evolutionary relationship about origin of life,

CO3: Understanding the concepts of cell theory and different types of cell.

CO4: Understanding concepts of evolution and origin of multicellularity.

CO5: Understanding classification of plants and

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Course: PHYLAB205

Course Name: Physical  
Practical

CO1: To determine the Refracting Angle, Refractive Index and Dispersive power of prism using spectrometer.

CO2: To determine the coefficient of thermal Conductivity of bad conductor

CO3: Study of charging and Discharging of Capacitor.

CO4: Verification of Kirchhoff's law

CO5: Wavelength determination of main spectral line of mercury light using plane transmission grating.

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Course: CHMLAB206

Course Name: Chemistry Practicals

CO1: Determination of heat of solution

CO2: Use of pH meter for determination of the chemical changes

CO3: Skill in the synthesis of inorganic complexes

CO4: TEchniques for the separation of natural products

CO5: Skill in the single stage preparation of the compound

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Course: BIOLAB207

Course Name: Biology

## Practicals

CO1: To understand handling of microscope for observations of slide.

CO2: To understand and hands on training to handle Gel apparatus.

CO3: Understand the working of electron and fluorescent microscopy.

CO4: Learning and handling hematocytometer for counting of cells.

CO5: Observing and learning to prepare slides to study cell division from onion root tip.

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Course: COMP208

Course Name: Computing

CO1: Basic concepts in programming

CO2: Framing of algorithm

CO3: Development of logical thinking via small computer programs

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**S. Y. B. Sc. Blended**

Semester 3

Course: MTH301

Course Name: Maths 3: Vector Calculus, and Probability and Statistics I

CO1: This course enhances interest of students towards core and basic linear Algebra.

CO2: This course enhances the quality and standards of Mathematical Education.

CO3: This course takes care of fast development in the knowledge of Mathematics.



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Course PHY302

Course Name: Physics3: Quantum mechanics and Thermodynamic

CO1: To understand matter waves in quantum mechanics.

CO2: To understand expectation values, observables and operators.

CO3: To understand tunnelling phenomenon and hydrogen atom, helium atom in quantum mechanics.

CO4: To learn about the zeroth law of thermodynamics and thermodynamic equilibrium.

CO5: To understand Carnot's cycle, Heat engines and Stirling cycle.

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Course: CHM303

Course Name: Reactions and Synthesis

CO1: Writing of the reaction mechanism in proper sequence

CO2: Reactions with specific reagents

CO3: Understanding of different oxidation states and their stability with the help of Latimer and Frost diagram.

CO4: Determination of lattice energy using Born Haber cycle.

CO5: Understanding of vapour pressure diagrams of liquid mixtures.

CO6: Application of kinetic gas equation to prove ideal gas laws.

CO7: Thermodynamic parameters of mixing

CO8: Principle of distillation Azeotropes in nature

CO9: Numerical problem solving.

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Course: BIO304

Course Name : Functional

Biology

CO1: Students able to understand the basics of animal and plant biology.

CO2: Students are enriched with knowledge of anatomy, function and system of animal biology.

CO3: Students are able to understand the systems, processes, development of plant biology.

CO4: It develops an interdisciplinary approach with plant and animal biology.  
CO5: It will inculcate a sense of social and environmental awareness.

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Course : PHYLAB305

Course Name: Physics Practical

CO1: Understanding the concepts in wave mechanics

CO2: Finding of the thermodynamic parameters

CO3: Correlation of theory with the practicals

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Course: CHMLAB306

Course Name: Chemistry Practical

CO1: Nernst equation and the factors affecting on emf

CO2: Hands on the usage of potentiometer

CO3: Separation of acid, base phenol from the mixture

CO4: Use of viscometer to determine the time of flow.

CO5: Hands on the usage of spectrophotometer

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Course: BIOLAB307

Course Name: Biology Practical

CO1: Students are able to understand the media preparation, conditions, and various methods.

CO2: Students will differentiate between gram positive and gram negative bacteria.  
CO3: Students understand the various parameter effects on enzyme kinetics.  
CO4: Students will be able to test the various microbial antibiotic activity and compare the zone of inhibition.

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Course: COMP208

Course Name: Computing

CO1: Framing of algorithm for the complex programming

CO2: Application of the programming in Physics or Chemistry or Biology

CO3: Development of a useful computer program independently.

CO4: Development of the computational skill

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SemesterIV

Course: MTH401

Course Name: Maths 4: Differential Equations, and Probability and Statistics II

CO1: Solving of advanced differential equations

CO2: Understanding of the probability concepts and its applications

CO3: Understanding of the concepts of statistics and its applications

CO4: Problem solving

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Course: PHY402

Course Name: Physics4: Electricity, magnetism and Optics

CO1: Understanding the basic concepts of Electro physics

CO2: Understanding of magnetism property variation

CO3: The application of optics in the instruments

CO4: Numerical problem solving

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Course: CHM403

Course Name: Chemistry4: Structure and properties

CO1: Identification and comparison of stereochemical structures  
CO2: Understanding of symmetry concept  
CO3: Understanding of the factors affecting on the reaction mechanism  
CO4: Use of Chem Draw  
CO5: Structure determination from the spectral data  
CO6: Understanding the properties of light emitting polymers

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Course: BIO404

Course Name: Biology 4: Genetics Evolution and Ecology

CO1: Students are able to understand the basic concept of transmission of genetics.  
CO2: Students enrich with the knowledge of population genetics.  
CO3: It will help to inculcate knowledge about population biology and communities.  
CO4: It develops an interdisciplinary approach between genetics and ecology.

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Course: PHY LAB 405

Course Name: Physics Practical

CO1: Verification of Stefan's Law by Electrical method

CO2: Understanding of the dependence of total radiation and hence verify the Stefan's Law.

CO2: Determine of the wavelength of sodium light by measuring the diameters of Newton's rings and Determine of the Reflection Index of a Liquid transparent medium such as water using Newton's ring apparatus.

CO3: Measurement of wavelength of Laser by Diffraction Grating.

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Course: CHMLAB406

Course Name: Chemistry Practical

CO1: Use of spectroscopy for understanding the reaction mechanism

CO2: Learning of separation techniques

CO3: Double stage preparation of a substance

CO4: Literature survey using Scifinder, Reaxys and other search engines

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Course: BIOLAB407

Course Name: Biology Practical

CO1: Students understand the pond ecosystem with various factors.

CO2: Students able to inoculate various species and understand population dynamics.

CO3: Study the habitat ecology and community composition .

CO4: Students will identify, quantify zooplankton taxa in collected samples.

CO5: Helpful for solving the problems on population genetics.

**T. Y. B. Sc. Blended (Chemistry)**

The syllabus development is under process

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