

Bachelor of Science (BSC)

Course Overview Institution: St. Anne's First Grade College for Women

Program Duration: 3 Years (6 Semesters)

Semester 5

Physical Chemistry

Physical Chemistry is the branch of chemistry that combines chemical theory with physical principles to understand the behavior of matter at the molecular and atomic levels. It focuses on thermodynamics, kinetics, quantum chemistry, and spectroscopy to study energy changes and reaction mechanisms. By analyzing how molecules interact and transform, physical chemistry bridges the gap between theoretical concepts and practical chemical processes, making it essential for material science, chemical engineering, and biochemistry.

Quantum Mechanics

Quantum Mechanics is the fundamental theory in physics that describes the behavior of particles at the atomic and subatomic levels. It challenges classical mechanics by introducing concepts like wave-particle duality, quantization, and the uncertainty principle. Central ideas include Schrödinger's equation, Heisenberg's uncertainty principle, and quantum entanglement. Quantum mechanics forms the foundation for modern technologies such as semiconductors, lasers, and quantum computing.

Numerical Methods

Numerical Methods are mathematical techniques used to find approximate solutions to complex mathematical problems that are difficult or impossible to solve analytically. These methods include algorithms for solving equations, integration, differentiation, and optimization. Techniques like the Newton-Raphson method, finite difference methods, and Monte Carlo simulations are widely used in scientific computing, engineering analysis, and data modeling. Numerical methods are essential for simulations and solving real-world problems where exact solutions are not feasible.

Solid State Physics

Solid State Physics is the study of the physical properties of solid materials, particularly their atomic structure and electronic behavior. It investigates phenomena like crystal lattice structures, electronic band theory, magnetism, and superconductivity. This field is foundational for understanding semiconductors, metals, and insulators, and it plays a vital role in developing electronic devices, materials science, and condensed matter physics.

Data Science

Data Science is an interdisciplinary field that uses scientific methods, algorithms, and systems to extract insights from structured and unstructured data. It combines techniques from statistics, machine learning, data analysis, and big data technologies to solve complex problems and make data-driven decisions. Applications include predictive analytics, natural language processing, image recognition, and business intelligence. Data science is crucial for industries like healthcare, finance, marketing, and technology.