B. Sc. Biotechnology: Semester-III BST 302: Bioenergetics and Thermodynamics	
Teaching Scheme Lectures: 3 hrs/Week Tutorials: 1hrs/Week Credits: 4	**Examination Scheme** Class Test -12Marks Teachers Assessment – 6Marks Attendance – 12 Marks End Semester Exam – 70 marks

Prerequisite: - BST 103 Cell Biology and BST 102 Introduction to Biotechnology, BST 202 Biochemistry

Course Objectives:

1. To give over view of Principles of Bioenergetics
2. To give complete knowledge of Energy yielding and Energy Requiring Reactions, Equilibrium Concentrations, Oxidation-Reduction Reactions
3. To describe Thermodynamic considerations: First and Second Law of Thermodynamics, Enthalpy and Entropy, Activation Energy
4. To explain the Catabolism and the Generation of Chemical Energy
5. To explain the Metabolic Strategies, General Principles of Intermediary Metabolism, Regulation of Pathways, Strategies for Pathway Analysis
6. To explain Oxidative Phosphorylation, Electron Transport and ATP Synthesis in Bacteria

Course Outcomes:

After completing the course, students will be able to:

CO1: Disciplinary knowledge and understanding of biochemistry, structure and function of biological molecules

CO2: Explain biological mechanisms, such as the processes and control of bioenergetics and metabolisms, as chemical reactions

CO3: Explain the biochemical processes that underlie the relationship between genotype and Phenotype

CO4: Demonstrate an understanding of the principles, and have practical experience of, a wide range of biochemical techniques (e.g. basic molecular biology, cell biology and microbiology methods, spectrophotometry, the use of standards for quantification, enzyme kinetics; macromolecular purification, chromatography electrophoresis, etc.).

CO5: Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.

CO6: Demonstrate an experiential learning and critical thinking of the structure and function of both prokaryotic and eukaryotic cells (including the molecular basis and role of sub-

Head
Department of Biotechnology
Invertis University, Bareilly (U.P.)

Dean
Faculty of Science
Invertis University, Bareilly (U.P.)

Registrar
Invertis University
Bareilly

cellular compartmentalization)

CO7: Analyze biochemical data (e.g. in enzyme kinetics, molecular structure analysis and biological databases

Detailed Syllabus:

UNIT-1 Bioenergetics
Principles of Bioenergetics, Energy Yielding and Energy Requiring Reactions, Equilibrium constant, Oxidation-Reduction Reactions, Metabolism and ATP Yield, Structure and properties of ATP, Photosynthetic Phosphorylation, Active Transport, Thermodynamic considerations: First and Second Law of Thermodynamics, Enthalpy and Entropy, Activation Energy
UNIT-2 Catabolism and the Generation of Chemical Energy
Catabolism and the Generation of Chemical Energy, Metabolic Strategies: General Principles of Intermediary Metabolism, Regulation of Pathways, Strategies for Pathway Analysis, Glycolysis, Gluconeogenesis, and the Pentose Phosphate Pathway & their regulation, Tricarboxylic Acid Cycle: Discovery of the TCA Cycle, Steps in the TCA Cycle, Stereochemical aspects of TCA Cycle Reactions, Thermodynamics of the TCA Cycle
UNIT-3 Mitochondria Electron Transport Chain
Mitochondria Electron Transport Chain, Oxidative Phosphorylation, Electron Transport and ATP Synthesis in Bacteria

Reference Books:

1. Smith and Vannes. Introduction to Chemical Engineering thermodynamics (Mcgraw Hill)
2. Y.V.C. rao. Chemical engineering thermodynamics (New age international)
3. J.B.Hawkins. Engineering Thermodynamics (University Press)
4. Spading and Cole. Engineering Thermodynamics (ELBS).
5. Biochemistry by Lehninger. McMillan publishers
6. Biochemistry by Lubert Stryer. W. H. Freeman & Company, NY

Head
Department of Biotechnology
Invertis University, Bareilly (U.P.)

Dean
Faculty of Science
Invertis University, Bareilly (U.P.)

Registrar
Invertis University
Bareilly