

**NOVA COLLEGE-WIDE COURSE CONTENT SUMMARY
BIO 251 – PROTEIN APPLICATIONS IN BIOTECHNOLOGY (4 CR.)**

Course Description

Prepares students to understand protein structure and function and teaches the laboratory skills needed to successfully work with proteins. Focuses on levels of protein structure and protein function. Includes common laboratory assays will for protein synthesis, purification, detection, and quantification. Lecture 3 hours. Laboratory 3 hours. Total 6 hours per week.

General Course Purpose

This course is designed to provide an introduction to protein structure and function. Students will be introduced to the theory behind protein structure-functions relationships will practice laboratory skills needed to be successful working with proteins. This course will cover aspects of protein synthesis, including *in vitro* systems for protein production while preserving a protein's structure and function. Assays for protein purification, detection, and quantification are included. Basic principles of enzymology, enzyme kinetics and binding assays will be discussed. Protein chromatography and electrophoresis techniques are also included. Principles of proteomics, diagnostic, therapeutic, and industrial applications of protein products are discussed.

Course Prerequisites/Corequisites

Prerequisites: BIO 250 and BIO 253 with a "C" or better

Course Objectives

Upon completing the course, the student will be able to:

- Describe the roles of proteins in cells and organisms
- Recognize and describe the properties of individual amino acids and the steps of protein synthesis (i.e. transcription and translation)
- Name and describe the levels of protein structure and how they are stabilized
- Understand the basic methodology used to determine protein structure
- Understand the types and importance of post-translations modifications
- Understand *in vitro* protein synthesis systems
- Understand the roles of enzymes in cells
- Understand the structures and roles of receptors, transporters, structural and recognition proteins in cells
- Understand how protein functions are regulated
- Understand the protein purification process
- Understand the protein sequencing process
- Explain the basic principles of bioinformatics and use computer programs to compare amino acids sequences in databases such as BLAST
- Work safely in a lab environment
- Demonstrate proficiency with basic lab skills including documentation, aseptic technique, pipetting, and solution preparation and dilution
- Describe how industrial protein production, such as in the pharmaceutical industry is accomplished
- Describe the recent methodological developments in biotechnology pertaining to proteins

Major Topics to be Included

- Introduction to protein characteristics
- Classifications of amino acids and their biochemical properties
- Transcription and translation
- Levels of protein structure, primary, secondary, tertiary, quaternary
- Posttranslational modifications
- Protein structures and functions, including enzyme structure, function, and regulation
- Methods of protein purification
- Methods of protein identification
- Bioinformatics overview and computer assisted sequence analysis
- Bioprocessing overview, including scale-up of protein production for pharmaceutical and other applications