

## **PROTEIN: STRUCTURE, FUNCTION AND ENGINEERING (IBT-821) Credit Hours 3 (3-0)**

### **Educational Objectives:**

1. The course has been designed to give students an insight into tools and utilization of basic techniques of protein engineering for development and improvement for various industrial biotechnological products.

### **Course Outcomes:**

2. After successful completion of the course students will have:
- a. Understanding of the necessary elements of protein over expression systems in bacteria.
  - b. Capability to design all the steps required to produce an expression system for a new protein.
  - c. Capability to make and purify proteins.
  - d. Understanding of techniques for modifying proteins.
  - e. Experience with basic techniques for protein analysis.
  - f. Understanding of advanced biophysical techniques for protein analysis, including the capacity to discuss their relative merits and interpret data from those techniques.

### **3. Course Contents:**

- a. Strategies for design of novel proteins
- b. Computational methods in protein modeling
- c. Molecular mechanics
- d. Electrostatics of protein structures
- e. Protein folding
- f. Free energy problems
- g. Sites and strategies for heterologous protein expression

- h. Post translational modifications
- i. Methods for expression of proteins in yeast
- j. Invitro mutagenesis
- k. Protein characterization
- l. Protein structure determination
- m. NMR
- n. Crystallography
- o. Spectrophotometric and colorimetric methods of characterization
- p. Applications of protein engineering

**Recommended Books:**

1. Gary Walsh. Proteins: Biochemistry and Biotechnology. John Wiley and sons. 2002
2. Dan Robertson. Protein Engineering. Methods in Enzymology. Volume 388. Elsevier academic Press. 2004
3. Paul Carey. Protein engineering and design. Academic Press. 1996.