Course title: Advances in Protein Structure and Function

Credit requirement: (L-T-P: 3-1-0, Credit: 4)

Committee for approval: UGPEC

Name of the School: School of Bioscience

Level of the subject: PG Level

Compulsory or Elective: Compulsory

Prerequisite: Nil

Faculty members willing to teach the subject:

AMIT K DAS (DEPARTMENT OF BIOTECHNOLOGY)
SWAGATA DASGUPTA (DEPARTMENT OF CHEMISTRY)
DIBYENDU SAMANTA (SCHOOL BIOSCIENCE)
SOUMYA DE (SCHOOL OF BIOSCIENCE)

Syllabus:

Primary, secondary, tertiary and quaternary structures; Motifs, super-secondary structures and fold types; forces that stabilize protein fold, folding pathways; Protein dynamics – timescales of motions, computation and experimental methods to study protein dynamics; intrinsically disordered proteins and their functions.

Directed protein evolution – phage display, cell surface display, cell free display systems; mutagenesis studies; Alternative scaffolds, combinatorial enzyme engineering; Protein engineering using non-canonical amino acids; Knowledge based protein design; Selected case studies.

Textbooks:

1. Introduction to Protein Science: Architecture, Function, and Genomics (2010) by Arthur M Lesk, Oxford University Press.

2. Introduction to Protein Structure (1998) by Branden & Tooze by Garland Publishing.

3. Protein Engineering and Design (2010) by Sheldon Park and Jennifer Cochran, CRC Press.

References:

1. Protein Engineering Handbook. (2006) by Stefan Lutz and Uwe Bornscheuer, Wiley-VCH.

Content: Lectures (total: 40 hours):

Primary, secondary, tertiary and quaternary structures (2 hours)

Motifs, super-secondary structures and fold types (2 hours)

Forces that stabilize protein fold, folding pathways (4 hours)

Protein dynamics – timescales of motions, computation and experimental methods to study protein dynamics (4 hours)

Intrinsically disordered proteins and their functions (4 hours)

Directed protein evolution: phage display, cell surface display, cell free display systems (4 hours)

mutagenesis studies (2 hours)

Alternative scaffolds, combinatorial enzyme engineering (4 hours)

Protein engineering using non-canonical amino acids (2 hours)

Knowledge based protein design (8 hours)

Selected case studies (4 hours)

Tutorials (total: 10 hours):

Various problems/exercises will be assigned on the structure-function relationship of proteins taught in the class. These problems will be discussed and solved.