Course Code and Title	BG7002 Molecular Biophysics
Details of Course	**Summary of course content** *(please note that this information provided will also be uploaded to the web for viewing at large)* This is an advanced course in molecular biophysics. The topics covered in the course include: structure and physics of biomolecules, polymer physics, entropic elasticity, fibrous proteins and molecular motors, protein thermodynamics, physics and mechanics of plasma membrane, and mechanics of cell adhesion. The course comprises 8 major topics: **1. Introduction and Basic Concepts** • Forces of nature: strong and weak interactions, gravitational and electromagnetic forces; Matter and energy; Electronic structure of atoms; Element of statistical mechanics. **2. Forces between atoms and molecules** • Derivation of interacting forces between atoms and molecules; electrostatic; Van Der Waals, hydrogen bonding, covalent bonding. **3. Structures and physical properties of biomolecules** • Biological systems and biomolecules, nucleic acids and proteins, protein structure, fibrous proteins, globular proteins, protein function. **4. Polymer Physics** • Physical parameters describing biopolymers: molecular weight, end-to-end distance and its distribution, radius of gyration, characteristic ratio, persistence length, Kuhn segment, dynamics of biopolymers. **5. Entropic Elasticity of Biomolecules** • Theories describing the elasticity of DNA and proteins – freely jointed chain model and worm-like chain model. **6. Structure, Physical properties and Dynamics of Fibrous proteins** • Structure, dynamics, physical and mechanical properties of actin, intermediate filament and microtubules. Molecular motors. **7. Protein thermodynamics** • Free energy and entropic forces, solvent interactions and solvent entropy, polypeptide chains in water, the folding process, folding pathways, simulations and predictions, experimental studies on folding. **8. Physics and Mechanics of Flexible membranes** • Structure and physical properties of cell membrane, membrane elasticity, mechanics of cell adhesion.
	Rationale for introducing this course This core course stipulated by the Division of Bioengineering will be imparted to the postgraduate students, who come from diverse backgrounds and different universities, a solid foundation in and broad understanding of molecular biophysics fundamentals and prepare them to conduct their research with greater efficiency.
	Aims and objectives The objective of the course is to provide students with solid foundation on the physics of biomolecules, starting from forces between atoms and molecules.

Assessment	*Final Examination:* *Test / Projects* *Tutorials / Homework*	*60%* *20%* *20%*
	Total:	100 %
Hours of Contact/Academic Units	Lecture hours per week: 2 Tutorial hours per week: 1 *Total: 3 hours / week; 3 AU*	