University of Pretoria Yearbook 2018

Macromolecules of life: Structure-function and Bioinformatics 356 (BCM 356)

Qualification	Undergraduate
Faculty	Faculty of Natural and Agricultural Sciences
Module credits	18.00
Programmes	BSc Biochemistry
	BSc Biotechnology
	BSc Chemistry
	BSc Genetics
	BSc Human Genetics
	BSc Human Physiology
	BSc Microbiology
	BSc Nutrition
	BSc Plant Science
Prerequisites	BCM 251 and BCM 252
Contact time	180 minute practical per week, 2 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Biochemistry
Period of presentation	Semester 1

Module content

Perspectives on the flow of information from nucleic acids to proteins, the structure and functions of nucleic acids and proteins and their organisation into hierarchical, interdependent systems. Nucleic acid structure as observed in fibres and crystals as well as global DNA and RNA analyses (methods and bioinformatic analyses). Biochemical analyses of nucleotides. DNA-DNA recognition: non-standard and higher order DNA structures. The RNA structural world, RNAi, miRNA and ribosomes. Cellular functions of coding and non-coding nucleic acids. Principles of small molecule-DNA recognition. Principles of protein-DNA recognition and interactions. Bioinformatics predictions of protein and small molecule DNA interactions. Chemical reactivity of amino acids. Domain structures of proteins and Ramachandran plots. Protein folding, sequence motifs and domains, higher order and supramolecular structure, self-assembly, conjugated proteins, post-translational modifications, conjugated proteins and bioinformatics predictions. Principles of protein function and protein structure relationships. Protein-ligand and protein-protein interactions. Protein aggregation in disease. Examples of the diverse functions of proteins and peptides, including enzymes, hormones, neurotransmitters, antibodies, receptors, transport and membrane proteins. Global analysis of proteins through proteomics. Basic principles of nuclear magnetic resonance, mass spectrometry and X-ray crystallography. Protein purification and characterization including, pI, molecular mass, amino acid composition and sequence. Practical training will include interactive computer-guided demonstrations of protein analysis, hands-on practical sessions for nucleic acid purification and chemical structure characterisation, protein expression and purification (including SDS-PAGE), protein sequence analysis including mass spectrometry, protein structure analysis by 3D protein modelling and protein folding (Bioinformatics).