UNIVERSITI TEKNOLOGI MARA

CBE451: BIOCHEMISTRY AND METABOLIC REGULATION

Course Name (English)	BIOCHEMISTRY AND METABOLIC REGULATION APPROVED
Course Code	CBE451
MQF Credit	3
Course Description	The course impact fundamental knowledge need for bioprocess engineering terms in chemical aspects of life from molecular point of view. The course provides the necessary knowledge of the structure, properties and metabolic regulation of Biomolecules viz. Amino acids, Proteins, Carbohydrate, Fatty acids, Lipids, Nucleotides, Nucleic acids. It includes cell transport, energetics, membrane structure, DNA replication, Transcription, Translation, Regulation of gene expression and signal transduction.
Transferable Skills	Softskills, active learning, critical thinking, problem solving, teamwork
Teaching Methodologies	Lectures, Blended Learning, Presentation
CLO	CLO1 Recognize and explain the basic structure of biomolecules in relation to their functional groups. CLO2 Differentiate the synthesis mechanisms of large biomolecules such as proteins, lipids and nucleid acids. CLO3 Predict various metabolic pathways including glycolysis and TCA cycle and explain how they are regulated in the cells.
Pre-Requisite Courses	No course recommendations

Topics
1. Chapter 1 Molecular Components of Cells 1.1) Importance of water; Structure and function of biomolecules: Carbohydrates, Lipids, Proteins and Nucleic. 1.2) Biomolecules and their conformation; Ramachandran map; Weak inter-molecular interactions in biomacromolecules; 1.3) Protein structure, folding and function: Myoglobin, Hemoglobin, Lysozyme, Ribonuclease A, Carboxypeptidase and Chymotrypsin. 1.4) Biological membranes; Transport across membranes and pumps; Signal transduction; hormones and neurotransmitters. 1.5) Nucleotides and Nucleic Acids: Structure and chemistry of nitrogeneous bases, nucleotides, and classes of nucleic acids. 1.6) Thermodynamics of Biological Systems: Basic concepts of thermodynamics, effect of concentration on net free energy changes, effect of pH on standard-state free energies, relationships between thermodynamic parameters and biochemical events.
2. Chapter 2 Protein Dynamics 2.1) Chemical and functional nature of enzymes; Kinetics of single substrate and bi-substrate enzyme catalysed reactions; inhibition of enzyme activity; Bioenergetics. 2.2) Enzyme kinetics including its regulation and inhibition, and Coenzymes.
3. Chapter 3 Metabolism and Its Regulation 3.1) Metabolism: An Overview 3.2) Metabolism and bioenergetics; Generation and utilisation of ATP. 3.3) Metabolic pathways and their regulation: glycolysis, TCA cycle, pentose phosphate pathway, oxidative phosphorylation, gluconeogenesis, glycogen and fatty acid metabolism.
4. Chapter 4 Nucleic Acids - Information Transfer 4.1) DNA replication, transcription and translation; Biochemical regulation of gene expression. 4.2) Recombinant DNA technology and applications: PCR, site directed mutagenesis and DNA-microarray.
5. Chapter 5 Techniques 5.1) Biochemical and biophysical techniques for macromolecular analysis; 5.2) Biochemical separation techniques and characterisation: ion exchange, size exclusion and affinity chromatography, electrophoresis, UV-visible, fluorescence and Mass spectrometry
6. Chapter 6 Special Topic: Bioinformatics 6.1) n/a

Assessment Breakdown	%
Continuous Assessment	40.00%
Final Assessment	60.00%

Details of Continuous Assessment

Assessment Type	Assessment Description	% of Total Mark	CLO
Assignment	n/a	20%	CLO1 , CLO2 , CLO3 , CLO
Test	n/a	20%	CLO1 , CLO2 , CLO3

Reading List

Reference Book Resources

- McKee,T.M. And McKee,J.R. 2003, *Biochemistry.The Molecular Basis of Life*, 3 Ed., McGraw Hill

Article/Paper List

Recommended Article/Paper Resources

- Jürgen G. Schmidt, Peter E. Nielsen1 and Leslie E. Orgel* 1997, Information transfer from peptide nucleic acids to RNA by template-directed syntheses, *Nucleid Acid Research*, Vol 23 issue 23, 47974
  http://doi: 10.1093/nar/25.23.4797
- D. SIEVERS & G. VON KIEDROWSKI* 1994, Self-replication of complementary nucleotide-based oligomers, *Letters To Nature*, vol 369, 22122 [ISSN: doi:10.10]
  http://www.nature.com/nature/journal/v369/n6477/abs/369221a0.html

Other References

This Course does not have any other resources