

SEMESTERS I and II
LSM1401 – FUNDAMENTALS OF BIOCHEMISTRY

Prerequisite: *Pass in 'A' Level Chemistry or equivalent. Chemistry, Pharmacy, Bioengineering, Chemical Engineering, Engineering Science, and Environmental Engineering students only*

Preclusion: *Life Sciences major/minor (except Chemistry major).*

Workload: *28 lecture hours + 10 tutorial hours (assignments, classes, etc.) + 3 laboratory sessions.*

This module aims to provide the student with a strong background in the fundamental aspects of the biochemistry of biomolecules including selected topics of cell biology, microbial systems, and molecular genetics with an emphasis on their application to chemical and pharmaceutical industries as well as engineering practices (in particular bioengineering, chemical engineering, environmental engineering, and engineering science). Upon completing this module, the student is expected to have sufficient knowledge of fundamental life processes in order to appreciate and relate the importance of biochemistry in industry as well as in everyday life. The student should also be well prepared to take other advanced modules as well in which biochemistry is a prerequisite.

S/N	Topics	Lecture Hours
1	Life and Aqueous Solutions Chemical processes as an integral part of a living cell. Acid-base reactions and concept of buffering. pH and buffers – maintenance of biological systems in engineering and pharmaceutical processes.	2
2	Cell Biology Diversity of living systems. Organisation, structure and functions of cells – prokaryotes, eukaryotes, plant, and animal cells. Cell membrane and transport. Cell cycle. Cell growth and nutritional needs. Overview of growing cells – batch and continuous culture. Industrial uses of microbes and other cell types.	4
3	Biomolecules – Protein Structure and Function Amino acids, peptides, and proteins. Chemical bonds and functional groups. Proteins as enzymes. Enzyme properties and kinetics. Industrial applications of proteins and enzymes. Immobilisation of proteins and enzymes.	6
4	Biomolecules – Lipid Structure and Function Structural diversity and functions. Lipids of commercial importance.	2
5	Biomolecules – Carbohydrate Structure and Function From monomers to polymers. Energy for human and raw material for industries.	2
6	Cellular Metabolism Concept of metabolic pathways. Diversity of metabolism. Production and utilisation of energy. Energy from lipids (β -oxidation). Glycolysis as model metabolic pathway. Fermentation. Citric acid cycle. Intermediary metabolism – large scale production of specific metabolites.	6
7	Biomolecules – Nucleic Acid Structure and Function Structure and function of nucleic acids. Flow of genetic information – replication, transcription, and translation. Manipulation and application of genetic information. Industrial application of recombinant DNA.	6
Lectures: 28h		
Tutorials (Assignments, Classes, Etc.): 10h		
Laboratory Sessions: 3 x 4h = 12h		
Total Hours:		50h

TEXTBOOKS:

1. *Biochemistry* by Mary K. Campbell and Shawn O. Farrell, 6th Edition, 2009, Thomson Brooks/Cole.
2. *Cell Biology and Genetics* by Cecie Starr, Ralph Taggart, Christine Evers, and Lisa Star, 12th Edition, 2009, Thomson Brooks/Cole.
3. *Biochemistry: The Molecular Basis of Life* by Trudy McKee and James R. McKee, 3rd Edition, 2003, McGraw-Hill Higher Education.
4. *Biochemistry* by Jeremy M. Berg, John L. Tymoczko, and Lubert Stryer, 6th Edition, 2007, W.H. Freeman.
5. *Molecular Cell Biology* by Harvey Lodish, Arnold Berk, Chris A. Kaiser, Monty Krieger, Matthew P. Scott, Anthony Bretscher, Hidde Ploegh, and Paul Matsudaira, Sixth Edition, 2008, W.H. Freeman.
6. *Fundamentals of Biochemistry: Life at the Molecular Level* by Donald Voet, Judith G. Voet, and Charlotte W. Pratt, 3rd Edition, 2008, John Wiley.
7. *Biochemistry* by Reginald H. Garrett and Charles M. Grisham, 4th Edition, 2010, Thomson Brooks/Cole.
8. *Lehninger Principles of Biochemistry* by David L. Nelson and Michael M. Cox, 5th Edition, 2009, W.H. Freeman.

MODE OF ASSESSMENT: 60% Continual Assessment + 40% Final Examination

MODULE CO-ORDINATORS:

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