



Course Outline Form

EVEN SEMESTER 2019

Dear Student: Course outlines are intended to provide students with an overall plan for a course to enable them to function efficiently and effectively in the course.

*Academic Programs
BSc Biochemistry
EMEA College
Kondotty*

Course Outline : BCH2B02 Biomolecules (2019-2020)

Name of the Stream	Science
Name of the Programme	BSc Biochemistry
Name of the Course	BCH2B02 Biomolecules
Nature of the Course	Core Course
Semester	Second
Lecturer(s)	Sulfikar Ali M N K Zaheera Banu
Name of the Coordinator	Sulfikar Ali M
Year	2019-2020
No of Credits	3
No of Contact Hours	3
Course Description	The course encompasses the detail study of definition, classification, structure and cellular functions of biomolecules carbohydrates, lipids, proteins and nucleic acids.It also provide an introduction to biomolecules
Course Objectives	1. To have detail knowledge about structure and function of biomolecules 2. to help to understand basics of bioinformatics
Course Outcome	At the end of the course, the students have a thorough understanding on the structure, classification of biomolecules and their functions.The students will also be introduced to concepts in bioinformatics.
Assessment Method	Assignments Homeworks Class Tests Unit Tests Term Exam Seminars
Teaching Methods Used	Lectures Cooperative Learning Collaborative Learning LMS Class Discussion
Textbook	

References

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3. Lubert Stryer, John L. Tymoczko, Jeremy Mark Berg. Biochemistry. 9th edition, W. H. Freeman and Company • New York, 2019.
4. Voet, Donald, and Judith G. Voet. Biochemistry. New York: J. Wiley & Sons, 1995.
5. A.C. Deb, Fundamentals of Biochemistry, 7th Edition, New Central Book Agency-Kolkata, 2001.
6. Debajyoti Das. Biochemistry, Academic Publishers, 1978.
7. J. L. Jain, Sunjay Jain, and Nitin Jain. Fundamentals of Biochemistry Publishers: S. Chand & Co Ltd. New Delhi. 2008
8. R.K. Murray, D. K. Granner, Peter A Mayer, Victor W Rodwell . Harper's Biochemistry, Lange Medical Publications, 1991.
9. E. E. Conn and P. K. Stumpf, Outlines of Biochemistry, John Wiley & Sons, New York, 1987.
- 10.S. C. Rastogi, Biochemistry, Tata McGraw Hill, New Delhi, Latest Editon.2010
- 11.U. Satyanarayana, Biochemistry, Books and Allied (P) Ltd., Calcutta, Latest Edition, 2013.
- 12.Richard J. Simmonds. Chemistry of Biomolecules: an Introduction. Publisher: Royal Society of Chemistry.
- 13.K G Prasannan, R Rajan S Ramakrishnan. Textbook of Medical Biochemistry, Orient Longman, 2004.
- 14.David E. Metzler. Biochemistry: The Chemical Reactions of Living Cells, Academic Press 2003
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- 17.Jean-Michel Claverie and Cedric Notredame. Bioinformatics: A Beginner's Guide. Wiley Publishing, Inc.2003.
- 18.K.Mani and N.Vijayaraj. Bioinformatics: A Practical approach., Aparnaa Publication, 2004
- 19.David. W. Mount .Bioinformatics: Sequence and Genome Analysis.CBS publishers.
- 20.C.A. Orengo, D.T.Jones and J.M. Thornton. Bioinformatics: Genes, proteins and computers. Taylor & Francis,2002
- 21.S.C.Rastogi, N Mendiratta, P.Rastogi. Bioinformatics methods and Application: genomics, proteomics and drug discovery, Prentice Hall India Learning Private Limited, 2013.
- 22.T.K Atwood and D.J Parry. Introduction Bioinformatics, Smith Publisher. Pearson Education Pvt Ltd. 2002.

Internet Resources

<http://web.indstate.edu:80/thcme/mwking/lipids.html>
<http://www.stark.kent.edu/~cearley/pchem/AAcids/titrate.htm>
<http://www.stark.kent.edu/~cearley/pchem/pchem.htm>
<http://www.cryst.bbk.ac.uk/PPS2/course/section3>
<http://www.cryst.bbk.ac.uk/PPS2/top.html>
<http://www.biology.arizona.edu/biochemistry/biochemistry.html>

Internal Exam Pattern

Items	Marks/20	Marks/15
Assignment	4	3
Test Paper(s)/Viva voce	8	6
Seminar/Presentation	4	3
Class Room Participation based on Attendance	4	3
Total	20	15

External Exam Pattern

Question Type	No of Question	Marks/Question	Total Marks
Short Questions(2-3 Sentences)	12	2	Ceiling 20
Paragraph / Problem Type	7	5	Ceiling 30
Essay Type	2 out of 4	10	10
Total			60
Time			2 hrs

Name of the Course: BCH2B02 Biomolecules

Knowledge

Academic and Intellectual Skills

Self Learning

Collaborative Learning

Cognitive Skills

Professional Skills

Problem Solving Skills

Research Skills

Personal Skills

Creative Thinking

Application Skills

Attitude and Values

Ethical Commitment

Global Citizen

Secular Outlook

Graduate Attributes

Course Schedule

Unit I Carbohydrates

Definition and classification, Isomerism of carbohydrates: optical isomerism and stereoisomerism, 'd' and 'l' D and L forms of compounds. Glyceraldehyde as an example. R and S nomenclature of enantiomers. Examples of epimers, mutarotation and its explanation, anomeric forms. Classification of monosaccharides, linear and cyclic structure (glucose, galactose, mannose, ribose, and fructose). Reactions and characteristics of aldehyde and keto group, action of acids and alkalis on sugars, reactions of sugars due to hydroxyl group. Disaccharides- structure, occurrence, chemistry, and functions of sucrose, lactose, maltose, isomaltose and cellobiose. Homopolysaccharides: occurrence, structure, chemistry, and functions of cellulose, starch, glycogen, chitin and inulin. Heteropolysaccharides: occurrence, types, composition, and function. Sugar derivatives: sugar alcohols, sugar acids, amino sugars, deoxy sugars, and their relevance.

Week 1

Week 2

Week 3

Unit II. Lipids

Definition, basic ideas about the biochemical functions of lipids. Classification of fatty acids, physical and chemical properties of fatty acids saponification number, acid number and iodine number and their application. Structure of the following fatty acids – stearic acid, oleic acid, linoleic acid. Essential and non-essential fatty acids with examples. Classification of lipids with structure and examples- simple lipids; (triacylglycerol), Compound lipids: storage and membrane lipids. Structure and functions of phospholipids and glycolipids derived lipids; Steroids: Structure of steroid nucleus, cholesterol, ergosterol, stigmaterol, calciferol. Eicosanoids – definition & classes only.

Week 4

Week 5

Week 6

Unit III Amino acids and Proteins

Amino acids: Definition, stereoisomerism, the structure of 20 'protein amino acids' - Three letter and single letter abbreviations of amino acids, and novel amino acids: selenocysteine and pyrrolysine.

Week 7

Week 8

Classification of amino acids based on charge and polarity, general reactions of amino acids-side chain, carboxyl and amino group- essential and nonessential amino acids. Ionization of amino acids. Zwitterion, isoelectric point for amino acids.

Week 9

Unit IV Proteins

Basic ideas about the classification (including solubility characteristics) and functions of proteins. Peptides: Formation of the peptide bond. Structure of glutathione, oxytocin, and vasopressin. Elementary study of primary, secondary, tertiary and quaternary structure of proteins, Ramachandran's plot, forces stabilizing the proteins. Endpoint determination of primary structure- N-terminal, C-terminal residues (one method each). Chemical reactions, purification, precipitation reactions - salt and heavy metal precipitation, denaturation, renaturation and precipitation of proteins. Color reactions for proteins. Sequencing of proteins (basic principles of the methods employed).

Week 10

Week 11

Week 12

Unit V Nucleic acids

Structure of common purine and pyrimidine bases, tautomeric forms of bases, structure of nucleosides and nucleotides.-unusual bases in nucleic acids. cAMP structure. DNA: Double helix (Watson and Crick model) A, B, and Z forms of DNA, physical properties of DNA (conformational variants). Introduction to circular DNA, supercoiling, helix to random coil transition – denaturation of nucleic acids, hyperchromic effect, T_m-values, cot curves, and their significance. Types of RNA- (t-RNA, r-RNA, m-RNA). Elementary study of the structures of these RNAs. Sequencing of DNA (basic principles of the methods employed).

Week 13

Week 14

Unit VI. Vitamins and Minerals

Definition, classification- fat soluble and water soluble-, sources, chemical nature (without structure), functions of vitamins. Macro minerals (Ca, P, Mg, Na, K, Cl) and micro minerals/trace elements (Co, I, Fe, Mn, Zn, and F)-their sources, daily requirements, functions and deficiency diseases.

Week 15

Week 16

UNIT VII Introduction to bioinformatics

Importance, scope of Bioinformatics. Introduction to Biological databases, Types of Biological data bases, primary and secondary sequence databases. Genbank, SCOP, NCBI, gene bank, CATH, Expasy, PIR, Prosite, PDB. Basics of sequence alignment -pair wise and multiple sequence alignment- Global and local alignment. BLAST, FASTA. Application of Bioinformatics - Drug designing and molecular docking, Homology modeling, Phylogenetics, Microarrays.

Week 17

Week 18

Contact Details

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