

# Biochemistry Syllabus

## (Effective from June 2011)

### Choice Based Credit System for Under Graduate students of Gujarat University

1. Objectives of Credit system:  
to provide mobility and flexibility for students within and outside the parent department
2. To provide broad based education
3. To help students learn at their own pace
4. To provide students scope for acquiring extra credits
5. To impart more job oriented skills to students
6. To make any course multi disciplinary in approach

*What is credit system?*

Weightage to a course is given in relation to hours assigned for the course. Generally one hour per week is one credit. However, there could be some flexibility because of practical, field visits and tutorials. Following table shows distribution of credits:

First year	Semester I	Semester II
4 credits	Biochemistry 101	Biochemistry 103
3 credits	Biochemistry 102 (Practical)	Biochemistry 104 (practical)
2 credits	Biochemistry Elective 101	Biochemistry Elective 102
		Biotechnology Elective102
<b>Total 18 credits</b>		

Second year	Semester III	Semester IV
4 credits	Biochemistry 201	Biochemistry 204
4 credits	Biochemistry 202	Biochemistry 205
3 credits	Biochemistry 203 (Practical)	Biochemistry 206 (practical)
2.5 credits	Biochem sub. Elective 201	Biochem sub. Elective 202
<b>Total 25 credits</b>		

Second year	Semester V	Semester VI
4 credits	Biochemistry 301	Biochemistry 307
4 credits	Biochemistry 302	Biochemistry 308
4 credits	Biochemistry 303	Biochemistry 309
4 credits	Biochemistry 304	Biochemistry 310
5 credits	Biochemistry 305 (Practical)	Biochem 3011 (Practical)
2 credits	Biochem sub. Elective 301	Biochem sub. Elective 303
2 credits	Biochem sub. Elective 302	Biochem sub. Elective 304
<b>Total 25 credits</b>		

In addition, in each year students will have foundation course for 2 credits. Students who opt for biotechnology will have to take compulsory subjective electives from semester I to VI as per syllabus.

Course pattern: The course consists of three major components. They are core course, elective course and subject elective course.

### **Core Course**

A core course is the course offered by the parent department, totally related to the major subject, components like Practicals, Projects, Group Discussion, Viva, Field Visit, Library record form part of the core course. All the students of the course must take the core courses.

### **Subject elective**

The optional course is also offered by the parent department. The objective is to provide choice and flexibility within the department. The student can choose his/her optional. The optional is related to the major subject. The difference between core course and optional course is that there is choice for the student. The department is at liberty to offer optional course every semester or in any two semesters. It must be offered at least in two semesters. The staff too may experiment with diverse courses.

### **Elective Course**

Elective Course is an interdepartmental course offered by a department for the students belonging to other departments. The objective is to provide mobility and flexibility outside the parent department. This is introduced to make every course multi-disciplinary in nature. It is to be chosen from a list of courses offered by various departments. The list is given at the end of the syllabus copies. Two Elective Courses must be taken by students.

## Semester II

### *103: Biomolecules Adv.*

*(4 credits)*

#### **Unit 1: Complex carbohydrates**

Oligosaccharides: Occurrence, structure, chemical name, functions and importance of: maltose, sucrose, lactose, cellobiose, trehalose, raffinose.

Polysaccharides: Occurrence, structure, chemical name, functions and importance of: starch, glycogen, cellulose, hemicelluloses, dextrin, chitin, inulin, dextran, pectin, agar, alginic acid, mannans.

Carbohydrate derivatives of biological importance: amino sugars, deoxy sugars, sugar phosphates, blood group polysaccharides, cell wall polysaccharides, teichoic acid, muramic acid, sialic acid, mucopeptides.

Glycosaminoglycans: Occurrence, structure and functions of hyaluronic acid, heparin, chondroitin sulphates, A, B and C, Glycoproteins and proteoglycans.

#### **Unit 2: Proteins**

Peptides, structure, formation and characteristics of peptide bonds.

Proteins: Classification based on solubility, shape and composition. Functions of proteins.

Properties: isoelectric pH of proteins, hydration, behaviours in solution, solubility, salting in and salting out of proteins, precipitation of proteins by acid reagents, heavy metals, heat, extreme pH changes, denaturation and renaturation of proteins.

Chemical properties of proteins: colour reactions.

Structure of proteins: primary, secondary, tertiary and quaternary structures.

Determination of sequences of amino acids in proteins.

Biological functions of : fibrous proteins, keratins, collagen, elastin. Globular proteins, haemoglobin, myoglobin. Other proteins, glycoproteins, lipoproteins, nucleoproteins, metalloproteins.

#### **Unit 3: Complex lipids and sterols**

Glycerophospholipids: Classification, properties and functions of lecithin, lysolecithin, cephalins, plasmalogens, phosphatidyl serine, phosphatidyl inositol. Sphingolipids:

Classification, properties and functions of cerebroside, gangliosides. Sulfolipids, gangliosides, proteolipids, and prostaglandins, Structure and properties of sterols. Colour reactions of cholesterol.

#### **Unit 4: Nucleic acids**

Introduction to nucleic acids. Composition of DNA and RNA. Nitrogenous bases: structure and properties of normal and rare. Sugars. Nomenclature for writing the structure of nucleic acids. Nucleosides and nucleotides, linkages, different types, naturally occurring, functions.

DNA: important features of double helix structure.

RNA: different types, structures, functions and differences and similarities with DNA.

**Ref:**

1. Berg JM, and Tymoczko TJ Stryer L.: Biochemistry (6<sup>th</sup> ed), (2008).WH Freeman Publishers
2. Conn EE, Stumpf PK, Bruening G and Doi RH: Outlines of Biochemistry (2007).
3. David Ucko: Living chemistry: an introduction to general, organic and biological chemistry, (1986).
4. Deb AC: Fundamentals of Biochemistry (2000).
5. Donald Voet and Voet J: Biochemistry (4<sup>th</sup> ed), (2011). John Wiley and Co.
6. Jeffrey Zubay: Origin of life on the earth and in the cosmos (2<sup>nd</sup> ed) (2000). Academic Press
7. Jeffrey Zubay: Principles of Biochemistry, McGraw Hill Publications, (1996).
8. Murray RK, Rodwell VW: Harpers review of Biochemistry (25<sup>th</sup> ed), (2000).
9. Nelson DL and Cox MM: Lehninger's Principles of Biochemistry (5<sup>th</sup> ed). (2008).
10. Rama Rao AV: A text book of Biochemistry (10<sup>th</sup> ed) (2006).
11. Rodney Boyer: Concepts in Biochemistry (3<sup>rd</sup> ed), (2006). John Wiley and Co.
12. West and Todd: Text book of Biochemistry (4<sup>th</sup> ed) (1970). The Macmillan Co. New York.
13. White A, Handler P and Smith EL: Principles of Biochemistry (6<sup>th</sup> ed) (1978). MacGraw-Hill Publications.

**104: Practicals****(3 credits)****Duration: 2hr****Marks: 100****Total 45 hrs**

1. Experiments involving oxidometry
  - a. Use of potassium permanganate in the estimation of i) Iron ii) oxalate iii) hydrogen peroxide iv) nitrite v) chromate.
  - b. Estimation of calcium from biological fluids.
  - c. Use of potassium dichromate in the standardization of sodium thiosulphate and estimation of copper by iodometry.
2. Qualitative analysis of colour reactions of amino acids.
3. Qualitative analysis of proteins like gelatin, egg albumin and its identification.
4. Precipitation test for proteins.
5. Analysis for physical and chemical properties of lipids e.g. solubility, cholesterol reaction, saturation and un saturation of lipids.
6. Qualitative tests for food stuffs.
  - a. Milk
  - b. Bread
  - c. Potato
7. Use of single cell colorimeter, its construction and operation
8. Estimation of protein by Biuret method.

**Ref:**

1. A Manual of Laboratory Techniques, MIN, ICMR Publications
2. Eaton AD, Clesceri LS, Greenberg, AE: Standard methods for the examination of water and waste water (13<sup>th</sup> ed), (1995).
3. Jayaraman, J: Laboratory manual in Biochemistry

4. Malhotra VK: Handbook of practical biochemistry
5. Mukherjee L: Medical Laboratory Technology, Vol 1,2,3.
6. Plummer: An Introduction to Practical Biochemistry, (1987), McGraw Hill Publications.
7. Ranjana Chawla: Clinical Chemistry
8. Sadasivan and Manickam: Biochemical methods.
9. Standard methods for the examination of water and waste water (13<sup>th</sup> ed)
10. Varley H: Practical Clinical Biochemistry, (1966).

**Semester II**

***Biochem Elective: 103: Environmental Studies***

***(2 credits)***