

INSTITUTE	FACULTY OF AGRICULTURE
PROGRAM	BACHELOR OF SCIENCE (Hons.) AGRICULTURE
SEMESTER	2
COURSE TITLE	FUNDAMENTALS OF PLANT BIOCHEMISTRY
COURSE CODE	16AS0206
COURSE CREDITS	3

Objective:

- 1 To integrate the basic biological and chemical knowledge and its structure.
- 2 To develop a foundation in the concepts and facts in modern cell and molecular biology and biochemistry.
- 3 To be familiar with carbohydrates, lipids, enzymes, proteins and vitamins.
- 4 To understand the nucleic acid and metabolism process.

Course Outcomes: After completion of this course, student will be able to:

- 1 Students will be able to know the role of enzymes and vitamins in the plants
- 2 Students will be able to define the DNA/ RNA structure, types, replication, features etc.
- 3 Students will be able to understand biochemistry and properties of pH, water, buffer
- 4 Student will be able to understand the role of carbohydrates, lipids and proteins in plants
- 5 Students will be able to discuss the synthesis pathways of biomolecules and metabolism

Pre-requisite of course: To create the awareness among the students about carbohydrate, protein, lipids and enzymes in the plant systems and their importance

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
2	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	Importance of Biochemistry Importance of Biochemistry	2
2	Properties of Water, pH and Buffer Properties of Water, pH and Buffer	2

Contents : Unit	Topics	Contact Hours
3	Carbohydrate: importance and classification. Structures of Monosaccharides, reducing and oxidizing properties of Monosaccharides, Mutarotation, structure of Disaccharides and polysaccharides Carbohydrate: importance and classification. Structures of Monosaccharides, reducing and oxidizing properties of Monosaccharides, Mutarotation, structure of Disaccharides and polysaccharides	2
4	Lipid: importance and classification. Structures and properties of fatty acids, storage lipids and membrane lipids Lipid: importance and classification. Structures and properties of fatty acids, storage lipids and membrane lipids	3
5	Proteins: importance of proteins and classification. Structures, titration and zwitterions nature of amino acids, structural organization of proteins. Introduction to secondary metabolites Proteins: importance of proteins and classification. Structures, titration and zwitterions nature of amino acids, structural organization of proteins. Introduction to secondary metabolites	3
6	Enzymes: General properties, classification Introduction to allosteric enzymes. Applications of enzymes Enzymes: General properties, classification Introduction to allosteric enzymes. Applications of enzymes	2
7	Vitamins and mineral nutrition for human health Vitamins and mineral nutrition for human health	2
8	Nucleic acids: Importance and classification, Chemical and physical properties of nucleic acids. Structures of nucleotides, A, B and Z Nucleic acids: Importance and classification, Chemical and physical properties of nucleic acids. Structures of nucleotides, A, B and Z	2
9	DNA ; RNA: Types and secondary and tertiary structure DNA ; RNA: Types and secondary and tertiary structure	2
10	Metabolism of carbohydrates: Glycolysis, TCA cycle, pentose phosphate pathway, Glyoxylates cycle, Electron transport chain Metabolism of carbohydrates: Glycolysis, TCA cycle, pentose phosphate pathway, Glyoxylates cycle, Electron transport chain	2
11	Substrate level and photo phosphorylation reaction, metabolism of lipids : Beta oxidation, Transamination reaction Substrate level and photo phosphorylation reaction, metabolism of lipids : Beta oxidation, Transamination reaction	2
Total Hours		24

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Preparation of solution Preparation of solution	2
2	pH and Buffers pH and Buffers	2
3	Qualitative tests of carbohydrates and amino acids Qualitative tests of carbohydrates and amino acids	2
4	Quantitative estimation of glucose/proteins Quantitative estimation of glucose/proteins	2
5	Titration methods for estimation of amino acids/lipids Titration methods for estimation of amino acids/lipids	2
6	Effect of pH, temperature and substrate concentration on enzyme action Effect of pH, temperature and substrate concentration on enzyme action	2
7	Quantitative analysis of DNA and RNA Quantitative analysis of DNA and RNA	2
8	Estimation of ascorbic acid and calcium by titration method total phenols/plant pigments/ total alkaloids Estimation of ascorbic acid and calcium by titration method total phenols/plant pigments/ total alkaloids	2
9	Estimation of total phenols/plant pigments/ total alkaloids Estimation of total phenols/plant pigments/ total alkaloids	2
Total Hours		18

Textbook :

- 1 NA, NA, NA, NA

References:

- 1 Fundamentals of Biochemistry., Fundamentals of Biochemistry., Voet D, Voet JG & Pratt CM., Wiley, 2004
- 2 Lehninger Principles of Biochemistry, Lehninger Principles of Biochemistry, Nelson, DL and Cox, MM, MacMillan, 2004
- 3 An Introduction to Practical Biochemistry, An Introduction to Practical Biochemistry, Plummer, D., Tata McGraw Hill,, 1988

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation

Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking
25.00	25.00	20.00	10.00	10.00	10.00

Instructional Method:

- 1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board may also use any of tools such as demonstration, role play, quiz, brainstorming, MOOCs etc.
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the class-room.
- 3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- 4 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.