Institute of Botany

Faculty of Life Sciences

University of the Punjab, Lahore

Course Outline

Semester – V

Programme	BS Botany	**Course Code**	**Bot-303**	**Credit Hours**	2
Course Title	**Advanced Plant Biochemistry (Theory)**				

Introduction

This course is focused on Bioenergetics and Metabolism with a focus on energy relationships between catabolic and anabolic processes. How do the catabolic pathways deliver chemical energy? How are energy carrier molecules used in anabolic pathways? These are some of the questions that are answered making use of our knowledge of fatty acid catabolism, biosynthesis of nucleotides etc. An insight to Alkaloids, Terpenoids and Vitamins is also presented with a focus on their general properties or role in metabolism.

Learning Outcomes

- Students are expected to get themselves familiarized with the key concepts of Bioenergetics and Metabolism.
- They should be able to figure out the use of various biochemical reactions and to assess as to where do these individual chemical reactions fit in an overall metabolic process.
- The students are expected to critically analyze the various biochemical pathways and their interaction with each other.
- Students should be able to highlight the significance of Alkaloids, Terpenoids and Vitamins and the role they might play in a living system

Course Contents

Bioenergetics

- Bioenergetics and Thermodaynamics.
- Oxidation and Reduction in living systems.

Metabolism

- Breakdown of fats with special reference to beta-oxidation, its energy balance and comparison with carbohydrate metabolism.
- DNA replication. Fundamental rules. Nucleases. DNA polymerases. Fidelity of DNA replication. Nick translation. DNA repair.
- Genetic code. Components of protein synthesis. Protein synthesis: Initiation, elongation, termination and post-translational modifications.

Alkaloids

- Occurrence, physiological effects, chemical nature with special reference to Solanine, Nicotine, Morphine, Theine and Caffeine.
- Aflatoxins, their nature and role.

Terpenoids:

- Classification: Monoterpenes, Sesquiterpenes, Diterpenes, Triterpenes, Tetraterpenes, Polyterpenes, their chemical constitution and biosynthesis.

Vitamins: General properties and role in metabolism.

Programme	BS Botany	Course Code	Bot-304	Credit Hours	1
Course Title	**Advanced Plant Biochemistry (Lab)**				

Lab Course Contents

- Separation of soluble proteins by Polyacrylamide Gel Electrophoresis (PAGE)
- Separation of Nucleic acids by gel electrophoresis.
- Estimation of vitamin C (orange, apple juice).
- Determination of potential Alkaloids in plants.
- Estimation of Terpenoids in plants.

Textbooks and Reading Material

1. Conn E. E. and Stumpf, P. K. 2009. Outlines of Biochemistry, John Wiley and Sons Inc. New York.
2. Buchanan B. B, Gruissem W and Jones R. L. 2015. Biochemistry and Molecular Biology of Plants. John Wiley and Sons.
3. Nelson, D. L and Cox M. M. (2021). Lehninger Principles of Biochemistry. 8th edition. W. H. Freeman and Company. New York.
4. Voet, D. Voet J. G. and Pratt, C. W. 2016. Fundamentals of Biochemistry: Life at the Molecular level, 5th Edition. John Wiley and Sons, New York.
5. Dey, P. M. and Harborne, J. B. 1997. Plant Biochemistry. Harcourt Asia PTE Ltd. Singapore.
6. Smith, E L., Hill, R. L., Lehman, R. I., Lefkowits, R J. and Abraham. H. Principles of Biochemistry, (General Aspects). White. International Student Edition. McGraw Hill International Book Company.
7. Zubay. G. 2003, Biochemistry, MacMillan Publishing Co., New York.
8. Chesworth, J. M., Strichbury T. and Scaife, J. R. 1998. An introduction to Agricultural Biochemistry. Chapman and Hall, London.
9. Mckee, T. and Mckee, J. R. 1999. Biochemistry – An Introduction. WCB / McGraw-Hill, New York, Boston, USA.
10. Taiz, L. and Zeiger, E. MØller, I M and Murphy A. 2014. Plant Physiology and Development. 6th Edition. Sinauer Associates, Inc.

Teaching Learning Strategies

- Lectures
- Group Discussion
- Laboratory work
- Seminar/ Workshop

Assignments: Types and Number with Calendar

- Lecture Based Examination (Objective and Subjective)
- Assignments
- Class discussion
- Quiz
- Tests

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