OPEN ELECTIVE OFFERED BY THE DEPARTMENT

BIOLOGY FOR ENGINEERS			
Course Code	**:** BT0E01	**Credits:**	3:0:0
Contact Hours	**:** 42L		
Prerequisite(s)	**:** None		
Course Coordinator(s)	**:** Dr. Bindu S & Dr. Krishna Murthy T P		

UNIT-I

Introduction

Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.

Evolution

Genes Within Populations, Evidence for Evolution, Origin of Species, Systematics, Phylogenetics, and Comparative Biology, Genome Evolution, evolution of Development.

UNIT-II

Classification

Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilisation -Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitataacquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups- *E. coli, S. cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. musculus*

Genetics

Mendel's laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but

how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.

UNIT-III

Biomolecules

Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.

Enzymes

Enzymology: How to monitor enzyme catalysed reactions. How does an enzyme catalyse reactions? Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.

UNIT-IV

Information Transfer

DNA as a genetic material. Hierarchy of DNA structure from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.

Macromolecular analysis

Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.

UNIT-V

Metabolism

Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of K_{eq} and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to $CO_2 + H_2O$ (Glycolysis and Krebs cycle) and synthesis of glucose from CO_2 and H_2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge

OPEN ELECTIVE OFFERED BY THE DEPARTMENT

PRINCIPLES OF FOOD PROCESSING & PRESERVATION (Open Elective)			
Course Code	: BTOE02	**Credits:**	3:0:0
Contact Hours	: 42L		
Prerequisite(s)	: Nil		
Course Coordinator(s)	: Dr. Bindu S & Mr. M Gokulakrishnan		

UNIT-I

Basic consideration: Aim and objectives of preservation and processing of foods, characteristics of food components, primary sources of microorganisms found in foods, deterioration of food quality, causes of quality deterioration and spoilage of perishable foods, spoilage in canned foods.

UNIT-II

Low temperature Preservation of foods: Chilling temperatures: Considerations relating to storage of foods at chilling temperatures, low temperature applications in food preservation, controlled and modified atmosphere storage of foods.

Freezing temperature: Preparation of foods for freezing, freezing process, slow and fast freezing of foods and its consequences, storage stability of frozen foods, effect of freezing on microorganisms.

UNIT-III

High temperature preservation of foods: Basic concepts in thermal destruction of microorganisms-D, Z, F, values, Heat resistance and thermophilisms in micro-organisms. Cooking, blanching, pasteurisation and sterilisation of foods. Assessing adequacy of thermal processing of foods, general process of canning of foods.

UNIT-IV

Preservation by Dehydration: Principles, technological aspects and applications of drying and dehydration of foods. Principles, technological aspects and applications of evaporative concentration processes, freeze concentration and membrane processes for food concentrations.

UNIT-V

Other techniques in preservation: Principles, technological aspects and applications of sugar and salt, anti-microbial agents, non-ionising and ionising radiations in preservations of foods, Fermented foods.

Text Books:

1. Norman N. Potter and Joseph H. Hotchkiss (2013) Food Science, CBS publishers and Distributors.
2. James M Jay (2012) Modern food microbiology, 5th Edn, CBS publishers and Distributors.
3. B. Sivasankar (2009) Food processing and preservation, Eastern economy edition, Prentice-Hall of India Pvt. Ltd.

Reference Books:

1. Osman Erkmen and T. Faruk Bozoglu (2016) Food Microbiology Principles in to Practice, John Wiley & Sons, Ltd, UK.
2. Shakuntla N. Manay and M. Shadaksharamurthy (2008) Foods: Facts and Principles, 3rd edition, New Age International.
3. Rick Parker (2003) Introduction to Food Science, Delmar/Thomson Learning
4. Subbulakshmi G and Shobha A. Udupi (2006) Food Processing and Preservation, 1st edition**,** New Age International.
5. John M DeMan (2013) Principles of Food Chemistry, 3rd Edition, Springer – Verlag.

Course outcomes (COs):

On completion of this course student will have improved ability to:-

1. List & identify the factors responsible for food spoilage including a description of the different types of spoilages. (PO-1, 2; PSO- 2)
2. Compare and contrast the different low temperature food preservation methods & discuss their principles. (PO-2, 3, 4, 5; PSO-2)
3. Compare and contrast the different high temperature food preservation methods & discuss their principles. (PO-2, 3, 4, 5; PSO-2)
4. Able to identify & discuss the applications of dehydration, membrane-based separation & irradiation as methods of food preservation. (PO-2, 4, 5; PSO-2)
5. Apply principles of drying & dehydration for food processing & preservation. (PO – 2, 3, 4, 5; PSO – 2)