

Semester-I

BTI-101 The Living Being (Credit 4, Hours 40)

Course Objectives:

1. The students should be able to know how life originated and evolved over the Earth.
2. The students should understand a biological domain and general diversity within it.
3. The students should be able to understand nature of life, its evolution and classification.
4. The students shall be prepared to work in biology laboratory, observe microbial life form and carry out biochemical analysis.

Life and its Origin

History of Earth, Theories of origin of life, Millers experiment, Quest for Extra-terrestrial life.

Properties of Water, Carbon and Biomolecules.

Evolution of Earliest life forms, Viruses, Prokaryotes, Eukaryotes, Endosymbiont Mitochondria and Chloroplast

Cell Theory, Cell differentiation, Levels of organization.

Law of Natural Selection.

Phylogenetic relation, Whittaker's five-kingdom classification.

Plant Kingdom

Plant Body: Organ system and Tissues, Stem, root, leaves.

Plant Adaptation to land, Plant sensory systems.

Growth: Nutritional requirements, Phytohormones, Reproductive structure, Pollination and Fertilization, Asexual reproduction.

Common types of plants: *Bryophytes*, *Vascular*, *Gymnosperms* and *Angiosperms* plants.

Outline of Kingdom *Plantae*.

Animal Kingdom

General characters of animal, Animal evolution, Body organization: Systems, Organs, Tissues, Coordination, Energy requirements.

Primitive and advanced marine animals, Adaptation to land, Exchange with Environment,

Outline of Kingdom *Animalia*.

The Microbial World

Bacteria: General character, Diversity, Harmful and Beneficial activities.

Eukaryotes: General character, Broad Classification and importance of Fungi, Algae and Protozoa.

Viruses: Structure, Chemical composition, Replication cycle.

General characters of Prion, Viroid and Virusoid.

References:

1. Elden D Enger, FC Ross and DB Bailey (2011) Concepts in Biology, (14th Ed), TMH
2. Lisa A. Urry, Michael L. Cain, Steven A. Wasserman, Peter V. Minorsky, Jane B. Reece (2017) Campbell Biology (11th Ed), Pearson
3. Mary A Clark, Matthew Douglas, and Jung Choi (2018) Biology (2nd Ed) OpenStax Rice Univ, USA
4. Cowan K and KP Talaro (2009) Microbiology: A Systems Approach, (2nd Ed), McGraw-Hill
5. Purves William K, David Sadava, Gordon H. Orians, and H. Craig Heller (2006) Life: The Science of Biology, (7th Ed), Academic Internet

BTI-102 Practical (Credits 3, Hours 40)

Laboratory course in BTI-101 The Living Being

1. Study of Laboratory Equipment
2. Preparation of Standard Solution, Stains and Buffers
3. Observation of microbes using Hanging-drop preparation
4. Microscopic observation of wet-mount preparation from fungi
5. Monochrome Staining of Yeasts
6. Colorimetric estimation of Protein using Folin's Method
7. Estimation of reducing sugar by Cole's method
8. Demonstration of aerobic respiration detecting Catalase

Semester-II

BTI-103 Cell: Structure and Function (Credit 4, Hours 40)

Course Objectives:

1. The students should be able to know cell as a structural and functional unit of life.
2. The students should understand a structure and chemistry of cell with its components.
3. The students should be able to understand cellular processes linked to its growth, metabolism and expression of traits.
4. The students shall be prepared to handle microbes, observe cellular components and activities, and understand biomolecules.

Structure of Cell

Chemistry, Ultrastructure and Functions of: Cell wall, Membrane, Flagella and Cilia, Organelles Mitochondria, Chloroplast, Golgi bodies, Peroxisome, Endoplasmic reticulum, Ribosome.

Nature of Cytosol, Cytoskeleton structures.

Cellular diversity at structural and compositional levels among Prokaryotes, Archeobacteria, and Eukaryotes (Plant, Animal and Fungi).

Cellular Metabolism

Oxidation-Reduction, Energy and Carbons source utilization, Modes of ATP generation, Generation of Reducing power, Electron Transport Chain and ATP generation.

Metabolism: Anabolism, Catabolism, Respiration, Fermentation, Photosynthesis.

Nutrient uptake Active transport, Passive transport, Facilitated diffusion, Group translocation.

Enzymes: Properties, Mechanism of catalysis, Activation energy, Factors affecting enzyme action.

Cell Division

Cell division, Phases of Mitosis and Meiosis, Significance.

Cell cycle: Phases, Check-points, Regulators.

Growth: Generation time and Growth rate.

Tumor: Types, Developmental stages, Carcinogens, Oncogenes.

Apoptosis: Events, Types, Autophagy.

Senescence: Theories and Significance.

Cell Expression

Central dogma of Life, Concept of Gene, Transcription, Translation and expression.

Coordination of Metabolism at Enzyme Activity (Allosteric control) and Synthesis (Feed-back regulation and Operon Model) levels.

Cell communication: Signal molecules, Receptors, Junction, Plasmodesmata and Cell signaling process.

References:

1. Elden D Enger, FC Ross and DB Bailey (2011) Concepts in Biology, (14th Edn), TMH
2. Purves William K, David Sadava, Gordon H. Orians, and H. Craig Heller (2006) Life: The Science of Biology, (7th Ed), Academic Internet
3. Lodish Harve et al (2008) Molecular Cell Biology, (6th Ed), Freeman
4. Cassimeris Lynne, VR Lingappa and G Plopper (2011) Lewin's Cells (2nd Ed), Jones and Bartlett
5. 2. Lisa A. Urry, Michael L. Cain, Steven A. Wasserman, Peter V. Minorsky, Jane B. Reece (2017) Campbell Biology (11th Ed), Pearson
6. Mary A Clark, Matthew Douglas, and Jung Choi (2018) Biology (2nd Ed) OpenStax Rice Univ, USA

BTI-104 Practical (Credit 3, Hours 40)

Laboratory course in BTI-103 Cell: Structure and Function

1. Aseptic handling and transfer of microorganisms
2. Observation of bacterial cell wall by Chances staining
3. Staining of Nucleus from human WBCs / *Chiromonas*
4. Microscopic observation of Mitosis (Onion) and Meiosis (Anther)
5. Study of Human Karyotype staining and banding patterns
6. Cell count and viability ratio by vital stain and Neubauer chamber
7. DNA estimation by colorimetric method using Diphenylamine
8. Glucose estimation by enzymatic method using Glucose oxidase