

## BTCH-CC-102: Cell Biology

Unit	Topic	Method	No. of classes needed
I	Introduction and Cell Membrane	Lecture, PPT, Discussion	15
II	Cell Organelles	do	15
III	Cytoskeleton and cell-cell interactions	do	15
IV	Cell Cycle & Signaling	do	15

### Outcomes

After going through this course student shall be able to:

- Define a cell; differentiate between prokaryotes, eukaryotes, animal and plant cells.
- Know about the components, organization of cell membrane
- And understand the transport of solutes across the membrane.
- Know the structure, organization and function of different organelles in a cell.
- Idea about protein sorting, vesicle transport, phagocytosis and endocytosis.
- Know the components and organization of cytoskeleton of cell and know how cells interact with other cells.
- Understand the different phases of cell cycle and its regulation
- Have an understanding of cell signaling, second messengers and signaling pathways.

### Activities

1. Preparation of assignment,
2. Group discussions,
3. Making of charts and presentations (PPT's).
4. Preparation of PPT for presentation in the class;

### References:

1. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc.
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3. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
4. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009 The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

**BTCH-CC-201: ANIMAL PHYSIOLOGY**

Unit	Topic	Method	No. of classes needed
<b>I</b>	Composition of bile, saliva, pancreatic, gastric and intestinal juice.	Lecture, Discussion	02
	Mechanism of digestion (Carbohydrates, proteins, lipids and nucleic acids)	do	03
	Mechanism of absorption (Carbohydrates, proteins, lipids and nucleic acids)	do	04
	Exchange of gases	do	02
	Transport of oxygen Oxygen dissociation curve	do	03
	Transport of carbon dioxide CO <sub>2</sub> Dissociation curve	do	02

**Learning Outcomes**

After going through this unit student shall be able to:

- Know the composition of different digestive juices,
- Explain the mechanism of digestion and absorption of different nutrients.
- Explain the role of bile in the digestion and absorption of fats,
- Describe how the blood transports oxygen and carbon dioxide.
- Explain the relationship between hemoglobin and PO<sub>2</sub>? How do temperature, H<sup>+</sup>, PCO<sub>2</sub>, and BPG influence the affinity of Hb for O<sub>2</sub>?
- Distinguish between Bohr effect and Haldane effect.

**Activities**

- Preparation of assignments by each student on different topics.
- Preparation of PPT for presentation in the class;
- Seminars were delivered by each student on the topics of their interest in the classroom during the semester.

**Points for discussion**

- What causes oxygen to enter pulmonary capillaries from alveoli and to enter tissue cells from systemic capillaries?
- Is O<sub>2</sub> more available or less available to tissue cells when you have a fever?
- Difference between digestion and absorption of food?
- By what routes do absorbed nutrients reach the liver?

Unit	Topic	Method	No. of classes needed
II	<b>Blood and Circulation</b>	<b>Lecture, PPT, Discussion</b>	<b>13</b>
	Composition of Blood, role of each component, genesis of blood cells.	Lecture, Discussion.	4
	Mechanism of Blood coagulation and enzymes involved in regulation.	Lecture, discussion	3
	Working of Human heart, structure function relation.	Lecture, Discussion	4
	Cardiac cycle and output	Lecture	1
	Heart Beat and its origin	Lecture, discussion	1

### Learning Outcomes

After going through this unit student shall be able to:

- Explain blood its components, formation of blood cells and role of each.
- Functional aspects of blood and its role in maintenance of life. Why tests are conducted on blood samples to know about diseases.
- Concept of why blood clotting is important, working of human heart.
- Practical of Blood clotting, hemoglobin content and different blood groups and how to interpret the experimental results were taught to students,

### Activities

- Assignments were prepared on the sub topic related by individual students;
- Talks and PPT were delivered by students.

### Points for discussion

- Physiological values of hemoglobin, Different types of blood groups and how tests for blood typing and clotting and importance of each.

Unit	Topic	Method	No. of classes needed
III	<b>Muscular System and Excretion.</b>	<b>Lecture, PPT, Discussion</b>	<b>17</b>
	Definitions, types of muscle, Comparative structure of various muscles. Role of muscle. Composition of muscle.	Lecture, Discussion	4
	Mechanism of Muscle contractions, stimulus its generation from nervous system and its translation. Types of contractions, theories of contraction.	Lecture, Discussion	5
	Physical and chemical events during muscle contraction and electric events. Diseases associated with malfunctioning of muscles.	Lecture, PPT	4
	Ornithine cycle, significance, various modes of excretion in humans.	Lecture	2
	Mechanism of Urine formation and its importance.	Lecture, discussion	2

### Learning Outcomes

After going through this unit, you will be able to:

- Define muscle, their function and composition.
- Distinguish between skeletal, smooth, and cardiac muscle by sighting.
- Learn about how nervous and muscular systems work in tandem. Theoretical and physical aspects of muscle contraction.
- Discuss various diseases and ailments of muscular system.
- Learn about various modes of excretion in humans and how kidneys are involved in urine formation. Kidney function in re-absorption and secretion of components.

### Activities

- Assignment was prepared on various topics of unit.
- Presentations and group discussion were held

### Points for the discussion:

Discussions were held about the muscle as a structural and physical defense mechanism and protective cover against the pathogens, external physical and chemical agents. Diseases due to defective muscle contraction.

## Learning Outcomes

After going through this unit, students will be able to:

Unit	Topic	Method	No. of Classes Needed
IV	Mechanism of generation and propagation of nerve impulse, Saltatory conduction	Lecture, Discussion	05
	Structure of synapse, Neurotransmitters, synaptic transmission	do	02
	Mechanism of action of hormones	do	02
	Different endocrine glands and their functions	do	08
	Hyper and hyposecretions of endocrine glands	do	02

- Define the resting membrane potential.
- Explain mechanism of generation of nerve impulse and its propagation.
- Distinguish between the continuous and saltatory nerve conduction.
- Give detailed description of mechanism of action of hormones.
- Discuss the physiological effects of various hormones secreted by different endocrine glands.
- Give the pathological consequences of hypo and hyper secretions of hormones.

### Activities

- Preparation of assignment on different topics by each candidate;
- Preparation of PPT for presentation in the class;
- Students delivered presentations and seminars during the semester in the class.
- Group discussions on various scientific topics.

### Points for the discussion:

- How is neurotransmitter removed from the synaptic cleft?
- Why may electrical synapses work in two directions, but chemical synapses can transmit a signal in only one direction?
- How could an iodine-deficient diet lead to goiter, which is an enlargement of the thyroid gland?

### References

1. John E. Hall, 2013 Guyton and Hall Textbook of Medical Physiology, 13th Ed. (Guyton Physiology) Saunders.
2. Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition. John wiley & sons, Inc.
3. Stuart Ira Fox 2008 Human Physiology 11th Ed. McGraw-Hill Higher Education
4. Eric P. Widmaier, Hershel Raff, Kevin T. Strang 2014 Vander's Human Physiology 13th Ed. McGraw-Hill Education .
5. Linda S. Costanzo 2014 BRS Physiology 6th Ed. LWW Publishers.

### **BTCH-CC-202: Microbiology**

<b>Units</b>	<b>Topic</b>	<b>Method</b>	<b>No. of Classes Needed</b>
<b>I</b>	Fundamentals, History & Microscopy	Lecture, PPT, Discussion	18
<b>II</b>	Microbial growth	do	17
<b>III</b>	Control, Food & Medical Microbiology	do	15
<b>IV</b>	General Virology	do	10

### **Learning Outcomes**

After going through this course, a student will be able to:

- Know the history, contributions of various scientists to microbiology.
- Understand the different approaches used for classifying microbes.
- Use of different types of microscopes to study microbes
- Have an idea about a bacterial cell.
- Know about the microbial growth, factors affecting it and measurement of growth.
- Learn about the different agents used to control growth, food borne infections and intoxications and different methods of preservations of foods.
- Learn about the morphology, pathogenesis, symptoms and treatment of diseases caused by pathogenic bacteria like M. tuberculosis, V. cholera etc.,
- Learn about viral structure, classification of viruses, and antiviral agents.

### **Activities**

1. Preparation of assignment,
2. Preparation of PPT for presentation in the class,
3. Group discussion
4. Tutorials
5. Making charts.

### **Points for discussion**

- Discussion about the specimen preparation and application of different types of microscopy types.
- Staining techniques used in the field of microbiology.
- Biofilms – formation and significance.
- Water pollution - role of microbes.
- Preservation of foods.
- Pros and cons of normal microflora.
- Detection and antiviral drugs used for HIV.

### **References**

1. Pelczar MJ, Chan ECS and Krieg NR. (2001). Microbiology. 5th edition. McGraw Hill Book Company.
2. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005). General Microbiology. 5<sup>th</sup> edition. McMillan.
3. Tortora GJ, Funke BR, and Case CL. (2008). Microbiology: An Introduction. 9<sup>th</sup> edition. Pearson Education. 8. Willey JM, Sherwood LM, and Woolverton CJ. (2008).
4. Joanne Willey, Linda Sherwood, Chris Woolverton (2011) Prescott's Microbiology 8th Ed. McGraw Hill Education
5. Carroll (2016) Jawetz Melnick & Adelbergs Medical Microbiology Mcgraw Hill.
6. John Carter, Venetia Saunders 2013 Virology: Principles and Applications 2nd Ed. John Wiley & Sons
7. Goering 2012 Mims' Medical Microbiology 5th Ed. Elsevier Health Sciences
8. Kayser 2004 Medical Microbiology 1st Ed. Thieme