

III Semester BSc Zoology Core Course Content

Course Title/Code: Molecular Biology, Bioinstrumentation & Techniques in Biology	Course Credits: 4
Course Code: DSCC5ZOOT3	L-T-P per week: 4-0-0
Total Contact Hours: 56	Duration of ESA: 2Hours
Formative Assessment Marks: 40	Summative Assessment Marks: 60

Course Outcomes (COs):

At the end of the course the student should be able to understand:
1. After successful accomplishment of the course, the learners will be able to acquire better understanding and comprehensive knowledge regarding most of the essential aspects of Molecular Biology subject which in turn will provide a fantastic opportunity to develop professional skill related to the field of molecular biology.
2. The course will mainly focus on the study of principal molecular events of cell incorporating DNA Replication, Transcription and Translation in prokaryotic as well as eukaryotic organisms.
3. Acquiring knowledge on instrumentation and techniques in biology.

Semester III-Zoology Core Course III Content:

Content	Hours
Unit I	14
Chapter1: Process of Transcription <ul style="list-style-type: none"> Fine structure of gene (Cistron, Recon, Muton) RNA polymerases-types and functions Transcription in prokaryotes and eukaryotes 	8
Chapter2: Process of Translation <ul style="list-style-type: none"> Genetic code and its salient features Translation in prokaryotes and eukaryotes 	6
Unit II	14
Chapter3: Regulation of gene expression-I <ul style="list-style-type: none"> Regulation of gene expression in prokaryotes- lac operon (inducible) and trp operon (repressible) in <i>E.coli</i> Regulation of gene expression in eukaryotes-Role of chromatin (euchromatin and heterochromatin) in gene expression Post-transcriptional modification: capping, splicing, polyadenylation Concept of RNA editing (mRNA), gene silencing, and RNAi. 	9
Chapter4: Regulation of gene expression-II <ul style="list-style-type: none"> Post-translational modifications: purpose, advantages, and significance; glycosylation, methylation, phosphorylation, and acetylation. Intracellular protein degradation (lysosomal autophagy and ubiquitin proteasome Pathway). 	5
Unit III	14

Chapter5: Microscopy <ul style="list-style-type: none"> Principles and applications of Light microscopy, Dark field microscopy, Phase contrast microscopy, Fluorescence microscopy, confocal microscopy and Electron microscopy (SEM and TEM). 	9
Chapter6: Centrifugation and Chromatography <ul style="list-style-type: none"> Centrifugation: Principles, types, and applications (High speed and Ultracentrifugation) Chromatography: Principle and applications of: TLC, HPLC and GC 	5
Unit IV	14
Chapter 7: Biochemical Instrumentation <ul style="list-style-type: none"> Colorimetry and Spectrophotometry: Beer-Lambert's law, Absorption spectrum, UV-VL Spectrophotometer. pH meter, measurement of pH Principle, applications and safety measure of Radio-tracer techniques- Autoradiography. 	6
Chapter 8: Molecular Techniques <ul style="list-style-type: none"> Principle and applications of Agarose gel-electrophoresis, SDS-PAGE, DNA Sequencing (Sanger's Dideoxymethod) , PCR, DNA Fingerprinting, ELISA, Southern Blotting and Western Blotting. 	8

Semester III (Practical III)**Core Course Lab Content**

Course Title: Molecular Biology, Bioinstrumentation and Techniques in Biology	Course Credits:2
Course Code:DSCC5ZOOP3	L-T-P per week: 0-0-4
Total Contact Hours: 56	Duration of ESA: 4Hours
Formative Assessment Marks: 25	Summative Assessment Marks: 25

Course Outcomes (COs):

At the end of the course the student should be able to:

1. At the end of the course, students will be able to understand the applications of biophysics and principle involved in bio-instruments.
2. Understand the methodology involved in biotechniques.
3. Students can demonstrate knowledge and practical skills of using instruments in biology and medical field.
4. They can perform techniques involved in molecular biology and diagnosis of diseases.

Lab Course Content

List of experiments	14 units(1unit-4hrs)
1.To study the principle and applications of simple,compound and binocular microscopes.	1
2.To study the principle and applications of various lab equipments-pH meter, Electronic balance, Vortex mixer, use of glass and micropipettes, Laminar airflow, Incubator, shaker, Waterbath and centrifuge.	2
3.To prepare Buffer solutions (Phosphate, Citrate, Tris-HCl buffer)	1
4. To estimate amount of RNA by Orcinol method.	2
5.Demonstration of differential centrifugation to fractionate components in a Given mixture.	1
6. To estimate amount of protein by Lowry's method.	2
7.To identify different unknown amino acids using ascending paper Chromatography.	1
8. Extraction of DNA from the given animal tissue sample.	2
9. To estimate amount of DNA by di-phenyl amine (DPA) method.	2

Suggested Readings:

1. Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter. Molecular Biology of the Cell, 4th edition. New York: Garland Science (2002).
2. Daniel L. Hartl and Maryellen Ruvolo. Genetics: Analysis of Genes and Genomes, 8th Edition. Burlington, Mass.: Jones & Bartlett Learning (2012).
3. Gerald Karp. Cell and Molecular Biology: Concepts and Experiments, 5th Edition. Wiley Publication (2008).
4. Harvey Lodish, Arnold Berk, Paul Matsudaira, Chris A. Kaiser, Monty Krieger, Freeman. Molecular Cell Biology, 5th edition. W.H. & Company (2003).
5. James D. Watson, Tania A. Baker, Stephen P. Bell, Alexander Gann, Michael Levine, Richard Losick. Molecular Biology of the Gene, 5th edition. Cold Spring Harbor Laboratory Press (2003).
6. Stryer, Lubert. Biochemistry, 2nd Edition. W.H. Freeman and Company, New York (1981).

Open Elective Course Content

Course Title: ENDOCRINOLOGY Course Code: OEC5ZOOT3	Course Credits: 3
Total Contact Hours: 42	Duration of ESA: 3Hours
Formative Assessment Marks: 40	Summative Assessment Marks: 60
Model Syllabus Authors:	

Course Outcomes (Cos):

At the end of the course the student should be able to:

Differentiate among endocrine, paracrine and autocrine systems.

1. Describe the different classes and chemical structures of hormones.
2. Identify the glands, organs, tissues and cells that synthesize and secrete hormones, hormone precursors and associated compounds.
3. Identify and discuss the integration of the endocrine system in general with focus on specific interactions.
4. Explain the consequences of under-and overproduction of hormones.

Course Content

Content	Hrs.
Unit I	14
Chapter 1. About Endocrine glands <ul style="list-style-type: none"> • Endocrine glands and classifications of hormones. • Characteristics and Transport of Hormones. 	
Chapter 2. Hypothalamus-Hypophysis <ul style="list-style-type: none"> • Hypothalamus as a neuroendocrine organ • Pituitary– Structure and functions • Chemical nature, mode of action, and functions. • Pituitary disorders 	
Chapter 3. Pineal gland <ul style="list-style-type: none"> • Structure and functions of Pineal gland. • Hypo-and hyperactive states of the gland. 	
Unit II	14
Chapter 4. Thyroid and parathyroid <ul style="list-style-type: none"> • Histological structure of the glands. • Chemical nature, mode of action, and functions of the hormones. • Hypo- and hyperactive states of the glands. Chapter 5.: Adrenal cortex and medulla– <ul style="list-style-type: none"> • Histological structure of the gland. Chemical nature, and functions • Hypo-and hyperactive states of the gland. Chapter 6. Prostaglandins	
Unit– III	14

<p>Chapter7:Pancreas:</p> <ul style="list-style-type: none"> • Pancreatic islets-histological structure. Chemical nature and function. Hormonal control of blood sugar. • Hyperinsulinism and diabetes mellitus. <p>Chapter8:Gastro-intestinal hormones–</p> <ul style="list-style-type: none"> • Functions and regulation of secretion of the hormones. <p>Chapter9:Differenttypesof Rhythms–</p> <ul style="list-style-type: none"> • Ultradian, circadian, infradian. Different zeitgebers and their relation with circadian clock • Neural basis of biological clock and role of suprachiasmatic nuclei. Sleep-wakefulness cycle. Time keeping genes. Jet-lagand shift work. 	
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Text Books & Suggested Readings:

1. William's TextBook of Endocrinology Larsen et al.: An Imprint of Elsevier.
2. Endocrinology, Mac E.Hadley, Pearson Education.
3. The Kidney-An outline of Normal and Abnormal Functions, by H.E.Dewardener, ELBS.
4. Vander's Human Physiology, E.P.Widmaier et al., McGraw- Hill, Higher Education.
5. Concise Medical Physiology by S.K.Chaudhuri, New Central Book Agency.
6. Endocrinology. Vols.I, II and III by L.O.DeGroot. W.B.Saunders Co.
7. The PhysiologyofReproduction, Vols.I&II, byE.KnobilandJ.D.Neil.RavenPress.
8. Guyton and Hall. Textbook of Medical Physiology. 13th Edition.
9. Histology:ATextandAtlas.SixthEdition.Ross&Pawlina.LippincottWilliams&Wilkins.
10. Vertebrate Endocrinology by David O.Norris.