

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: 3 Hours
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 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
Chapter 1: 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
Chapter 2: Process of Translation <ul style="list-style-type: none"> • Genetic code and its salient features • Translation in prokaryotes and eukaryotes 	6
Unit II	14
Chapter 3. 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
Chapter 4. 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
Chapter 5: 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
Chapter 6: Centrifugation and Chromatography <ul style="list-style-type: none"> Principle of centrifugation. Types of centrifuges: High speed and Ultracentrifugation. Principle and applications of Chromatography: TLC and HPLC. 	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 measures 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 method) PCR, DNA Fingerprinting, ELISA, Southern Blotting and Western Blotting. 	8

Suggested Readings:

Pedagogy: Written Assignment/Presentation/Project / Term Papers/Seminar

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test	15
Written Assignment/Presentation/Project / Term	15
Class performance/Participation	10
Total	40

Zoology

Core Course Lab Content

Semester III (Practical III)

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: 3 Hours
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 bio techniques.
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 air flow, Incubator, shaker, Water bath 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).

Pedagogy: Written Assignment/Presentation/Project / Term Papers/Seminar

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test	05
Written Assignment/Presentation/Project /Term papers/Seminar	10
Class performance/Participation	10
Total	25