

VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY

JNANASAGARA CAMPUS, BALLARI-583105



Bachelor of Science in Zoology

Syllabus for Semester III

(Effective from Academic Year 2021-22)

(Revised as per NEP-2020)

DSC3: MOLECULAR BIOLOGY, BIOINSTRUMENTATION & TECHNIQUES IN BIOLOGY

Course Title: Molecular Biology, Bioinstrumentation & Techniques in Biology	Course code: : 21BSC3C3ZOL
Total Contact Hours: 56	Course Credits: 04
Internal Assessment Marks: 40 marks	Duration of SEE: 03 hours
Semester End Examination Marks: 60 marks	

Course Outcomes (CO's):

At the end of the course, students will be able to:

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.

DSC 2: MOLECULAR BIOLOGY, BIOINSTRUMENTATION & TECHNIQUES IN BIOLOGY

Unit	Description	Hours
1	<p>Chapter 1. Process of Transcription</p> <ul style="list-style-type: none"> • Fine structure of gene (Cistron, Recon, Muton) • RNA polymerases - types and functions • Transcription in prokaryotes and eukaryotes <p>Chapter 2: Process of Translation</p> <ul style="list-style-type: none"> • Genetic code and its salient features • Translation in prokaryotes and eukaryotes 	11
2	<p>Chapter 3: Regulation of gene expression-I</p> <ul style="list-style-type: none"> • Regulation of gene expression in prokaryotes- lac operon (inducible) and trp operon (repressible) in E. coli • 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 <p>Chapter 4. Regulation of gene expression-II</p> <ul style="list-style-type: none"> • Post-translational modifications: purpose, advantages, and significance; glycosylation, methylation, phosphorylation, and acetylation. 	12

	<ul style="list-style-type: none"> Intracellular protein degradation (lysosomal autophagy and ubiquitin proteasome pathway). 	
3	<p>Chapter 5: Microscopy</p> <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). <p>Chapter 6: Centrifugation and Chromatography</p> <ul style="list-style-type: none"> Centrifugation: Principles, types, and applications (High speed and Ultracentrifugation) Chromatography : Principle and applications of: TLC, HPLC and GC 	12
4	<p>Chapter 7. Biochemical Instrumentation</p> <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. 	11
5	<p>Chapter 8. Molecular Techniques</p> <ul style="list-style-type: none"> Principle and applications of Agarose gel-electrophoresis, SDS-PAGE, DNA Sequencing (Sanger's Dideoxy method) PCR, DNA Fingerprinting, ELISA, Southern Blotting and Western Blotting. 	10
<p>References:</p> <ol style="list-style-type: none"> Nelson & Cox: Leininger's Principles of Biochemistry: McMillan (2000) Zubay et al: Principles of Biochemistry: WCB (1995) Voet & Voet: Biochemistry Vols I & 2: Wiley (2004) Murray et al: Harper's Illustrated Biochemistry: McGraw Hill (2003) Elliott and Elliott: Biochemistry and Molecular Biology: Oxford University Press Guyton, A.C. & Hall, J.E. Textbook of Medical Physiology, XI Edition, Hercourt Asia PTE Ltd. /W.B. Saunders Company. (2006). Tortora, G.J. & Grabowski, S. Principles of Anatomy & Physiology. XI Edition John Wiley & sons (2006). Christopher D. Moyes, Patricia M. Schulte. Principles of Animal Physiology. 3rd Edition, Pearson Education (2016). Hill, Richard W., et al. Anima I physiology. Vol. 2. Sunderland, MA: Sinauer Associates, (2004). Chatterjee CC Human Physiology Volume I & 2, 11th edition, CBS Publishers (2016). 		

DSC3: MOLECULAR BIOLOGY, BIOINSTRUMENTATION & TECHNIQUES IN BIOLOGY LAB

Course Title: Molecular Biology, Bioinstrumentation & Techniques in Biology Lab	Course code: 21BSC3C3ZOP
Total Contact Hours: 56	Course Credits: 02
Internal Assessment Marks: 25	Duration of SEE: 03 hours
Semester End Examination Marks: 25	

Course Outcomes (CO's):

At the end of the course, students will 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.

DSC 3: MOLECULAR BIOLOGY, BIOINSTRUMENTATION & TECHNIQUES IN BIOLOGY LAB

List of Experiments

1. To study the principle and applications of simple, compound and binocular microscopes.
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.
3. To prepare Buffer solutions (Phosphate, Citrate, Tris-HCl buffer)
4. To estimate amount of RNA by Orcinol method.
5. Demonstration of differential centrifugation to fractionate components in given mixture.
6. To estimate amount of protein by Lowry's method.
7. To identify different unknown amino acids using ascending paper chromatography.
8. Extraction of DNA from the given animal tissue sample.
9. To estimate amount of DNA by di-phenyl amine (DPA) method.

References:

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).