SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Biotechnology	LP: BT18503 Rev. No: 00 Date: 10.07.2023
B.E/B.Tech/M.E/M.Tech : Biotechnology Regulation:2018 PG Specialisation : Nil Sub. Code / Sub. Name : **BT18503/ Molecular Biology** Unit : I	

UNIT I CHEMISTRY OF NUCLEIC ACIDS 9

Introduction to nucleic acids: Nucleic acids as genetic material, Classical experiments – Griffith experiment, Hershey and Chase, Avery, McLeod and McCarty- Structure and physicochemical properties of elements in DNA and RNA- Biological significance of differences in DNA and RNA- Primary structure of DNA: Chemical and structural qualities of 3',5'-Phosphodiester bond- Secondary Structure of DNA: Watson & Crick model- Chargaff's rule- X ray diffraction analysis of DNA- Forces stabilizes DNA structure- Conformational variants of double helical DNA- Hogsteen base pairing- Reversible denaturation and hyperchromic effect- Tertiary structure of DNA: DNA supercoiling.

OBJECTIVE: The objective of this unit is to impart the students the basic knowledge of nucleic acids, structure and mechanisms.

Session No*	Topics to be covered	Ref	Teaching Aids
1	Mendelian genetics - Linkage, Crossing over Introduction to nucleic acids - Nucleic acids as genetic material	T2 (01-42) T1 (61-63, 89-90, 117-119, 123-124)	BB & PPT
2	Classical experiments - experiments – Griffith experiment, Hershey and Chase, Avery, McLeod and McCarty	T1 (79-85, 117-119) T5 (01-45) R1 (99-174)	BB & PPT
3	Structure and physicochemical properties of elements in DNA and RNA	T1 (79-85, 117-119) T5 (01-45) R1 (99-174)	BB & PPT
4	Biological significance of differences in DNA and RNA	R2 (14-46)	BB & PPT
5	Primary structure of DNA: Chemical and structural qualities of 3',5'-Phosphodiester bond	T1 (60-63) T3 (40-70) T4 (30-55)	BB & PPT
6	Secondary Structure of DNA: Watson & Crick model, Chargaff's rule	T1 (79-85)	BB & PPT
7	X ray diffraction analysis of DNA, Forces stabilizes DNA structure, Conformational variants of double helical DNA	T1 (64-67, 79-81, 87-92) T2 (01-30)	BB & PPT
8	Hogsteen base pairing- Reversible denaturation and hyperchromic effect	T3 (35-62) T4 (25-55) T1 (96-103, 86)	BB & PPT
9	Tertiary structure of DNA: DNA supercoiling.	T1 (228-233) R1 (318-378)	BB & PPT
Content beyond syllabus covered (if any): Mendelian genetics, Linkage, Crossing over			

* Session duration: 50 minutes

Sub. Code / Sub. Name : **BT18503/ Molecular Biology**
Unit : II

UNIT II DNA REPLICATION & REPAIR 9

Overview of Central dogma- Organization of prokaryotic and eukaryotic chromosomes- Enzymology of replication- DNA replication: Meselson & Stahl experiment- bi directional DNA replication- Geometry of replication- θ replication- Okazaki fragments- Proteomics of DNA replication- Fidelity of DNA replication- Inhibitors of DNA replication- Overview of differences in prokaryotic and eukaryotic DNA replication- D-loop and rolling circle mode of replication- Mutagens, DNA mutations and their mechanism- various types of repair mechanisms.

OBJECTIVE: The objective of this unit is to impart the students the deep knowledge on nature and properties of genetic material, various replication processes in prokaryotes and Eukaryotes

Session No*	Topics to be covered	Ref	Teaching Aids
10	Overview of Central dogma, Organization of prokaryotic and eukaryotic chromosomes	T1 (178-180, 181-188, 207-208)	Animated Videos & PPT
11	Enzymology of replication	T1 (226-227)	BB & PPT
12	DNA replication: Meselson & Stahl experiment- bi directional DNA replication	T1 (226-227)	BB & PPT
13	Geometry of replication- θ replication- Okazaki fragments	T1 (226-250) R1 (318-378)	Animated Videos & PPT
14	Proteomics of DNA replication	T1 (223-243)	BB & PPT
15	Fidelity of DNA replication- Inhibitors of DNA replication	T1 (233-253)	BB & PPT
16	Overview of differences in prokaryotic and eukaryotic DNA replication	T5 (353-399)	Smart Board & PPT
17	Telomere replication in eukaryotes - Centromeres and Telomeres, D-loop and rolling circle mode of replication	T1 (106, 269, 186-188, 258-260, 260-262, 640)	BB & PPT
18	Mutagens, DNA mutations and their mechanism- various types of repair mechanisms.	T1 (277-300) R1 (379-440)	BB & PPT
Content beyond syllabus covered (if any)**:** Mutations in cancer			

* Session duration: 50 minutes

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name : **BT18503/ Molecular Biology**
Unit : III

UNIT III TRANSCRIPTION 9

Structure and function of mRNA, rRNA and tRNA- Characteristics of promoter and enhancer sequences- RNA synthesis: Initiation, elongation and termination of RNA synthesis- Proteins of RNA synthesis- Fidelity of RNA synthesis- Inhibitors of transcription, Differences in prokaryotic and eukaryotic transcription- Basic concepts in RNA world: Ribozymes, RNA processing: 5'-Capping, Splicing- Poly 'A' tail addition and base modification.

OBJECTIVE: The objective of this unit is to impart the students the deep knowledge on transcription process and various components involved in the process of transcription in both Prokaryotes and Eukaryotes.

Session No*	Topics to be covered	Ref	Teaching Aids
19	Structure and function of mRNA, rRNA and tRNA	T1 (334-341, 379)	BB & PPT
20	Characteristics of promoter and enhancer sequences	T1 (321-325, 349-342)	BB & PPT
21	RNA synthesis: Initiation, elongation and termination of RNA synthesis	T1 (321-333) T5 (241-274) R1 (553-827)	BB & PPT
22	Proteins of RNA synthesis	T1 (325-327)	Animated Videos & PPT
23	Fidelity of RNA synthesis- Inhibitors of transcription	T1 (346-351)	BB & PPT
24	Differences in prokaryotic and eukaryotic transcription (Transcription factors)	R1 (553-827)	BB & PPT
25	Basic concepts in RNA world: Ribozymes	T1 (352-355)	BB & PPT
26	RNA processing: 5'-Capping	T1 (352-355)	BB & PPT
27	Splicing- Poly 'A' tail addition and base modification	T1(355-363) T5 (697-710) T1 (353-355)	BB & PPT
Content beyond syllabus covered (if any): Transcription factors of prokaryotes and Eukaryotes			

* Session duration: 50 minutes

Sub. Code / Sub. Name : **BT18503/ Molecular Biology**
Unit : IV

UNIT IV TRANSLATION 9

Introduction to Genetic code: Elucidation of genetic code- Codon degeneracy- Wobble hypothesis and its importance- Prokaryotic and eukaryotic ribosomes- Steps in translation: Initiation, Elongation and termination of protein synthesis- Inhibitors of protein synthesis- Post translational modifications and its importance.

OBJECTIVE: The objective of this unit is to impart the students the knowledge on genetic codon, translation in prokaryote and eukaryotes and post translational modifications.

Session No*	Topics to be covered	Ref	Teaching Aids
28	Introduction to Genetic code	T1 (355-377) T5 (167-178)	BB & PPT
29	Elucidation of genetic code	T1 (355-377) T5 (167-178)	BB & PPT
30	Wobble hypothesis and its importance	T1 (388-391)	BB & PPT
31	Prokaryotic and eukaryotic ribosomes	T1 (415-419)	BB & PPT
32	Steps in translation - Initiation, Elongation	T1 (425-435) T5 (135-150)	BB & PPT
33	Steps in translation - termination of protein synthesis	T1 (425-435) T5 (135-150)	BB & PPT
34	Inhibitors of protein synthesis	T1 (441-445)	BB & PPT
35	Post translational modifications (PTM)	T1 (436-438)	BB & PPT
36	Importance of PTM	T1 (436-438)	BB & PPT
Content beyond syllabus covered (if any): Codon redundancy and usage in different organisms.			

* Session duration: 50 minutes

Sub. Code / Sub. Name **: BT18503/ Molecular Biology**
Unit : V

UNIT V REGULATION OF GENE EXPRESSION 9

Organization of genes in prokaryotic and eukaryotic chromosomes- Hierarchical levels of gene regulation- Prokaryotic gene regulation- lac and trp operon- Regulation of gene expression with reference to λ phage life cycle.

OBJECTIVE: The objective of this unit is to impart the students the knowledge on gene regulation, life cycle of Bacteriophages and various Operon concepts.

Session No*	Topics to be covered	Ref	Teaching Aids
37	Organization of genes in prokaryotic chromosomes	T1 (178-188)	BB & PPT
38	Organization of genes in eukaryotic chromosomes	T1 (178-188)	BB & PPT
39	Hierarchical levels of gene regulation	T1 (453-456, 501-504)	BB & PPT
40	Prokaryotic gene regulation	T1 (456-481)	BB & PPT
41	lac operon and Gal operon	T3 (456-460) R1 (588-640)	BB & PPT
42	trp operon and Ara operon	T4 (479-481) T5 (279-297)	BB & PPT
43	λ phage	T1 (579-584) T5 (329-349)	BB & PPT
44	λ phage life cycle	T1 (579-584) T5 (329-349)	BB & PPT
45	Regulation of gene expression with reference to λ phage life cycle	T1 (579-584)	BB & PPT
Content beyond syllabus covered (if any): Eukaryotic gene regulation.			

* Session duration: 50 minutes

Sub Code / Sub Name: **BT18029 / Molecular Therapeutics**

TEXT BOOKS:

1. Bernhard, O. P & Sangeeta, N. B. Tissue Engineering, 2nd ed., Prentice Hall, 2009.
2. Pamela, G & Michelle, M. Molecular Therapeutics: 21st Century Medicine, John Wiley & Sons Limited, 2008.

REFERENCES:

1. Goldsby, R.A., Kindt, T.J., Osbome, B.A & Kerby, J. Immunology, 5th Ed., W.H Freeman, 2003.
2. Winnacker, E.L., From Genes to clones: Introduction to Gene Technology, Panima Publishing Corporation, 2003.
3. Glick, B.R., & Pasternak, J.J., Molecular Biotechnology: Principles and applications of recombinant DNA, 3rd Ed., ASM Press, 2003.
4. Lemonie, N.R., & Cooper, D.N., Gene therapy, Oxford BIOS Scientific Publishers, 1996.
5. Gary Walsh, Pharmaceutical Biotechnology: Concepts ans Applications, Wiley, 2007.

	Prepared by	Approved by
Signature		
Name	Mr. J. Hariharan	Dr. E. Nakkeeran
Designation	Assistant Professor	HOD
Date	10-07-2023	10-07-2023

Remarks *: The same lesson plan will be followed in the subsequent semester/year.