

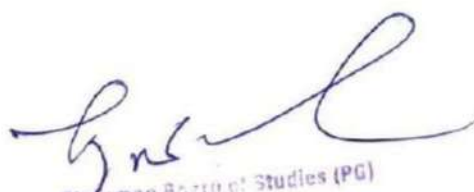


Sri Venkateswara University, Tirupati

Syllabus for MICROBIOLOGY Major in consonance with Curriculum frame work
w.e.f. AY 2026-27

COURSE STRUCTURE (for Semester III)

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
II	III	5	Cell biology and Genetics	3	3
			Cell biology and Genetics-Practical	2	1
		6	Molecular biology and bacterial Genetics	3	3
			Molecular biology and bacterial Genetics-Practical	2	1
		7	r DNA Technology, Bioinformatics and Biostatistics	3	3
			r DNA Technology, Bioinformatics and Biostatistics-Practical	2	1


Chairman Board of Studies (PG)
MICROBIOLOGY
S. V. UNIVERSITY
TIRUPATI-517 502 A.P.

B.Sc. (Microbiology)
(W.E.F. AY-2026-27)

Major

SEMESTER-III

COURSE 6: MOLECULAR BIOLOGY AND BACTERIAL GENETICS

Theory

Credits: 3

3 hrs/week

I. Learning Objectives:

1. Explore experiments demonstrating DNA/RNA as genetic material, prokaryotic replication, and plasmids/transposons.
2. Examine gene concepts, structure, and transcription in prokaryotes and eukaryotes.
3. Illustrate translation, genetic code, and bacterial gene regulation.
4. Analyze mutations, their molecular basis, and DNA repair mechanisms.
5. Investigate bacterial recombination through conjugation, transformation, and transduction.

II. Course Outcomes: On completion of this course, students will be able to:

1. Explain the experiments demonstrating DNA/RNA as genetic material, DNA replication, and plasmids/transposons.
2. Describe gene concepts, structure, and transcription.
3. Illustrate translation and bacterial gene regulation.
4. Classify mutations and summarize DNA repair.
5. Explain bacterial recombination and its applications.

III. Syllabus of Theory:

Unit - 1: DNA/RNA as genetic material, Replication of DNA **9 Hrs.**

- 1.1 DNA and RNA as genetic material (Griffith, Avery-MacLeod-McCarty Experiment, Hershey & Chase) Genome organization in prokaryotes.
- 1.2 Replication of DNA in prokaryotes. Bidirectional and unidirectional replication, Semiconservative Replication: Proof Mechanism.
- 1.3 Extrachromosomal genetic elements: General characteristics, types, and applications of plasmids and transposons.

Unit - 2: Concept of gene, Transcription **9 Hrs**

- 2.1 Classical Concept of Gene: Muton, Recon and Cistron; One Gene-one Enzyme, one gene-One polypeptide.
- 2.2 Modern concept of gene: Definition of gene; Open reading frame; Types of genes (structural, Constitutive and regulatory genes; Gene Slicing –concept of introns and exons
- 2.3 Transcription-Definition, mechanism of transcription.

Unit - 3: Translation and regulation of gene expression **9 Hrs.**

- 3.1 Genetic code: Salient features, Wobble hypothesis.
- 3.2 Translation- Mechanisms of initiation, elongation, and termination of polypeptides. Inhibitors of protein synthesis.
- 3.3 Regulation of gene expression in bacteria – lac operon.

Unit - 4: Mutations and DNA repair **9 Hrs**

- 4.1 Mutations: Definition and types of Mutations (Spontaneous and induced, Somatic and germline); Physical and chemical mutagens;

- 4.2 Molecular basis of mutations (base pair changes, frame shifts, deletions, inversions, tandem duplications, insertions); Functional mutants (loss and gain of mutants); Uses of mutations.
- 4.3 Outlines of DNA repair mechanisms: Excision, Mismatch, Recombination Repair, SOS Repair.

Unit - 5: Genetic recombination in bacteria

9 Hrs

- 5.1 Conjugation- Definition, F-factor, F+ & Hfr, mechanism of conjugation, applications of conjugation;
- 5.2 Transformation- Discovery, mechanism of transformation, factors affecting transformation, and application of transformation.
- 5.3 Transduction- discovery, mechanism, and types of transduction.

IV. Co-curricular activities:

1. Prepare and present a poster/model illustrating DNA replication, plasmids, and transposons.
2. Perform a simulation or virtual lab on transcription, translation, and bacterial gene regulation.
3. Conduct a case study or discussion on mutations, DNA repair, and bacterial recombination, highlighting real-world applications.

V. Reference Books:

1. James D. Watson, Tania A. Baker, Stephen P. Bell, Alexander Gann, Michael Levine, Richard Losick, 2013, Molecular Biology of the Gene, 5th Edition, Pearson Education Publishers.
2. Roger Y. Stanier, Edward A. Adelberg, John L. Ingraham, 1977, General Microbiology, 5th edition, London: Macmillan.
3. David Freifelder 1986 Molecular Biology 3rd edition, Jones & Bartlett Publishers
4. T.A. Brown, Gene Cloning and DNA Analysis- An Introduction, 4th edition
5. Bernard R. Glick and Jack. J. Pasternak, Molecular Biotechnology. 3rd edition
6. David Freifelder. Essentials of molecular biology. Jones and Bartlett Publishers, 1998

SEMESTER-III
COURSE 6: MOLECULAR BIOLOGY AND BACTERIAL GENETICS

Practical Credits: 1 2 hrs/week

I. Course Outcomes: On successful completion of this practical course, the student shall be able to:

1. Isolate and visualize DNA/RNA and plasmids using electrophoresis micrographs and schematic representations.
2. Solve DNA/RNA, transcription, and translation problems and study bacterial mutations.
3. Demonstrate molecular biology equipment like transformation, PCR, and ultracentrifugation.

II. Laboratory/Field exercises:

1. Isolation of genomic DNA from *E. coli*
2. Study of different types of DNA and RNA using model / schematic representations
3. Study of semi-conservative replication of DNA through micrographs: Representations
4. Resolution and visualization of DNA by Agarose Gel Electrophoresis.
5. Study of different conformations of plasmid DNA through agarose gel electrophoresis.
6. Problems related to DNA and RNA characteristics, transcription, and Translation.
7. Induction of mutations in bacteria by UV light.
8. Demonstration of bacterial transformation
9. Instrumentation in molecular biology – Ultra centrifuge, Transilluminator, PCR

**4- Year UG Honours, Major
Syllabus
(2026-27)
Semester-III**

Model Question Paper

Time : 3hrs

Marks:75

Part-A

Answer any Five Questions. Each Question carries 3 Marks.

5x3=15

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Answer the following questions. Each question carries 12 Marks

5x12=60

11. a) Unit-I
(Or)
b) Unit-I

12. a) Unit-II
(Or)
b) Unit-II

13. a) Unit-III
(Or)
b) Unit-III

14. a) Unit-IV
(Or)
b) Unit-IV

15. a) Unit-V
(Or)
b) Unit-V