



SRI VENKATESWARA UNIVERSITY, TIRUPATHI

4 -Year UG Honours in B.Sc. BOTANY: Major in Consonance with Curriculum Frame work w.e.f AY 2026-27

IV Semester

COURSE STRUCTURE (for Semester IV)

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
II	IV	8	Cell and Molecular biology	3	3
			Cell and Molecular biology -Practical	2	1
		9	Genetics and Plant breeding	3	3
			Genetics and Plant breeding -Practical	2	1
		10	Plant Physiology and Metabolism	3	3
			Plant Physiology and Metabolism -Practical	2	1

Signatures of the Board of Studies members

Sl No.	Designation	Name	Signature
1	BOS Chairman	Dr Mohano Behera, Department of Botany, Govt. Degree College, Pakala	
2	Member	Dr L. Md. Bakshu, Department of Botany, Dr YSR Govt. Degree College, Vedula Kuppam	
3	Member	Dr M. Hemalatha, Department of Botany, SVCR Govt. Degree College, Palamaner	
4	Member	Dr A. Sasikala, Department of Botany, SVCR Govt. Degree College, Palamaner	
5	Member	Smt. S. Padmavathi, Department of Botany, Govt. Degree College, Puttur	
6	Member	Dr P. Sujana, Department of Botany, Govt. Degree College, Puttur	


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COURSE 8: CELL AND MOLECULAR BIOLOGY

Theory

Credits: 3

3 hrs/week

I. Learning Objectives: By the end of this course the learner has:

1. To look into the ultra-structure of plant cell and its organelle
2. To know the morphology and functions of chromosomes
3. To understand the principles of autocatalysis and heterocatalysis of DNA

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

1. Sketch the ultra-structural aspects of plant cell and its components.
2. Hypothesize the role of chromosomes in inheritance.
3. Justify the role of genes in inheritance of characters by descent.
4. Correlate the functions of the nucleic acid with their structure.
5. Explain molecular mechanisms of DNA replication, transcription, translation, and gene regulation.

III. Syllabus of Theory:

Unit-1: Cell and its organelle

8 Hrs.

1. Cell theory; prokaryotic vs eukaryotic cell; animal vs plant cell; a brief account on ultra-structure of a plant cell.
2. Ultra-structure and functions of cell wall.
3. Ultra-structure and functions of plasma membrane and various models on its organization.
4. Polymorphic cell organelles (Plastids); ultra-structure of chloroplast, plastid DNA.
5. Ultrastructure of mitochondria, mitochondrial DNA.

Unit-2: Chromosomes

8 Hrs.

1. Nucleus-Nuclear membrane, nuclear pore complex
2. Prokaryotic vs eukaryotic chromosome; morphology of a eukaryotic chromosome.
3. Euchromatin and Heterochromatin; Karyotype and ideogram.
4. Organization of DNA in a chromosome (nucleosome and solenoid models).
5. Special types of chromosomes-Lampbrush chromosomes, polytene chromosomes, B chromosomes

Unit-3: Cell cycle and its regulation

10 Hrs.

1. Cell cycle-phases of cell cycle, amitosis.
2. Mitosis-Phases of mitosis and significance of mitosis.
3. Meiosis-phases of meiosis and significance of meiosis
4. Cell cycle check points, apoptosis

Unit-4: Nucleic acids

10 Hrs.

1. Experimental evidences for DNA as genetic material
2. Types of Nucleic acids, DNA structure : Primary structure of DNA, Watson and Crick model of DNA, types of DNA
3. Methods of DNA replication, mechanism of DNA replication
4. DNA damage and repair
5. Structure, functions and types of RNA. Differences between DNA & RNA


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Unit-5: Transcription and Translation

9 Hrs.

1. Transcription: Mechanism of transcription in prokaryotes and eukaryotes
2. mRNA processing –Post transcriptional changes
3. Genetic code: Nature of Genetic code, essential features of genetic code
4. Translation: Process of translation (Peptide chain initiation, Elongation and Termination), post translational modifications, protein trafficking and sorting
5. Regulation of gene expression-Lac, Trp operons

IV. Text Books:

1. Lodish, H., Berk, A., Kaiser, C. A., Krieger, M., Bretscher, A., Ploegh, H., & Matsudaira, P. (2021). Molecular Cell Biology (9th ed.). W.H. Freeman.
2. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2019). Molecular Biology of the Cell (6th ed.). Garland Science.
3. Karp, G. (2021). Cell and Molecular Biology: Concepts and Experiments (9th ed.). Wiley.
4. De Robertis, E. D. P., & De Robertis, E. M. F. (2006). Cell and Molecular Biology (8th ed.). Lippincott Williams & Wilkins.
5. Cooper, G. M., & Hausman, R. E. (2019). The Cell: A Molecular Approach (8th ed.). Oxford University Press.
6. Verma, P. S., & Agarwal, V. K. (2020). Cell Biology. S. Chand & Company Ltd.

V. Reference Books:

1. Krebs, J. E., Goldstein, E. S., & Kilpatrick, S. T. (2020). Lewin's Genes XII (12th ed.). Jones & Bartlett Learning.
2. Watson, J. D., Baker, T. A., Bell, S. P., Gann, A., Levine, M., & Losick, R. (2013). Molecular Biology of the Gene (7th ed.). Pearson Education.
3. Pollard, T. D., Earnshaw, W. C., & Lippincott-Schwartz, J. (2017). Cell Biology (3rd ed.). Elsevier.
4. Kleinsmith, L. J. (1995). Principles of Cell and Molecular Biology (2nd ed.). HarperCollins College Publishers.
5. Robert H. Tamarin (2002) Principles of Genetics, Tata McGraw-Hill Publishing Company Limited, New Delhi.
7. Gardner, E.J., M. J. Simmons & D.P. Snustad (2004) Principles of Genetics, John Wiley & Sons Inc., New York
8. Micklos, D.A., G.A. Freyer & D.A. Cotty (2005) DNA Science: A First Course, I.K. International Pvt. Ltd., New Delhi

VI. Suggested activities and evaluation methods:

Unit-1: Activity: Group discussion on different types of cells and their components.

Evaluation method: Identifying the best group or performer and giving a reward.

Unit-2: Activity: Making nucleosome model

Evaluation method: Selecting the best and assigning a grade.

Unit-3: Activity: Observation of cell division in online root tip

Evaluation method: Selecting the best for any stage of cell division.

Unit-4: Activity: Making models of nucleic acids.

Evaluation method: Selecting the best and assigning a grade.

Unit-4: Activity: Making model for operons

Evaluation method: Selecting the best and assigning a grade.


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IV Semester

COURSE 8: CELL AND MOLECULAR BIOLOGY

Practical

Credits: 1

2 hrs/week

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

1. Identify the stages of mitotic and meiotic cell divisions.
2. Infer the structure and functions of nucleic acids.

II Laboratory/field exercises:

1. Study of ultra structure of a plant cell and its organelles using electron microscopic photographs /models.
2. Demonstration of mitosis in *Allium cepa*/*Aloe vera* roots using squash technique.
3. Observation of various stages of mitosis in permanent slides.
4. Demonstration of meiosis in P.M.C.s of *Allium cepa* flower buds using squash technique.
5. Observation of various stages of meiosis in permanent slides.
6. Illustrations of Giant Chromosomes
7. Study of structure of DNA and RNA
8. Illustrations of DNA Replication


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COURSE 8: CELL AND MOLECULAR BIOLOGY
Suggested Model Paper for Practical Examination

Max Time: 3 Hrs

Max. Marks: 50

1. Make a cytological preparation of given material 'A' by squash technique, report any two stages, draw labeled diagrams and write the reasons. 15 M
2. Study the given model (Nucleic acids) Identify the molecules, describe the structural components, Comment on the functional significance. 'B' 15 M
3. Identify and comment on the given specimens/spotters/slides/photographs 4 x 3=12 M
 - C. From Cell Biology
 - D. From Cell Biology
 - E. From Molecular Biology
 - F. From Molecular Biology
4. Record & Viva-voce 5 + 3 = 08 M

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

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