



RAICHUR UNIVERSITY, RAICHUR

Under Graduate Curriculum for Degree of Bachelor of Science (B.Sc) in

Biotechnology (I & IV Semester)

**As per Revised NEP 2024
With Effect from the Academic year from
2024-25 and onwards**

Raichur University, Raichur

B.Sc. Biotechnology

Programme Specific Outcomes (PSO):

On completion of the 03 years Degree in B.Sc. **Biotechnology** (Basics) students will be able to:

- Demonstrate, solve and understand the major concepts in all the disciplines of Biotechnology.
- Understand practical skills so that they can understand and assess risks and work safely and competently in the laboratory.
- To apply standard methodology to the solutions of problems in Biotechnology
- Provide students with the ability to plan and carry out experiments independently and assess the significance of outcomes.
- Develop in students the ability to adapt and apply methodology to the solution of unfamiliar types of problems.
- Employ critical thinking and the scientific knowledge to design, carry out, record and analyze the results of Biotechnology.
- To build confidence in the candidate to be able to work on his own in industry and institution of higher education.
- To develop an independent and responsible work ethics.

B.Sc. Semester-I

Discipline Specific Course (DSC)-1

Course Title: - Cell Biology and Genetics.

Course Code: C1BIT1T1

Course Outcomes (COs): At the end of the course students will be able to:

- CO1: Understand the Basic structure of Cell, its composition and functions.
- CO2: Explain cell division and cell cycle.
- CO3: Attain the concept of ageing mechanisms
- CO4: Gain knowledge of principles of Genetics.
- CO5: Differentiate Spermatogenesis and Oogenesis.
- CO6: Understand genetic disorders.

Unit	Title: Cell Biology and Genetics (Theory-4, Practical-2)
Unit 1	1.1: Biotechnology - A brief introduction, Historical development of Biotechnology, branches of Biotechnology. 1.2: Introduction to living world– Discovery of cell, Cell Theory, cell as a basic unit of life. 1.3: Ultra structure of Plant and animal cells, structure and function of Cell wall, Plasma membrane, Structure and function of cell organelles- Mitochondria, Chloroplast, Ribosome, Golgi complex. Endoplasmic reticulum. Nucleus, Lysosomes, Peroxisomes. Vacuole, Cytosol and Cytoskeletal structures. 1.4. Structure of Bacteria and virus. Difference between prokaryotic and eukaryotic cell.
Unit 2	2.1: Chromosomes - Discovery, Morphology and structural organization; number, size and types, Chromosomal morphology, fine structure and models, Heterochromatin and Euchromatin, Special chromosomes (Salivary gland and Lampbrush). 2.2: Cell Division in Eukaryotes - Cell cycle, mitosis and meiosis, mitotic apparatus, centrioles, spindles, cell plate formation, regulation of cell cycle and check points and enzymes involved in cell cycle. 2.3 : Cell synchrony, Cell senescence and programmed cell death. Cell-cell interaction and cancer cells. 2.4: Gametogenesis - Spermatogenesis and Oogenesis.
Unit 3	3.1: Introduction and history of genetics . 3.2: Mendels experiments- Factors contributing to success of Mendels experiments, Law of Dominance, Law of segregation, Law of independent assortment, Test-cross, Complete and Incomplete dominance co - dominance. 3.3: Interaction of Genes- Supplementary factors (Comb pattern in fowls), complementary genes (flower colour in sweet peas), Multiple factors (Skin colour in human beings), Epistasis (Plumage colour in poultry), Multiple alleles: Blood groups in human beings. 3.4: Mutation- Spontaneous, Induced-physical and chemical mutagens.
Unit 4	4.1: Linkage and recombination- Gene linkage and types, Linkage in maize and Drosophila, Cytological proof of crossing over, Mechanism of crossing over and its importance 4.2: Extrachromosomal inheritance (Plastid inheritance in Mirabilis, Petite characters in yeast and Kappa particles in Paramecium). 4.3: Mechanism of sex determination- Homogametic and heterogametic theory (Human, mammalian and birds), X linked inheritance (Haemophilia, Colourblindness). 4.4: Chromosomal variations - Structural and numerical aberrations. Human genetics- Karyotype in man, inherited disorders – Autosomal (Klienfelter syndrome and Turners syndrome) and Autosomal (Down syndrome and Cri-du- chat syndrome)

Books recommended:

1. Sudberry P. 2002, Human Molecular cytogenetics. Prentice hall publication
2. Knudson A.G. 1998, Anti–Oncogenes and Human cancer. Proceedings of the National academy of sciences USA 90: 10, 0114 – 10921
3. Lodish, H., Ber, A., Zipursky, L.S., Matsudaira, P., Bahimore, D and Darnell J. 2001, Molecular Biology W. H. Freeman G Co 47
4. Preeti G.2011, Fundamentals of Biotechnology. Galgotia Publications.
5. Sabiha Khan. 2020, Fundamentals of Biotechnology. Lenin Media Pvt. Ltd.
6. FirdosA.K.2020, Biotechnology Fundamentals. Third Edition CRC Press.
7. Bazlur Rashid. M. 2016, Methods in Biotechnology 1st edition Wiley-Blackwell.
8. Alberts, B., Bray, D., Lewis, J., Raff, M., Roberts, K., & Watson, J. D. (2008). *Molecular Biology of the Gene* (6th ed.). Garland Publisher Inc.
9. Gerald Karp 2004, Cell and Molecular Biology. John Wiley and Sons. Inc
10. Elliot and Elliot, 2001 Biochemistry and Molecular Biology. Oxford University Press.
11. Celis JE(Eds): 2008 Cell Biology: A Laboratory Hand Book. VolI & II Academic Press.
12. Pollard J.P. and W.C. Earnshaw 2002.Cell Biology, Sunders
13. Tamarin, R.H, (2000): Principles of genetics, 6th Edn. WMC Brown Publication. London.
14. Snustad, P. D, Simmons, M. J 2019: Principles of genetics 2nd Edn. John Wiley and sons, Inc. New York.
15. Fairbanks, D. J and Anderson, W. R 1999: Genetics–continuity of life. Brooks and Cole Publication Company. New York.
16. Lewin, B (2020): GENES VII. Oxford University Press, New York.
17. Strick berger, M.W(2000): Genetics Prentice- Hall of India private limited, New Delhi.
18. Miglani G.S 2000 Basic Genetics Narosa publishing New Delhi.
19. E.D.P. and De Robertis E.M.S. 1998: Cell and Molecular Biology, Lea and Jeliger. Philadelphians K.M Varghese Company

B.Sc. Semester–I

Discipline Specific Course (DSC)

Course Title - Cell Biology and Genetics

Course Code: C1BIT1P1

Course Outcomes (COs): At the end of the course, students will be able to:

CO1: Learning and practicing the laboratory skills in cell biology

CO2: Learning and practicing the laboratory skills in Genetics

List of the Experiments, each will have 04Hrs / Week

1. Study of plasmolysis and de-plasmolysis .
2. Study and maintenance of simple and Compound microscope.
3. To study mitotic cell division - onion root tips.
4. To study meiotic cell division – Grasshopper/ flower bud (Onion)
5. Cell counting methods: Haemocytometer and other aids.
6. To study special chromosomes
7. Use of Micrometer and calibration measurement of onion epidermal cell and yeast cell.
8. Pedigree charts of common characters like Blood group and Colorblindness and Hemophilia.
9. Isolation of chloroplast from spinach leaves.
10. Solve genetic problems.
11. Karyotype analysis in Man.
12. Cell fractionation and determination of enzyme activity in organelles using sprouted seed or any other source.
13. Preparation of permanent slides (Mitosis & Meiosis two from each).