

Session - (2022-2023).



Biotechnology (1st and 2nd Sem NEP-2020)

GOVT. COLLEGE FOR WOMEN PARADEGROUND  
JAMMU (Autonomous)  
(Erstwhile Maharani Mahila College) Estd 1944  
Affiliated to University of Jammu

Programme: - Undergraduate programme in Biotechnology (FYUGP)  
Semester- 1  
Course type: - Major-theory Course  
Course title: -Cell Biology and Genetics  
Course code: -UBTMJT101

**Objectives of the Course:** -To impart elementary knowledge about the course Cell biology and Genetics.

**Learning outcomes of the course:** -Students will understand the structure and purpose of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles, how these cellular components are used to generate and utilize energy in cells, the cellular components underlying mitotic and meiotic cell division, structural organization of Genetic material (DNA and RNA). Students will learn the basic principles of inheritance as classical genetics and rules governing it. Students will test and deepen their mastery of Cell Biology and Genetics by applying this knowledge in a variety of problem-solving situations.

**Total marks:** - 100

**Total credits:** - 4

**Total teaching hours:** - 60 hrs

**Syllabus**

**Unit-01**

**Introduction to Cell:** Origin and evolution of cells, Cell theory, Ultra structure of pro-and eukaryotic cells; Structure and function of Plasma membrane, transport through membrane; Structure and function of cell wall (plant and bacteria).

**Cell organelles and Cytoskeletal:** Structure, function and significance of Cell organelles: Nucleus, Mitochondria, Chloroplast, Endoplasmic reticulum and Golgi complex. **12hrs**

**Unit-02**

**Chromosome:** Introduction, morphology, physical and chemical organization of chromosome: Folded fibre and Nucleosome model. Chromosome types, primary and secondary constrictions, Structure and function of Telomers. Satellite chromosome.

**Cell division:** Cell cycle, cell-division (Mitosis and Meiosis): Phases and significance, Regulation of cell cycle: checkpoints and significance. **12hrs**

**Unit-03**

**Mendelian Genetics:** History of genetics, Laws of inheritance-Dominance, Segregation, incomplete dominance, co-dominance, Law of independent assortment. Chromosomal theory

Mahab Tufelhi  
HOD  
Biotechnology  
09/11/22



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of inheritance. Mutations and its molecular basis. Overview of transposable elements in bacteria and plants.

**Non-allelic genetic interactions:** Complementary and Supplementary gene interactions. Inhibitory genes and epistasis. **12hrs**

Unit-04

**Genetic Material:** Experimental basis of DNA and RNA as a genetic material. DNA structure: Factors determining structure of DNA, Hydrogen bonding in DNA, Hydrophobic interactions in DNA, base stacking, different forms of DNA: A, B, Z form of DNA, Linear and Circular DNA. Spectroscopy and Agarose gel electrophoresis as methods of DNA/RNA analysis.

**Gene Organization:** Structure of gene in prokaryotes and eukaryotes. Concept of operon, Genetic code. **12hrs**

Unit-05

**Cell-Biomolecules (Macromolecules and Micro molecules):** Carbohydrates, structure of mono-, di- and polysaccharides (cellulose, glycogen, starch). Glycoproteins, peptidoglycans, lipopolysaccharides. General structure of amino acids: acidic, basic and neutral amino acids, essential amino acids. Structural organization of proteins, primary, secondary, tertiary and quaternary structure of proteins and the forces that stabilize the structure.

Lipids and fats: Classification of lipids and fatty acids, saturated and unsaturated fatty acids, general structure and functions of major subclasses of lipids-acylglycerol, phosphoglycerides and cholesterol. **12hrs**

Books Recommended:

1. Principles of Genetics, Snustad and Simmons, John Wiley & Sons, USA.
2. Modern Genetics Analysis: Integrating Genes and Genomes, Griffith, J.F., Gelbart, M., Lewontin, C and Miller, W.H. Freeman and Company, New York, USA.
3. Genetics, J Russell, Benjamin- Cummings Publishing Company, San Francisco, California, USA.
4. Molecular Cell Biology, Lodish et al., W.H. Freeman and Company, New York, USA.
5. Molecular Biology of the Cell, Alberts et al., Garland Science, Taylor and Francis Group, New York, USA.
6. Lehninger, A.L., Nelson, D.L. and Lox, M.M. Principles of Biochemistry, CBS Publishers and Distributors, New Delhi.
7. Stryer, L. Biochemistry: W.H. Freeman and Company, New York.

Mahab Tufeky



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**Examination pattern shall be as under: -**

1. 20 marks shall be earmarked for internal assessment (5 marks for attendance +15 for assessment test).
2. Scheme for award of marks for attendance shall be same as followed by the College
3. Internal assessment test shall be conducted after the completion of 40% of the syllabus in a particular course.

**Pattern for setting internal assessment test paper**

The paper shall comprise of three sections: -

- a) Short answer questions – Attempt two questions of 2 marks each out of three questions (Maximum of 30 words each)
- b) Medium answer question - Attempt two questions of 3 marks each out of 3 questions (Maximum of 50 words each)
- c) Long answer question - Attempt one out of two questions of 5 marks (Maximum of 100 words)

Note: - Questions shall be set in such a way that the syllabi prescribed for the examination is fully represented

Duration of the paper: - 1 hour

**Pattern of External Examination:**

Total marks: - 80

Time allowed: - 3 hours

The paper shall comprise of 3 sections.

- a) Short answer questions - 5 questions of 3 marks each (one question shall be asked from each unit).  
All questions are compulsory
- b) Medium answer questions – 5 questions of 7 marks each (one question shall be asked from each unit).  
All questions are compulsory
- c) Long answer questions: - 5 questions be set from five units, and the students shall be asked to attempt 2 questions only.  
Each question shall be of 15 marks.

(The word limit shall be same as is the usual practice in external examination of similar weightage.)

*Mahala Tufah*



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**Major-practical Course**

Code: - UBTMJP101

Objective: - Hands on training to the students of different techniques used in Cell Biology and Genetics Course.

Learning outcomes: -To generate technically skilled students with knowledge of basic techniques used in Cell Biology, use of different instruments like microscope, spectrophotometer, electrophoretic unit etc. that has a utility in employment generation.

Total marks: - 50

Total Credits: - 2

Minimum No. of practical to be performed:-15

**Practical Exercises**

1. Introduction to light microscope and the different components involved in its working.
2. To observe the characteristics of prokaryotic and eukaryotic cells.
3. To observe the different stages of mitosis under a microscope.
4. To observe the different stages of meiosis I and meiosis II under a microscope.
5. Demonstration of sterilization of glassware, plasticware (autoclavable) through wet heat sterilization.
6. Demonstration of different dry heat sterilization techniques used in culture preparation.
7. Preparation of DNA extraction buffer.
8. Isolation of plant cellular DNA using CTAB method.
9. Introduction to Spectrophotometry, UV/Vis Spectrophotometer: Principle and it's Working.
10. To study the relationship between concentration and absorbance using standard curve.
11. Agarose gel electrophoresis as a separation technique for DNA analysis.
12. Estimation of reducing sugars by Fehling's method.
13. Determination of protein by Bradford method.
14. Emulsion ethanol test for fats.
15. Solubility test for lipids and proteins

*Mohale Tanya*



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**Books recommended:**

1. Plummer, D.T. (1990). An Introduction of Practical Biochemistry. 3rd Ed. Tata McGraw Hill Publishers Co. Ltd., New Delhi.
2. Singh, R. and Sawhney, S.K. (2002). Introduction to Practical Biochemistry. Narosa Publications, New Delhi.
3. Sambrook J, Fritsch, E.F. and Maniatis, T. (2001). Molecular cloning. A Laboratory Manual 3rd ed., Cold Spring Harbor Laboratory Press.
4. Dabre P.D. (1998) Introduction to Practical Molecular Biology, John Wiley & Sons Ltd., New York.
5. Cappuccino, J.G. and Sherman, N. (1996) Microbiology – A Laboratory Manual. Addison – Wesle.

**Examination pattern: -**

**A) Internal assessment**

Weightage of Internal assessment: - 50% i.e., 25 marks out of 50.

**Components of internal assessment: -**

- a) 5 marks for attendance. Marks shall be awarded as per the rules already followed by the College
- b) 6 marks earmarked for the daily performance of the students in the practical exercises. The evaluation of daily performance shall be undertaken as per the standard  $\alpha \beta \gamma$  scheme being followed in the College.
- c) 6 marks are earmarked for minor project assigned to each student. Students shall have to submit the project report according to a prescribed format on the day of internal assessment test.
- d) 8 marks earmarked for internal assessment test in practical. The nature of the test shall be similar as is already followed by the College

**External examination: -**

Weightage of external examination: - 50% i.e. 25 marks out of 50.

The examination pattern shall be same as followed by the College.

Mahave Tujchi



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Programme: - Undergraduate programme (FYUGP) in Biotechnology  
Semester- I  
Course type: - Minor-theory Course  
Course title: -Cell Biology and Genetics  
Course code: -UBTMNT101

**Objectives of the Course:** -To impart elementary knowledge about the course Cell biology and Genetics.

**Learning outcomes of the course:** Students will understand the structure and purpose of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles, how these cellular components are used to generate and utilize energy in cells, the cellular components underlying mitotic and meiotic cell division, structural organization of Genetic material (DNA and RNA). Students will learn the basic principles of inheritance as classical genetics and rules underlying it. Students will test and deepen their mastery of Cell Biology and Genetics by applying this knowledge in a variety of problem-solving situations.

**Total marks: - 100**

**Total credits: - 4**

**Total teaching hours: - 60 hrs**

### Syllabus

#### Unit-01

**Introduction to Cell:** Origin and evolution of cells, Cell theory, Ultra structure of pro-and eukaryotic cells; Structure and function of Plasma membrane, transport through membrane; Structure and function of cell wall (plants and microbes).

**Cell organelles and Cytoskeleton:** Structure, function and significance of Cell organelles: Nucleus, Mitochondria, Chloroplast, Endoplasmic reticulum and Golgi complex. **12hrs**

#### Unit-02

**Chromosome:** Introduction, morphology, physical and chemical organization of chromosome: Folded fibre and Nucleosome model. Chromosome types, primary and secondary constrictions, Structure and function of Telomers. Satellite chromosome.

**Cell division:** Cell cycle, cell-division (Mitosis and Meiosis): Phases and significance, Regulation of cell cycle: checkpoints and significance. **12hrs**

#### Unit-03

**Mendelian Genetics:** History of genetics, Laws of inheritance-Dominance, Segregation, incomplete dominance, co-dominance, Law of independent assortment. Chromosomal theory

Maharaj Tyagi



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Unit-04

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Unit-05

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Lipids and fats: Classification of lipids and fatty acids, saturated and unsaturated fatty acids, general structure and functions of major subclasses of lipids-acylglycerol, phosphoglycerides and cholesterol. **12hrs**

Books Recommended:

1. Principles of Genetics, Snustad and Simmons, John Wiley & Sons, USA.
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3. Genetics, J Russell, Benjamin- Cummings Publishing Company, San Francisco, California, USA.
4. Molecular Cell Biology, Lodish et al., W.H. Freeman and Company, New York, USA.
5. Molecular Biology of the Cell, Alberts et al., Garland Science, Taylor and Francis Group, New York, USA.
6. Lehninger, A.L., Nelson, D.L. and Lox, M.M. Principles of Biochemistry, CBS Publishers and Distributors, New Delhi.
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*Mahabir Singh*



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*Mahab Tulya*





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Minor-practical Course

Code: - UBTMNP101

Objective: - Hands on training to the students of different techniques used in Cell Biology and Genetics Course.

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Total marks: - 50

Total Credits: - 2

Minimum No. of practical to be performed:-15

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7. Preparation of DNA extraction buffer.
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15. Solubility test for lipids and proteins

*Mahesh Tyagi*



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**Examination pattern: -**

**A) Internal assessment**

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**Components of internal assessment: -**

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- b) 12 marks earmarked for the daily performance of the students in the practical exercises. The evaluation of daily performance shall be undertaken as per the standard  $\alpha \beta \gamma$  scheme being followed in the College.
- c) 8 marks earmarked for internal assessment test in practical. The nature of the test shall be similar as is already followed by the College

**External examination: -**

Weightage of external examination: - 50% i.e. 25 marks out of 50.

The examination pattern shall be same as followed by the College.

*Mahat English*