Swami Shraddhanand College
(University of Delhi)
Alipur, Delhi- 1100036
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Lesson Plan

Name of Teacher	**Prof. Bhoopander Giri (2 classes/week)** **Dr. Bhawna Saxena (2 classes/week)**	**Department**	**Botany**
Course	**B.Sc. (ALS)**	**Semester**	**V**
Paper	**Genetic and Plant Biotechnology**	**Academic Year**	**2023-2024**

Learning Objectives

Learning Objectives:

To have knowledge of Mendelian and non-Mendelian inheritance, Chromosome biology and structure and function of genes. To have understanding of structure and functions of DNA and RNA, models of DNA replication, prokaryotic and eukaryotic genome-structure, Central dogma and genetic code, transcription and gene silencing. Acquaintance of RNA processing and translation, protein synthesis and gene functions. Such knowledge is applied in the field of biotechnology

To give students new knowledge and widening of the knowledge acquired in other course by handling of classical and modern plant biotechnology processes, including tissue culture for

healthy plants, plants with improved characteristics. This course explores the use of biotechnology to both generate genetic variation in plants and to understand how factors at the cellular level contribute to the expression of genotypes and hence to phenotypic variation. Understanding of biotechnological processes such as recombinant DNA technology and its applicative value in pharmaceuticals (vaccines, antibodies, antibiotics etc.), food industry (transgenic crops with improved qualities (nutraceuticals, industrial enzymes etc.), agriculture (biotic and abiotic stress tolerant plants, disease and pest resistant plants, improved horticultural varieties etc.), ecology (plants role in bioremediation). This knowledge is central to our ability to modify plant responses and properties for global food security and commercial gains in biotechnology and agriculture.

Learning Outcomes

Course Learning Outcomes

To generate interest among the students in Genetics and make them aware about the importance and opportunities in higher education and research, the first unit should be Introductory dealing with how this area has revolutionised all aspects of our life from its growth from Mendel to Genetic Engineering. The first unit may include brief introduction of: Definition, Application of this field in Food production, Medicines, Industries, Bioinformatics, Genomics, Proteomics, Transcriptomics, System Biology to Personalised medicines.

The successful students will be able to learn the basic concepts, principles and processes in plant biotechnology. They will have the ability of explanation of concepts, principles and usage of the acquired knowledge in biotechnological, pharmaceutical, medical, ecological and agricultural applications.

Use basic biotechnological techniques to explore molecular biology of plants

Explain how biotechnology is used to for plant improvement and discuss the biosafety concern and ethical issue of that use.

Lesson Plan

Week No.	Theme/ Curriculum
1. Week 1 (16^{st} -20^{th} Aug 23)	Orientation
2. Week 2 (21^{st} -27^{th} Aug 23)	Unit- 1. Transmission Genetics: Mendel's laws of inheritance **(Prof. Bhoopander Giri)** Unit -2. Physical and Molecular Organization of Genetic Material — chromosomes, chromosome morphology **(Dr. Bhawna Saxena)**
3. Week 3 (28^{th} -3^{rd} Sept 23)	Unit- 1. Transmission Genetics: allelic and non-allelic interactions **(Prof. Bhoopander Giri)** Unit -2. Physical and Molecular Organization of Genetic Material — karyotype, ideogram **(Dr. Bhawna Saxena)**
4. Week 4 (4^{th}-10^{th} Sept 23)	Unit- 1. Transmission Genetics: modified dihybrid ratios **(Prof. Bhoopander Giri)** Unit -2. Physical and Molecular Organization of Genetic Material —polytene and lampbrush chromosomes, nucleosome **(Dr. Bhawna Saxena)**
5. Week 5 (11^{th} -17^{th} Sept 23)	Unit- 1. Transmission Genetics: polygenic inheritance, multiple alleles **(Prof. Bhoopander Giri)** Unit -2. Physical and Molecular Organization of Genetic Material — DNA/RNA as genetic material **(Dr. Bhawna Saxena)**
6. Week 6 (18^{th}-24^{th} Sept 23)	Unit- 1. Transmission Genetics: extra nuclear inheritance. **(Prof. Bhoopander Giri)** Unit -2. Physical and Molecular Organization of Genetic Material —Watson and Crick's model, RNA types**. (Dr. Bhawna Saxena)**
7. Week 7 (25^{th}-1^{th} Oct 23)	Unit -3. Mutations — spontaneous mutations **(Prof. Bhoopander Giri)** Unit -4. Linkage and Crossing Over — complete and incomplete linkage **(Dr. Bhawna Saxena)**
8. Week 8 (2^{nd}-8^{th} oct 23)	Unit -3. Mutations —induced mutations **(Prof. Bhoopander Giri)** Unit -4.Linkage and Crossing Over —two-point and three-point test cross, cytological basis of crossing over**(Dr. Bhawna Saxena)**

9. Week 9 (9^{th}-15^{th} oct 23)	Unit -3. Mutations —mechanism of mutation **(Prof. Bhoopander Giri)** Unit -4.Linkage and Crossing Over —Molecular basis of recombination; sex-linked inheritance. **(Dr. Bhawna Saxena)**
10. Week 10 (16^{th}-22th Oct 23)	Unit -3. Mutations —genomic mutations (aneuploidy, eupolyploidy), **(Prof. Bhoopander Giri)** Unit-7.Microbial and Industrial Biotechnology: production of antibiotics, alcohol **(Dr. Bhawna Saxena)**
11. Week 11 (23th -29^{th} Oct 23)	Unit -3. Mutations —chromosomal aberrations **(Prof. Bhoopander Giri)** Unit-7.Microbial and Industrial Biotechnology: single cell proteins, enzymes **(Dr. Bhawna Saxena)**
12. Week 12 (30^{th}-5^{th} Nov 23)	Unit -5. Recombinant DNA Technology: Basics **(Prof. Bhoopander Giri)** Unit -8.Gene therapy **(Dr. Bhawna Saxena)**
13. Week 13 (6^{th}-12^{th} Nov 23)	Unit -5. Recombinant DNA Technology: Agrobacterium mediated gene transfer **(Prof. Bhoopander Giri)** Unit -8.Gene therapy **(Dr. Bhawna Saxena)**
14. Week 14 (13^{th}-19^{th} Nov 23)	Unit -6.GM plants: resistance to pathogens & pests **(Prof. Bhoopander Giri)** Unit -8. DNA Fingerprinting. **(Dr. Bhawna Saxena)**
15. Week 15 (20^{th}-26^{th} Nov 23)	Unit -6.GM plants: golden rice, BT-cotton **(Prof. Bhoopander Giri)** Unit -6.GM plants: stress tolerance **(Prof. Bhoopander Giri)** Revision- **Dr. Bhawna Saxena**
16. Week 16 (27^{th}-3^{rd} Dec 23)	Unit -6.GM plants: flavor savor tomato. **(Prof. Bhoopander Giri)** Revision- **Dr. Bhawna Saxena**
17. Week 17 (4^{th} -6^{th} Dec 23)	Unit -9. Ethics and Biosafety: public perception of biotechnology, ethical and biosafety issues. **(Prof. Bhoopander Giri)** Unit -9. Ethics and Biosafety: public perception of biotechnology, ethical and biosafety issues. **(Prof. Bhoopander Giri)** Revision- **Dr. Bhawna Saxena**

Suggested Readings	
Books	1. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics. John Wiley and Sons, U.K.5th edition. 2. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington. 3. Tortora, G.J., Funke, B.R., Case. C.L. (2007). Microbiology. Pearson Benjamin Cummings, San Francisco, U.S.A. 9th edition
Assignment and Class Test Schedule for Semester **Assignments: Submission by 30th October 2023** **Class Test: As per the College mid-semester exam schedule**	