

INDIRA GANDHI (P.G.) MAHILA MAHAVIDYALAYA, KAITHAL

Affiliated to Kurukshetra University, Kurukshetra

Department Of Science

Lesson Plan (Session 2025-2026)

Class: B.Sc. Life Science

Semester: **III**

Name of the Course: Genetic Engineering

Course Code: B23-SEC-323

Dates: 22 July, 2025 – 24 Nov., 2025

SYLLABUS

Maximum Marks: 100

Time: 3 hours

End Term Exam Marks: 50(T)+20(P)=70 Marks

Assessment: 20(T)+10(P)=30 Marks

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of short type question covering the entire syllabus in addition to that eight more questions will be set, two question from each unit. Students will be required to attempt in all. In addition to the compulsory question, student will have to attempt four more questions selecting one question from each unit.

| Unit | Topics | Contact Hours |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| Unit: I | Cloning and amplification of DNA: Introduction, choice of the organism, use of restriction endonucleases for the production of DNA fragments. Vehicles for cloning - plasmids, phage vectors and cosmids. RNA isolation, preparation and use of cDNAs. Application of recombinant DNA technology. | 8 |
| Unit: II | Isolation, sequencing and synthesis of genes: Isolation of genes, sequencing of genes, synthesis of genes, Cloning of specific eukaryotic genes and their expression in bacteria. Genes involved in regulation, regulatory gene, promoter gene, operator gene and structural genes. | 7 |
| Unit: III | Gene transfer methods: Gene transfer methods for plants Agrobacterium mediated gene transfer, physical and chemical methods. Gene transfer methods for animals- Biochemical, physical and virus-mediated gene transfer methods. | 7 |
| Unit: IV | Applications of Genetic Engineering: Genetic engineering in animals: Production and applications of transgenic mice, role of ES cells in gene targeting in mice, Therapeutic products produced by genetic engineering. | 8 |
| V | 1. Isolation of chromosomal DNA from plant/animal cells 2. Qualitative and quantitative analysis of DNA using spectrophotometer. 3. Plasmid DNA isolation 4. Restriction digestion of DNA 5. Making competent cells 6. Transformation of competent cells. | 15 |

Text Books:

1. B. D. Singh , Biotechnology : Expanding Horizons

Course Outcomes

After completing this course, the learner will be able to:

1. Understand about different terminology related to genetic engineering and tools used for it.
2. Understand about isolation, sequencing and synthesis of genes.
3. Know the techniques for transfer and expression of cloned gene.
4. Apply the knowledge of genetic engineering in biological research.
5. Develop the skills to isolate DNA from plants and bacteria, plasmid DNA; Demonstrate the making and transforming competent cells.

Lesson Plan

| SR. No | Date | Course Content | |
|--------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| | | Theory (2) | Practical (2) |
| 1 | 22 July -25July 2025 | Cloning and amplification of DNA: Introduction, | ----- |
| 2 | 28 July - 2 August | Choice of the organism, use of restriction endonucleases for the production of DNA fragments. | ----- |
| 3 | 4 August -8 August | Vehicles for cloning - plasmids, phage vectors and cosmids. | Practical exposure to GST: Online GST registration demonstration; |
| 4 | 11 August - 14 August | RNA isolation, preparation and use of cDNAs. Application of recombinant DNA technology. | Payment of GST by electronic ledger: |
| 5 | 18 August - 23August | Isolation, sequencing and synthesis of genes: Isolation of genes, sequencing of genes, synthesis of genes | Electronic liability register, |
| 6 | 25 August -30 August | Cloning of specific eukaryotic genes and their expression in bacteria. | Electronic credit ledger, |
| 7 | 1 Sept. - 6 Sept. | Genes involved in regulation, regulatory gene, promoter gene, operator gene and structural genes. | Electronic cash ledger; |
| 8 | 8 Sept. - 13 Sept. | Gene transfer methods: Gene transfer methods for plants Agrobacterium mediated gene transfer, physical and chemical methods. | Types of GST returns, |
| 9 | 15 Sept. - 20 Sept. | Value of supply, exempt supplies, small supplies, zero rated supply; | Types of GST returns, |
| 10 | 22 Sept. - 27 Sept. | Composition levy scheme; hsn/sac classification; composite and mixed supplies; eco operators. | Annual return and reconciliation statement, |
| 11 | 29 Sept.- 4 Oct. | Input tax credit & tax invoice: Eligibility conditions, apportionment of credit, blocked credits; Revision & test. | Annual return and reconciliation statement, practice |
| 12 | 6 Oct.- 11 Oct. | Tax credit in respect of capital goods and in special circumstances, transfer of input credit (input service distribution); doctrine of unjust enrichment; | Practice |
| 13 | 13 Oct.- 18 Oct. | Reverse charge mechanism; job work tax invoice; | Filing a refund application, |
| 14 | 27 Oct. - 1 Nov. | Credit and debit notes; e- way bills. Revision. | Filing a refund application, practice |
| 15 | 3 Nov. - 8Nov | Miscellaneous and special provisions: GST returns – types of returns, monthly returns, annual returns and final return – due dates for filing of returns final assessment; | Practice |
| 16 | 10 Nov-15 Nov | Accounts and audit under GST. Revision & test. | Generating e-way bill |
| 17 | 17 Nov -22 Nov | Payment of tax; appeals, offences & penalties. | Generating e-way bill |
| 18 | 24 Nov. | Revision of payment of tax; appeals, offences & penalties. | Practice |

Signature of Teacher

Head of Department