

SRI VENKATESWARA UNIVERSITY:TIRUPATI

MINOR

Subject: Biotechnology

w.e.f AY 2024-25

Semester IV

Course Code:

Course: IV-1: r DNA Technology

Theory

Credits:3

3hrs

I. Learning outcomes:

Students after successful completion of the course will be able to

1. Understand radiolabelling and DNA sequencing
2. Know about various types of restriction Enzymes
3. Gain knowledge about vectors
4. Familiarize with principle and applications in analysis of recombinants
5. Know about expression systems

II. Syllabus:

UNIT -1: Characterization of Nucleic Acids

DNA and RNA: Quantification, Radiolabelling of nucleic acids, labelling by primer extension, DNA sequencing: Maxam-Gilbert (Chemical) and Sanger- Nicolson (Dideoxy/ enzymatic) sequencing method, Pyrosequencing.

UNIT-2: Restriction Enzymes

Types and uses of restriction endonuclease, Restriction mapping. DNA modifying enzymes Nucleases, Polymerases, Phosphatases and ligases.

UNIT-3: Vectors

Plasmid vectors, Bacteriophage, expression vectors, other vectors, Construction of genomic and c-DNA libraries, Joining of DNA Fragments to vectors, cohesive and blunt end Ligation, adaptors, and linkers.

UNIT- 4: Principle and applications in analysis of recombinants

Principle of hybridization. Northern blotting, Southern blotting and Western blotting. Polymerase chain reaction, selection and screening of recombinants, Restriction fragments length polymorphism, RAPD, AFLP, MAP.

UNIT – 5: Expression systems

Methods of Transformation, Codon optimization, host engineering. Strategies of genedelivery, *in vitro* translation, expression in bacteria, yeast, expression in insects and mammalian cells. Applications of r DNA Technology

Practical syllabus:IV-1: r DNA Technology

Practical

Credits:1

2hrs/week

III. Skill outcomes:

On successful completion of the practical course, student shall be able to

1. develop skill on primer designing
2. learn plasmid DNA Isolation from *E.coli*
3. learn restriction Digestion and analysis
4. learn the technique of competent cell preparation and bacterial transformation
5. learn to perform Agarose Gel Electrophoresis

IV. Practical syllabus:

1. Primer designing- A computer approach.
2. Plasmid DNA Isolation from *E.coli*
3. Restriction Digestion and analysis (web cutter).
4. Competent Cell preparation and bacterial transformation
5. DNA Ligation.
6. Bacterial transformation.
7. Agarose Gel Electrophoresis.
8. Quantifying DNA by zymogram (computer approach).
9. SDS – PAGE.

V. References:

1. Principles of Gene manipulation (1994) Old R.N. and Primrose S.B.
2. From Genes to Clones (1987) Winnaeker E.L.
3. Recombinant DNA (1992) Watson J.D., Witreowski J., Gilman M. and Zooller M.
4. An Introduction to Genetic Engineering: Nicholl, D.S.T.
5. Molecular Biotechnology (1996) Pasternak
6. The Biochemistry of Nucleic acid(1996)Adam et al
7. Genetic Engineering (1998)Janke k. swtlow
8. Molecular cloning: Sambrook et al.

SRI VENKATESWARA UNIVERSITY:TIRUPATI

MINOR

Subject: Biotechnology

w.e.f AY 2024-25

SEMESTER IV

Course Code:

Course: IV-2: PLANT & ANIMAL BIOTECHNOLOGY

Theory

Credits:3

3hrs

I. Learning outcomes:

Students after successful completion of the course will be able to

1. Understand concepts and applications of plant tissue culture
2. Learn about transgenic plants and molecular markers
3. Acquire knowledge regarding animal Tissue Culture Techniques
4. Apprehend the concepts and applications of IVF technology
5. Understand methods of transgenic Animal Production

II. Syllabus

UNIT -I: Basic aspects of Plant Tissue Culture

Introduction to plant tissue culture: Preparatory techniques - cleaning, sterilization, sterile handling tissue culture lab requirements. Totipotency, Media & Composition, Sterilization techniques, Establishment of cultures: Callus and suspension cultures. Organogenesis and plant regeneration. Somatic embryogenesis.

UNIT-II: Applications of Plant Tissue Culture

Haploid plants Production, Virus Free Plants Production, Micropropagation, Protoplast culture, Somatic hybridization, and, Plant Secondary Metabolites- production & importance. Germplasm preservation.

UNIT-3: Animal Tissue Culture Techniques

Animal cell culture: Culture media and types, Culture of mammalian cells, Primary culture, Secondary cultures, cell lines. Stem Cells: Types, Culture and Applications. Cell Viability and Toxicity tests, Cryopreservation, Gene Transfer Methods.

UNIT- 4: Assisted Reproductive Technology

Human Embryo Development, Overview of IVF: Artificial insemination, Ovum retrieval, ICSI, ZIFT, Embryo Transfer, GIFT, Surrogacy, Pre Implantation Genetic Diagnosis, Advantages and Limitations, Ethical issues.

UNIT – 5: Transgenic Animals & Gene Therapy

Methods of Transgenic Animal Production & Examples. Recombinant production of Insulin, Somatostatin & Vaccines. Gene Therapy and its types. Applications of Biotechnology in human and animal health care.

Practical syllabus:IV-2: PLANT & ANIMAL BIOTECHNOLOGY

Practical

Credits:1

2hrs/week

III. Skill outcomes:

On successful completion of the practical course, student shall be able to:

1. Perform Plant cell culture media preparation
2. Learn the skill to perform callus Culture, micropropagation
3. Prepare synthetic Seeds
4. Will do RAPD and RFLP analysis
5. Perform cell viability tests, cell Counting

IV. Practical syllabus:

1. MS Media preparation
2. Callus Culture
3. Micropropagation
4. Protoplast Isolation
5. Preparation of Synthetic Seeds
6. Animal cell culture Media preparation
7. Cell Viability tests
8. Cell Counting
9. Culture of Chick Embryo fibroblast

V. References:

1. Introduction to Plant tissue Culture. MK Razdan, 2003
2. Plant Tissue Culture, Kalyan Kumar De, 199 M7, New Central Book Agency
3. Biotechnology by U. Satyanarayana
4. Plant cell, Tissue and Organ Culture: Applied & Fundamental Aspects: YSP Bajaj, A. Reinhard: 2001
5. A Text book of Biotechnology by RC Dubey, 2003
6. Elements of Biotechnology by PK Gupta (1994)Rastogi Publications
7. Daniel et.al; Stem Cell Biology, 200; CSHL press, New York
8. M MRanga, Animal Biotechnology: Agrobios (India) 2006

