Course Objective
Helps the student to understand and apply this knowledge in research to study the molecular mechanism of DNA and RNA synthesis and Protein synthesis, mutation, r-DNA technology. To impart knowledge on moral issues, IPR and biosafety.

Course Outcome
At the end of the semester the students would have learnt about r-DNA technology, genomic library, PCR and other applications of genetic engineering also
• Engineering Ethics and Human Values.
• Moral and Social Values and Loyalty
• The rights of others

Unit I
**Basics of Recombinant DNA Technology:** Role of genes within cells, genetic elements that control gene expression, restriction and modifying enzymes, safety guidelines of recombinant DNA research. Restriction mapping, design of linkers and adaptors. Characteristics of plasmid and phage vectors, prokaryotic and eukaryotic expression vectors. Insect, Yeast and Mammalian vectors.

Unit II
**DNA Manipulation Techniques:** Inverse PCR, Nested PCR, Taqman assay, Molecular beacons, RACE PCR, RAPD, Site Directed Mutagenesis, methods of nucleic acid sequencing-Sanger’s method, (Kunkel’s Method). Diagnostic importance. Construction of cDNA and genomic libraries. Screening of libraries with DNA probes and with antisera

Unit III
**Applications of rDNA and Bioethics:** Cloning in plants, transgenic and knockout animals. Recombinant cytokines and antibodies, vaccines, gene-therapy, stem cell therapy. Invitro fertilization, embryo transfer technology.
What is bioethics? The legal and socioeconomic impacts of biotechnology-Public education of the process of biotechnology involved in generating new forms of life for informed decision-making - ethical concerns of biotechnology research and innovation

Unit IV
**IPR and PATENTS:** Intellectual property rights -TRIP- GATT- International conventions patents and methods of application of patents-Legal implications-Biodiversity and farmer rights. PATENTS: Objectives of the patent system - Basic principles and general requirements of patent law-biotechnological inventions and patent law-Legal development-Patentable subjects and protection in biotechnology-The patenting living organisms.

Unit V
**Biosafety:** Introduction; Historical Background; Introduction to Biological Safety Cabinets; Primary Containment for Biohazards; Biosafety Levels; Biosafety Levels of Specific Microorganisms; Recommended Biosafety Levels for Infectious Agents and Infected Animals; Biosafety guidelines - Government of India; Definition of GMOs & LMOs; Roles of Institutional
Biosafety Committee, RCGM, GEAC etc. for GMO applications in food and agriculture; Environmental release of GMOs; Risk Analysis; Risk Assessment; Risk management and communication; Overview of National Regulations and relevant International Agreements including Cartagena Protocol.

Text Books

Reference Books