

Semester IV [Core (CR)]

Course No: BT23401CR	Credits: 1
Course Title: Proposal writing	
Maximum Marks: 25 [25(SEE)]	

The students in consultation with their faculty advisor will prepare a synopsis of the project to be pursued. In the following months, the synopsis should include the rationale, objectives, proposed methodology and significance of the study. The students shall make an open presentation of the synopsis during the fourth week of the semester.

Semester IV [Core (CR)]

Course No: BT23402CR	Credits: 14
Course Title: Research Based Project	
Maximum Marks: 350 [280 (SEE)+ 70 (IA)]	

The project will be based upon research and actual bench work, carried under the guidance of faculty supervisor and in close collaboration with other research groups. The students are expected to put in at least six working hours daily for a maximum of six months. The students will participate in Journal club and Lab meetings of the research group. Project report will be submitted and will be evaluated at the end of 4th semester.

Part 1 of the project will be based upon introduction to the subject and a general review of the literature pertaining to the project. The students should be encouraged to write a review of the problem or on a related topic.

Part 2 of the project will be based on the actual experimental work, presentation and analysis of the data generated. The project report should consist of Abstract, Rationale, Review of literature, Methodology, Results and discussion, and bibliography. Two examiners will evaluate the project reports of the students. The examiners will be nominated by the Head of the department from the panel of examiners proposed by the Project advisor; one of them will be the advisor. The examiners should be either from the department or from allied

Semester IV [Core (CR)]

Course No: BT23403CR	Credits: 2
Course Title: Seminar and Journal Club	
Maximum Marks: 50 [40(SEE)+ 10 (IA)]	

Each student under the supervision of a faculty advisor will deliver a seminar on a topic related to his/her Project work. Two faculty members nominated by the Head of the department will evaluate the seminars. The journal club will consist of a research paper presentation to be assigned and evaluated by the Project advisor.

Semester IV [Core (CR)]

Course No: BT23404CR	Credits: 3
Course Title: Project presentation	
Maximum Marks: 75 [60(SEE)+ 15(IA)]	

The students should make an open presentation defending their project work. One external expert and two faculty members nominated by the Head of the department will evaluate the presentation. The presentation will be open to all the students, scholars and teachers of the department and other allied departments.

Semester IV [Core (CR)]

Course No: BT23405CR	Credits: 2
Course Title: Project viva	
Maximum Marks: 50 [40(SEE)+ 10 (IA)]	

One expert and all the faculty members of the department will conduct project viva.

Semester IV [Generic Elective (GE)]

Course No: BT23005GE	Credits: 2
Course Title: Basic Recombinant DNA Technology	
Maximum Marks: 50 [40(SEE)+ 10 (IA)]	

Course Objective:

Recombinant DNA Technology course aim is to provide general and basic information of recombinant DNA to the students so that they can apply it in their own respective subjects.

Unit I

Historical background of Recombinant DNA technology. Tools for making Recombinant DNA: Restriction enzymes: Nomenclature, types, properties. DNA ligases: Mechanism and types of DNA ligation. DNA phosphatases and their role in recombinant DNA technology. DNA Pol I and Klenow fragment and their role in recombinant DNA technology. Vectors: Plasmid: General features, copy Number and its regulation. Selection marker genes in plasmid vector. Bacteriophages : Lambda phage as vector. General features of Cosmids and Phagemids

Unit II

DNA cloning in Plasmid vectors. General features of expression plasmid vector. Expression in bacterial systems using Inducible promoter systems. Expression in yeast using Gal Inducible systems. Expression in mammalian cells. Mammalian expression vectors. Viral and cellular promoter used in expression vectors. Expression and purification of *GST* and *His* tagged fusion proteins.

Learning Outcome:

After successful completion of the course, the students are expected to gain knowledge in Recombinant DNA Technology concepts. The academic knowledge will orient them to take some skill-based entrepreneurship in biotech companies.

Books Recommended:

- 1) Analysis of Genes and Genomes by Richard J. Reece: Wiley.
- 2) Molecular Biotechnology - Principles and Applications of Recombinant DNA by Glick, Bernard R.; Pasternak, Jack J.; Patten, Cheryl L: ASM Press.
- 3) DNA recombinant Technology and molecular techniques by M U Hussain: Black Prints India INC

Semester IV [Open Elective (OE)]

Course No: BT23003 OE	Credits: 2
Course Title: Bioethics	
Maximum Marks: 50 [40(SEE)+ 10 (IA)]	

Course Objectives:

Course aim is to introduce students to Bioethics, its meaning, its philosophical foundations and bioethics principles. Imparting knowledge and skills that will enable students to develop ethical answers to these various issues especially related to research discoveries made in the field of biology. Identify the basic concepts of modern biology and explain how recent advancements in these areas have influenced current bioethical issues.

Unit I

Introduction to Bioethics. Ethics and Morality. Introduction to subject areas of Bioethics (Poverty, Birth control, ethics and religion, euthanasia, Environmental ethics). Bioethical Principles. Bioethics and boundaries of public and private. Bioethics and conflict of interest. Bioethics in Research.

Unit II

Ethical issues concerning Embryonic Stem cells and Cloning. Animal cloning. Controversies regarding Designer babies. Gene therapy. Ethical controversies on Organ Transplantation. Surrogacy. Ethical regulations on Surrogacy. Genetically modified crops. Political and ethical issues involved in GMO,s. Advantages and Disadvantages. Ethical Limits of Animal use. Animal experiments in light of Bioethics.

Learning Outcomes:

Students will be able to understand basics of bioethics, importance of this course, its relevance in research, publishing field and healthcare. Students will be able to understand the goal behind transgenic plants and animals, Ethical concerns and analysis. Students will understand various ethical issues pertaining to animal use in research, growth hormone usage, Surrogacy and cloning. Students will understand the tools and approaches needed to make a bioethical decision and to communicate that decision in rationally informed way.

Books Recommended:

- 1) Title: Bioethics, an introduction for the biosciences Author: Ben Mepham Publisher: Oxford University, UK Year: 2013 Edition: 2nd
- 2) Title: Bioethics: An Anthology (Blackwell Philosophy Anthologies) Paperback. Authors: Helga Kuhse, Udo Schüklenk and Peter Singer Publisher: John Wiley & Sons; Year: 2015 Edition: 3rd Revised edition
- 3) Title: The Biological Foundations of Bioethics Author: Tim Lewens Publisher: OUP, Oxford Year: 2015 Edition