Course Outcomes COs (2017) for P.G

Course Name: C101 Advanced Genetic Engineering

C101.1	To teach the students about recombinant DNA techniques basic principles and equipments.
C101.2	To educate the students about recombinant DNA so that they can undertake research /project work in Modern Biology.
C101.3	To demonstrate and give hands on training in gene cloning experiments an essential aspect for recombinant protein production
C101.4	To teach the students about modern techniques such as blotting, sequencing and PCR which are the important tool for medical analysis.
C101.5	To make the student to understand that it is important prerequisite for electives like genomics & proteomics, Immunotechnology and molecular biology.

Course Name: C102 Enzyme Technology and Fermentation Technology

C102.1	The knowledge on enzyme and enzyme reactions will be the key step in to proceed towards various concepts in biotechnology.
C102.2	The theoretical and practical aspects of kinetics will provide the importance and utility of enzyme kinetics towards research.
C102.3	The process of immobilization has been increased steadily in food, pharmaceutical and chemical industries and thus this study will provide simple and easy method of implementation.
C102.4	Ideas on Processing, Production and Purification of enzymes at an industrial scale will be helpful to work technologically.
C102.5	The course will develop understanding in the applications of enzymes – biotransformation processes.

Course Name: C103 Bioinformatics and Applications

C103.1	Students will understand the different terms used in Bioinformatics and basics in Bioinformatics.
C103.2	Students will have the ability to retrieve biological data from various databases for their research work.
C103.3	Students will be able to analyse gene and protein sequences using different tools.
C103.4	Students will be able to identify distances between various species using phylogenetic analysis.
C103.5	Students will understand the gene expression patterns using micro array and other computational techniques.

Course Name: C104 METABOLIC PROCESS AND ENGINEERING

C104.1	Students will be able to learn stoichiometry and energetics of metabolism
C104.2	Students will be able to use organisms to produce valuable substances on an industrial
C104.3	Students will have a quantitative basis, enzyme kinetics, for the understanding of metabolic
C104.4	Students will be able to apply practical applications of metabolic engineering in chemical, energy, medical and
C104.5	Students will understand to integrate modern biology with engineering process to meet desired needs

Course Name: C105 Analytical Techniques in Biotechnology

C105.1	Students will have a fundamental knowledge about the Light spectrum, Absoprtion, Fluorescence, NMR, Mass spectroscopy
C105.2	Students will be able to acquire knowledge on the different chromotographic methods

	for separation of biological products
C105.3	Students will Understand the methods to obtain pure proteins, enzymes and in general about product development R & D
C105.4	Students will have a better understanding of spectroscopy and the separation techniques used for biological products.
C105.5	Students will be able to Apply principles of various unit operations used in downstream processing and enhance problem solving techniques

Course Name: C106 Environmental Biotechnology

C106.1	Students understand the different unit operations involved in biodegradation and bioremediation
C106.2	Students gained the ability to design and solve Environmental Pollution or problems
C106.3	Students can aid in the improvement for the alternate sources of energy to avoid environmental disasters
C106.4	Students learned be able to select Scientific solutions and participation can be served for the environmental Protection
C106.5	Students understand the importance of bioproducts from renewable sources

Course Name: C107 Advanced Genetic Engineering Laboratory

C107.1	Students will be able To learn and understand the principles behind the qualitative and quantitative estimation of bio molecules and laboratory analysis of the same in the body fluids
C107.2	Students will be able To have a practical hands on experience on Absorption Spectroscopic methods and to validate spectrometric and microscopic techniques
C107.3	Students will be able To acquire experience in the purification by performing chromatography

Course Name: C108 Bioprocess and Downstream Processing Laboratory

C108.1	Students understand the different unit operations involved in bioseparation and understand the various methods of cell disruption.
C108.2	Students gained the ability to design filtration and centrifugation operation for separation of biomass
C108.3	Students learned to identify a suitable unit operation for isolation and concentration for the given bioproduct
C108.4	Students learned be able to select a suitable chromatographic operation for purification of given bioproduct
C108.5	Students understand the importance of final polishing of bioproducts and their methods

Course Name: C109 Bioprocess Engineering

C109.1	Students would have a fundamental knowledge about the various organs involving in immune response and the types of antigen invading the immune system.
C109.2	Students would have developed knowledge about development, maturation, activation and regulation of T cells and B cell and also about the production and application of producing monoclonal antibodies.
C109.3	Students would have gained knowledge about the mechanism by which the body interacts with a pathogenic microorganisms and about the basic criteria for designing a vaccine. Students would have gained knowledge about the basis of hypersensitivity diseases and immunodeficiency diseases.
C109.4	After completing this course, students get familiar about the laws of transplantation and have gained the knowledge in tumor immunology
C109.5	At the end of the course the student would acquire knowledge on different aspects of

	immunology and about the autoimmune disorders.

Course Name: C110 Bioreactor Design and Analysis

C110.1	Students would be able to To make the students aware of the overall industrial bioprocess so as to help them to manipulate the process to the requirement of the industrial needs.
C110.2	Students would be able To develop bioengineering skills for the production of biochemical product using integrated biochemical processes.
C110.3	Students would be able to provide the students with the basics of bioreactor engineering
C110.4	Students will be able to To develop bioengineering skills for the production of biochemical product using integrated biochemical processes.
C110.5	At the end of the course the student would acquire knowledge on the overall industrial bioprocess

Course Name: C111 Immunotechnology

C111.1	Students would have a fundamental knowledge about the various organs involving in immune response and the types of antigen invading the immune system.
C111.2	Students would have developed knowledge about development, maturation, activation and regulation of T ells and B cell and also about the production and application of producing monoclonal antibodies.
C111.3	Students would have gained knowledge about the mechanism by which the body interacts with a pathogenic microorganisms and about the basic criteria for
C111.4	After completing this course, students get familiar about the laws of transplantation and have gained the knowledge in tumor immunology
C111.5	At the end of the course the student would acquire knowledge on different aspects of immunology and about the autoimmune disorders.

Course Name: C112 Advanced Genomics and Proteomics

C112.1	Students will understand the gene cloning methods, tools and techniques involved in genome analysis and genomics.
C112.2	Students will be able to explain comparative genomics and proteomics
C112.3	To demonstrate and give hands on training in gene cloning experiments an essential aspect for recombinant protein production
C112.4	To teach the students about modern techniques such as blotting, sequencing and PCR which are the important tool for medical analysis.
C112.5	To make the student to understand that it is important prerequisite for electives like genomics & proteomics, Immuno technology and molecular biology.

Course Name: C113 Bio Nanotechnology

C113.1	Students would be able to learn about basis of nanomaterial science, preparation method, types and application
C113.2	Students would be able to be familiarized about the science of nanomaterials
C113.3	Students would be able to demonstrate the preparation of nanomaterials
C113.4	Students will have an awareness about the properties and broad applications of biomaterials
C113.5	Students would be able to understand the role of nanotechnology in biotechnology.

Course Name: C114 Biopharmaceuticals and Biosimilars

C114.1	Students would have a fundamental knowledge about the various phases and the regulatory aspects involved in the drug development.
C114.2	Students would have gained knowledge about mechanism of action of drug on a human body and how a body responds to a drug.
C114.3	Students would have developed knowledge about chemical reactions and

	processes involved in manufacturing a drug product.
C114.4	After completing this course, students get familiar about the preparation of various dosage forms of drug and its quality control.
C114.5	At the end of the course the student would acquire knowledge on different types of biopharmaceuticals.

Course Name: C115 Immunotechnology Laboratory

C115.1	The students will experience hands on training related to all immunotechniques used for medical analysis.
C115.2	To demonstrate the students about maintenance, handling of Laboratory animals, immunization and raising of antisera.
C115.3	To demonstrate and give hands on training in Elisa techniques, which is an important task for pathogenic analysis.
C115.4	To teach the students about blood grouping this is an important for blood transfusion.
C115.5	To teach and give hands on experience to understand the importance of identification of cells through staining, precipitation and immunoflouresence

Course Name: C201 Advanced Genetic Engineering Laboratory

C201.1	The students will experience hands on training related to all recombinant DNA techniques basic principles.
C201.2	To demonstrate the students about isolation, elution and handling of recombinant DNA and vectors.
C201.3	To demonstrate and give hands on training in gene cloning experiments an essential aspect for recombinant protein production
C201.4	To teach the students about blotting techniques which an important tool for medical analysis.
C201.5	To teach and give hands on experience to understand the importance of protein production & subsequent purification of protein

Course Name: C202 Bioprocess and Downstream Processing Laboratory

C202.1	Acquired knowledge for the separation of whole cells and other insoluble ingredients from the culture broth.
C202.2	Learned cell disruption techniques to release intracellular products
C202.3	Learned various techniques like evaporation, extraction, precipitation, membrane separation for concentrating biological products
C202.4	Learned the basic principles and techniques of chromatography to purify the biological products
C202.5	Learned the methods of formulation of biological products for end uses

Course Name: C203 Project work phase I

C203.1	Gives the basic theory and principle about the techniques used in the project.
C203.2	Students learn about the instrumental techniques adopted in their project work.
C203.3	Students will learn the basic start techniques and trouble shootouts in starting their projects.
C203.4	Students learn the interpretation details of the instrumental results obtained from the analysis
C203.5	Students would have learnt the idea how to go with a project work, time management in completing the project and result interpretation skills for thesis writing

Course Name: C204 Project work phase II

C204.1	Gives the basic theory and principle about the techniques used in the project.
C204.2	Students learn about the instrumental techniques adopted in their project work.
C204.3	Students will learn the basic start techniques and trouble shootouts in starting their projects.
C204.4	Students learn the interpretation details of the instrumental results obtained from the analysis
C204.5	Students would have learnt the idea how to go with a project work, time management in completing the project and result interpretation skills for thesis writing

CO-PO Mapping for P.G (Regulation 2017)

	POs										PSOs		
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**
C101.1	2	-	1	-	3	-	-	2	-	-	1	2	3
C101.2	2	3	1	-	2	-	-	-	-	-	1	2	3
C101.3	-	1	2	-	3	1	2	-	-	-	1	1	3
C101.4	1	1	-	-	1	2		-	-	-	1	3	2
C101.5	1	2	3	2	-	-	1	2	-	-	1	2	3
C102.1	1	1	1	2	2	-	-	-	-	-	2	2	3
C102.2	2	3	2	1	1	-	-	-	1	-	3	3	3
C102.3	2	3	3	3	2	2	1	-	-	-	3	3	3
C102.4	3	2	3	3	1	2	-	-	2	-	2	3	3
C102.5	2	2	2	2	2	1	-	-	-	-	2	2	3
C103.1	1	2	2	2	3	2	2	1	2	-	2	2	2
C103.2	2	2	3	2	3	2	2	2	2	-	2	2	3
C103.3	2	3	3	3	3	2	3	2	2	-	3	3	3
C103.4	2	3	3	3	3	2	2	2	2	-	3	3	3
C103.5	2	2	3	3	3	2	2	2	2	-	3	3	3
C105.1	1	2	-	1	-	-	-	-	-	-	2	2	1
C105.2	1	1	-	2	2	-	-	-	-	-	2	2	1
C105.3	2	1	-	2	2	-	-	-	-	-	2	2	1
C105.4	2	1	-	2	2	-	-	-	-	-	2	2	1
C105.5	2	1	-	2	2	-	-	-	-	-	2	-	1
C105.1	2	2	-	1	-	-	-	-	-	-	2	2	1
C105.2	2	1	-	2	2	-	-	-	-	-	2	2	1
C105.3	2	1	-	2	2	-	-	-	-	-	2	2	1
C105.4	2	1	-	2	2	-	-	-	-	-	2	2	1
C105.5	2	1	-	2	2	-	-	-	-	-	2	-	1
C106.1	1	1	2	1	-	2	3	-	-	-	3	1	1

	POs										PSOs		
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**
C106.2	1	-	1	-	1	-	2	-	-	1	1	3	-
C106.3	2	1	2	1	-	1	2	-	2	-	1	3	-
C106.4	-	1	-	1	-	1	2	1	-	1	2	3	-
C106.5	-	-	-	-	1	2	2	1	1	1	1	1	3
C107.1	2	2	-	1	-	-	-	-	-	-	2	2	1
C107.2	2	1	-	2	2	-	-	-	-	-	2	2	1
C107.3	2	1	-	2	2	-	-	-	-	-	2	2	1
C107.4	2	1	-	2	2	-	-	-	-	-	2	2	1
C107.5	2	1	-	2	2	-	-	-	-	-	2	-	1
C108.1	-	-	3	2	2	3	1	-	1	-	1	1	-
C108.2	1	1	2	1	2	3	1	-	-	-	-	2	-
C108.3	3	1	2	1	1	1	1	-	-	-	3	-	-
C108.4	1	3	3	3	3	1	1	-	-	-	-	-	2
C108.5	1	3	2	1	1	1	1	-	-	-	1	-	3
C109.1	2	-	1	-	3	-	-	2	-	-	1	2	3
C109.2	2	3	1	-	2	-	-	-	-	-	1	2	3
C109.3	-	1	2	-	3	1	2	-	-	-	1	1	3
C109.4	1	1	-	-	1	2	-	-	-	-	1	3	2
C109.5	1	2	3	2	-	-	1	2	-	-	1	2	3
C110.1	2		1	-	3	-	-	2	-	-	1	2	3
C110.2	2	3	1	-	2	-	-	-	-	-	1	2	3
C110.3		1	2	-	3	1	2	-	-	-	1	1	3
C110.4	1	1		-	1	2	-	-	-	-	1	3	2
C110.5	1	2	3	2	-	-	1	2	-	-	1	2	3
C111.1	1	2	-	-	-	-	-	-	-	-	2	1	-
C111.2	1	2	-	-	-	1	-	-	-	-	1	1	-
C111.3	-	-	-	2	1	2	-	-	-	-	1	2	3
C111.4	-	-	-	2	2	2	-	-	-	-	1	2	2

	POs										PSOs		
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**
C111.5	-	-	2	2	2	1	-	-	-	-	1	1	2
C112.1	2	-	1	-	3	-	-	2	-	-	1	2	3
C112.2	2	3	1	-	2	-	-	-	-	-	1	2	3
C112.3		1	2	-	3	1	2	-	-	-	1	1	3
C112.4	1	1	-	-	1	2	-	-	-	-	1	3	2
C112.5	1	2	3	2	-	-	1	2	-	-	1	2	3
C113.1	1	2	2	2	3	2	2	1	2	-	2	2	2
C113.2	2	2	3	2	3	2	2	2	2	-	2	2	3
C113.3	2	3	3	3	3	2	3	2	2	-	3	3	3
C113.4	2	3	3	3	3	2	2	2	2	-	3	3	3
C113.5	2	2	3	3	3	2	2	2	2	-	3	3	3
C114.1	1	-	-	-	-	2	-	-	-	-	2	-	-
C114.2	3	-	-	-	-	-	-	-	-	-	2	3	-
C114.3	2	-	-	-	-	-	-	2	-	-	1	-	1
C114.4	1	-	-	-	-	-	-	1	-	-	2	-	3
C114.5	-	-	2	-	-	-	-		-	-	2	2	1
C115.1	2	-	-	-	-	-	-	2	-	-	3	-	-
C115.2	-	-	-	-	1	-	2	3	-	-	-	1	-
C115.3	-	1	2	-	1	-	-	-	-	-	-	-	2
C115.4	1	1	-	-	1	2	-	-	-	-	-	1	-
C115.5	1	2	3	2	-	-	-	-	-	-	-	-	3
C116.1	2	-	1	-	3	-	-	2	-	-	-	2	3
C116.2	2	-	-	-	2	-	1	3	-	-	2	1	3
C116.3	-	1	2	-	3	1	2	-	-	-	1	1	3
C116.4	1	1	-	-	1	2	-	-	-	-	1	-	2
C116.5	1	2	3	2	-	-	-	-	-	-	1	-	3
C117.1	-	-	1	2	-	-	-	-	-	-	-	3	2
C117.2	-	-	2	2	-	-	-	-	-	-	-	3	2

	POs										PSOs		
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**	**PSO3**
C117.3	-	-	2	3	-	-	-	-	-	-	-	3	2
C117.4	-	-	1	2	2	-	-	-	-	-	-	3	2
C117.5	-	-	1	2	2	-	1	-	-	-	-	3	2
C118.1	1	-	-	-	-	2	-	-	-	-	2	-	-
C118.2	3	-	-	-	-	-	-	-	-	-	2	3	-
C118.3	2	-	-	-	-	-	-	2	-	-	1	-	1
C118.4	1	-	-	-	-	-	-	1	-	-	2	-	3
C118.5	-	-	2	-	-	-	-	-	-	-	2	2	1
C119.1	1	-	-	-	-	2	-	-	-	-	2	-	-
C119.2	3	-	-	-	-	-	-	-	-	-	2	3	-
C119.3	2	-	-	-	-	-	-	2	-	-	1	-	1
C119.4	1	-	-	-	-	-	-	1	-	-	2	-	3
C119.5	-	-	2	-	-	-	-	-	-	-	2	2	1