22BES407 – FLUID MECHANICS

COURSE OUTCOMES

On completion of the course, the students will be able to:

CO Code	Course Outcome	PO(s) Mapped
CO1	Understand stress–strain relationship in fluids and analyse fluid flow problems.	
CO2	Apply Bernoulli principle and measure pressure drop in flow systems.	PO1, PO2, PO5
CO3	Describe the function and performance of flow metering devices.	PO2, PO3, PO4
CO4	Determine minimum fluidization velocity in fluidized beds.	PO2, PO3, PO4
CO5	Present characteristics of particulate solids and principles of size reduction and screening, crushing and grinding equipment.	PO1, PO2

CO–PO–PSO MAPPING (COURSE ARTICULATION MATRIX)

COs \ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	–	–	–	–	–	–	–	–	–	–	–	–	–
CO2	3	2	–	–	2	–	–	–	–	–	–	2	1
CO3	–	2	2	2	–	–	–	–	–	–	–	2	2
CO4	–	2	2	2	–	–	–	–	–	–	–	2	2
CO5	2	2	–	–	–	–	–	–	–	–	–	1	2

22BPC409 – ENZYME ENGINNERING & TECHNOLOGY		
COURSE OUTCOMES **At the end of the course, the student will be able to:**		**PO's Mapped**
CO1	Explain the structure, classification, kinetics, and mechanisms of enzymes relevant to industrial biotechnology.	PO1,PO2
CO2	Analyze enzyme kinetics and inhibition data to evaluate enzyme performance in bioprocess applications.	PO1, PO2, PO4, PO5
CO3	Design and optimize enzyme immobilization techniques and reactor configurations for industrial use.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Apply enzyme engineering strategies for improving stability, specificity, and productivity of enzymes.	PO1, PO2, PO3, PO4, PO5, PO6, PO7
CO5	Assess industrial, environmental, ethical, and economic aspects of enzyme-based technologies and demonstrate professional communication and teamwork skills.	PO5, PO6, PO7, PO8, PO9, PO10, P11

CO PO MAPPING

COs\POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	–	–	–	–	–	–	–	–	–	–	–
CO2	2	3	–	2	1	–	–	–	–	–	–	2	1
CO3	2	2	3	2	2	1	–	–	–	–	–	2	1
CO4	2	2	3	3	2	1	1	–	–	–	–	3	1
CO5	–	–	–	–	1	3	2	2	3	3	3	3	2

22BPC410 –ANALYTICAL TECHNIQUES IN BIOTECHNOLOGY		
COURSE OUTCOMES **At the end of the course, the student will be able to:**		**PO's Mapped**
CO1	Describe the basic principles of measurement and calibration in analytical methods by highlighting accuracy, precision, and the process of calibration to ensure reliable and reproducible results.	-
CO2	Apply the working principles of spectroscopic instruments by describing how they interact with matter and how their components enable detection, quantification, and interpretation of spectroscopic data.	PO1, PO2, PO4, PO5
CO3	Analyze the separation of biomolecules such as nucleic acids and proteins by describing and applying the principles of electrophoresis and chromatography to analyze their physical and chemical properties.	PO1, PO2, PO4, PO5
CO4	Interpret the thermal behaviour of bio products and biosensor components by describing how temperature influences their stability, structure, function, and overall biosensor performance.	PO1, PO2, PO4, PO5
CO5	Develop a protocol to identify an analyte and determine its concentration using analytical instruments, ensuring accuracy, reliability, and reproducibility of the measurements.	PO1, PO2, PO4, PO5 PO6

SAMPLE - CO PO MAPPING

COs\POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	1	1
CO2	2	1	-	1	2	-	-	-	-	-	-	1	-
CO3	2	1	-	1	2	-	-	-	-	-	-	-	-
CO4	1	1	-	1	2	-	-	-	-	-	-	1	-
CO5	1	-	-	2	2	1	-	-	-	-	-	1	1

22BPC407 – MOLECULAR BIOLOGY		
COURSE OUTCOMES **At the end of the course, the student will be able to:**		**PO's Mapped**
CO1	**Recall** the fundamental structural components of nucleic acids and the basic organization of eukaryotic chromosomes.	--
CO2	**Understand** the principles of enzymology and the mechanisms governing DNA replication in prokaryotic and eukaryotic systems.	PO1
CO3	**Illustrate** the process of transcription, including the role of promoters, enhancers, and RNA editing mechanisms.	PO2
CO4	**Utilize** the genetic code to describe protein synthesis, post-translational modifications, and protein targeting pathways.	PO1, PO3
CO5	**Examine** the regulatory mechanisms of gene expression, specifically the Lac and Trp operon models.	PO4, PO5
CO6	**Relate** the impacts of DNA mutations and repair mechanisms to sustainable biotechnological development and biosafety.	PO6, PO11

CO PO MAPPING

COs\POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	–	–	–	–	–	–	–	–	–	–	–	3	1
CO2	3	–	–	–	–	–	–	–	–	–	–	3	2
CO3	–	3	–	–	–	–	–	–	–	–	–	3	1
CO4	2	–	3	–	–	–	–	–	–	–	–	2	2
CO5	–	–	–	3	3	–	–	–	–	–	–	2	2
CO6	–	–	–	–	–	2	–	–	–	–	2	3	3

22BES611 – CHEMICAL REACTION ENGINEERING

Course Outcomes (COs)
After successful completion of the course, the student will be able to:

COURSE OUTCOMES WITH PO(s) MAPPED

CO Code	Course Outcome Statement	PO(s) Mapped
CO1	Explain the fundamentals of chemical reaction kinetics, classification of reactions, rate expressions, and temperature dependence of reaction rates.	—
CO2	Apply differential and integral methods to analyze reaction rate data in batch and flow reactor systems.	PO1, PO2, PO5
CO3	Design ideal chemical reactors (Batch, CSTR, PFR) for single and multiple reactions under steady-state conditions.	PO2, PO3, PO5
CO4	Analyze non-ideal flow behavior using residence time distribution (RTD) concepts and reactor models.	PO2, PO3, PO4
CO5	Evaluate heterogeneous reaction systems including fluid–solid reactions and catalytic reaction kinetics.	PO2, PO3, PO4, PO5
CO6	Demonstrate engineering problem-solving ability, teamwork, and lifelong learning skills in reaction engineering applications.	PO6, PO7, PO8, PO9, PO10, PO11

CO–PO & PSO Mapping Table

COs \ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	–	–	–	–	–	–	–	–	–	–	–	–	–
CO2	3	2	–	–	2	–	–	–	–	–	–	3	1
CO3	2	3	3	–	2	–	–	–	–	–	–	3	2
CO4	–	3	2	3	–	–	–	–	–	–	–	2	3
CO5	–	2	3	3	2	–	–	–	–	–	–	3	2
CO6	–	–	–	–	–	2	2	2	2	–	–	3	2

22BPC617 – IMMUNOLOGY		
COURSE OUTCOMES **At the end of the course, the student will be able to:**		**PO's Mapped**
CO1	Explain the general concepts of immune response and describe the cells and organs of the immune system	PO1, PO2
CO2	Apply the properties of antigens and different classes of antibodies, demonstrate various antigen-antibody interactions	PO1, PO2, PO4
CO3	Analyse the concept of cell and antibody mediated immunity and outline the mechanism of complement system	PO1, PO2, PO4, PO6
CO4	Develop mechanisms of hypersensitivity and molecular pathways involved in disease pathogenesis.	PO1, PO2, PO3,PO4, PO6,PO7
CO5	Interpret the concepts of transplantation immunology, autoimmunity, and immunodeficiency.	PO1, PO2, PO3,PO4, PO5 PO6
CO6	Evaluate the societal implications of immunological processes for clearing the pathogen in the host system.	PO1, PO2, PO3,PO4, PO5 PO6

COs\POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	1	-	-	-	-	-	-	-	-	-	2	1
CO2	3	2	-	3	-	-	-	-	-	-	-	3	1
CO3	1	3	-	2	-	1	-	-	-	-	-	3	2
CO4	3	2	3	2	-	1	1	-	-	-	-	3	1
CO5	3	2	3	2	1	2	-	-	-	-	-	3	2
CO6	2	2	2	2	2	3	-	-	-	-	-	2	2

22BPE$03 – MOLECULAR PATHOGENESIS		
COURSE OUTCOMES **At the end of the course, the student will be able to:**		**PO's Mapped**
CO1	**Explain** the molecular basis of host–pathogen interactions, virulence factors, and mechanisms of infection.	----
CO2	**Describe** molecular mechanisms of microbial pathogenicity, including adhesion, invasion, immune evasion, and toxin production.	PO1, PO2, P05, P11
CO3	**Analyze** host defense mechanisms and pathogen strategies using molecular and cellular principles.	PO1, PO2, PO3, PO4, PO5, PO6, P11
CO4	**Apply** molecular pathogenesis concepts to understand disease progression, diagnosis, and therapeutic targets.	PO1, PO2, PO3, PO4, PO5, PO6, P11
CO5	**Interpret** experimental data and research findings related to molecular pathogenesis using analytical and bioinformatics tools.	PO1, PO2, PO4, PO5, PO8, P11
CO6	**Evaluate** ethical, biosafety, regulatory, and societal aspects of infectious diseases and pathogen research.	PO1, PO3, PO6, PO7, PO8, PO9, PO10, P11

CO PO MAPPING

COs\POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	–	–	–	–	–	–	–	–	–	–	1	–	–
CO2	3	3	–	–	1	–	–	–	–	–	1	3	1
CO3	2	3	2	1	2	1	–	–	–	–	1	3	1
CO4	2	2	2	1	1	2	–	–	–	–	2	3	1
CO5	1	2	–	2	3	–	–	1	–	–	1	3	2
CO6	1	–	1	–	–	3	3	1	1	1	2	3	1

22BPC619 – BIOINFORMATICS

COURSE OUTCOMES

At the end of the course, the student will be able to:

CO	Course Outcome	PO's Mapped
CO1	Explain the fundamentals of UNIX operating systems and Perl programming for handling and processing biological data.	PO1, PO2
CO2	Apply concepts of biological databases, data formats, and retrieval tools for analysis of biological information.	PO1, PO2, PO4
CO3	Analyze biological sequences using pairwise and multiple sequence alignment, pattern matching, and machine learning techniques.	PO1, PO2, PO4, PO6
CO4	Apply phylogenetic analysis methods to infer evolutionary relationships among biological sequences.	PO1, PO2, PO4
CO5	Explain and apply structure prediction, homology modeling, and drug design concepts using bioinformatics tools.	PO1, PO2, PO4, PO5, PO6, PO7
CO6	Apply modern bioinformatics tools to solve real-world biological problems and effectively communicate results.	PO1, PO2, PO4, PO5, PO10

CO–PO MAPPING

COs \ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	–	–	2	–	–	–	–	1	–	3	2
CO2	3	3	–	2	2	–	–	–	–	1	–	3	2
CO3	3	3	–	2	3	–	–	–	–	1	–	3	2
CO4	2	3	–	3	2	–	–	–	–	1	–	3	2
CO5	3	3	2	2	3	1	1	–	–	1	–	3	2
CO6	3	2	–	2	3	–	–	–	1	2	–	3	2

22BPE$25 – CLINICAL TRIALS AND HEALTH CARE POLICIES IN BIOTECHNOLOGY		
COURSE OUTCOMES **At the end of the course, the student will be able to:**		**PO's Mapped**
CO1	**Explain** the fundamentals of clinical trials, biostatistics, clinical trial practices, ethical principles, and international guidelines governing clinical research.	-------
CO2	**Illustrate** the principles of drug development, trial planning, and regulatory requirements to design clinical trial protocols.	PO1, PO2, PO3, PO5
CO3	**Apply** the regulatory frameworks, investigator responsibilities, and clinical trial data to ensure compliance with national and international regulations.	PO2, PO4, PO5
CO4	**Analyze** the informed consent documents, data protection strategies, trial master files, and essential clinical trial documentation in accordance with legal and ethical guidelines.	PO3, PO6, PO7
CO5	**Investigate** and evaluate quality assurance systems, monitoring, audits, inspections, pharmacovigilance, and governance practices in clinical trials.	PO4, PO5, PO7, PO8
CO6	**Evaluate** ethical, societal, legal, and healthcare policy impacts of clinical trials and demonstrate effective communication, teamwork, project management, and lifelong learning skills.	PO6, PO7, PO8, PO9, P10, P11

CO-PO mapping

COs\POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	–	–	–	–	–	–	–	–	–	–	–	–	–
CO2	3	3	2	–	2	–	–	–	–	–	–	3	1
CO3	–	3	–	3	3	–	–	–	–	–	–	3	2
CO4	–	–	3	–	–	2	2	–	–	–	–	3	2
CO5	–	–	–	3	3	–	2	2	–	–	–	2	3
CO6	–	–	–	–	–	2	2	2	2	2	3	2	3

22BPE$11- PLANT BIOTECHNOLOGY		
COURSE OUTCOMES: Upon completion of the course, the students will be able to:		**PO's mapped to**
CO1	Explain the significance and principles of various plant breeding techniques used for crop improvement, basic environmental and nutritional requirements for establishing plant tissue culture	-
CO2	Apply the fundamental concepts of biotechnology and genetic engineering tools in plant systems.	PO1,PO2,PO3, PO5
CO3	Analyze the role of plant cell and tissue culture techniques in crop improvement and germplasm conservation.	PO1,PO2,PO3, PO5
CO4	Demonstrate plant–pathogen interactions and evaluate biotechnological approaches for developing disease resistance plants.	PO1,PO2,PO4, PO5
CO5	Create transgenic plants, herbicide-resistant, and pest-resistant crops which express the useful plant traits, helpful for the society	PO1,PO2,PO3, PO5,PO6,PO7

COURSE ARTICULATION MATRIX

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	-	-	-	-	-	-	3	1
CO2	3	2	2	-	2	-	-	-	-	-	-	3	1
CO3	3	2	-	2	2	-	-	-	-	-	-	3	1
CO4	3	2	-	2	2	1	1	-	-	-	-	3	1
CO5	3	2	2	-	2	1	1	-	-	-	-	3	2
22BPE$11	3	2	2	2	2	1	1	-	-	-	-	3	1
1 – Slight, 2 – Moderate, 3 – Substantial													

22BPE636 - ENVIRONMENTAL BIOTECHNOLOGY		
COURSE OUTCOMES **At the end of the course, the student will be able to:**		**PO's Mapped**
CO1	**Recognize** and list the various microorganism in soil ecosystem and its roles in ecosystem management, bioremediation of wastes produced by various sectors. It will also enable the students to define the properties of effluents and wastes generated by various industries.	--
CO2	**Explain** the impacts of xenobiotic compounds on the environment and their degradation pathway by soil microbes and its utilization in solving environment related problems.	PO1, PO2
CO3	**Apply** the knowledge of biological entities and develop solutions and prototypes to address the environmental issues.	PO2, PO3, PO4
CO4	**Evaluate** the current technologies employed in the treatment of waste and propose novel solutions based on its limitations.	PO5, PO6
CO5	**Build** a safer and sustainable environment to a better future and assist the government in framing the policies, making laws and being a responsible citizen.	PO6, PO7. PO8

CO PO MAPPING

COs\POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	2	1
CO2	2	3	-	-	-	-	-	-	-	-	-	-	-
CO3	-	1	3	3	-	-	-	-	-	-	-	-	1
CO4	-	-	-	-	3	2	-	-	-	-	-	-	1
CO5	-	-	-	-	-	3	3	3	-	-	-	3	1