

PRIYADARSHINI COLLEGE OF ENGINEERING, NAGPUR
DEPARTMENT OF BIOTECHNOLOGY

B.Tech. in Biotechnology COs Year 2022-23

Fifth Semester

Academic Year: **Fifth** semester

Course : B.Tech Biotechnology

Subject code: (BT-HS-501T) **Entrepreneurship and Startups**

Sr. no	COs	Course outcomes : At the end of the course the student will be able to
1	CO1	Acquire know-how on entrepreneurship development.
2	CO2	Get the knowledge of various types of startups.
3	CO3	Interpret the concept of ideation.
4	CO4	Know the funding for startups.

Academic Year: **Fifth** semester

Course : B.Tech Biotechnology

Subject code: (BT-PC-502 T) **Immunology & Immunotechnology**

Sr. no	COs	Course outcomes : At the end of the course the student will be able to
1	CO1	Distinguish between innate and acquired Immunity. Recognizes significance of foreign,self and nonself, explain structure of antigen ,antibodies and molecular basis of immune response.
2	CO2	Explain cell mediated and antibody-mediated immunity and role of complement proteins in defense mechanism.
3	CO3	Apply different serological techniques such as agglutination, precipitation, immunoelectrophoresis RIA, ELISA routinely used in clinical analysis and diagnosis.
4	CO4	Classify vaccines and illustrate the techniques of design of different vaccines, monoclonal antibody productions and their applications in research.
5	CO5	Explain and distinguish types of hypersensitivity reactions, Immune tolerance and mechanism of graft rejection including tumor immunology.

Academic Year: **Fifth** semester

Course : B.Tech Biotechnology

Subject code: **(BT-PC-503T) Genetic Engineering and rDNA Technology**

Sr. no	COs	Course outcomes : At the end of the course the student will be able to
1	CO1	Summarize the uses of modification enzymes. Explain the different DNA fingerprinting techniques and its application in Marker assisted selection.
2	CO2	Summarize the r-DNA technology.
3	CO3	Analyze various concepts and methods for gene cloning.
4	CO4	Identify problems associated with Protein Engineering and protein purification.
5	CO5	Construct GMOs and apply it for problem solving.

Academic Year: **Fifth** semester

Course : B.Tech Biotechnology

Subject code: **(BT-PC-504 T) Fluid Mechanics and Solid Handling**

Sr. no	COs	Course outcomes : At the end of the course the student will be able to
1	CO1	Extend the knowledge of fundamental concepts of fluid and fluid flow, and distinguish the types of flows.
2	CO2	Relate and apply the flow measurement devices by their operation and applications.
3	CO3	Apply principles of fluid mechanics to the operation, and selection of fluid machinery such as pumps.
4	CO4	Review the practical importance and relevance of unit operations used for crushing, grinding and size separation.
5	CO5	Discuss filtration theory, equipment for filtration, operation etc. and to analyze mixing processes.

Academic Year: **Fifth** semester

Course : B.Tech Biotechnology

Subject code: **(BT-PE-505 Ti) Professional Elective-I: Big Data Analytics**

Sr.no		Course outcomes : At the end of the course the student will be able to
1	CO1	Predicy, identify big data and its business implications.
2	CO2	Analyze scalability and performance of Hadoop system.
3	CO3	Apply MapReduce programming model to access and process data on distributed file systems.
4	CO4	Summarize the capability of HDFS(Hadoop Distributed file system).
5	CO5	Manage Job execution in the Hadoop environment and develop big data solutions by applying Hadoop Eco system Components.

Academic Year: **Fifth** semester

Course : B.Tech Biotechnology

Subject code: (BT-PE-505 Tii) **Professional Elective-I: Advanced Bioprocess Control**

Sr.no		Course outcomes : At the end of the course the student will be able to
1	CO1	Explain the order of control systems as a means of conveniently representing process control systems.
2	CO2	Apply knowledge of control systems for biological processes and able to develop the block diagram.
3	CO3	Apply the Concept of stability for linear systems.
4	CO4	Demonstrate the knowledge of frequency analysis for control system.
5	CO5	Illustrate applications of various measuring instruments in biochemical industries.

Academic Year: **Fifth** semester

Course : B.Tech Biotechnology

Subject code: (BT-PE-505 Tiii) **Professional Elective-I: Biosimilars Technology**

Sr. no	COs	Course outcomes : At the end of the course the student will be able to
1	CO1	Demonstrate appropriate depth and breadth of knowledge in Biologics.
2	CO2	Describe principles of the formulation of biological products and requirements for FDA approval of biologics.
3	CO3	Explain the concept and characteristics of biologics, biosimilars, and bioequivalence.
4	CO4	Recognize the process and approaches for evaluation of biologics safety components.
5	CO5	Apply knowledge to identify problems and justify solutions in case study with biologics.

Academic Year: **Fifth** semester

Course : B.Tech Biotechnology

Subject code: **(BT-OS-506i T) Open Subject-I: 3D Printing & Design**

Sr.no		Course outcomes : At the end of the course the student will be able to
1	CO1	Develop CAD models for 3D printing.
2	CO2	Import and Export CAD data and generate .stl file.
3	CO3	Select a specific material for the given application.
4	CO4	Select a 3D printing process for an application.
5	CO5	Produce a product using 3D Printing or Additive Manufacturing (AM).

Academic Year: **Fifth** semester

Course : B.Tech Biotechnology

Subject code: **(BT-OS-506ii T) Open Subject-I: Internet of Things**

Sr.no		Course outcomes : At the end of the course the student will be able to
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1	CO1	Identify the Internet of Things.
2	CO2	Explain the hardware and software components.
3	CO3	Interface I/O devices, sensors & communication modules.
4	CO4	Remotely monitor data and control devices.
5	CO5	Develop real life IoT based projects.

Academic Year: **Fifth** semester

Course : B.Tech Biotechnology

Subject code: **(BT-OS-506iii T) Open Subject-I: Cheminformatics & Medicinal Chemistry**

Sr.no		Course outcomes : At the end of the course the student will be able to
1	CO1	Discuss the concept and characteristics of chemical components to design drug molecules.
2	CO2	Knowing how to use chemical databases for silico based drug design.
3	CO3	Describe the structure of molecules to predict physicochemical features and action of molecules.
4	CO4	Apply knowledge to design molecule which are relevant to the process of drug discovery.
5	CO5	Recognize the process and approaches for chemical data based information and evaluate to predict biological activity of compounds.

Academic Year: **Fifth** semester

Course : B.Tech Biotechnology

Subject code: **(BT-OS-506ivT) Open Subject-I: Biomaterials**

Sr. no	COs	Course outcomes : At the end of the course the student will be able to
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1	CO1	Distinguish and classify types of Biomaterials.
2	CO2	Identify significant challenges in the development of metallic and ceramic materials.
3	CO3	Identify significant challenges in the development of polymeric materials.
4	CO4	Design various combinations of materials that could be used as a tissue replacement implant.
5	CO5	Analyzed the testing procedures for biomaterials.

Academic Year: **Fifth** semester

Course : B.Tech Biotechnology

Subject code: (BT-OS-506vT) **Open Subject-I: Green Economy and Sustainability**

Sr.no		Course outcomes : At the end of the course the student will be able to
1	CO1	Explain the concept of a green economy as well as sustainable development from the perspective of economy.
2	CO2	Learn sector specific approach towards green economy.
3	CO3	Illustrates the roles of different stakeholders for sustainable development (policy makers, enterprises, consumers, etc.) and relevant planning processes in support of a green transformation.
4	CO4	Identify the range of international, national and regional green initiatives and support services to foster green development.
5	CO5	Apply the concept of green economy indicators to a real and practical world and learn new flagship programs.

Academic Year: **Fifth** semester

Course : B.Tech Biotechnology

Subject code: (BT-AU-507 T) **Indian Constitution**

Sr.no		Course outcomes : At the end of the course the student will be able to
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1	CO1	Become aware of Indian culture and civilization and their role in the development of society.
2	CO2	Discuss Industrial work-culture.
3	CO3	Sensitized towards professional ethics.
4	CO4	Summarize the Indian Constitution and governance of the country.
5	CO5	Relate the structure and system of work organizations.

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B.Tech. in Biotechnology Subjectwise COs Year 2021-22

Sixth Semester

Academic Year: **Sixth** semester

Course : B.Tech Biotechnology

Subject code: **(BT-PC- 601 T) Bioseparation Engineering**

Sr. no	COs	Course outcomes : At the end of the course the student will be able to
1	CO1	Express the significance of downstream processing in a bioproduct separation.
2	CO2	Apply the knowledge of unit operations for the separation intracellular biomolecules.
3	CO3	Illustrate various process of extraction of bioproduct from the fermentation broth.
4	CO4	Summarise purification techniques for separation of biomolecules.
5	CO5	Demonstrate the finishing process in the bioprocess industry.

Academic Year: **Sixth** semester

Course : B.Tech Biotechnology

Subject code: **(BT-PC-602 T) Mass Transfer in Biotechnology**

Sr. no	COs	Course outcomes : At the end of the course the student will be able to
1	CO1	Describe practical applications of diffusive mass transfer processes in biochemical engineering.
2	CO2	Evaluate the vapor liquid equilibrium and various techniques of distillation.

3	CO3	Analyze the gas absorption operation.
4	CO4	Explain the equilibrium and design of Liquid- Liquid Extraction processes.
5	CO5	Apply the knowledge of drying and crystallization process for biological materials.

Academic Year: **Sixth** semester

Course : B.Tech Biotechnology

Subject code: **(BT-PC-603 T) Bioprocess Engineering**

Sr. no	COs	Course outcomes : At the end of the course the student will be able to
1	CO1	Acquire fundamental knowledge and analyze microbial growth.
2	CO2	Analyze and evaluate the kinetics of Enzyme reaction.
3	CO3	Illustrate various methods of enzyme immobilization.
4	CO4	Analyze enzyme inhibition reaction kinetics.
5	CO5	Apply the knowledge of cell and enzyme kinetics for bioreactor design.

Academic Year: **Sixth** semester

Course : B.Tech Biotechnology

Subject code: **(BT-PC-604 T) Plant Tissue culture Technology**

Sr. no	COs	Course outcomes : At the end of the course the student will be able to
1	CO1	Summarize the concept and principle of plant tissue culture.

2	CO2	Demonstrate various tissue culture techniques and its applications.
3	CO3	Apply the knowledge of somatic hybridization and in vitro production of secondary metabolites.
4	CO4	Illustrate the techniques of development of transgenic plant.
5	CO5	Evaluate and interpret transgenic plant for its applications.

Academic Year: **Sixth** semester

Course : B.Tech Biotechnology

Subject code: (**BT-PE-605i T**) **Professional Elective-II: Machine Learning**

Sr.no		Course outcomes : At the end of the course the student will be able to
1	CO1	Acquire fundamental knowledge of machine learning theory.
2	CO2	Evaluate data pre-processing and dimensionality reduction technique for given data.
3	CO3	Apply supervised machine learning techniques such as classification and regression for problem solving and evaluate the designed technique using performance measures.
4	CO4	Solve the problems using various unsupervised machine learning techniques such as clustering.
5	CO5	Apply the artificial neural network technique to solve the problem.

Academic Year: **Sixth** semester

Course : B.Tech Biotechnology

Subject code: (**BT-PE-605ii T**) **Professional Elective-II: Waste Management**

Sr. no	COs	Course outcomes : At the end of the course the student will be able to

1	CO1	Explain; classify waste and its management.
2	CO2	Illustrate the fundamentals of various waste treatment technologies and its applications.
3	CO3	Evaluate the impact of land filling and recycling on health and environment.
4	CO4	Demonstrate decision support tools for sustainable waste management.
5	CO5	Apply the knowledge waste upcycling and and downcycling technologies for sustainable waste management.

Academic Year: **Sixth** semester

Course : B.Tech Biotechnology

Subject code: **(BT-PE-605iii T) Professional Elective-II: Stem-Cell Technology**

Sr. no	COs	Course outcomes : At the end of the course the student will be able to
1	CO1	Summarized the basic properties of stem cells.
2	CO2	Categorize the different stem cells as per their sources and their methods of preservation.
3	CO3	Demonstrate techniques for identification of human stem cells.
4	CO4	Illustrate the various medical applications of stem cells technology.
5	CO5	Relate and report the various ethical issues of stem cells.

Academic Year: **Sixth** semester

Course : B.Tech Biotechnology

Subject code: **(BT-OS-606i T) Open Subject-II: Artificial Intelligence**

Sr.no		Course outcomes : At the end of the course the student will be able to
1	CO1	Build intelligent agents for search and games.

2	CO2	Solve AI problems through programming with Python.
3	CO3	Learning optimization and inference algorithms for model learning.
4	CO4	Design and develop programs for an agent to learn and act in a structured environment.
5	CO5	Perform Reinforcement Learning.

Academic Year: **Sixth** semester

Course : B.Tech Biotechnology

Subject code: (**BT-OS-606ii T**) **Open Subject-II: Synthetic & Systems Biology**

Sr.no		Course outcomes : At the end of the course the student will be able to
1	CO1	The students will learn the concept of synthetic biology and its widespread applications in research and industry.
2	CO2	They will be able to assemble DNA and genes into biological circuits to make a biosensor or even engineer organisms.
3	CO3	The students will also appreciate that biological systems are highly dynamic and not static and can be manipulated by various design strategies.
4	CO4	The students will facilitate the commercial approach and application of bioindustries.
5	CO5	The student will analyze bioethics and application of synthetic biology.

Academic Year: **Sixth** semester

Course : B.Tech Biotechnology

Subject code: (**BT-OS-606iii T**) **Open Subject-II: Good Manufacturing and Laboratory Practice**

Sr.no		Course outcomes : At the end of the course the student will be able to
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1	CO1	Apply knowledge and ethics for Good manufacturing and laboratory practices.
2	CO2	Associate the quality of biotech product design and formulation.
3	CO3	Describe an essential tool to ensure products and processes satisfy quality by design requirements, imposed by regulatory agencies.
4	CO4	Recognize the process of drug regulatory agencies to get the approval of products.
5	CO5	Evaluate the regulations for drug development.

Academic Year: **Sixth** semester

Course : B.Tech Biotechnology

Subject code: (BT-OS-606iv T) **Open Subject-II: Heat Transfer in Biotechnology**

Sr.no		Course outcomes : At the end of the course the student will be able to
1	CO1	Explain the basics and modes of heat transfer in steady state and unsteady state for thermal analysis of engineering system
2	CO2	Evaluate heat transfer coefficient for free and forced convection, condensation and boiling phenomenon.
3	CO3	Evaluate heat transfer coefficient for radiation.
4	CO4	Discuss the heat transfer during phase change.
5	CO5	Design and analysis heat exchangers performance in various types of heat exchanger equipment.

Academic Year: **Sixth** semester

Course : B.Tech Biotechnology

Subject code: (BT-OS-606v T) **Open Subject-II: Environment and Sustainability**

Sr. no	COs	Course outcomes : At the end of the course the student will be able to

1	CO1	Explain basic concept of sustainability.
2	CO2	Illustrate renewable and non-renewable energy sources.
3	CO3	Summarize environmental impact on climate change.
4	CO4	Relate the impact of major challenges of automobile transport and its effect on global warming.
5	CO5	Demonstrate the policies for sustainable community.

Academic Year: **Sixth** semester

Course : B.Tech Biotechnology

Subject code: **(BT-AU-607 T) Sports and Yoga**

Sr. no	COs	Course outcomes : At the end of the course the student will be able to
1	CO1	Practice Physical activities and Hatha Yoga focusing on yoga for strength, flexibility, and relaxation.
2	CO2	Assess current personal fitness levels.
3	CO3	Identify opportunities for participation in yoga and sports activities.
4	CO4	Improve personal fitness through participation in sports and yogic activities.
5	CO5	Identify and apply injury prevention principles related to yoga and physical fitness activities.