Programme	BS Biotechnology	Course Code	BT. 405	Credit Hours	3
Course Title	AI in Biotechnology				

Course Introduction

This course provides an introduction to the application of Artificial Intelligence (AI) in Biotechnology, designed for undergraduate students majoring in Biochemistry and Biotechnology. The curriculum covers fundamental AI techniques and their applications in biotechnology, including machine learning, neural networks, and data mining. Students will learn about AI tools and software, and how to apply these techniques to solve problems in biotechnology research and development.

Learning Outcomes

On the completion of the course, the students will:
- Explain the fundamental concepts of artificial intelligence and its applications in biotechnology.
- Identify the role of artificial intelligence in various biotechnological processes and research.
- Demonstrate an understanding of the ethical considerations related to artificial intelligence in biotechnology.

Course Content

- Introduction, overview, History and Applications
- AI in Biotechnology, Importance and Applications, Case Studies
- Machine Learning Basics, Supervised Learning, Unsupervised Learning
- Neural Networks, Basics of Neural Networks, Introduction to Deep Learning
- Data Preprocessing, Data Cleaning, Data Transformation
- Feature Selection, Techniques for Feature Selection, Introduction to Dimensionality Reduction
- Classification Algorithms, Decision Trees, Support Vector Machines
- Regression Algorithms, Linear Regression, Logistic Regression
- Clustering Algorithms, Kmeans Clustering, Hierarchical Clustering
- AI Tools and Software, Introduction to Python, Libraries for AI
- AI Software for Biotechnology,
- Introduction to TensorFlow,
- Basics of Keras
- Genomics and AI, AI in Genome Sequencing, Basic Genomic Data Analysis
- Data Mining in Biotechnology, Basic Techniques
- Introduction to Big Data, Big Data in Biotechnology, Basic Data Analysis
- AI in Drug Discovery, Basics of Target Identification, Introduction to Virtual Screening
- AI in Personalized Medicine, Basics of Precision Medicine, AI Applications
- Proteomics and AI, AI in Protein Structure Prediction, Protein Protein Interactions
- Clinical Applications of AI, AI in Disease Diagnosis, Predictive Modeling
- AI in Medical Imaging, Basics of Image Analysis, Case Studies
- AI in Agricultural Biotechnology, AI in Crop Genomics, Pest Resistance
- AI in Environmental Biotechnology, AI in Bioremediation, Case Studies

• AI in Industrial Biotechnology, AI in Process Optimization, AI in Biofuel Production • AI in Food Biotechnology, AI in Food Safety, Case Studies • AI and Bioethics, Ethical Considerations in AI, Regulatory Framework • Future Prospects of AI in Biotechnology, Innovations, Challenges and Opportunities	

Textbooks and Reading Material

Textbooks.

• Pham, T. D., Yan, H., Ashraf, M. W., & Sjöberg, F. (2021). *Advances in Artificial Intelligence, Computation, and Data Science*. Springer International Publishing.

• Hamadani, A., Ganai, N. A., Henna, H., & Bashir, J. (Eds.). (2024). A Biologist's Guide to Artificial Intelligence: Building the foundations of Artificial Intelligence and Machine Learning for Achieving Advancements in Life Sciences. Elsevier.

• Carpentieri, B., & Lecca, P. (Eds.). (2024). Big Data Analysis and Artificial Intelligence for Medical Sciences. John Wiley & Sons.

Teaching Learning Strategies

- Class lecture
- Class Discussions
- Class Tutorials

Assignments: Types and Number with Calendar

- 1st Quiz in 4th Week of 5 marks
- 2nd Quiz in 10th Week of 5 marks
- 3rd Quiz in 14th Week of 5 marks
- 1st Assignment in 8th Week of 10 marks

Assessment

Sr. No.	Elements	Weightage	Details
1	Midterm Assessment	35%	Written Assessment at the midpoint of the semester.
2	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, handsonactivities, short tests, projects, practical, reflections, readings, quizzes etc.
3	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.