Gyanmanjari Innovative University

Course Syllabus
Gyanmanjari Science College
Semester-5 (B.Sc.)

Subject: Application of AI in Medical Technology- BSCMB15319

Type of course: Skill Enhancement Course (SEC)

Prerequisite: Students should have basic knowledge of microbiology, medical diagnostics, and computer fundamentals. Familiarity with microbial diseases, laboratory data, and the use of digital tools (Excel, internet browsing) is expected.

Rationale: The integration of Artificial Intelligence (AI) in healthcare is transforming diagnostics, disease prediction, drug discovery, and patient care. Microbiology students must understand how AI enhances medical technologies like pathogen identification, outbreak tracking, and personalized medicine. This course equips them with interdisciplinary skills by combining microbiological expertise with modern AI applications, preparing them for future-ready roles in clinical labs, research, and biotech industries.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
					CCE			
CI	T	P	C	SEE	LWA	V	ALA	
0	0	4	2	50	20	10	20	100

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; SEE - Semester End Evaluation; CCE-Continuous and Comprehensive Evaluation; LWA - Lab Work Assessment; V – Viva; ALA- Active Learning Activities.

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**AI Workflow Using Orange Tool** Students will analyze disease prediction data using Orange software, apply machine learning models, interpret results, and submit a report with screenshots and observations on the GMIU Web portal.	10
2	**Image Classification Using Teachable Machine** Students will train an image classification model using Google Teachable Machine to identify infected cells, document steps with screenshots, and submit a report on the GMIU Web portal.	10
Total		**20**

Course Content:

Unit No.	Course content	Weightage
1	**Introduction to AI and Data Science in Healthcare** • Fundamentals of AI, ML, DL • History and Types of AI • AI algorithms: Supervised, Unsupervised • Data sources in medical microbiology • Introduction to data mining tools (Orange, Weka)	25%
2	**AI Applications in Microbial Diagnostics** • Role of AI in medical diagnostics • AI in microbiological culture, blood smear, and imaging • Diagnostic AI systems for TB, pneumonia, malaria • Machine learning for disease detection • Presenting skills and tips.	25%
3	**Image Processing and Pattern Recognition** • Image recognition in diagnostic microbiology • Use of AI in histopathology and radiology • Pattern recognition in colony morphology • Pre-trained image models	25%
4	**AI in Epidemiology and Public Health** • Disease outbreak modeling • AI in real-time disease surveillance • Predictive analytics in public health • Health dashboards and visualization	25%

List of Practical:

Sr. No	Practical	Unit no	Hours
1	Introduction to AI: Understanding Basic Concepts using video modules and quiz.	1	4
2	Getting Started with Orange Data Mining Tool – Exploring interface and basic operations.	1	4
3	Creating a Basic Workflow in Orange using example health-related datasets.	1	4
4	Use of Google Teachable Machine for Visual Recognition (e.g., infected vs. non-infected images).	2	4
5	Data Visualization with Orange – Pie chart, scatter plots, and box plots using microbiology data.	2	4
6	Simulated AI Diagnosis of Pneumonia from chest X-ray images (using Kaggle datasets or demo tools).	2	4
7	Classifying Microbial Infections using simple decision trees in Orange	2	4

8	Disease Prediction (e.g., Diabetes) using logistic regression in Orange.	2	4
9	Unsupervised Clustering of Microbial Isolate Data Using Orange	2	4
10	BLAST Search for Sequence Identification and interpretation of pathogen match.	3	4
11	Prediction of Vaccine Targets Using VaxiJen (AI-based antigen prediction).	3	4
12	Metagenomic Data Classification using AI-based tools like MG-RAST/QIIME demo.	3	4
13	Antibiotic Sensitivity Prediction Model based on AI simulation of lab test results.	3	4
14	Region-Wise Outbreak Risk Classification using Naive Bayes in Orange	4	4
15	Protein Structure Prediction using AlphaFold Demo (online visualization only).	4	4
	Total		60

Suggested Specification table with Marks (Theory): NA

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	**Remembrance (R)**	**Understanding (U)**	**Application (A)**	**Analyze (N)**	**Evaluate (E)**	**Create (C)**
Weightage (%)	NA	NA	NA	NA	NA	NA

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course, the students should be able to:	
CO1	Introduce the fundamentals of artificial intelligence and machine learning
CO2	Understand the role of AI in modern medical microbiology and diagnostics
CO3	Explore the integration of AI in healthcare systems for disease prediction, diagnostics, and patient care
CO4	Encourage students to think critically about ethical, regulatory, and practical aspects of AI in healthcare

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

[1] Bohr, A., & Memarzadeh, K. (2020). *Artificial Intelligence in Healthcare*. Academic Press.
[2] Topol, E. (2019). *Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again*. Basic Books.
[3] Dey, N., Ashour, A. S., & Balas, V. E. (2019). *Smart Medical Data Sensing and IoT Systems Design in Healthcare*. Springer.
[4] Bresnick, J. (2022). *Artificial Intelligence Applications in Healthcare*. Health IT Analytics Press.
[5] Jha, S., & Topol, E. J. (2021). *AI in Medical Imaging*. Nature Reviews.