COURSE TITLE	**AI FOR HEALTHCARE**
COURSE CODE	**01AS0505**
COURSE CREDITS	**4**

Objective:

1 To enable students to apply AI and data analytics techniques in healthcare for disease prediction, medical imaging, and clinical decision support systems, while addressing ethical, privacy, and regulatory challenges.

Course Outcomes: After completion of this course, student will be able to:

1 Understand healthcare systems and types of medical data (Understand)
2 Apply AI techniques in medical imaging and predictive modeling (Apply)
3 Analyze healthcare datasets for insights and decision-making (Analyze)
4 Evaluate ethical, privacy, and regulatory issues in healthcare AI (Evaluate)
5 Develop AI-based healthcare applications (Create)

Pre-requisite of course: Intermediate Python Programming and Statistics

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Healthcare Data & AI** Healthcare ecosystem overview , Types of healthcare data (EHR, imaging, genomic) , Data preprocessing challenges , Data imbalance & noise , AI applications in healthcare , Clinical workflows , Public datasets (NIH, MIMIC) , Case studies	8
2	**Medical Imaging AI** Image modalities: X-ray, MRI, CT , Image preprocessing techniques , CNN architectures for healthcare , Image segmentation (U-Net) , Transfer learning in medical imaging , Evaluation metrics (IoU, Dice score) , Explainability in imaging , Case studies	9
3	**Risk & Fraud Detection** Types of financial fraud , Anomaly detection techniques , Credit scoring models , Classification models , Imbalanced datasets handling , Fraud detection pipelines , Case studies (banking fraud) , Model evaluation	9
4	**Explainability & Trust** Explainable AI concepts , Human trust in AI , Interpretability tools , Transparency in AI systems , Bias detection , User feedback loops , Ethical interface design , Case studies	10

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Contents : Unit	Topics	Contact Hours
5	**Ethics & Future Trends** Responsible AI principles , Fairness & accountability , Human-AI collaboration , AI governance , Social impact of AI , Future of AI interfaces , Regulations , Research directions	9
Total Hours		**45**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Practical 1** Exploration of healthcare datasets (UCI/Kaggle/MIMIC)	2
2	**Practical 2** Data preprocessing (handling missing values, normalization)	2
3	**Practical 3** Exploratory Data Analysis (EDA) for healthcare data	2
4	**Practical 4** Implementation of disease prediction model (classification)	2
5	**Practical 5** Evaluation of ML models (accuracy, precision, recall, F1-score)	2
6	**Practical 6** Medical image classification using CNN (basic implementation)	2
7	**Practical 7** Image preprocessing (augmentation, normalization)	2
8	**Practical 8** Clinical text processing using NLP techniques	2
9	**Practical 9** Development of a healthcare chatbot (basic)	2
10	**Practical 10** Bias detection and fairness analysis in dataset	2
11	**Practical 11** Case study analysis of real-world healthcare AI system	2
12	**Practical 12** Mini Project: End-to-end AI-based healthcare solution	2
Total Hours		**24**

Textbook :

1 Artificial Intelligence in Healthcare, Adam Bohr, Kaveh Memarzadeh, Academic Press, 2020

2 Deep Learning for Medical Image Analysis, S. Kevin Zhou et al., Academic Press, 2017

References:

1 Machine Learning for Healthcare, Machine Learning for Healthcare, Andreas Holzinger, Springer, 2016

References:

2 AI for Healthcare Applications, AI for Healthcare Applications, Arjun Panesar, Apress, 2019

3 Deep Learning for Healthcare, Deep Learning for Healthcare, Rashmi Phadnis & Shweta Sridhar, O'Reilly Media, 2021

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
10.00	20.00	30.00	20.00	10.00	10.00

Instructional Method:

1 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.

2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

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

4 Students will use resources like online videos, NPTEL course videos, e-courses from Geeksforgeeks, Simplilearn, Coursera, Microsoft.

Supplementary Resources:

1 https://elearn.nptel.ac.in/shop/iit-workshops/ongoing/life-science-computer-science/ai-for-clinicians/?v=13b5bfe96f3e

2 https://onlinecourses.nptel.ac.in/noc25_ch96/preview

3 https://www.edx.org/masters/micromasters/mgh-institute-healthcare-data-analytics-toolkit

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