University of Mumbai

Syllabus for

Honours/Minor Degree Program

In

Artificial Intelligence and Machine Learning

FACULTY OF SCIENCE & TECHNOLOGY

(As per AICTE guidelines with effect from the academic year 2022-2023)

University of Mumbai Artificial Intelligence and Machine Learning (AI&ML) (With effect from 2022-23)										
Year & Sem	Course Code & Course Title	Teaching Scheme Hrs / Week			Examination Scheme and Marks					Credit Scheme
		Theory	Seminar / Tutorial	Practical	Internal Assessment	End Sem Exam	Term Work	Oral	Total	Credits
TE Sem V	**HAIMLC501: Mathematics for AI & ML**	04	--	--	20	80	--	--	100	04
	Total	**04**	**-**	**--**	**100**	**-**	**-**		**100**	**04**
										Total Credits = 04
TE Sem VI	**HAIMLC601: Game Theory using AI & ML**	04	--	--	20	80	--	--	100	04
	Total	**04**	**-**	**-**	**100**	**-**	**-**		**100**	**04**
										Total Credits = 04
BE Sem VII	**HAIMLC701: AI&ML in Healthcare**	04	--	--	20	80	--	--	100	04
	HAIMLSBL701: AI&ML in Healthcare: Lab	--	--	04	--	--	50	50	100	02
	Total	**04**	**-**	**04**	**100**		**50**	**50**	**200**	**06**
										Total Credits = 06
BE Sem VIII	**HAIMLC801: Text, Web and Social Media Analytics**	04	-	--	20	80	--	--	100	04
	Total	**04**	**-**	**-**	**100**		**-**	**-**	**100**	**04**
										Total Credits = 04
Total Credits for Semesters V,VI, VII &VIII = 04+04+06+04 = 18										

Artificial Intelligence and Machine Learning: Sem V								
Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
HAIMLC501	Mathematics for AI&ML	04	--	--	04	--	--	04

Course Code	Course Name	Examination Scheme							
		Theory Marks				Exam Duration In Hours	Term Work	Practical and Oral	Total
		Internal Assessment			End Sem. Exam.				
		Test1	Test2	Avg.					
HAIMLC501	Mathematics for AI&ML	20	20	20	80	03	--	--	100

Course Prerequisites:	
Applied Mathematics, Discrete mathematics	
Course Objectives:	
1	To build an intuitive understanding of Mathematics and relating it to Artificial Intelligence, Machine Learning and Data Science.
2	To provide a strong foundation for probabilistic and statistical analysis mostly used in varied applications in Engineering.
3	To focus on exploring the data with the help of graphical representation and drawing conclusions.
4	To explore optimization and dimensionality reduction techniques.
Course Outcomes:	
After successful completion of the course, the student will be able to:	
1	Use linear algebra concepts to model, solve, and analyze real-world problems.
2	Apply probability distributions and sampling distributions to various business problems.
3	Select an appropriate graph representation for the given data.
4	Apply exploratory data analysis to some real data sets and provide interpretations via relevant visualization
5	Analyze various optimization techniques.
6	Describe Dimension Reduction Algorithms

Module No.		Topics	Hrs.
1.0		**Linear Algebra**	**05**
	1.1	Vectors and Matrices, Solving Linear equations, The four Fundamental Subspaces, Eigenvalues and Eigen Vectors, The Singular Value Decomposition (SVD).	
2.0		**Probability and Statistics**	**09**
	2.1	Introduction, Random Variables and their probability Distribution, Random Sampling, Sample Characteristics and their Distributions, Chi-Square, t-, and F-Distributions: Exact Sampling Distributions, Sampling from a Bivariate Normal Distribution, The Central Limit Theorem.	
3.0		**Introduction to Graphs**	**10**

	3.1	Quantitative vs. Qualitative data, Types of Quantitative data: Continuous data, Discrete data, Types of Qualitative data: Categorical data, Binary data, Ordinary data, Plotting data using Bar graph, Pie chart, Histogram, Stem and Leaf plot, Dot plot, Scatter plot, Time-series graph, Exponential graph, Logarithmic graph, Trigonometric graph, Frequency distribution graph.	
4.0		**Exploratory Data Analysis**	**09**
	4.1	Need of exploratory data analysis, cleaning and preparing data, Feature engineering, Missing values, understand dataset through various plots and graphs, draw conclusions, deciding appropriate machine learning models.	
5.0		**Optimization Techniques**	**10**
	5.1	Types of optimization-Constrained and Unconstrained optimization, Methods of Optimization-Numerical Optimization, Bracketing Methods-Bisection Method, False Position Method, Newton's Method, Steepest Descent Method, Penalty Function Method.	
6.0		**Dimension Reduction Algorithms**	**05**
	6.1	Introduction to Dimension Reduction Algorithms, Linear Dimensionality Reduction: Principal component analysis, Factor Analysis, Linear discriminant analysis.	
	6.2	Non-Linear Dimensionality Reduction: Multidimensional Scaling, Isometric Feature Mapping. Minimal polynomial	
		Total	**48**

Text Books:

1 Linear Algebra for Everyone,
2 Gilbert Strang, Wellesley Cambridge Press.
3 An Introduction to Probability and Statistics, Vijay Rohatgi, Wiley Publication
4 An introduction to Optimization, Second Edition, Wiley-Edwin Chong, Stainslaw Zak.
5 Mathematics for Machine Learning, Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, Cambridge University Press.
6 Exploratory Data Analysis, John Tukey, Princeton University and Bell Laboratories.

References:

1 Introduction to Linear Algebra, Gilbert Strang.
2 Advanced Engineering Mathematics, Erwin Kreyszig
3 Mehryar Mohri, Afshin Rostamizadeh, and Ameet Talwalkar. Foundations of Machine Learning. MIT Press, 2018.
4 Shai Shalev-Shwartz and Shai Ben-David. Understanding Machine Learning: From Theory to Algorithms. Cambridge University Press, 2014
5 Last updated on Sep 9, 2018.
6 Mathematics and Programming for Machine Learning with R, William B. Claster, CRC Press,2020

Useful Links:

1 https://math.mit.edu/~gs/linearalgebra/
2 https://www.coursera.org/learn/probability-theory-statistics
3 https://nptel.ac.in/courses/111/105/111105090/
4 https://onlinecourses.nptel.ac.in/noc21_ma01/preview
5 https://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/video-lectures/

Assessment:

Internal Assessment: (20)

1 Assessment consists of two class tests of 20 marks each.

2 The first-class test is to be conducted when approx. 40% syllabus is completed and second-class test when additional 40% syllabus is completed.
3 Duration of each test shall be one hour.

End Semester Theory Examination: (80)

1 Question paper will comprise of **total 06** questions, each carrying **20 marks**.
2 **Question No: 01** will be **compulsory** and based on the entire syllabus wherein 4 to 5 sub-questions will be asked.
3 Remaining questions will be mixed in nature and randomly selected from all the modules.
4 Weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.
5 **Total 04 questions** need to be solved.

Artificial Intelligence and Machine Learning: Sem VI								
Course Code	**Course Name**	**Teaching Scheme (Contact Hours)**			**Credits Assigned**			
		Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
HAIMLC601	**Game Theory using AI & ML**	**04**	**--**	**--**	**04**	**--**	**--**	**04**

Course Code	**Course Name**	**Examination Scheme**							
		Theory Marks				**Exam Duration In Hours**	**Term Work**	**Practical and Oral**	**Total**
		Internal Assessment			**End Sem. Exam.**				
		Test1	**Test2**	**Avg.**					
HAIMLC601	**Game Theory using AI & ML**	**20**	**20**	**20**	**80**	**03**	**--**	**--**	**100**

Course Prerequisites:	
Knowledge of probability theory, discrete mathematics, and algorithm design is required.	
Course Objectives:	
1	To acquire the knowledge of game theory.
2	To understand the basic concept of AI, strength and weakness of problem solving and search
3	To study about various heuristic and game search algorithms
4	To optimize the different linear methods of regression and classification
5	To interpret the different supervised classification methods of support vector machine.
6	To acquire the knowledge of different generative models through unsupervised learning
Course Outcomes:	
After successful completion of the course, the student will be able to:	
1	Understand basic concept of game theory.
2	Evaluate Artificial Intelligence (AI) methods and describe their foundations
3	Analyze and illustrate how search algorithms play vital role in problem solving, inference, perception, knowledge representation and learning
4	Demonstrate knowledge of reasoning and knowledge representation for solving real world problems
5	Recognize the characteristics of machine learning that makes it useful to realworld problems and apply different dimensionality reduction techniques
6	Apply the different supervised learning methods of support vector machine and tree based models

Module No.		**Topics**	**Hours.**
1.0		**Introduction to Game Theory**	**05**
	1.1	Introduction, The theory of rational choice, Games with Perfect Information, Nash Equilibrium: Theory, Prisoner's Dilemma, Stag Hunt, Matching pennies, BOS, Multi NE, Cooperative and Competitive Games, Strict and Non Strict NE, Best response functions for NE.	
	1.2	Nash Equilibrium: Illustrations, Cournot's model of oligopoly, Bertrand's model of oligopoly, Electoral competition, The War of Attrition, Auctions, Mixed Strategy Equilibrium, Strategic games in which players may randomize, Dominated actions, Extensive Games with Perfect Information	

2.0		**Games with Imperfect Information**	**09**
	2.1	Bayesian Games, Introduction, Motivational examples, General definitions, two examples concerning information, Strictly Competitive Games and Maxminimization, Rationalizability	
	2.2	Evolutionary Equilibrium, Monomorphic pure strategy equilibrium, Mixed strategies and polymorphic equilibrium, Repeated games: The Prisoner's Dilemma, Infinitely repeated games, Strategies, General Results,	
3.0		**Introduction to AI & Problem Solving**	**10**
	3.1	**Definitions** – Foundation and History of AI, Evolution of AI - Applications of AI, Classification of AI systems with respect to environment. Artificial Intelligence vs Machine learning,	
	3.2	**Heuristic Search Techniques:** Generate-and-Test; Hill Climbing; Properties of A* algorithm, Best first Search; Problem Reduction.	
	3.3	**Beyond Classical Search:** Local search algorithms and optimization problem, local search in continuous spaces, searching with nondeterministic action and partial observation, online search agent and unknown environments	
4.0		**Knowledge and Reasoning**	**09**
	4.1	**Knowledge and Reasoning:** Building a Knowledge Base: Propositional logic, first order Logic, situation calculus. Theorem Proving in First Order Logic, Planning, partial order planning. Uncertain Knowledge and Reasoning, Probabilities,	
	4.2	Bayesian Networks. Probabilistic reasoning over time: time and uncertainty, hidden Markova models, Kalman filter, dynamic bayesian network, keeping track of many objects	
5.0		**Introduction to ML**	**10**
	5.1	Introduction to Machine Learning, Examples of Machine Learning Applications, Learning Types, **Supervised Learning** -Learning a Class from Examples, Vapnik- Chervonenkis (VC) Dimension, Probably Approximately Correct (PAC) Learning, Noise, Learning Multiple Classes, Regression, Model Selection and Generalization, Dimensions of a Supervised Machine Learning Algorithm	
	5.2	Introduction, Linear Regression Models and Least Squares, Subset Selection, Shrinkage Methods, **Logistic Regression-** Fitting Logistic Regression Models, Quadratic Approximations and Inference, L1 Regularized Logistic Regression, **SVM**-Introduction to SVM, The Support Vector Classifier, Support Vector Machines and Kernels- Computing the SVM for Classification	
6.0		**Unsupervised Learning**	**05**
	6.1	Introduction, Association Rules-Market Basket Analysis, The Apriori Algorithm, Unsupervised as Supervised Learning, Generalized Association Rules, Cluster Analysis Proximity Matrices, **Clustering Algorithms**-K-mean, Gaussian Mixtures as Soft K-means Clustering, Example: Human Tumor Microarray Data, Vector Quantization, K-medoids, Hierarchical Clustering, Self-Organizing Maps, PCA-Spectral Clustering	
	6.2	**Hidden Markov Models**-Introduction, Discrete Markov Processes, Hidden Markov Models, Three Basic Problems of HMMs, Evaluation Problem, Finding the State Sequence, Learning Model Parameters, Continuous Observations, The HMM with Input, Model Selection in HMM	
		Total	**48**

Text Books:

1 Martin Osborne, An Introduction to Game Theory, Oxford University Press.
2 Russell, S. and Norvig, P. 2015. Artificial Intelligence - A Modern Approach, 3rd edition,Prentice Hall
3 Introduction to Machine Learning Edition 2, by Ethem Alpaydin

References:

1 Thomas Ferguson, Game Theory, World Scientific, 2018.
2 Stef Tijs. Introduction to Game Theory, Hindustan Book Agency
3 J. Gabriel, Artificial Intelligence: Artificial Intelligence for Humans (Artificial Intelligence, Machine Learning), Create Space Independent Publishing Platform, First edition , 2016
4 Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI.,2010 2. S Kaushik, Artificial Intelligence, Cengage Learning, 1st ed.2011
5 Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997

Assessment:

Internal Assessment: (20)

1 Assessment consists of two class tests of 20 marks each.
2 The first-class test is to be conducted when approx. 40% syllabus is completed and second-class test when additional 40% syllabus is completed.
3 Duration of each test shall be one hour.

End Semester Theory Examination: (80)

1 Question paper will comprise of **total 06** questions, each carrying **20 marks**.
2 **Question No: 01** will be **compulsory** and based on the entire syllabus wherein 4 to 5 sub-questions will be asked.
3 Remaining questions will be mixed in nature and randomly selected from all the modules.
4 Weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.
5 **Total 04 questions** need to be solved.

Artificial Intelligence and Machine Learning: Sem VII								
Course Code	**Course Name**	**Teaching Scheme (Contact Hours)**			**Credits Assigned**			
		Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
HAIMLC701	**AI&ML in Healthcare**	**04**	**--**	**--**	**04**	**--**	**--**	**04**

Course Code	**Course Name**	**Examination Scheme**							
		Theory Marks				**Exam Duration In Hours**	**Term Work**	**Practical and Oral**	**Total**
		Internal Assessment			**End Sem. Exam.**				
		Test1	**Test2**	**Avg.**					
HAIMLC701	**AI&ML in Healthcare**	**20**	**20**	**20**	**80**	**03**	**--**	**--**	**100**

Course Prerequisites:	
Artificial Intelligence, Machine Learning	
Course Objectives: The course aims	
1	To understand the need and significance of AI and ML for Healthcare.
2	To study advanced AI algorithms for Healthcare.
3	To learn Computational Intelligence techniques .
4	To understand evaluation metrics and ethics in intelligence for Healthcare systems,
5	To learn various NLP algorithms and their application in Healthcare,
6	To investigate the current scope, implications of AI and ML for developing futuristic Healthcare Applications.
Course Outcomes:	
After successful completion of the course, the student will be able to:	
1	Understand the role of AI and ML for handling Healthcare data.
2	Apply Advanced AI algorithms for Healthcare Problems.
3	Learn and Apply various Computational Intelligence techniques for Healthcare Application.
4	Use evaluation metrics for evaluating healthcare systems.
5	Develop NLP applications for healthcare using various NLP Techniques..
6	Apply AI and ML algorithms for building Healthcare Applications

Module		**Topics**	**Hours.**
1.0		**Introduction**	**04**
	1.1	Overview of AI and ML,A Multifaceted Discipline, Applications of AI in Healthcare - Prediction, Diagnosis, personalized treatment and behavior modification, drug discovery, followup care etc,	
	1.2	Realizing potential of AI and ML in healthcare, Healthcare Data - Use Cases.	
2.0		**AI, ML, Deep Learning and Data Mining Methods for Healthcare**	10
	2.1	Knowledge discovery and Data Mining, ML, Multi classifier Decision Fusion, Ensemble Learning, Meta-Learning and other Abstract Methods.	
	2.2	Evolutionary Algorithms, Illustrative Medical Application-Multiagent Infectious Disease Propagation and Outbreak Prediction, Automated Amblyopia Screening System etc.	
	2.3	Computational Intelligence Techniques, Deep Learning, Unsupervised learning, dimensionality reduction algorithms.	

3.0		**Evaluating learning for Intelligence**	06
	3.1	Model development and workflow, evaluation metrics, Parameters and Hyperparameters, Hyperparameter tuning algorithms, multivariate testing, Ethics of Intelligence.	
4.0		**Natural Language Processing in Healthcare**	**08**
	4.1	NLP tasks in Medicine, Low-level NLP components, High level NLP components, NLP Methods.	
	4.2	Clinical NLP resources and Tools, NLP Applications in Healthcare. Model Interpretability using Explainable AI for NLP applications.	
5.0		**Intelligent personal Health Record**	**04**
	5.1	Introduction, Guided Search for Disease Information, Recommending SCA's. Recommending HHP's , Continuous User Monitoring.	
6.0		**Future of Healthcare using AI and ML**	**07**
	6.1	Evidence based medicine, Personalized Medicine, Connected Medicine, Digital Health and Therapeutics, Conversational AI, Virtual and Augmented Reality, Blockchain for verifying supply chain, patient record access, Robot - Assisted Surgery, Smart Hospitals, Case Studies on use of AI and ML for Disease Risk Diagnosis from patient data, Augmented reality applications for Junior doctors.	
	6.2	Blockchain for verifying supply chain, patient record access, Robot - Assisted Surgery, Smart Hospitals, Case Studies on use of AI and ML for Disease Risk Diagnosis from patient data, Augmented reality applications for Junior doctors.	
		Total	**48**

Textbooks:

1 Arjun Panesar, "Machine Learning and AI for Healthcare", A Press.

2 Arvin Agah, "Medical applications of Artificial Systems ", CRC Press

References:

1 Erik R. Ranschaert Sergey Morozov Paul R. Algra, "Artificial Intelligence in medical Imaging-Opportunities, Applications and Risks", Springer

2 Sergio Consoli Diego Reforgiato Recupero Milan Petković,"Data Science for Healthcare-Methodologies and Applications", Springer

3 Dac-Nhuong Le, Chung Van Le, Jolanda G. Tromp, Gia Nhu Nguyen, "Emerging technologies for health and medicine", Wiley.

4 Ton J. Cleophas • Aeilko H. Zwinderman, "Machine Learning in Medicine- Complete Overview", Springer

Assessment:

Internal Assessment: (20)

1 Assessment consists of two class tests of 20 marks each.

2 The first-class test is to be conducted when approx. 40% syllabus is completed and second-class test when additional 40% syllabus is completed.

3 Duration of each test shall be one hour.

End Semester Theory Examination: (80)

1 Question paper will comprise of **total 06** questions, each carrying **20 marks**.

2 **Question No: 01** will be **compulsory** and based on the entire syllabus wherein 4 to 5 sub-questions will be asked.

3 Remaining questions will be mixed in nature and randomly selected from all the modules.

4 Weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

5 **Total 04 questions** need to be solved.

Artificial Intelligence and Machine Learning: Sem VIII								
Course Code	**Course Name**	**Teaching Scheme (Contact Hours)**			**Credits Assigned**			
		Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
HAIMLC801	**Text, Web and Social Media Analytics**	**04**	**--**	**--**	**04**	**--**	**--**	**04**

Course Code	**Course Name**	**Examination Scheme**							
		Theory Marks				**Exam Duration In Hours**	**Term Work**	**Practical and Oral**	**Total**
		Internal Assessment			**End Sem. Exam.**				
		Test1	**Test2**	**Avg.**					
HAIMLC801	**Text, Web and Social Media Analytics**	**20**	**20**	**20**	**80**	**03**	**--**	**--**	**100**

Course Prerequisites:	
Python, Data Mining	
Course Objectives: The course aims	
1	To have a strong foundation on text, web and social media analytics.
2	To understand the complexities of extracting the text from different data sources and analysing it.
3	To enable students to solve complex real-world problems using sentiment analysis and Recommendation systems.
Course Outcomes:	
After successful completion of the course, the student will be able to:	
1	Extract Information from the text and perform data pre-processing
2	Apply clustering and classification algorithms on textual data and perform prediction.
3	Apply various web mining techniques to perform mining, searching and spamming of web data.
4	Provide solutions to the emerging problems with social media using behaviour analytics and Recommendation systems.
5	Apply machine learning techniques to perform Sentiment Analysis on data from social media.

Module		**Topics**	**Hours.**
1.0		**Introduction**	**06**
	1.1	**Introduction to Text Mining:** Introduction, Algorithms for Text Mining, Future Directions	
	1.2	**Information Extraction from Text**: Named Entity Recognition, Relation Extraction, Unsupervised Information Extraction	
	1.3	**Text Representation:** tokenization, stemming, stop words, NER, N-gram modelling	
2.0		Clustering and Classification	10

	2.1	**Text Clustering**: Feature Selection and Transformation Methods, distance based Clustering Algorithms, Word and Phrase based Clustering, Probabilistic document Clustering	
	2.2	**Text Classification**: Feature Selection, Decision tree Classifiers, Rule-based Classifiers, Probabilistic based Classifiers, Proximity based Classifiers.	
	2.3	**Text Modelling:** Bayesian Networks, Hidden Markovian Models, Markov random Fields, Conditional Random Fields	
3.0		**Web-Mining:**	05
	3.1	**Introduction to Web-Mining:** Inverted indices and Compression, Latent Semantic Indexing, Web Search,	
	3.2	**Meta Search:** Using Similarity Scores, Rank Positons	
	3.3	**Web Spamming**: Content Spamming, Link Spamming, hiding Techniques, and Combating Spam	
4.0		**Web Usage Mining:**	**05**
	4.1	Data Collection and Pre-processing, Sources and types of Data, Data Modelling, Session and Visitor Analysis, Cluster Analysis and Visitor segmentation, Association and Correlation Analysis, Analysis of Sequential and Navigational Patterns, Classification and Prediction based on Web User Transactions.	
5.0		**Social Media Mining**:	**05**
	5.1	Introduction, Challenges, Types of social Network Graphs	
	5.2	Mining Social Media: Influence and Homophily, Behaviour Analytics, Recommendation in Social Media: Challenges, Classical recommendation Algorithms, Recommendation using Social Context, Evaluating recommendations.	
6.0		**Opinion Mining and Sentiment Analysis**:	**08**
	6.1	The problem of opinion mining,	
	6.2	**Document Sentiment Classification**: Supervised, Unsupervised	
	6.3	**Opinion Lexicon Expansion:** Dictionary based, Corpus based	
	6.4	**Opinion Spam Detection**: Supervised Learning, Abnormal Behaviours, Group Spam Detection.	
		Total	**48**

Textbooks:

1 Daniel Jurafsky and James H. Martin, “Speech and Language Processing,” 3rd edition, 2020

2 Charu. C. Aggarwal, Cheng Xiang Zhai, Mining Text Data, Springer Science and Business Media, 2012.

3 BingLiu, “Web Data Mining-Exploring Hyperlinks, Contents, and Usage Data”, Springer, Second Edition, 2011.

4 Reza Zafarani, Mohammad Ali Abbasiand Huan Liu, “Social Media Mining- An Introduction”, Cambridge University Press, 2014

Assessment:

Internal Assessment: (20)

1 Assessment consists of two class tests of 20 marks each.
2 The first-class test is to be conducted when approx. 40% syllabus is completed and second-class test when additional 40% syllabus is completed.
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End Semester Theory Examination: (80)

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2 **Question No: 01** will be **compulsory** and based on the entire syllabus wherein 4 to 5 sub-questions will be asked.
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5 **Total 04 questions** need to be solved.

Artificial Intelligence and Machine Learning:Sem VII								
Course Code	**Course Name**	**Teaching Scheme (Contact Hours)**			**Credits Assigned**			
		Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**	**Total**
HAIMLSBL701	**AI&ML in Healthcare: Lab**	**--**	**04**	**--**	**--**	**02**	**--**	**02**

Course Code	**Course Name**	**Examination Scheme**							
		Theory Marks				**Exam Duration**	**Term Work**	**Oral**	**Total**
		Internal Assessment			**End Sem. Exam.**				
		Test1	**Test2**	**Avg.**					
HAIMLSBL701	**AI&ML in Healthcare: Lab**						**50**	**50**	**100**

Course Prerequisites:	
Python	
Course Outcomes:	
After successful completion of the course, the student will be able to:	
1	Students will be able to understand computational models of AI and ML.
2	Students will be able to develop healthcare applications using appropriate computational tools.
3	Students will be able to apply appropriate models to solve specific healthcare problems.
4	Students will be able to analyze and justify the performance of specific models as applied to healthcare problems.
5	Students will be able to design and implement AI and ML-based healthcare applications.

Suggested Experiments:	
Sr. No.	**Name of the Experiment**
1	Collect, Clean, Integrate and Transform Healthcare Data based on specific disease.
2	Perform Exploratory data analysis of Healthcare Data.
3	AI for medical diagnosis based on MRI/X-ray data.
4	AI for medical prognosis .
5	Natural language Entity Extraction from medical reports.
6	Predict disease risk from Patient data.
7	Medical Reviews Analysis from social media data.
8	Explainable AI in healthcare for model interpretation.
9	Mini Project-Design and implement innovative web/mobile based AI application using Healthcare Data.
10	Documentation and Presentation of Mini Project.

Useful Links:

1. https://www.coursera.org/learn/introduction-tensorflow?specialization=tensorflow-in-practice
2. https://www.coursera.org/learn/convolutional-neural-networks-tensorflow?specialization=tensorflow-in-practice
3. https://datarade.ai/data-categories/electronic-health-record-ehr-data
4. https://www.cms.gov/Medicare/E-Health/EHealthRecords
5. https://www.coursera.org/learn/tensorflow-sequences-time-series-and-prediction?specialization=tensorflow-in-practice

Term Work:

1. Term work should consist of 8 experiments and a Mini Project.
2. The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work.
3. Total 50Marks (Experiments: 30-Marks, Mini Project-15 Marks, Attendance- Theory & Practical: 05-marks)

Oral & Practical exam

1. Based on the entire syllabus of **AI ML for Healthcare**