ARTIFICIAL INTELLIGENCE AND MEACHINE LEARNING IN HEALTHCARE

(Effective from the academic year 2023 -2024)

Course Code	21AME012	**CIE Marks**	50
Number of Contact Hours/Week	3:0:0	**SEE Marks**	50
Total Number of Contact Hours	39	**Exam Hours**	03
Credits – 3			

Course Objectives:

This Course will enable students to:

1) Outline how AI is transforming the practice of medicine.
2) Understand different evaluation models
3) Understand image classification technique
4) Analyse the use knowledge-based techniques in AI
5) Apply Fuzzy Logic and Genetic Algorithm in disease prediction.

Unit I	**Contact Hours**
AI and ML in Health care Introduction, History of AI, Clinical Application of AI, AI technologies used in healthcare, AI-based healthcare system vs. Traditional healthcare system, Advantage of AI in health care, Use of AI in Health care, Roles of AI in Health, Challenges for AI in Healthcare Associate features of machine learning for healthcare structure, Pillars of machine learning for healthcare. **Artificial Intelligence Disease Diagnosis** Framework for AI in disease detection modelling , Medical imaging for diseases diagnosis , Symptoms of diseases and challenges to diagnostics, diseases with their sign and indications for events , Medical imaging types , Healthcare applications and their purpose , Use of AI in Diagnosis of Alzheimer's disease , Use of AI in Diabetes detection , Use of AI in Heart disease diagnosis , Use of AI in Hypertension disease detection , Use of AI in Cancer disease detection Cross Validation , The train , test and validation split , Evidence-Based Medicine, Automated Machine Learning for Health care. **Clinical information System** Introduction to clinical information systems, contemporary issues in healthcare, workflow and related tools for workflow design, electronic health records databases, Healthcare IT & portable technology **Evaluating models** Sensitivity, Specificity, and Evaluation Metrics, Accuracy in terms of conditional probability, Confusion matrix, ROC and AUC curve and Threshold.	15
UNIT II	

Image Classification: What Is Image Classification? Image Processing, Purpose of Image processing, Phases of image processing, Steps in Image Classification, Image Classification Techniques, Maximum likelihood, Minimum-distance, Principal components, so cluster, Parallel piped, Mahala Nobis Distance, Application of Image Processing, Resolving Class imbalance Problem, SNOMED-CT : Classification of Conditions , The CAESAR-ALE Framework , Generating Perceptual-Gestural Sequences : Traces Merging and Somatization , Traces Enrichment , **Image segmentation on MRI images** Introduction, segmentation methods: Region Based Segmentation, Thresholding, Region growing, Region growing, Classification methods, boundary-based methods, Parametric deformable model, non-Parametric deformable model Medical, Hybrid methods, Level set methods, Graph cut method. Model Development and Workflow, Parameters and Hyperparameters, Hyper parameter Tuning, Multivariate Testing. **Knowledge Represent** Knowledge-Based Agent in Artificial intelligence , The architecture of knowledge-based agent , Inference system , Operations Performed by KBA , A generic knowledge-based agent , Various levels of knowledge-based agent , Approaches to designing a knowledge-based agent , What is knowledge representation , What to Represent , Types of knowledge , The relation between knowledge and intelligence , AI knowledge cycle , Approaches to knowledge representation , Requirements for knowledge Representation system , Techniques of knowledge representation, Bayesian Belief Network in artificial intelligence.	15
Unit III	
Use of Fuzzy System in AI Introduction, Fuzzy System history**,** Fuzzification, Defuzzification, Architecture of Fuzzy System, Member function, Advantages and Disadvantages of fuzzy logics. **Introduction to Genetic Algorithm** Introduction, Advantages of Gas, Limitations of Gas, Basic Terminology, Basic Structure, Algorithm of Genetic Algorithm, Classes of Search Techniques, Working Mechanism of Genetic Algorithms, The Genetic Algorithm Cycle of Reproduction, Two Armed and K – Armed Bandit Problem, Case study of Predicting Heart disease and kidney disease using Genetic Algorithm.	9
Course Outcomes: **Students should be able to do** 1)Understand how AI can be applied to diagnosis of diseases. 2) Describe different evaluation models 3) Outline different Image Processing Technique 4) Analyse how to apply knowledge-based techniques to AI 5) Demonstrate the use of Genetic and Fuzzy logic in AI.	

Textbooks:

1. Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again, Eric Topol, Basic Books, 1st edition 2019.
2. Machine Learning and AI for Healthcare: Big Data for Improved Health Outcomes, Arjun Panesar, Apress, 1st ed. Edition, 2019.

Reference Books:

1. "Healthcare and Artificial Intelligence", Springer, 2020

E Books / MOOCs/ NPTEL

1. https://www.coursera.org/learn/ai-for-medical-diagnosis
2. https://www.coursera.org/learn/ai-for-medical-prognosis#syllabus
3. https://www.coursera.org/learn/ai-for-medical-treatment#syllabus

Table 1: Mapping Levels of COs to POs

COs	Program Objectives (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2		1								2	
CO2	3	3	3	2	3								3	
CO3	3	3	2	2	3								3	
CO4	3	3	2		1								2	
CO5	3	3	3	2	3								2	

Table 2: Mapping of COs to PIs, POs and BTL

Course outcomes	Program Outcomes	Performance Indicators	Bloom's Taxonomy Level
CO1	PO1,PO2,PO3,PO5	1.1.1,1.1.2,1.2.1,1.3.1,1.4.1,2.1.1, 2.1.2,2.2.1,3.1.1,3.1.2, 4.1.1,5.1.1,5.1.2	L2
CO2	PO1,PO2,PO3,PO4,PO 5	1.1.1,1.1.2,1.2.1,1.3.1,1.4.1,2.1.1, 2.1.2,2.2.1,3.1.1,3.1.2, 4.1.1,5.1.1,5.1.2	L3
CO3	PO1,PO2,PO3,PO4,PO 5	1.1.1,1.1.2,1.2.1,1.3.1,1.4.1,2.1.1, 2.1.2,2.2.1,3.1.1,3.1.2, 4.1.1,5.1.1,5.1.2	L2
CO4	PO1,PO2,PO3,PO5	1.1.1,1.1.2,1.2.1,1.3.1,1.4.1,2.1.1, 2.1.2,2.2.1,3.1.1,3.1.2, 4.1.1,5.1.1,5.1.2	L3
CO5	PO1,PO2,PO3,PO4,PO 5	1.1.1,1.1.2,1.2.1,1.3.1,1.4.1,2.1.1, 2.1.2,2.2.1,3.1.1,3.1.2, 4.1.1,5.1.1,5.1.2	L2

BIG DATA ANALYTICS
(Effective from the academic year 2023 -2024)

Course Code	21AME016	**CIE Marks**	50
Number of Contact Hours/Week	3:0:0	**SEE Marks**	50
Total Number of Contact Hours	39	**Exam Hours**	03
Credits – 3			

Course Objectives:
The students should be able to
1. Understand basic terminologies used in data analytics.
2. understand and apply big data flow to actual projects
3. apply data analytics life cycle to big data projects.
4. identify and successfully apply appropriate techniques
5. tools to solve big data problems.

Unit I	**Contact Hours**
Overview of Big Data: Big data, Defining big data, Growth of and digitization of Global Information Storage Capacity, Big data types, Analytics, Industry Examples of Big data, Big data technologies, The evolution of big data architecture, Selecting big data technology, The Benefits of big data(Text Book 1). **Basics of Hadoop:** Big data and Hadoop, Architecture of Hadoop, Main components of Hadoop framework, Analysing big data with Hadoop, Distributed application concept: Comparison between Hadoop and RDBMS, Hadoop clustering, YARN, The Map Reducer's Engine, Advantages of Hadoop, Hadoop security concerns, Hadoop Streaming: Basics. (Text Book 1). **Hadoop Distributed File System:** HDFS**,** Architecture of Apache, Other file systems, HDFS File Blocks, HDFS File commands: cat, chgrp, chmod, chown, count, cp, ls, rm, mkdir (Text Book 1).	15
UNIT II	
NO SQL Data management and MONGODB: NO SQL Data Management, Types of NO SQL databases, Benefits of No SQL(Text book 1) MongoDB: What, Why- Replication, Sharding, Terms used in RDBMS and MongoDB, Data types in MongoDB (Text Book 2), Advantages of MongoDB over RDBMS (Text book 1)	15

HBASE and CASSANDRA: Introduction to HBase, Row-oriented vs column oriented data stores, HDFS vs HBase, HBase architecture, HBase Performance, Understanding HBase model (Text book 1) **Cassandra**: Introduction, Features of Cassandra, Data replication in Cassandra, Components of Cassandra ,Cassandra Data model, Data models of Cassandra and RDBMS (Text book 1), CQL Data types, CQLSH, Keyspaces (Text book 2) **MAP REDUCE:** Introduction to Map Reduce-5 steps, How Map reduce works, What is map operations, What is reduce operations, Submitting a map reduce job.(Text book 1)	
Unit III	
Introduction to Hive-Define, features, architecture, Hive data models, Hive building blocks, Hive data file formats (Text Book 1). Hive data types, Basics of HQL(Text Book 2) **PIG: The higher level programming environment:** Introduction to pig, Components of Pig, Pig program execution modes, Data formats and models, Other capabilities, pig v/s map reduce, Difference between hive and pig(Text Book 1).	9

Course Outcomes: At the end of the course student will be able to:

1.Understand and apply big data flow to actual projects as well as apply data analytics life cycle to big data projects.

2. Apply appropriate techniques and tools to solve big data problems

3. Understand various clustering techniques used for unsupervised data modelling.

4. Describe big data and use cases from selected business domains

5. Explain NoSQL big data management and understand the usage of Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics

Textbooks:

1. V.K. Jain, Big Data & Hadoop, Khanna Book Publishing Co., Delhi. (ISBN 978-93-82609-131),2017

2. Seema Acharya, Subhashini Chellappan, “Big Data Analytics”, Wiley Publications, 2nd Edition, 2019.

Reference Books:

1. Bart Baesens, “Analytics in a Big Data World: The Essential Guide to data Science and its applications”, Wiley publications, 2014.

2. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2003.

3. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2020.

4. Jeeva Jose, Beginner’s Guide for Data Analysis using R Programming, Khanna Book Publishing House, 2019.

5. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, Wiley, 2012.

E Books / MOOCs/ NPTEL

1. ftp://public.dhe.ibm.com/software/pdf/at/SWP10/Big_Data_Analytics.pdf
2. https://www.wileyindia.com/big-data-analytics-2ed.html
3. https://www.coursera.org/specializations/big-data

4. nptel.ac.in/courses/106104135/48

Table 1: Mapping Levels of COs to POs														
COs	**Program Objectives (POs)**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	2		1								2	
CO2	3	3	3	2	3								3	
CO3	3	3	2	2	3								3	
CO4	3	3	2		1								2	
CO5	3	3	3	2	3								2	

Table 2: Mapping of COs to PIs, POs and BTL			
Course outcomes	**Program Outcomes**	**Performance Indicators**	**Bloom's Taxonomy Level**
CO1	PO1,PO2,PO3,PO5	1.1.1,1.1.2,1.2.1,1.3.1,1.4.1,2.1.1, 2.1.2,2.2.1,3.1.1,3.1.2, 4.1.1,5.1.1,5.1.2	L2
CO2	PO1,PO2,PO3,PO4,PO 5	1.1.1,1.1.2,1.2.1,1.3.1,1.4.1,2.1.1, 2.1.2,2.2.1,3.1.1,3.1.2, 4.1.1,5.1.1,5.1.2	L3
CO3	PO1,PO2,PO3,PO4,PO 5	1.1.1,1.1.2,1.2.1,1.3.1,1.4.1,2.1.1, 2.1.2,2.2.1,3.1.1,3.1.2, 4.1.1,5.1.1,5.1.2	L2
CO4	PO1,PO2,PO3,PO5	1.1.1,1.1.2,1.2.1,1.3.1,1.4.1,2.1.1, 2.1.2,2.2.1,3.1.1,3.1.2, 4.1.1,5.1.1,5.1.2	L3
CO5	PO1,PO2,PO3,PO4,PO 5	1.1.1,1.1.2,1.2.1,1.3.1,1.4.1,2.1.1, 2.1.2,2.2.1,3.1.1,3.1.2, 4.1.1,5.1.1,5.1.2	L2

BLOCKCHAIN TECHNOLOGY
(Effective from the academic year 2022 -2023)
SEMESTER – VI

Course Code	20CC621	**CIE Marks**	50
Number of Contact Hours/Week	3:0:0	**SEE Marks**	50
Total Number of Contact Hours	40	**Exam Hours**	03

Credits – 3

Course Learning Objectives:

This Course will enable students to:

1. Understand basic of Blockchain Technology
2. Explain cryptographic primitives used in Blockchain
3. Get the idea of Ethereum Blockchain and Smart Contract
4. Explore Solidity Programming language and Remix IDE to develop smart contract.
5. Understand Hyperledger fabric and its framework

Unit I	**Hours**
Introduction: Blockchain 101: Distributed systems, History of blockchain, Introduction to blockchain, Types of blockchain, CAP theorem and blockchain, Benefits and limitations of blockchain. **Decentralization and Cryptography**: Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Decentralized Organizations. **Cryptographic primitives**: Symmetric cryptography, Stream ciphers, Block ciphers, Block encryption mode, Keystream generation modes, Message authentication modes, Electronic code book, Cipher block chaining, Counter mode, Data Encryption Standard (DES) Advanced Encryption Standard (AES), Asymmetric cryptography; Public and private keys, Encryption and decryption using RSA, Cryptographic Hash Function, Properties of a hash function, Digital signatures :Sign then encrypt, Encrypt then sign, Merkle tree.	15
Unit II	
Smart Contracts and Ethereum 101: Smart Contracts: Definition, Ricardian Contracts. Ethereum 101: Introduction, Ethereum blockchain, Elements of the Ethereum blockchain, Precompiled contracts. **Introducing solidity:** Types,Value types :Boolean, Integers, Address, Array value types (fixed size and dynamically sized byte arrays), Literals, Integer	15

literals, String literals, Hexadecimal literals, Enums, Function types, Internal functions, External functions, Reference types, Arrays, Structs, Data location, Mappings, Global variables, Control structures, Events, Inheritance,Libraries, Functions, Layout of a solidity source code file. Truffle Basics and Unit Testing, Debugging Contracts Remix IDE: Programs execution.	
Unit III	
Exploring Hyperledger Fabric: Building on the foundations of open computing, Fundamentals of the Hyperledger project, The Linux Foundation, Hyperledger, Open source and open standards, Hyperledger frameworks, tools, and building blocks, Hyperledger Fabric component design, Principles of Hyperledger design, Hyperledger Fabric reference architecture, Hyperledger Fabric runtime architecture, Strengths and advantages of componentized design	10

Course Outcomes:

Upon completion of this course, students will be able to:

1. Explain the fundamental building blocks of Blockchain technology.
2. Understand the significance of Consensus and working of cryptocurrency.
3. Explain basics of Ethereum blockchain and smart contract
4. Develop block chain-based solutions and write smart contract using Solidity, Remix IDE and Ethereum frameworks.
5. Describe Hyperledger fabric and its framework, design principles and architecture

Textbooks:

1. Imran Bashir, “Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained”, Packt Publishing.
2. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O’Dowd, Venkatraman Ramakrishna, “Hands-On Block Chain with Hyperledger: Building Decentralized Applications with Hyperledger Fabric and Composer”, Import, 2018.

Reference Books:

1. Melanic Swan, “Block Chain: Blueprint for a New Economy”, O’Reilly, 2015.
1. Josh Thompsons, “Block Chain: The Block Chain for Beginners-Guide to Block chain Technology and Leveraging Block Chain Programming”.
2. Daniel Drescher, “Block Chain Basics”, Apress; 1st edition, 2017.
3. Anshul Kaushik, “Block Chain and Crypto Currencies”, Khanna Publishing House, Delhi.
4. Ritesh Modi, “Solidity Programming Essentials: A Beginner’s Guide to Build Smart Contracts for Ethereum and Block Chain”, Packt Publishing.

Course Outcomes Mapping with Program Outcomes & PSO

Program Outcomes→ / ↓ Course Outcomes	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓ 1	PSO↓ 2
AM1602-1.1	3		2										3	
AM1602-1.2	3		2										3	
AM1602-1.3	2		2										3	
AM1602-1.4	2		3		3								3	
AM1602-1.5	2		2		1								3	
1: Low 2: Medium 3: High														

FULL STACK DEVELOPMENT

(Effective from the academic year 2023 -2024)

Course Code	21AME028	**CIE Marks**	50
Number of Contact Hours/Week	3:0:0	**SEE Marks**	50
Total Number of Contact Hours	39	**Exam Hours**	03
Credits – 3			

Course Learning Objectives:

1. Design static and modern web pages using HTML5, Cascading Style Sheets (CSS) and Bootstrap.
2. Develop client-side validations using JavaScript.
3. Develop the server-side script using PHP.
4. Design the server-side database using MySQL
5. Develop the interactive web application using NodeJS framework and MongoDB.

Unit I	**Contact Hours**
Basics of Html5, Css and Javascript: Overview of HTML5, HTML5 elements, Introduction to CSS, Levels of style sheets, The Box Model, The basics of Javascript, General syntactic characteristics, Event Handling. **Bootstrap**	15

What is Bootstrap? Why use Bootstrap? Where to get Bootstrap? Bootstrap CDN, First Web Page with Bootstrap, Bootstrap Grid system, Contextual Colors and Backgrounds, Bootstrap Tables, Bootstrap Images, Bootstrap Jumbotron and Page Header, Bootstrap Wells, Bootstrap Alerts, Bootstrap Buttons, Bootstrap Badges and Labels, Bootstrap Progress Bars, Bootstrap List Groups, List Group with Badges, Tabs, Tabs with Dropdown Menu, Pills, Bootstrap Navigation Bar, Bootstrap Forms, Bootstrap Form Inputs, Bootstrap Media Objects, Bootstrap Carousel Plugin.	
Unit II	
Introduction to Php: Origins and uses of PHP, Overview of PHP, General syntactic characteristics, Primitives, Operations and Expressions, Output, Control statements, Arrays, Functions, Pattern Matching, Form handling, Files, Cookies, Session tracking, Database access with PHP and MySQL.	15
Unit III	
NodeJS: Introduction to Node.js- Installing Node.js - Node.js Modules, Node.js File System, Node.js URL Module, Node.js NPM, Node.js Events, Node.js Upload Files, Node.js Email. **NodeJS MySQL**- Create Database, Create Table, Insert into, select from, Where, Order by, Delete, Drop Table, Update, Limit, Join. **Introduction to Mongo DB**- Node.js MongoDB, Create Database, Create Collection, Insert, Find, Query, Sort, Delete, Drop Collection, Update, Limit, Join	9

Course Outcomes:

Upon completion of this course, students will be able to:

1. Describe the fundamental features of HTML5, CSS and Bootstrap and Design static web pages.
2. Design and Implement the client-side validations using JavaScript.
3. Illustrate the concept of PHP and Develop the server-side script using PHP.
4. Design the server-side database using MySQL
5. Develop the interactive web application using NodeJS framework and MongoDB.

Textbooks:

1. Robert W. Sebesta, “Programming the World Wide Web”, Fourth Edition, Pearson, 2014.
2. Jake Spurlock, “Bootstrap-Responsive Web Development”, O’Reilly publications, 2013.
3. Ari Lerner, Ng-book, “The complete book on Angular JS”, 2013.
4. Chris Northwood, The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer Paperback – Import, 20 November 2018.
5. David Herron, Node.js Web Development: Server-side web development made easy with Node 14 using practical examples, 5th Editio, 2020

Reference Books:

1. M. Deitel, P.J. Deitel, A. B. Goldberg," Internet & World Wide Web: How to Program, 4e Paperback – 1 January 2009.
2. Chris Bates,"Web Programming Building Internet Applications", Third Edition, Wiley India, 2006**.**

E Books / MOOCs/ NPTEL:

1. https://www.cs.uct.ac.za/mit_notes/web_programming.html
2. http://www.multitech.ac.ug/uploads/IntroductiontoWebProgramming.pdf
3. https://www.w3schools.com/php/
4. https://www.w3schools.com/bootstrap/

Table 1: Mapping Levels of COs to POs

COs	Program Objectives (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	1		1								2	
CO2	3	3	1		1								2	
CO3	3	2	1		1								2	
CO4	3	2	1		1								3	
CO5	3	2	2		1								2	

Table 2: Mapping of COs to PIs, POs and BTL

Course outcomes	Program Outcomes	Performance Indicators	Bloom's Taxonomy Level
CO1	P1, P2, P3, P5	1.1.1,1.1.2,1.2.1,1.3.1,2.1.1,2.1.2,3.1.1,3.1.2 5.1.1,5.2.1,5.2.2,5.3.1	L2
CO2	P1, P2, P3, P5	1.1.1,1.1.2,1.2.1,1.3.1,2.1.1,2.1.2,3.1.1,3.1.2 5.1.1,5.2.1,5.2.2,5.3.1	L2
CO3	P1, P2, P3, P5	1.1.1,1.1.2,1.2.1,1.3.1,2.1.1,2.1.2,3.1.1,3.1.2 5.1.1,5.2.1,5.2.2,5.3.1	L2
CO4	P1, P2, P3, P5	1.1.1,1.1.2,1.2.1,1.3.1,2.1.1,2.1.2,3.1.1,3.1.2 5.1.1,5.2.1,5.2.2,5.3.1	L2
CO5	P1, P2,P3, P5	1.1.1,1.1.2,1.2.1,1.3.1,2.1.1,2.1.2,3.1.1,3.1.2 5.1.1,5.2.1,5.2.2,5.3.1	L2