M.Tech. (CSE with Specialization in Artificial Intelligence and Machine Learning (CSE-AIML)

Programme Structure July 2021 onwards

FIRST SEMESTER

SNo	Course No.	Course Title	L Total	T	P	Total	Credits
1.	17M11CS111	Data Structures and Algorithms for Big Data	3	-	-	03	3
2.	17M11CS112	Machine Learning and Data Mining	3	-	-	03	3
3.	21xxxxx	Elective – I	3	-	-	03	3
4.	21xxxxx	Elective – II	3	-	-	03	3
5.	21xxxxx	Elective – III	3	-	-	03	3
6.	18M11GE111	Research Methodology and Intellectual Property Right	2	-	-	02	2
7.	17M15CS111	Advanced Algorithms Lab	-	-	2	02	1
8.	17M15CS112	Machine Learning and Data Mining Lab			2	02	1
9.	17M15CS113	Cloud Technology Lab			2	02	1
		TOTAL	17	-	6	23	20

Elective-I: Game Theory using Python
                Data Science with Python

Elective –II: Knowledge Engg. and Expert Systems
                Advances in Artificial Intelligence

Elective-III:: Metaheuristics in Modelling and Optimization
                Soft Computing & Applications
                Computational Models of Cognition

SECOND SEMESTER

SNo	Course No.	Course Title	L	T	P	Total	Credits
1.	17M11CS121	Cloud and Web Services Software Engineering	3	-	-	03	3
2.	17M11CS122	Performance Evaluation of Computing Systems	3	-	-	03	3
3.	21xxxxx	Elective – IV	3	-	-	03	3
4.	21xxxxx	Elective – V	3	-	-	03	3
5		Audit-I (HSS)	2	-	-	02	Qualifying
6.	17M17CS111	Project Based Learning-I (Open Source Software Development)		-	4	04	2
7.	17M15CS121	Cloud and Web Services Lab	-	-	2	02	1
8.	17M15CS122	Performance Engineering Lab			2	02	1
9.	17M15CS123	IOT Systems Development Lab			2	02	1
		TOTAL	15	-	10	24	17

Elective-IV: Computer Vision
                Natural LanguageUnderstanding& Processing
                Neural Networks and DeepLearning

Elective-V: Human Machine Interaction
                Cloud, IOT & Big Data
                Semantic Web and Social Networks

THIRD SEMESTER

SNo	Course		Contact Hours				Credits
	No.	Title	L	T	P	Total	
1.		OPEN ELECTIVE	3			3	3
2.	17M17CS212	Seminar & Term Paper/ Supervised Study or credits transfer from another university through normal course or MOOC				4	4
3.	17M17CS211	Project Based Learning-II (Software Development Automation)				8	4
4.	17M17CS213/ 17M17CS214/ 17M17CS215	Dissertation /Industrial Project/Entrepreneurial Project				8	4
5.		Audit-II (HSS)	2			2	Qualifying
		TOTAL					15

FOURTH SEMESTER

SNo	Course		Contact Hours				Credits
	No.	Title	L	T	P	Total	
1.	17M17CS223/ 17M17CS224/ 17M17CS225	Dissertation /Industrial Project/ Entrepreneurial Project				32	16
		TOTAL					16

TOTAL CREDITS : 68

COURSE OUTLINES

ELECTEVIE COURSES:

SEMESTER -1

Elective - I

a. Game theory using Python

Introduction, uses of game theory, Two player Static Games, Mixed Strategies and Utilities, Pure Strategy Nash Equilibrium, Multiple Nash Equilibria, Zero Sum Games and Mixed Strategies, Two player Dynamic Games, Analysis of Dynamic Games, minimax strategies and the minimax theorem for zero-sum game, correlated equilibria, ExtensiveForm Games ,Perfect information games: trees, players assigned to nodes, payoffs, backward Induction, sub game perfect equilibrium, introduction to imperfect-information games, mixed versus behavioral strategies, Repeated Games, Rectangular Games, Minmax Theorem, Graphical Solution of $2 \times n$, $3 \times n$, $m \times 2$, $m \times 3$ and mxn Games

b. Data Science using Python

Python Fundamentals; Data Preparation: Data cleaning, Handling Missing Data, Aggregation; Inferential Statistics, Various forms of distribution: A normal distribution, normal distribution from a binomial distribution, A Poisson distribution, The chi-square distribution; Exploratory Data Analysis: Analysing univariate and multivariate data: Heat Map, Box and Whisker plot, Scatter plots with histograms, Bubble charts.; Model development: Creating training and testing sets, Building a model, Model evaluation, Evaluating a model based on test data, Model building and evaluation with SciKit; Supervised learning: Decision trees, Linear regression: Simple and Multiple and Logistic regression, Naive Bayes classifier. ; Unsupervised learning: The k-means clustering, Hierarchical clustering;

Elective -II

a. Knowledge Engg. and Expert Systems

Schemes for the knowledge representation , language and tools for knowledge engineering, conceptual data analysis; automated reasoning ; validation and measurement methods in knowledge engineering; Knowledge Engineering in uncertainty situations; characteristics of current expert systems; concepts for building expert systems; architecture of building expert system; techniques for the construction of expert system; evaluation of expert system. Case studies on expert system

b. Advances in Artificial Intelligence

Introduction to Artificial Intelligence, Overview of probability theory, Bayes networks, Independece, I-Maps, Undirected graphical models, Bayesian and Markov networks, Local models; Exact inference, Clique trees, Belief propagation, Tree construction, Introduction to optimization, Approximate inference: sampling, Markov chains, MAP inference, Inference in temporal models; Learning graphical models, parameter estimation, Bayesian networks and shared parameters, structure learning, Partially observed data, Gradient descent, Expected Maximization, Hidden variables, Undirected models, Undirected structure learning, Causalty, Utility functions, Decision problem, Expected utility.

Elective – III

a. Metaheuristics in Modelling and Optimization

Optimization Models, Approximate Algorithms; Fundamentals of Metaheuristics; Single-Solution Based Metaheuristics; Population-Based Metaheuristics Methiods; Metaheuristics for Multiobjective Optimization; Fitness Assignment Strategies and Evaluation of Multiobjective Optimization; Hybrid Metaheuristics ; Parallel Metaheuristics; Parallel Design and implementation of Metaheuristics;Parallel Metaheuristics for Multiobjective Optimization

b. Soft Computing & Applications

Introduction to soft computing, Fuzzy sets, Approximate reasoning, fuzzy inference systems, fuzzy decision making and its applications, Elements of Genetic Algorithms, Types of Genetic Algorithms, Multi-objective Genetic algorithm and its variants (VEGA, NSGA) , Problem solving using GA, Back propagation networks, LearningVector Quantization , Counter Propagation Networks, Auto encoders, RNN, LSTM and its applications , Integration of neural networks, fuzzy logic and genetic algorithms. Neuro-Fuzzy, Neuro-Genetic and Fuzzy-Genetic systems, Applications of Soft computing in different fields of research specially in Data Analysis and communications.

c. Computational Models of Cognition

The journey from machines that compute to machines that "think": the central challenges, philosophical conundrums, schools of thought, the big debates; **Modeling Paradigms**: Declarative/ logic-based computational cognitive modeling, connectionist models of cognition, Bayesian models of cognition, a dynamical systems approach to cognition; **Cognitive Models of Memory and Language; Modeling Select Aspects of Cognition** Classical models of rationality, symbolic reasoning and decision making; **Cognition and Artificial Intelligence** The import of modeling aspects of human cognition on Artificial Intelligence; cognitive architectures such as as ACT-R, SOAR, OpenCog, CopyCat, Memory Networks

SEMESTER-II

Elective-1V

a. Advanced Computer Vision

Introduction to computer vision, Advanced topics in computer vision including low-level vision, Geometrical and 3D vision, Stereo, 3D scene reconstruction, Motion analysis, Visual tracking, Object recognition and human motion analysis, Capturing and recognition, Applications to video processing and vision-based modeling and interaction.

b. Natural Language Understanding & Processing

Introduction; Words: Regular Expressions, Tokenization, Stemming, Morphology and Finite-State Transducers, N-grams; Syntax: Part-of-Speech Tagging, Parsing with Context-Free Grammars, Lexicalized and Probabilistic Parsing; Semantics: Semantic Analysis, Lexical Semantics, Word Sense Disambiguation and Information Retrieval; Pragmatics: Discourse, Machine Translation

c. Neural Networks and DeepLearning: Linear Algebra review, Basics of Neural Networks; Bias-Variance Trade-off; Overfitting and Underfitting; Regularization, Convolution Neural Network and popular CNN architectures; RNN, LSTM; Deep Learning for Vision and Language; Deep Unsupervised Learning: Auto Encoders;

Elective-V

a. Human Machine Interaction

Introduction; Interaction Devices; Color and Content; Interface Design Process, User Interface Models, Design Methodologies; Human Interaction Speeds, Human Characteristics in Design, Human Consideration in Design; Graphical User Interface; Device and Screen-Based Control ; Device Based Controls, Operable Controls, Text Entry/Read-Only Controls, Selection Controls;Screen Design; Design Goals; Software Tools Specification Methods; Information Search and Visualization.

b. Cloud, IOT & Big Data

Enabling Technologies for Big Data Computing; Smart Clouds, Virtualization and Mashup Services ; Cloud Computing Models and Services; Cloud Architectures and Resources Management; Mobile Clouds and Inter-Cloud Mashup Services; IoT Sensing, Mobile and Cognitive Systems ; IoT Interactions with GPS, Clouds and Smart Machines ; Radio Frequency Identification (RFID) ; Sensors, Wireless Sensor Networks and GPS Systems; IoT based Big Data System;

c. Semantic Web and Social Networks

Web Intelligence Thinking and Intelligent Web Applications; Knowledge Representation for the Semantic Web Ontologies and their role in the semantic web; Ontologies Languages for the Semantic Web – Resource Description Framework(RDF) / RDF ;Ontology Engineering; Semantic Web Applications, Services and Technology ;Social Network Analysis and semantic web;