MOTHER TERESA WOMEN'S UNIVERSITY

KODAIKANAL

DEPARTMENT OF COMPUTER SCIENCE

M.Phil. Computer Science

SYLLABUS

With Effect from 2021-2022

CURRICULUM UNDER CHOICE BASED CREDIT SYSTEM

M.PHIL. COMPUTER SCIENCE

Semester	Course Code	Title of the Paper	Hours	Credits	Int. Marks	Ext. Marks	Total Marks
I	M21CST11	Research Methodology	10	4	40	60	100
	M21CST12	High Performance Computing	10	4	40	60	100
	M21PST13	Professional Skills	10	4	40	60	100
	Total		**30**	**12**			**300**
II	M21CST21	SPECIAL PAPER	10	4	40	60	100
	M21CSD22	Dissertation and Viva-voce	20	14 (12+2)	120	80	200
	Total		**30**	**18**			**300**
	TOTAL		**60**	**30**	**Total Marks**		**600**

For each course other than the Dissertation

Continuous Internal Assessment : 40 Marks

End Semester Examination : 60 Marks

Total : 100 Marks

Question Pattern

Answer any Five Questions (5 x 15 = 75)

Question 1 (or) Question 2 → Unit 1

Question 3 (or) Question 4 → Unit 2

Question 5 (or) Question 6 → Unit 3

Question 7 (or) Question 8 → Unit 4

Question 9 (or) Question 10 → Unit 5

Special Paper related to Project

S.No.	Course
1	Digital Image Processing
2	Cloud Computing
3	Network Security
4	Biometrics
5	Advanced Databases
6	Machine Learning Techniques
7	Internet of Things
	Directed Study*
	Any UGC approved online course related to Research

*Any new course can be added as a Special paper by getting permission from BoS and Academic Council

PROGRAMME OUTCOMES

PO 1 : Develop and integrate effectively for mastery in Research Methodology
PO 2 : Create significant contributions in scientific knowledge in their area of research
PO 3 : Analyze and publish research in a clear and effective manner
PO 4 : Engage and equip with productive research with publications and conference presentations
PO 5 : Use their knowledge to analyze, interpret the data and synthesis the information
PO 6 : Expertise in developing application with required domain knowledge

PROGRAMME SPECIFIC OUTCOMES

PSO 1 : Developing knowledge of the literature and comprehensive understanding of Scientific methods and techniques applicable to their own research.
PSO 2 : Demonstrate originality in the application of knowledge, together with a practical Understanding of how research and enquiry are used to create and interpret knowledge in their field
PSO 3 : Develop the ability to critically evaluate current research and research techniques and methodologies.
PSO 4 : Inculcate self-direction and originality in tackling and problems solving ability.

M21CST11	Research Methodology		
	Semester I	**Credits: 4**	**Hours: 10**
Cognitive Level	K2: Understand K3: Apply K4: Analyze		
Objectives	1. To create awareness on the research concepts 2. To understand the overall process of designing a research study 3. To learn the components of literature review process. 4. To identify and formulate a research problem		

Unit I: Research Methodology

Introduction – Mathematical tools for analysis – Research problems – Types of research – Research Process – Data Collection – Primary data – Secondary data – Data Presentation – Mathematical Tool for Analysis – Ethics in Research – Importance – Integrity in Research – Scientific Misconduct and Consequences.

Unit II: Scientific Research Methods

Research process – Criteria for good Research – Problems encountered by Researchers - Journal Reading Techniques - Defining the Research problem– Selecting the Problem – Necessity of Defining the problem – Technique involved in Defining the Problem – An illustration.

Research Design – Need for Research Design – Features of good design – Important concepts relating to Research Design – Different Research Design – Basic principles of Experimental Designs – Conclusion – Developing a Research Plan.

Unit III: Algorithmic Research

Algorithmic Research Problems: Polynomial Problem – Combinational/NP hard problems – Types of Algorithmic Research– Solution Procedure/Algorithm: Polynomial Algorithms – Exponential Algorithms – Scope of Algorithms – Steps in Development of Algorithms –Time and Space Complexity of Algorithms

Unit IV: Design of Algorithms

Backtracking - Subset sum problem – Branch and Bound - Assignment problem – Methods to solve assignment problem: Enumeration method – Simplex method – Transportation method – Hungarian method – Knapsack problem – Traveling salesman problem – Greedy method – Prim's algorithm – Kruskal's algorithm – Dijkstra's algorithm.

Unit V: Thesis Writing

Literature Survey - Writing at the Tertiary Level – Planning the thesis – Computer tools for writing and publishing – Publishing of Papers - The General Format – Page and Chapter Format – Footnotes – Tables and Figures – References – Appendices - Plagiarism – Citation and Acknowledgement.

References:

1. C.R. Kothari, "Research Methodology Methods and Techniques", 2nd Edition New Age International Publishers, 2009.
2. R Pannerselvam, "Design and Analysis of Algorithms", PHI, New Delhi, 2007.
3. Behrouz A. Forouzan, Debdeep Mukhopadhyay, "Cryptography and Network Security", McGraw Hill, 2011.
4. Anderson, Berny H.Dujrston, H.Pode, "Thesis & Assignment Writing" Wiley Publications , 4th Edition, NewDelhi, 2008.
5. T.S.Rajasekaran & G.A. Vijaylakshmi Pai, "Neural Networks, Fuzzy Logic & Genetic Algorithms– Synthesis & applications", PHI, 2009.

Course Outcomes:

After successful completion of the Course, Scholar shall be able to

CO 1: Gain the Scientific knowledge in the area of Research K2
CO 2: Acquire the significance of carrying out their research work in latest technology K2
CO 3: Obtain proficiency of computing for Technical paper and thesis writing K3
CO 4: Aware about the knowledge of Research Ethics K4

Mapping of Cos with Pos and PSOs :

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1		M	M	S		M	M		M	
CO2	M	S	M				S			M
CO3	M	S	M				S			M
CO4	M	M			M	S	S	S	M	M

S – Strongly Correlating M- Moderately Correlating

M21CST12	High Performance Computing		
	Semester I	**Credits: 4**	**Hours: 10**
Cognitive Level	K2-Understand K3-Apply K6-Analyze		
Objectives	1. To introduce the concepts of advance computing. 2. To understand about IOT and Image Processing techniques. 3. To study and analyze the techniques on Data Mining and Network Security. 4. To identify and formulate the Research Domain.		

Unit I: Emerging Technologies

Grid and Cloud Computing: Computational grid – Data grid – Collaborative grid – Difference between grid and cloud computing – Types of cloud computing - Mobile computing: Mobile communication – Mobile Hardware – Mobile Software - Internet of Things - Logical Design of IoT - Physical Design of IoT– IoT Enabling Technologies – IoT & Deployment Templates

Unit II: Advanced Computing Methods

Fundamentals of Neural Networks: Properties – Architecture - Learning methods: activation functions, Feed forward, Feedback, Recurrent Neural Networks, Convolutional Neural Networks - Genetic Algorithm: Basic concept - Role of GA in optimization - Fitness function - Cross over – Mutation – Inversion – Deletion

Unit III: Digital Image Processing

Digital Image Fundamentals - Components of Image Processing System- Sampling and Quantization - Color Image Processing – Color models – Pseudo color Image processing - Image Segmentation- Detection of discontinuities – Edge Linking and Boundary Detection – Thresholding – Region Based Segmentation

Unit IV: Data Mining

Introduction to Data Mining: Functionalities – Classification of Data Mining Systems – Characterization and Comparison - Association Rule Mining - Clustering - Classification and prediction.

Machine Learning Techniques: Supervised and Unsupervised Machine Learning – Bayesian and Computational Learning – Advanced Learning

Unit V: Network Security

Cryptography - Introduction -Submission Ciphers – Transposition Ciphers - One-time pads – Cryptographic Principles – Symmetric Key Algorithms: DES - AES – Cipher Modes - Cryptanalysis –Public Key Algorithms – Digital Signatures: Symmetric Key Signatures – Public Key Signatures - Message Digests.

References:

1. Ellis Horowtz and Sartaj Sahni, "Fundamentals of Computer algorithms", Galgotia Publications, New Delhi, 2008.
2. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", Pearson Education, New Delhi, Fourth Edition, 2018.
3. Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufman Publishers (Elsevier Science), 2006.
4. ArshdeepBahga, Vijay Madisetti, "Internet of Things", Universities Press(INDIA) Private Ltd., 2015.
5. William Stallings, "Cryptography and New Network Security", Pearson Education, Delhi, 2017.
6. Mark A. Weiss Addison Wesley, "Data Structures and Algorithm Analysis in Java", 2/E, 2006.

Course Outcomes:

After successful completion of the Course, Scholar shall be able to

CO 1: Understand the role of HPC in science and engineering. K2
CO 2: Use HPC platforms and parallel programming models. K3
CO 3: Able to measure, analyse and assess the performance of HPC applications and their supporting hardware. K3,K6
CO 4: Analyse the suitability of different HPC solutions to common problems found in Computational Science. K2
CO 5: Able to administration, scheduling, code portability and data management in an HPC environment, with particular reference to Grid Computing. K3

Mapping of Cos with Pos and PSOs :

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	S	M		M		M	S		S	M
CO2	S	M		M		M	S		S	M
CO3		M		S		S	S	S	M	
CO4	S	M		M		M	S		S	M
CO5	S	M		M		M	S		S	M

S – Strongly Correlating M- Moderately Correlating

M21CST21	Special Paper - Digital Image Processing		
	Semester II	**Credits: 4**	**Hours: 10**
Cognitive Level	K2-Understand K3-Apply K4-Analyze		
Objectives	1. To know the basic components of Digital Image Processing system. 2. To Analyze and implement image processing algorithms 3. To understand the differences between computer vision and image processing. 4. To develop Application-Specific Algorithms for image processing		

Unit I: Introduction

Digital Image representation - Fundamental steps in Image Processing - Elements of Digital Image Processing Systems - Sampling and Quantization: Basic concepts in sampling and quantization – representing digital images – spatial and intensity resolution – image interpolation.

Unit II: Image Fundamentals and Intensity Transformations

Basic relationships between pixels: Neighbours of a pixel – Adjacency, Connectivity, Regions and Boundaries – Distance measures - Imaging Geometry - Transformation Technology - Basic Intensity Transformation functions - The Fourier Transform, The Hadamard Transform, The Discrete Cosine Transform.

Unit III: Image Enhancement

The Spatial Domain Methods, The Frequency Domain Methods - Image Segmentation: Pixel Classification by Thresholding, Histogram Techniques: Histogram Equalization – Histogram Matching – Local Histogram Processing – Using Histogram statistics for Image Enhancement, Smoothing and Thresholding - Gradient Based Segmentation: Gradient Image, Boundary Tracking, Laplacian Edge Detection.

Unit IV: Color Image Processing

Color models – Pseudo color Image processing: Intensity Slicing – Intensity to Color Transformations – Basic of full color Image Processing – Color transformations: Formulation – Color Complements - Color Slicing – Tone and Color Corrections - Histogram Processing – Smoothing and Sharpening – Color Segmentation – Noise in Color Images – Color Image Compression.

Unit V: Image Segmentation

Detection of discontinuities – Edge Linking and Boundary Detection – Thresholding – Region Based Segmentation: Region Growing – Region Splitting and Merging – Segmentation by Morphological Watersheds:– Watershed Segmentation Algorithm – Use of Markers – The Use of Motion in Segmentation: Spatial Techniques – Frequency Domain Techniques.

References:

1. Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Eastern Economy Edition, 1992.
2. C. Gonzalez and R.E. Woods, “Digital Image Processing", Addison Wasley, 2012.
3. A.K.Jain, “Fundamentals of Digital Image Processing", Prentice Hall of India, 2014.

Course Outcomes:

After completion of the course, Student shall be able to

CO 1: Understand how digital images are represented and manipulated in computer K2
CO 2: Analyse the basic algorithms used for image processing. K3
CO 3: Evaluate the techniques for image enhancement and image restoration. K4
CO 4: Interpret image segmentation and representation techniques. K4
CO 5: Identify, Analyse and categorize the image compression techniques K3,K4

Mapping of Cos with Pos and PSOs :

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	S	M		M	M	M	M	S	M	S
CO2		S	M	S	M		S	M	S	
CO3	S	M		M	M	M	M	S	M	S
CO4	S	M	S	M	M	M	M	S	M	S
CO5	M	S	M	S	M		S	M	S	M

S – Strongly Correlating M- Moderately Correlating

M21CST21	Special Paper - Cloud Computing		
	Semester II	**Credits: 4**	**Hours: 10**
Cognitive Level	K2-Understand K4-Analyze		
Objectives	1. To understand the principle of cloud virtualization, cloud storage, data management and data visualization. 2. To learn the key dimensions and challenges of Cloud Computing. 3. To facilitate to choose the appropriate technologies, algorithms, and approaches for the related issues. 4. Able to develop and deploy cloud application using popular cloud platforms.		

Unit I: Distributed Computing

Overview of Distributed Computing - Trends of computing - Introduction to distributed computing – Types of Distributed computing: Network Centric – Server based Computing – Peer to peer computing - Next big thing: cloud computing - Application availability, performance, security and disaster recovery - Next generation Cloud Applications.

Unit II: Introduction to Cloud Computing

What's cloud computing – Public cloud – Private cloud – Hybrid cloud – Cloud computing methodologies - Properties & Characteristics - Service Models – Difference between service models - Deployment models - Cloud architecture - Advantages and Disadvantages – Uses of cloud computing – Cloud Applications.

Unit III: Infrastructure as a Service (IaaS)

Introduction to IaaS – IaaS Architecture - Characteristics of IaaS - Resource Virtualization – Server-Storage Network - Case studies - Performance and scalability of services - Tools and technologies used to manage cloud services deployment – Advantages and Disadvantages of IaaS.

Unit IV: Platform as a Service (PaaS)

Introduction to PaaS - PaaS Architecture - Characteristics of PaaS – Uses of PaaS and its Deployment – Development Tools - Cloud platform and Management – Computation – Storage - Case studies - Advantages and Disadvantages of PaaS – How is PaaS different from server less computing? - Communication PaaS – Mobile Paas – Open PaaS

Unit V: Software as a Service (SaaS)

Introduction to SaaS - SaaS Architecture - Characteristics of SaaS - Web services - Cloud based service - Applications and development - Platform deployment so as to improve the total cost of ownership (TCO) – Adoption drivers – Adoption challenges - Advantages and Disadvantages of SaaS – Security and Privacy - Popular SaaS providers.

References:

1. Barrie Sosinsky, "Cloud Computing Bible", Wiley-India, 2010.
2. James Broberg, Andrzej M. Goscinski, "Cloud Computing: Principles and Paradigms", 2011.
3. Lee Gillam, "Cloud Computing: Principles, Systems and Applications", Springer, 2012.
4. Ronald L. Krutz, Russell Dean Vines, "Cloud Security: A Comprehensive Guide to Secure Cloud Computing", Wiley-India, 2010.

Course Outcomes:

After successful completion of this course, the students shall be able to

CO1: Understand the concepts, characteristics, delivery models and benefits of cloud computing K2

CO2: Understand the key security and compliance challenges of cloud computing K4

CO3: Understand the key technical and organisational challenges K2

CO4: Understand the different characteristics of public, private and hybrid cloud deployment models. K2

Mapping of Cos with Pos and PSOs :

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	S	M		M	M	S	M	M	S	
CO2	M	M		S		M	M	S	S	M
CO3	S	M		M	M	S	M	M	S	
CO4	S	M		M	M	S	M	M	S	

S – Strongly Correlating M- Moderately Correlating

M21CST21	Special Paper-Network Security		
	Semester II	**Credits: 4**	**Hours: 10**
Cognitive Level	K2-Understand K3-Apply K4-Analyze		
Objectives	1. To understand the security design principles 2. To learn secure programming techniques in networking 3. To Understand the security requirements in operating systems and databases 4. To make familiar with security applications in wireless environment		

Unit I: Introduction

Services and Mechanism: Security Attacks, Security Services - Classical Encryption Techniques - Cipher Principles - Data Encryption Standard - Block Cipher Design Principles and modes of Operation - Evaluation criteria for AES - AES Cipher - Triple DES - Placement of Encryption function - Traffic Confidentiality.

Unit II: Public Key Encryption

Public Key Cryptography: Principles of public Key Cryptosystems – The RSA Algorithm - Key Management - Diffie-Hellman Key Exchange - Elliptic Curve Architecture and Cryptography - Introduction to Number Theory: Prime and Relatively Prime Numbers – Modular Arithmetic – Fermat's and Euler's Theorems – Testing for Primarily - Euclid's Algorithm – The Chinese Remainder Theorem - Discrete Logarithms - Confidentiality using Symmetric Encryption.

Unit III: Hash Functions

Message Authentication and Hash Functions: Authentication requirements - Authentication Functions - Message Authentication Codes – Hash Functions - Security of Hash Functions and MACs – Hash and Mac Algorithms: MD5 message digest algorithm - Secure Hash Algorithm – RIPEMD – HMAC – Digital Signatures and Authentication Protocols: Digital Signatures - Authentication Protocols - Digital Signature Standard.

Unit IV: Network Security

Authentication Applications: Kerberos - X.509 Authentication Service - Electronic Mail Security – PGP - S/MIME - IP Security: IP Security Overview – IP Security Architecture – Authentication Header – Encapsulating Security Payload – Combining Security Associations – Key Management - Web Security: Web Security Requirements – Secure Sockets Layer and Transport Layer Security – Secure Electronic Transaction.

Unit V: System Security

Intrusion Detection - Password management - Viruses and related Threats - Virus Counter measures – Firewalls: Firewall Design principles – Trusted Systems, SSL, SET.

References:

1. Williams Stallings, "Cryptography and Network Security-Principles and Practices", Prentice Hall of India, Third Edition, 2003.
2. Atual Kahate, "Cryptography and Network Security", McGraw Hill, 2019.
3. Bruce Schenier, "Applied Cryptography", John Wiley & Sons Inc, 2001.

Course Outcomes:

After completion of the Course, students shall be able to

CO 1: Apply cryptographic utilities and authentication mechanisms to design secure applications K2

CO 2: Understand the design issues in Network Security K2

CO 3: Identify security threats, security services and mechanisms to counter them. K4

CO 4: Understand, compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication K3

CO 5: Apply different digital signature algorithms to achieve authentication and create secure applications K4

Mapping of Cos with Pos and PSOs :

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	S	M		S		M	S	M	S	M
CO2	S	M		S	M	M	S	M	S	
CO3		M	M		S	M	M	M	M	S
CO4	S	M		S	M	M	S	M	S	M
CO5	S	M	M		S	M	M	M	M	S

S – Strongly Correlating M - Moderately Correlating

M21CST21	Special Paper - Biometric Gait Analysis		
	Semester II	**Credits: 4**	**Hours: 10**
Cognitive Level	K2-Understand K3-Apply K4-Analyze		
Objectives	1. To recognize the Gait characteristics using Biometrics 2. To understand the strength and weakness of biometric gait recognition 3. To analyze signals based on image and video through biometric 4. To evaluate the error distribution and quality of gait recognition technique		

Unit I : Introduction

Biometric gait recognition: MV-based gait recognition – FS-based gait recognition – WS-based gait recognition - Behavioral biometric: Keystroke dynamics – Gait analysis – Voice ID – Mouse use characteristics – Signature Analysis – Biometric sensing from distance - Gait as a biometric - Gait authentication – Identification – Challenges - Issues and prospects.

Unit II: Fundamentals of Biometric Gait Recognition

Strength and weakness – Why gait recognition – Keystroke dynamics in gait recognition – Motion - based gait recognition – Model based gait recognition – Types of phases in gait cycle

Unit III: Gait Processing

Image based recognition – Signal based recognition: kinetic, kinematic, pose, Electronygraphy (EMG) – Marker based recognition- Devices used in biometric gait recognition.

Unit IV: Gait Analysis

2D and 3D Analysis- Biomechanics of standing – Ground reaction of normal gait- pressure and movement, measurement, evaluation, description – Technology challenges- clinical gait analysis

Unit V: Error Distribution

Error types – Threshold score distribution – FAR/FRR – System design issues – Gait velocity matching performance – system vulnerabilities – Circumvention – Covert acquisition – Quality control – Template generation – Interoperability – Data storage

References:

1. Christopher Kirtley, “Clinical Gait Analysis”, Elsevier Churchchill Livingstone, 2005.
2. Adam M.Fullenkamp, “A hybrid Gait recognition solution using video and ground contact information”, 2007.
3. Samir Nanavati, Michael Thieme, Raj Nanavati, “Biometrics – Identity”, 2002.

Course Outcomes:

After successful completion of the course, Student shall be able to:

CO1: Demonstrate deeper understanding of gait analysis . K2
CO2: Evaluate gait process using various methods K4
CO3: Understand the error distribution in gait analysis K3
CO4: Implement dynamics in gait recognition K2

Mapping of Cos with Pos and PSOs :

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	M	S		S		M	M	S	M	
CO2	S	S	M	S	S	S	S	M	S	S
CO3	M	S		S	M	M	M	S	M	
CO4	M	S	M	S		M	M	S	M	S

S – Strongly Correlating M- Moderately Correlating

M21CST21	Special Paper - Advanced Databases		
	Semester II	**Credits:4**	**Hours: 10**
Cognitive Level	K2: Understand K3: Apply K4: Analyse K6: Create		
Objectives	1. To recognise the importance of Distributed Data processing and design issues 2. To understand and apply query processing and optimization 3. To categorize and analyze the Object oriented and Object Relational Database 4. To make familiar for database creation using advanced Concept		

Unit I: Distributed Databases

Introduction – Distributed Data Processing - Distributed Database System – Promises of DDBS - Problem Areas - Overview of Relational DBMS: Relational Database Concepts – Normalization - Integrity – Rules - Relational Data Languages.

Distributed DBMS Architecture: Architectural Models for Distributed DBMS - Distributed Database Design: Alternative Design Strategies - Distribution Design Issues – Fragmentation - Allocation.

Unit II: Query Processing and Decomposition

Query Processing Objectives - Characterization of Query Processors - Layers of Query Processing - Query Decomposition - Localization of Distributed Data - Distributed Query Optimization: Query Optimization - Centralized Query Optimization - Distributed Query Optimization Algorithms.

Unit III: Transaction Management

Definition – Characterization of Transactions – Formalization of Transaction concept - Properties of Transaction - Types of Transaction - Distributed Concurrency Control – Serialization - Concurrency control Mechanism and Algorithms - Time Stamped and Optimistic Concurrency Control Algorithms - Deadlock Management.

Unit IV: Distributed Object Database Management Systems

Fundamental Object Concepts and Models - Object Distributed Design: Horizontal Class Partitioning – Vertical Class Partitioning – Path Partitioning – Class Partitioning Algorithms – Allocation - Replication - Architectural Issues - Object Management: Object Identifier Management – Pointer Swizzling – Object Migration - Distributed Object Storage - Object Query Processing.

Unit V: Object Oriented Data Model

Components of Object oriented data model - Advantages and Disadvantages of Object Oriented Data Model – Abstract data types - Inheritance – Object Identity - Persistent

Programming Languages - Persistence of object - Comparing OODBMS and ORDBMS – Concurrent access – Support of transactions

References:

1. M.Texter OZSU and Patuck Valduries, "'Principles of Distributed Database Systems", Pearson Edition, 2001.
2. Stefan Cari and Willipse Peiagatti, "Distributed Database", McGraw Hill, 1988.
3. Henry P.Korth, A Silberschatz and Sundarshan, "Database System Concepts", McGraw Hill, 2019.
4. Raghuramakrishnan and Johanes Geheke, "Database Management Systems", McGraw Hill, 2014.

Course Outcomes:

After successful completion of the course, Student shall be able to:

CO 1: Understand the use of Structured Query Language (SQL) K2
CO 2: Create E/R models from application descriptions. K3
CO 3: Apply normalization techniques to standardize the database. K3, K4
CO 4: Design and implement a database system for real time problem K6
CO 5: Create databases in an RDBMS and enforce data integrity constraints and queries using SQL K6

Mapping of Cos with Pos and PSOs:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	S	M	S	M	M	S	M	S	M	M
CO2	M	M	M	S	S	M	S	M	M	S
CO3	M	M	M	S	S	S	S	M	S	S
CO4	M	M	S	S	S	S	S	M	S	S
CO5	M	M	S	S	S	S	S	M	S	S

S – Strongly Correlating M- Moderately Correlating

M21CST21	Special Paper - Machine Learning Techniques		
	Semester II	**Credits: 4**	**Hours: 10**
Cognitive Level	K2-Understand K4-Analyze K6-Create		
Objectives	1. To Learn about Machine Intelligence and Machine Learning applications 2. To implement and apply machine learning algorithms to real-world applications. 3. To identify and apply the appropriate machine learning technique to classification, pattern recognition, optimization and decision problems. 4. To understand how to perform evaluation of learning algorithms and model selection.		

Unit I: Introduction

Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

Unit II: Neural Networks And Genetic Algorithms

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning – Advantages and Disadvantages of Genetic Algorithm.

Unit III: Bayesian And Computational Learning

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model**.**

Unit IV: Instant Based Learning

Nearest Neighbour - K-Nearest Neighbour Learning – K-Nearest Neighbour learning in Euclidean space – Distance weighted Nearest Neighbours - Advantages and Disadvantages of KNN - Locally weighted Regression – Radial Basis Functions – Case Based Reasoning – Advantages and Disadvantages of Instance based learning – Lazy vs. Eager Learning.

Unit V: Advanced Learning

Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning

Text Book:

1. Tom M. Mitchell, "Machine Learning", McGraw-Hill Education (India) Private Limited, 2013.

Reference Books:

1. EthemAlpaydin, "Introduction to Machine Learning (Adaptive Computation and Machine Learning)", The MIT Press, 2004.
2. Stephen Marsland, "Machine Learning: An Algorithmic Perspective", CRC Press, 2009.
3. Michael Affenzeller, Stephan Winkler, Stefan Wagner, Andreas Beham, "Genetic Algorithms and Genetic Programming", CRC Press Taylor and Francis Group, 2009.

Course Outcomes:

After successful completion of the course, Student shall be able to:

CO 1: Have a good understanding of the fundamental issues and challenges of machine learning concept K2

CO 2: Understand, Analyse and identify the strengths and weaknesses of many popular machine learning approaches. K2, K4

CO 3: Understand the underlying mathematical relationships across Machine Learning algorithms and the paradigms of supervised and un-supervised learning. K2

CO 4: Ability to design and implement various machine learning algorithms in a range of real-world applications. K4, K6

CO 5: Perform evaluation of machine learning algorithms and model selection. K4

Mapping of Cos with Pos and PSOs :

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	S	S		S		M	M	M	S	M
CO2	S	S		S	M	M	M	M	S	
CO3	S	M	M	S		M	M	M	S	M
CO4	M	S	S		M	S	M	S		S
CO5	M	S	S		M	S	M	S		S

S – Strongly Correlating M- Moderately Correlating

M21CST21	Special Paper - Internet of Things		
	Semester II	**Credits: 4**	**Hours: 10**
Cognitive Level	K2-Understand K3-Apply K4-Analyze		
Objectives	1. In order to gain knowledge on bases of Internet of Things (IoT) 2. To gain knowledge of IoT Architecture, and the Protocols related to IoT; 3. To understand the concept of the Web of Thing 4. To understand the relationship between the IoT and WoT		

Unit I: Introduction to IoT

Definition and characteristics of Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies: WSN – Cloud Computing – Big Data Analytics – Communication Protocols – Embedded Systems - IoT Levels and Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF - YANG- IoT Platforms Design Methodology.

Unit II: IoT Architecture

ETSI M2M high-level architecture: ETSI M2M SCL Resource Structure – Security in ETSI M2M Framework - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - Information model - Functional model - Communication model - IoT reference architecture.

Unit III: IoT Protocols

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol: Standardization – Technology – Security – BACnet over web services – Modbus – Zigbee Architecture – Network layer – APS Lauer - 6LowPAN – RPL - CoAP - Security

Unit IV: Web of Things:

Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence. Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards – Cloud Providers and Systems – Mobile Cloud Computing – The Cloud of Things Architecture.

Unit V: Applications

The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronisation and Software Agents – Applications - Smart Grid – Electrical Vehicle Charging – Case Study.

Text Books:

1. Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015.
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet of Things”, Springer, 2011.

Reference Books:

1. Jan Ho¨ ller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
2. David Easley and Jon Kleinberg, “Networks, Crowds, and Markets: Reasoning About a Highly Connected World”, Cambridge University Press, 2010.
3. Olivier Hersent, David Boswarthick, Omar Elloumi, “The Internet of Things – Key Applications and Protocols”, Wiley, 2012.

Course Outcomes:

After successful completion of the course, Student shall be able to:

CO 1: Organize and Analyze Bigdata	K2
CO 2: Discover Useful Information for Decision Making	K2, K4
CO 3: Analyze applications of IoT in real time scenario	K2
CO 4: Design a portable IoT using Rasperry Pi	K4, K6
CO 5: Analyze various protocols in IoT	K4

Mapping of Cos with Pos and PSOs :

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	S	S		S		M	M	M	S	M
CO2	S	S		S	M	M	M	M	S	
CO3	S	M	M	S		M	M	M	S	M
CO4	M	S	S		M	S	M	S		S
CO5	M	S	S		M	S	M	S		S

S – Strongly Correlating M- Moderately Correlating

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