
Islamic University of Science & Technology, Kashmir, J&K - 192122
Department
of
Computer Science
SoET

Semester - IV

Semester-IV(24 Credit Semester)						
Course Code	Course Name	Paper category	Hours / Week			Credits
			L	T	P	
20 Core Credit Units						
MCA-4T1-C	Theory of Formal Languages	Core	2	2	0	4
MCA-4T2-C	Big Data Analytics	Core	2	2	0	4
MCA-4T3-C	Project work	Core	0	10	10	10
6 Elective Credit Units						
Pool A: 3 Elective Credit Units						
MCA-4E1-DCE	Wireless Communications	DCE	2	1	0	3
MCA-4E2-DCE	Cloud and Grid Computing	DCE	2	1	0	3
MCA-4E3-DCE	Information Security and Networks	DCE	2	1	0	3
MCA-4E4-DCE	Compiler Design	DCE	2	1	0	3
Pool B: 3 Elective Credit Units						
MCA-4E5-DCE	Block Chain Technologies	DCE	2	0	2	3
MCA-4E6-DCE	Machine Learning/Data Science	DCE	2	0	2	3
MCA-4E7-DCE	Quantum Computing	DCE	2	0	2	3
MCA-4E8-DCE	Advanced Java	DCE	2	0	2	3

Course Title:	Theory of Computation & Formal Languages	**Course Code:**	MCA-4T1-C
Semester:	4th	**Paper Type:**	Core
Credits:	04	**Max Marks:**	100
Pre Requisite:	MCA-2T1-C, MCA-3E6-DCE	**Co-Requisite:**	MCA-4E4-DCE

Marks Distribution: (Mid Term:30, End Term:50, Viva:10, Assignment / Presentations:10)

COURSE OBJECTIVES:

- *To be able to construct finite state machines and the equivalent regular expressions.*
- *To understand the class of languages described by finite state machines and regular expressions.*
- *To understand and construct pushdown automata and the equivalent context free grammars.*
- *To understand the concept of construct Linear bounded automata and the equivalent context Sensitive grammars.*
- *To understand the concept of Turing Machine and Universal Turing machine*

COURSE CONTENT:

UNIT I

Introduction to Set Theory, Introduction to Automata, Alphabets, String, Languages, Strings, Kleen Star, Kleen Plus, Introduction to Finite automata, Deterministic finite automata, DFA notations (Transition Table, Transition Table) Languages Accepted by DFA, Designing DFA by pattern recognition, Application of DFA, Non-deterministic Finite Automata, Language accepted by NDFA, Conversion of DFA to NDFA, Overview of e-NDFA. DFA vs NDFA vs e-NDFA,

UNIT II

Finite Automata & Regular Expressions: Definition, Basic Regular Expressions, Obtaining regular expression: Using Basics Expressions & State Elimination Method, Application of regular Expressions, Regular Languages: Definition, Properties, and Pumping Lemma for Regular Languages, Decidable and Closure properties of Regular languages. Limitation of Finite Automata, Equivalence & minimization of DFA.

UNIT III

Introduction to Grammar, Chomsky Hierarchy, Generation of Grammar from Finite Automata & Regular Expressions, Derivation Trees, Left most and Right Most Derivation Trees, Ambiguous Grammar, Context Free Grammar and its applications, properties of context free languages.

Introduction to Push down Automata, Transition & Graphical Representation.

UNIT IV

Introduction to Linear bounded Automata & Turing Machine. Turing machine model, transition table Instantaneous definition, Acceptance and Construction of Turing machine. Standard Turing
machine, Transducers, Lexical and Syntax Analyze: Parsing, Top down Parsing (Predictive parsers, LL (K), recursive Descent) and Bottom up Parsing (LR (K)).

COURSE OUTCOMES:

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

- *Describe the mathematical model of machines.*
- *Understand the concept of formal language and corresponding automaton.*
- *Introduces the concept of ambiguity, derivations and parse tree in grammar.*
- *Apply the acquired knowledge of formal languages to the engineering areas like Compiler Design*
- *Apply the acquired knowledge of finite automata theory and to design discrete problems to solve by computers.*

Text Books:

1. Finite Automata and Formal Languages"- A Simple Approach, A.M Padma Read Pearson Education

References:

1. Hopcroft, J., & Ullman, J., "Introduction to Automata Theory, Languages & Computation", Pearson Education
2. Hopcroft J, R. Motwani, & J. Ullman, "Introduction to Automata Theory, Languages & Computation", Pearson Education
3. P. Linz, "Introduction to Formal Languages & Automata", Jones & Barlett PWS Publishing Company
4. Donald Knuth, "The Art of Computer Programming", Prentice Hall

Course Title:	Big Data Analytics	**Course Code:**	MCA-4T2-C
Semester:	4th	**Paper Type:**	Core
Credits:	04	**Max Marks:**	100
Pre Requisite:	MCA-1E4-DCE, MCA-3T2-C	**Co-Requisite:**	MCA-4E8-DCE

Marks Distribution: (Mid Term:30, End Term:50, Viva:10, Assignment / Presentations:10)

COURSE OBJECTIVES:

- *To learn big data challenges in different domains including social media*
- *To learn MAP-REDUCE programming model for better scalability and performance*
- *To analyze the capability of No-SQL systems*
- *To apply machine learning algorithms for big data analytics*

COURSE CONTENT:

UNIT I

Introduction to core concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications

Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, using multiple data sources

UNIT II

Introduction to Big Data: Big Data - Definition, overview of Big Data, Big Data Characteristics – Volume, Velocity, Variety and other Vs, Issues and challenges of Big Data, Stages of analytical evolution, State of the Practice in Analytics, Big Data Architecture – space of Big Data: Transactions, Interactions, Observations; Big data Technological approaches and Potential use cases for Big Data. The Hadoop Ecosystem–Distributed File Systems basics, Advantages of Hadoop, Query languages for Hadoop,Hadoop Distributed File System (HDFS), Overview of HBase, Hive and PIG.

MapReduce Framework , Introduction to Machine Learning .

UNIT III

Data analysis: Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes.

NoSQL Databases – Review of traditional Databases, Need for NoSQL Databases, Columnar Databases, Failover and reliability principles, working mechanisms of NoSQL Databases – HBase, Cassandra, Couch DB, Mango DB.

UNIT IV

Applications of Data Science, Technologies for visualisation, , recent trends in various data collection and analysis techniques, various visualization techniques, application development methods in data science using g R, Spreadsheet-like analytics.

COURSE OUTCOMES:

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

- *Preparing for data summarization, query, and analysis.*
- *Applying data modelling techniques to large data sets*
- *Creating applications for Big Data analytics*
- *Building a complete business data analytic solution*

Text Books:

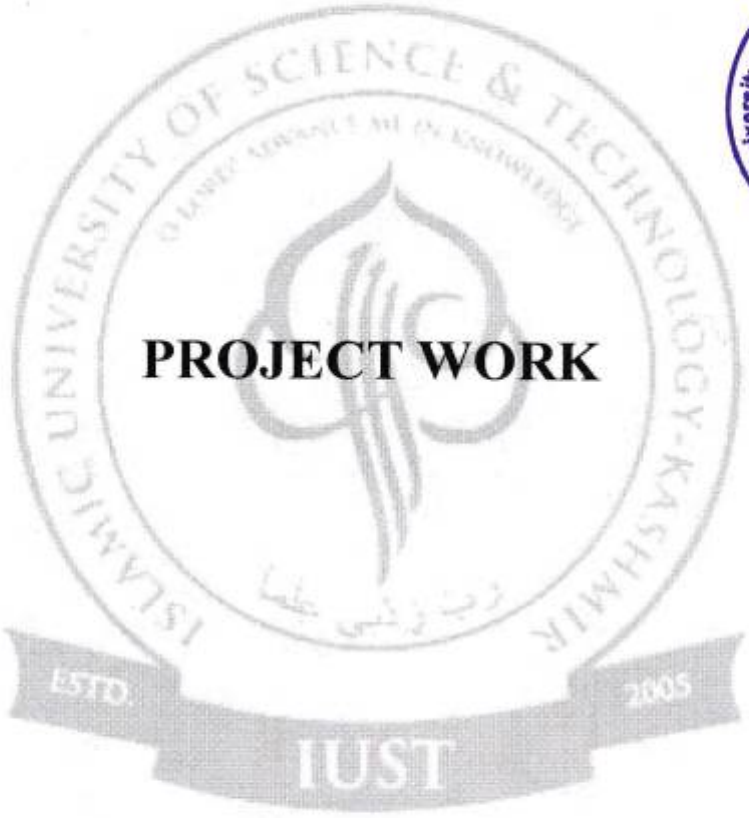
1. Big Data – A Primer, H. Mohanty, P. Bhuyan, D. Chenthati (Eds.), Springer , Studies in Big Data, vol. 11, 2015.
2. Big Data Analytics with Rand Hadoop, Vignesh Prajapati, PACKT Publishing

References:

1. Mining of Massive Datasets, Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman, Cambridge Universities Press, 2012.
2. Big Data at Work: Dispelling the Myths, Uncovering the Opportunities Book by Thomas H. Davenpor

Course Title:	Project Work	**Course Code:**	MCA-4T3-C
Semester:	4th	**Paper Type:**	Core
Credits:	10	**Max Marks:**	250
Pre Requisite:	All courses upto semester 3rd	**Co-Requisite:**	MCA-4T2-C, MCA-4E8-DCE

Marks Distribution: (Mid Term: 100, End Term: 150, Viva: 0, Assignment / Presentations: 0)



PROJECT WORK

Course Title:	Wireless Communications	**Course Code:**	MCA-4E1-DCE
Semester:	4th	**Paper Type:**	DCE
Credits:	03	**Max Marks:**	75
Pre Requisite:	MCA-3T3-C	**Co-Requisite:**	MCA-4E3-DCE

Marks Distribution: (Mid Term:25, End Term:35, Viva:05, Assignment / Presentations:10)

COURSE OBJECTIVES:

- *The objective of this course is to give an introduction to the fundamentals of the wireless communications systems, the wireless network architectures, protocols, and applications.*
- *To provide an overview of Wireless Communication networks area and its applications in communication engineering.*
- *To enable the student to synthesis and analyze wireless and mobile cellular communication systems over a stochastic fading channel*
- *To provide the student with an understanding of advanced multiple access techniques.*
- *To provide the student with an understanding of diversity reception techniques*
- *To give the student an understanding digital cellular systems (cdma2000, W-CDMA, LTE and candidate 5G waveforms).*

COURSE CONTENT:

UNIT I

Wireless Communication Systems: Basic Concepts, Wireless Networks, Wireless vs Wired networks, Classification of Wireless Networks. Wireless Transmission Concepts: Antennas, Types of antennas, Signal propagation, Multipath propagation. Types of Wireless Telephones (Cordless, Fixed Wireless (WLL), Wireless With Limited Mobility (WLL-M), Fully Mobile Wireless Phones). Introduction to various Generations of Mobile Phone Technologies. Wireline/Wireless Portion of Mobile Communication Network.

UNIT II

Electromagnetic spectrum, its use & allocation to well-known bands. Multiple Access Techniques: FDMA, TDMA & CDMA. Basic concepts of Spread Spectrum(SS) technique; Direct Sequence SS versus Frequency Hopping SS. Concept of cells, sectorization, coverage area, frequency reuse, cellular networks, microcells & handoffs. Simplified Implementation of IS-95 CDMA Using Chip Sequences, Concept of (Walsh) Code, Concept Of CDMA (PCS and Cellular) Channel, Forward & Reverse CDMA Channel for a Cell/Sector, Comparison of Cellular/PCS CDMA Networks, Frequencies & Cell-Sizes.

UNIT III

Cellular Mobile Systems: Introduction & Overview of GSM/CDMA. Channel: Types, Forward & Reverse CDMA channel for a cell/sector (Pilot, Sync, Paging, Forward Traffic Channels, Access, Reverse TC). Concept of Voice Coding. Components of Mobile Network Architecture: MS, BTS, BSC, MSC, & their basic Functions. Types of Handoffs in GSM. Use of HLR & VLR in Mobile

Networks. Concept of Mobile IP & WAP. Wireless LAN Technology: Overview of Wifi & the IEEE 802.11. Concept of Bluetooth & IEEE 802.15.

COURSE OUTCOMES:

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

- *Demonstrate advanced knowledge of networking and wireless networking and understand various types of wireless networks, standards, operations and use cases.*
- *Demonstrate knowledge of protocols used in wireless networks and learn simulating wireless networks.*

Text Books:

1. T. Rappaport, "Wireless Communications, Principles andamp; Practice", Pearson andy Dornan, "The Essential Guide to Wireless Communications", Pearson
2. Jochen Schiller, "Mobile Communications", Pearson andrew Tanenbaum, "Computer Networks", PHI

References:

1. William Stallings, "Wireless Communications & Networks", Pearson
2. K.Pahlavan, P.Krishnamurthy, "Principles of Wireless Networks", Pearson Education.

Course Title:	Cloud & Grid Computing	**Course Code:**	MCA-4E2-DCE
Semester:	4th	**Paper Type:**	DCE
Credits:	03	**Max Marks:**	75
Pre Requisite:	MCA-3E10-DCE	**Co-Requisite:**	MCA-4E5-DCE

Marks Distribution: (Mid Term:25, End Term:35, Viva:05, Assignment / Presentations:10)

COURSE OBJECTIVE:

The objective of studying Cloud and Grid Computing is that it enables new social services by connecting users via social networks that are constructed using multiple cloud service and it will run the software industry upside down. Thus educates potential users about the benefits of cloud computing and the best way to make full use of them.

COURSE CONTENT:

UNIT I

Cloud Computing: Introduction to cloud & Cluster computing, cloud computing vs cluster computing, Evolution of cloud computing, principles of cloud computing, cloud Computing architecture, Cloud computing applications. Cloud service models (IaaS, PaaS, SaaS), could Deployment models (Public, Private, hybrid& community models). Challenge and Security Issues

UNIT II

Grid Computing: Introduction to Grid Computing, Characteristics, grid computing Architecture, grid complexity levels and topologies, grid components and grid layers, applications of Grid Computing. Grid security issues: Authorization and Authentication methods, Grid computing vs Cloud Computing Cluster Computing.

UNIT III

Introduction to OGSA, Services, Schema and architecture, Overview of OGSI, Virtualization: Virtual machines and visualization of clusters and data centres, levels of virtualization, virtualization structures and tools and mechanism, virtualization of CPU, Memory & I/O devices

COURSE OUTCOMES:

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

- *Elaborate the basic concepts of cloud computing and defining the basic terms*
- *Understand various cloud implementations and migration techniques*
- *To define the various industrial applications of cloud virtualization.*
- *learn security challenges and preventive measures in cloud computing*

Text Books:

1. Cloud Computing by pankaj Sharma published by S.K.Kataria and Sons.
2. Cloud Computig Bible: Published by Wiley India Pvt. Ltd.
3. Grid and Cloud Computing and Applications: The 2014 World Comp International Conference. Publisher C.S.R.E.A
4. Grid, Cloud and Cluster Computing and Applications by Hamid R.Arabnia, Ashu M.G.Solo

References:

1. Mastering Cloud Computing, Paperback-1 Feb 2013 by Buyya, Vecchiola&Selvi.
2. Cloud Computing: Concepts, Technology & Architecture, 1e Paperback-2014 by Erl.
3. Grid & Cloud Computing, a business perspective on Technology & Applications, Springer by Stanoevska-Slabeva, Katarina, Wozniak, Thomas, Ristol, Santi (Eds.)

Course Title:	Information Security & Networks	**Course Code:**	MCA-4E3-DCE
Semester:	4th	**Paper Type:**	DCE
Credits:	03	**Max Marks:**	75
Pre Requisite:	MCA-3T3-C	**Co-Requisite:**	MCA-4E1-DCE

Marks Distribution: (Mid Term:25, End Term:35, Viva:05, Assignment / Presentations:10)

COURSE OBJECTIVES:

- *To develop an understanding of information assurance as practiced in computer operating systems, distributed systems, networks and representative applications.*
- *To Gain familiarity with prevalent network and distributed system attacks, defenses against them, and forensics to investigate the aftermath.*
- *Develop a basic understanding of cryptography, how it has evolved, and some key encryption techniques used today.*
- *Develop an understanding of security policies (such as authentication, integrity and confidentiality), as well as protocols to implement such policies in the form of message exchanges.*

COURSE CONTENT:

UNIT I

Introduction: Security trends, the OSI Security Architecture, Security attacks, Security mechanisms, Security services, Model for Network Security. Encryption: Symmetric & Asymmetric Encryption, Symmetric Cipher model, Substitution techniques (Mono-alphabetic & Poly-alphabetic) & Transposition Technique, Rotor Machines, Block and Stream ciphers, Modern Round Ciphers: DES, AES, Introduction to Steganography. Encryption vs Steganography.

UNIT II

Introduction to Number Theory: Prime Numbers, Fermat's & Euler's theorem & discrete logarithms. Public Key Cryptography & RSA. Key management: Diffie-Hellman Key Exchange, Elliptic Curve Arithmetic & Elliptic Curve Cryptography. Message Authentication & Hash functions. Digital Signatures & Authentication protocols. Network Security Applications: IP Security

UNIT III

Mechanics of Routing Protocols: Routing , Static and Dynamic Routing, Distant vector routing & link state routing, Internet working with Dissimilar Protocols, Protocol design Consideration: Simplicity, flexibility, Optimality, Overhead & Scaling, Operation above Capacity, forward compatibility. Migration: Routing Algorithms & addressing parameters, making multi-protocol operation possible. Network Security: Security Features in Wireless Adhoc & Wireless Sensor Networks.

COURSE OUTCOMES:

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

- *Evaluate the security treats in modern computer era*
- *Define and identify firewall and network filtering*
- *List and recognize various VPN*
- *Identify different technique of sandboxing*
- *Distinguish various ethical hacking and testing procedures*

Text Books:

1. William Stalling ," Cryptography & Network Security", Pearson Education

References:

1. Radia Perlman, "Interconnections: Bridges, Routers switches & Internet-working protocols Pearson education
2. Mark Sportack, "IP Routing Fundamentals", Pearson Education
3. Gerard J. Holzmann, "Design & Validation Computer Protocols", Prentice Hall

Course Title:	Compiler Design	**Course Code:**	MCA-4E4-DCE
Semester:	4th	**Paper Type:**	DCE
Credits:	03	**Max Marks:**	75
Pre Requisite:	MCA-3E5-DCE	**Co-Requisite:**	MCA-4T1-C

Marks Distribution: (Mid Term:25, End Term:35, Viva:05, Assignment / Presentations:10)

COURSE OBJECTIVES:

- *To understand the various phases in the design of a compiler.*
- *To understand the design of top-down and bottom-up parsers.*
- *To understand syntax directed translation schemes.*
- *To learn to develop algorithms to generate code for a target machine.*

COURSE CONTENT:

UNIT I

Introduction to compilers: Structure of a compiler – Lexical Analysis – Role of Lexical Analyzer – Input Buffering –Specification of Tokens – Recognition of Tokens – Lex – Finite Automata – Regular Expressions to Automata – Minimizing DFA.

UNIT II

Syntax Analysis: Role of Parser – Grammars – Error Handling – Context-free grammars – Writing a grammar –Top Down Parsing – General Strategies Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser-LR(0)Item Construction of SLR Parsing Table -Introduction to LALR Parser – Error Handling and Recovery in Syntax Analyzer Intermediate Code Generation: Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate Languages: Syntax Tree, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking.

UNIT III

Run-Time Environment And Code Generation: Storage Organization, Stack Allocation Space, Access to Non-local Data on the Stack, Heap Management-– Issues in Code Generation – Design of a simple Code Generator.
Code Optimization: Principal Sources of Optimization – Peep-hole optimization – DAG - Optimization of Basic Blocks Global Data Flow Analysis – Efficient Data Flow Algorithm.

COURSE OUTCOMES:

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

- *Get an understanding of how the different phases of compiler work.*
- *Study of lexical analysis, and various parsing techiques.*
- *Use compiler tools like lex and yacc.*
- *Implement a simple compiler for a hypothetical machine using syntax directed translation*

Text Books:

1. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, Pearson.
2. Compiler Construction-Principles and Practice, Kenneth C Louden, Cengage Learning.

References:

1. Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.
2. The Theory and Practice of Compiler writing, J. P. Tremblay and P. G. Sorenson, TMH

Course Title:	Block Chain Technologies	**Course Code:**	MCA-4E5-DCE
Semester:	4th	**Paper Type:**	DCE
Credits:	03	**Max Marks:**	75
Pre Requisite:	MCA-3E2-DCE, MCA-3E10-DCE	**Co-Requisite:**	MCA-4E2-DCE

Marks Distribution: (Mid Term:25, End Term:35, Viva:05, Assignment / Presentations:10)

COURSE OBJECTIVES:

- *To understand the function of Block chain as a method of securing distributed ledgers*
- *To familiarize the functional/operational aspects of cryptocurrency ecosystem.*
- *To familiarize about wallets and learn their utilization of wallet during transaction*
- *To understand that how to write and apply the Smart Contracts*
- *To understand the concept of Hyperledger*

COURSE CONTENT:

UNIT I

Introduction to Cryptography, Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat's and Euler's theorem, Euclid's Algorithm, RSA algorithm, Diffie-Hellman key exchange algorithm, ElGamal Encryption, Elliptic curve cryptography, SHA 256, Digital Signature, Zero Knowledge Proof (ZKP)

UNIT II

Introduction from barter system to Cryptocurrency, fundamental of Blockchain, Block structure, Genesis Block, Orphaned Blocks, Stale Block, Uncle Block, Distributed Ledger Technology (DLT), peer-to- peer network, Merkle Tree, Lifecycle of Blockchain, Evolutions of Blockchain, Fork, double spending money, Transactions and UTXO's, Types of Blockchain. Need of Blockchain, Benefits of Blockchain

UNIT III

Cryptocurrencies: BitCoin (BTC), Ethereum (ETH), Ripple (XRP), LiteCoin (LTC), Bitcoin Cash (BCH), Mining pools, Mining, Difficulty Level, Current Target, Nonce, how miners picks transactions, How do mempools work, 51% attack.
Consensus Algorithms: Proof of Work (PoW), Asynchronous Byzantine Agreement, Proof of Stake (PoS), Hybrid models (PoW + PoS),

COURSE OUTCOMES:

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

- *Implement the blockchain*
- *Implement the smart contracts on Ethereum platform.*
- *Implement the use cases on Hyperledger*

Text Books

1. Mastering Blockchain, Imran Bashir, Packt Publishing
2. Bitcoin and Cryptocurrency Technologies, Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, Princeton University Press. https://bitcoinbook.cs.princeton.edu/

References:

1. Grokking Bitcoin, Kalle Rosenbaum, Manning Publications.
2. http://rosenbaum.se/book/grokking-bitcoin.htmlModern compiler implementation in C
3. Blockchain Basics, Daniel Drescher, Apress Publication

Course Title:	Machine Learning	**Course Code:**	MCA-4E6-DCE
Semester:	4th	**Paper Type:**	DCE
Credits:	03	**Max Marks:**	75
Pre Requisite:	MCA-3T4-C	**Co-Requisite:**	MCA-4T1-C, MCA-4E5-DCE

Marks Distribution: (Mid Term:25, End Term:35, Viva:05, Assignment / Presentations:10)

COURSE OBJECTIVES:

- *To explain Curve fitting with a specific focus on Regression analysis, logistic Regression Analysis.*
- *To explain different machine learning procedures which include Supervised, Unsupervised, semi supervised and reinforcement learning etc.*
- *To explain familiar machine learning Techniques like Support Vector Machines and its nonlinear variant.*
- *To explain few distribution like Gaussian, Dirichlet etc. and its subsequent use in modelling data for learning.*
- *To explain common applications of machine learning with a specific focus on latest developments in the said area.*

COURSE CONTENT:

UNIT I

Introduction: Basic definitions, learning types: supervised & unsupervised, hypothesis space & inductive bias, evaluation, cross-validation, Linear regression, Decision trees, over fitting, Instance based learning, Feature reduction, Collaborative filtering based recommendation

UNIT II

Probability & Bayes learning Logistic Regression, Support Vector Machine, Kernel function & Kernel SVM neural network: Perceptron, multilayer network, back propagation, introduction to deep neural network, Introduction to Graphical Models. Generative Vs. Discriminative Models.

UNIT III

Computational learning theory, PAC learning model, Sample complexity, VC Dimension, Ensemble learning, Clustering: k-means, adaptive hierarchical clustering, Gaussian mixture model. Some application areas of machine learning e.g. Natural Language Processing, Computer Vision, applications on the web.

COURSE OUTCOMES:

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

- *Apply a variety of learning algorithms to data.*
- *Perform evaluation of learning algorithms and model selection?*
- *Apply machine learning algorithms to solve problems of moderate complexity*

Text Books:

1. Michalski, Ryszard S., Jaime G. Carbonell, and Tom M. Mitchell, eds. Machine learning: An artificial intelligence approach. Springer Science & Business Media, 2013.

References:

1. Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997.
2. Introduction to Machine Learning Edition 2, by Ethem Alpaydin

Course Title:	Quantum Computing	**Course Code:**	MCA-4E7-DCE
Semester:	4th	**Paper Type:**	DCE
Credits:	03	**Max Marks:**	75
Pre Requisite:	MCA-3E10-DCE	**Co-Requisite:**	MCA-4E6-DCE

Marks Distribution: (Mid Term:25, End Term:35, Viva:05, Assignment / Presentations:10)

COURSE OBJECTIVES:

The course will provide an insight of basic of quantum physics from a computer scientist's perspective, and how it describes reality and understand the philosophical implications of quantum computing

COURSE CONTENT:

UNIT I

Qubit & Quantum States: The Qubit, Vector Spaces. Linear Combination Of Vectors, Uniqueness of a spanning set, basis & dimensions, inner Products, orthonormality, gram-schmidt orthogonalization, bra-ket formalism, the Cauchy- schwarez and triangle Inequalities.

UNIT II

Matrices & Operators: Observables, The Pauli Operators, Outer Products, The Closure Relation, Representation of operators using matrices, outer products & matrix representation, matrix representation of operators in two dimensional spaces, Pauli Matrix, Hermitian unitary and normal operator, Eigen values & Eigen Vectors, Spectral Decomposition, Trace of an operator, important properties of Trace, Expectation Value of Operator, Projection Operator, Positive Operators.

UNIT III

Commutator Algebra, Heisenberg uncertainty principle, polar decomposition & singular values, Postulates of Quantum Mechanics.

COURSE OUTCOMES:

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

Achieve knowledge of Vector spaces, Matrices, Quantum state, Density operator and Quantum Measurement theory.

Text Books:

1. Quantum Computing without Magic by Zdzislaw Meglicki
2. Quantum Computing Explained By DAVID Mc MAHON

References:

1. Quantum Computer Science By Marco Lanzagorta, Jeffrey Uhlmann
2. An Introduction to Quantum Computing Phillip Kaye, Raymond Laflamme, Michele Mosca.

Course Title:	Advanced Java	**Course Code:**	MCA-4E8-DCE
Semester:	4th	**Paper Type:**	DCE
Credits:	03	**Max Marks:**	75
Pre Requisite:	MCA-3T2-C	**Co-Requisite:**	MCA-4T2-C

Marks Distribution: (Mid Term:25, End Term:35, Viva:05, Assignment / Presentations:10)

COURSE OBJECTIVES:

- *To learn about streams and how java is using functional programming concepts.*
- *To learn about database connectivity in java.*
- *To learn about socket programming in java.*
- *To learn about Spring Framework in java*

COURSE CONTENT:

UNIT I

Streams: stream operations, stream creation, filter map & flatmap methods, extracting substreams & concatenating streams, other stream transformation, simple reductions, the optional type ,collecting results, collecting into maps, grouping & partitioning, downstream collections, reduction operations, primitive type streams, parallel streamsInput & outputi/o streams, text input & output, reading & writing binary data, object i/o streams & serialization.

UNIT II

Networking Connecting to a server, implementing servers, Database Programming JDBC design, structured query language, JDBC Configuration, Working with JDBC statements, query execution, scrollable & updatable result sets, row sets, metadata, transactions, advanced sql type, connection management in web & enterprise applications

UNIT III

Core Spring: Introduction to spring, wiring beans, advanced wiring, aspect oriented spring, Spring on web building, spring web application , Spring in the backend using databases with Spring & JDBC, persisting database with object relational mapping, advanced spring MVC, working with spring web flow , securing web applications.

COURSE OUTCOMES:

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

- *Interpret enumerations and collections in advanced Java.*
- *Build programs using collection framework.*
- *Illustrate and develop String Handling methods in JAVA.*
- *Apply Servlets to develop web applications.*
- *Demonstrate database access using JDBC API.*
- *Design reusable software components using JSP.*

Text Books:

1. Core Java Volume 11-Advanced features by Cay S.horstman 10th edition Publisher: Prentice HallSpring in Action, Fourth Edition

References:

1. Pro Spring 5 Authors: Cosmina, I.Harrop, R., Schaefer, C.
2. Spring Boot in Action by Craig Walls