

KHWAJA MOINUDDIN CHISHTI LANGUAGE UNIVERSITY
UTTAR PRADESH, LUCKNOW



MCA Evaluation Scheme and Course Structure
Regulations 2021

As Per
National Education Policy 2020
(Effective from the Session: 2021-22)

Introduction

The Program's thrust is to provide the students a thorough and sound background in theoretical and skill-oriented courses relevant for productive careers in software industry, corporate sector, Govt. organizations and academia. The program emphasizes providing skill-based environment for teaching and research in the core and emerging areas of software technology to solve mathematical, computing, communications/networking and commercial problems.

This Master's Degree Program has been designed with a semester approach in mind. The first-year courses are aimed at skills development in computers using various technologies while the second year is more focused on core courses providing conceptual frame work and the third year provides the specialization and the project work.

A two-year degree (six-semesters) in Computer Applications will get skills and information not only about Computer and Information Technology but also in communication, organization and management. One also gets to learn programming languages such as C, C++, Java, SQL, Php, Python, front-end and back-end design etc. Information about various computer applications and latest developments in IT and communication systems is also provided. The Bachelor of Computer Application Programme has been designed to supply trained manpower to ever growing IT and IT Enabled industry.

1. Applicability

These regulations shall apply to the Master of Computer Application (MCA) programme from the session 2021-22.

2. Minimum Eligibility for Admission

Passed BCA/ Bachelor Degree in Computer Science Engineering or equivalent Degree.

OR

Passed B.Sc./ B.Com./ B.A. with Mathematics at 10+2 Level or at Graduation Level (with additional bridge Courses as per the norms of the concerned University).

Obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the qualifying Examination.

3. Programme Objectives

The MCA Programme is designed to enhance employability by preparing students for careers in computer science and leadership in both the private and public sectors. Students acquire a comprehensive foundation in the fundamentals of computer applications, the environment in which they will function, the analytical tools for intelligent decision-making and problem solving. Specifically:

- Produce knowledgeable and skilled human resources which are employable in IT and ITES.
- Impart knowledge required for planning, designing and building complex Application Software Systems as well as provide support to automated systems or application.
- Produce entrepreneurs who can develop customized solutions for small to large Enterprises.

- To develop academically competent and professionally motivated personnel, equipped with objective, critical thinking, right moral and ethical values that compassionately foster the scientific temper with a sense of social responsibility.
- To develop students to become globally competent.
- To inculcate Entrepreneurial skills among students

4. Programme Outcomes (POs)

Upon completion of the MCA Programme, the students will be able to:

- PO1. To produce knowledgeable and skilled human resources which are employable in IT industry.
- PO2. To impart knowledge required for planning, designing and building complex Application Software Systems as well as provide support to automated systems or applications.
- PO3. To produce entrepreneurs who can develop customized solutions for small to large enterprises.
- PO4. To develop competent and professionally motivated personnel, equipped with objective, critical thinking, right moral and ethical values that foster the scientific temper with a sense of social responsibility.
- PO5. To train students to become globally competent and employable.

5. Programme Specific Outcomes (PSOs)

After completing the program students will be capable of:

- PSO1. Understanding to apply knowledge of computing and technological advances appropriate to the programme.
- PSO2. Analysing, identifying and defining problems for logical modelling and its solutions.
- PSO3. Understanding a sense of professional, ethical, legal, security and social issues and responsibilities.
- PSO4. Analysing the local and global impact of business solutions on individuals, organizations, and society.

6. Course Structure

The course structure of the Master of ComputerApplication (MCA) programme shall be as under:

Master of Computer Application (Two Year Course)
Study and Evaluation Scheme



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Course	Course Code	Title of the Paper	Maximum Marks			Credits Allotted				Teaching Hours
Semester I										
			Internal	ESE	Total	Lecture	Tutorial	Practical	Total Credits	
Core Course	MCACC 101	Fundamental of Computers & Emerging Technologies	30	70	100	3	1	0	4	04
Core Course	MCACC 102	Problem Solving using C	30	70	100	3	1	0	4	04
Core Course	MCACC 103	Computer Organization & Architecture	30	70	100	3	1	0	4	04
Core Course	MCACC 104	Data Structures	30	70	100	3	1	0	4	04
Value Added Course (Credited)	MCAVC 105	Discrete Mathematics	30	70	100	3	1	0	4	04
Practical										
Core Course	MCACC 106	Lab: Problem Solving using C	30	70	100	0	0	4	2	04
Core Course	MCACC 107	Lab: Data Structures	30	70	100	0	0	4	2	04
Semester Total			210	490	700	15	5	8	24	28 Hours
Course	Subject Code	Title of the Paper	Maximum Marks			Credits Allotted				Teaching Hours
	Semester II									
			Internal	ESE	Total	Lecture	Tutorial	Practical	Total Credits	
Core Course	MCACC 201	Object Oriented Programming using Java	30	70	100	3	1	0	4	04
Core Course	MCACC 202	Operating System	30	70	100	3	1	0	4	04
Core Course	MCACC 203	Database Management System	30	70	100	3	1	0	4	04
Core Course	MCACC 204	Automata Theory and Formal Languages	30	70	100	3	1	0	4	04
Core Course	MCACC 205	Computer Network	30	70	100	3	1	0	4	04
Value Added Course (Non Credited)	MCAVNC 206	Cyber Security	30	70		3	1	0	0	04
Practical										
Core Course	MCACC 207	Lab: OOP using Java	30	70	100	0	0	4	2	04
Core Course	MCACC 208	Lab: DBMS	30	70	100	0	0	4	2	04
Semester Total			240	490	700	18	6	8	24	32 Hours
Course	Subject Code	Title of the Paper	Maximum Marks			Credits Allotted				Teaching Hours
	Semester III									
			Internal	ESE	Total	Lecture	Tutorial	Practical	Total Credits	
Core	MCACC 301	Python Programming	30	70	100	3	1	0	4	04

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Course/ MOOC										
Core Course	MCACC 302	Software Engineering	30	70	100	3	1	0	4	04
Elective I	GE-I	Select any one from the list (Elective-I)	30	70	100	3	1	0	4	04
Elective II	GE-2	Select any one from the list (Elective-II)	30	70	100	3	1	0	4	04
Inter-departmen- tal Course*	MCAIER 303	E-Commerce	30	70	100	3	1	0	4	04
Practical										
Core Course	MCACC 304	Lab: Python Programming	30	70	100	0	0	4	2	04
Core Course	MCACC 305	Lab-Mini Project	30	70	100	0	0	4	2	04
		Semester Total	210	490	700	15	5	8	24	28 Hours
Course	Subject Code	Title of the Paper	Maximum Marks				Credits Allotted			Teaching Hours
	Semester IV									
			Internal	ESE	Total	Lecture	Tutorial	Practical	Total Credits	
Core Course/ MOOC	MCACC 401	Design and Analysis of Algorithms	30	70	100	3	1	0	4	04
Elective-III	GE-III	Select any one from the list (Elective-III)	30	70	100	3	1	0	4	04
Elective-IV	GE-IV	Select any one from the list (Elective-IV)	30	70	100	3	1	0	4	04
Intra-departmen- tal Course*	MCAIRA 402	Office Automation (For other department students) MCA students may choose from other departments offering Intradepartmental course from KMCL University	30	70	100	3	1	0	4	04
Master's Thesis	MCAPD 403	Dissertation (Project)	30	70	100			8	4	08
Viva-Voce	MCAPV 404	Project- Viva-Voce	30	70	100				4	
		Semester Total	180	420	600	12	4	8	24	24 Hours
		GRAND TOTAL	810	1890	2700	60	20	32	96	112 Hours

MCACC – Core Course
MCAVC – Value Added Course (Credited)
MCAVNC – Value Added Course (Non-Credited)
MCAE – Elective Course
MCAIER – Inter-Departmental Course
MCAIRA – Intra-Departmental Course
MOOC – Massive Open Online Course

- IA: Internal Assessment, ESE: End Semester Examination.
- Students are required to select one course from each set of electives (Elective-I to Elective-IV) offered by the department.
- ESE=70, IA=30, P=70 (30 Marks for Practical Problems, 30 Marks for Viva-Voce, 10 Marks for Lab Record)
- The weight age of Internal Assessment and External Assessment will be in the ratio of 30% and 70% of total marks in all theory, practical papers & projects.



Elective Papers

Semester-III

Elective-I

1. MCAE11- Cryptography & Network Security
2. MCAE12- Blockchain Fundamentals
3. MCAE13- Privacy & Security in Online Social Media
4. MCAE14- Mobile Computing (MOOCs*)

Elective-II

1. MCAE21- Cloud Computing (MOOCs*)
2. MCAE22- Internet of Things (IoT)
3. MCAE23- Soft Computing
4. MCAE24- Software Quality Engineering

Semester-IV

Elective-III

1. MCAE31- Machine Learning
2. MCAE32- Neural Network
3. MCAE33- Artificial Intelligence (MOOCs*)
4. MCAE34- Pattern Recognition

Elective-IV

1. MCAE41- Data Warehousing & Data Mining
2. MCAE42- Big Data Analytics (MOOCs*)
3. MCAE43- Advanced Database Management System
4. MCAE44- Compiler Design

Detailed Syllabus - MCA Semester III (Two Year Course)



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MCA Semester III

MCACC 301 - Python Programming

Credit: 04, IA Marks: 30, ESE Marks: 70

Lectures: 45 Hours, Tutorial: 15 Hours

OBJECTIVES OF THE COURSE:

1. To acquire programming skills in core Python.
2. To explore the use of data structures, strings, text files, lists and dictionaries.
3. To acquire Object Oriented Skills in Python.
4. To understand to solve the problems with Python database, Python multithreading.
5. To work with Django framework, Numpy and other libraries.

UNIT-I

Lectures: 09

Introduction, Problem solving: Planning a computer program, Problem solving techniques. History of Python, Need of Python Programming, Applications Basics of Python Programming. Getting started with Python programming- Running code in interactive shell. Input, processing and output. Editing, saving and running Python Scripts. Variables, Assignment, Keywords, Input-Output, Indentation.

UNIT-II

Lectures: 09

Data Types, Operators and Expressions: Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while, break, continue, pass.

Data Structures-Lists- Operations, Slicing, Methods, Tuples, Sets, Dictionaries, Sequences, Comprehensions.

UNIT-III

Lectures: 09

Functions - Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Scope of the Variables in a Function - Global and Local Variables

Object Oriented Design: Design with Classes, Programming types, Object Oriented Programming, Structuring classes with Inheritance and Polymorphism. Case study- request, analysis, design & implementation. Python Regular Expression. **Error and Exceptions:** Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User defined Exceptions.

UNIT-IV

Lectures: 09

Python Database Interaction: SQL Database connection using Python. Creating and searching tables. Reading and storing config information on database. Programming using database connections.

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Python Multithreading: Understanding threads, synchronizing the threads, programming using multithreading.

UNIT-V

Lectures: 09

Logging in python, **Introduction to Django framework:** Creating a project and application, URLs, models, templates and views files, Introduction to web development, **Introduction to Pycharm. Numpy:** Main advantages of Numpy arrays over Python list, Creating arrays.

Course Outcome: After successful completion of this course students will be able to:

S. No.	Course Outcome	Bloom's Taxonomy
1	CO1. Understand and comprehend the Basics of Python programming.	K1, K2
2	CO2. Describe and explain the use of the built-in data structures list, sets, tuples and dictionary.	K2, K3
3	CO3. Make use of functions, modules and its applications.	K2, K3
4	CO4. Demonstrate the principles of OOPs and identify real-world applications using OOPs, files and exception handling provided by Python.	K2, K3
5	CO5. Implement Python Database handling and concepts of Python Multithreading.	K2, K3
6	CO6. Familiarize and be able to use Django framework, Pycharm IDE, Python standard libraries.	K2, K3

Suggested Readings:

1. Kenneth A. Lambert, Martin, Juneja "Fundamentals of Python", Cengage Learning.
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.
3. Learning Python, Mark Lutz, Orielly.
4. Harsh Bhasin, "Python for Beginners", New Age International.
5. Ashok Namdev Kamthane, Programming and Problem Solving with Python, TMH.
6. Allen Downey, Learning with Python, Dreamtech.

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MCA Semester III

MCACC 302: Software Engineering

Credit: 04, IA Marks: 30, ESE Marks: 70

Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE:

1. To understand the methodologies involved in the development and maintenance of software (i.e.) over the entire life cycle.
2. To learn about generic models of software development process.
3. To understand methods of capturing, specifying, visualizing and analyzing software requirements and analysis modeling.
4. To know basics of testing and understanding concept of software quality assurance and software configuration management process.
5. To understand the different design techniques and their implementation.
6. To learn various testing and maintenance measures.
7. To understand Project management and Quality Assurance plan and measures.

UNIT-I

Lectures: 09

Introduction: Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

UNIT-II

Lectures: 09

Software Requirement Specifications (SRS): Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS.

Software Quality Assurance: (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

UNIT-III

Lectures: 09

Software Design:

Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halstead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

Detailed Syllabus - MCA Semester III (Two Year Course)



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UNIT-IV

Lectures: 09

Software Testing: Testing Objectives, UNIT Testing, Integration Testing, 8 Acceptance Testing, Regression Testing, Testing for functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

UNIT-V

Lectures: 09

Software Maintenance and Software Project Management: Software as an Evolutionary Entity, Need for maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource allocation Models, Software Risk Analysis and Management.

Course Outcome: After successful completion of this course students will be able to:

S. No.	Course Outcome	Bloom's Taxonomy
1	CO1. Understand and comprehend the nature of software development and software life cycle models.	K1,K2
2	CO2. Explain needs for software specifications, software requirements and their gathering techniques and their application.	K2,K3
3	CO3. Understand and comprehend software quality assurance techniques.	K1,K2
4	CO4. Learn and implement concepts of software design modeling and principles.	K1, K2
5	CO5. Compare, understand and learn different testing strategies and tactics.	K1,K2
6	CO6. Understand, compare and apply various software maintenance and management techniques.	K1, K2, K3

Suggested Readings:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
3. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.

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4. Pankaj Jalote, Software Engineering, Wiley.
5. Deepak Jain, "Software Engineering: Principles and Practices", Oxford University Press.
6. Munesh C. Trivedi, Software Engineering, Khanna Publishing House.
7. N.S. Gill, Software Engineering, Khanna Publishing House.
8. Jibitesh Mishra and Ashok Mohanty, Software Engineering: Pearson.
9. Sommerville, I., Software Engineering, Narosa.
10. Fairley, R.E., Software Engineering Concept, Mc-Graw Hill.
11. Shooman, M., Software Engineering, Mc-Graw Hill.
12. Robert N. Charett, Software Engineering Environments, McGraw Hill.

Detailed Syllabus - MCA Semester III (Two Year Course)



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MCA Semester III (Elective-I)

MCAE11: Cryptography & Network Security

Credit: 04, IA Marks: 30, ESE Marks: 70

Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE:

1. To understand the fundamentals of Cryptography, modular arithmetic, etc.
2. To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
3. To understand the various key distribution and management schemes, message authentication and hashing functions.
4. To understand how to deploy encryption techniques to secure data in transit across data networks.
5. To design security applications in the field of Information technology.

UNIT-I

Lectures: 10

Introduction: to security attacks, services and mechanism, introduction to cryptography. Conventional Encryption: Conventional encryption model, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stereography, stream and block ciphers.

Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard(DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES, IDEA encryption and decryption, strength of IDEA, confidentiality using conventional encryption, traffic confidentiality, key distribution, random number generation.

UNIT-II

Lectures: 09

Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat's and Euler's theorem, primality testing, Euclid's Algorithm, Chinese Remainder theorem, discrete logarithms. Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffle-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elganel encryption.

UNIT-III

Lectures: 09

Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm (SHA). Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm.

Detailed Syllabus - MCA Semester III (Two Year Course)



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UNIT-IV

Lectures: 08

Authentication Applications: Kerberos and X.509, directory authentication service, electronic mail security, pretty good privacy (PGP), S/MIME.

UNIT-V

Lectures: 09

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Web Security: Secure socket layer and transport layer security, secure electronic transaction (SET). System Security: Intruders, Viruses and related threads, firewall design principals, trusted systems.

Course Outcome: After successful completion of this course students will be able to:

S. No.	Course Outcome	Bloom's Taxonomy
1	CO1. Understand and become familiar with basics of cryptography and mathematics behind it.	K1, K2
2	CO2. Explain, distinguish and apply various cryptographic techniques/ algorithms and its applications to network security.	K2, K4
3	CO3. Acquire knowledge about Message Authentication, Hashing and Digital Signature techniques.	K1, K2
4	CO4. Understand various authentication applications.	K1, K2
5	CO5. Understand, describe network security threats, security services and related protocols as IPSec, SSL, etc	K1, K2

Suggested Readings:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Behrouz A. Forouzan:: Cryptography and Network Security, Tata McGraw Hill
3. C K Shyamala, N Harini, Dr. T.R.Padmnabhan Cryptography and Security, Wiley
4. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
5. V.K. Jain, Cryptography and Network Security, Khanna Publishing House
6. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
7. Atul Kahate, "Cryptography and Network Security", Tata McGraw Hill

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MCA Semester III (Elective-I)

MCAE12: Blockchain Fundamentals

Credit: 04, IA Marks: 30, ESE Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE:

1. To provide the overview of the structure of Blockchain and cryptography behind it.
2. To understand the basics of Blockchain Consensus Mechanism.
3. To get overview of digital money and crypto-currencies as Bitcoin.
4. To understand Blockchain implementation platforms as Hyperledger fabric, Ethereum and their components.
5. To discuss and cover both the conceptual as well as application aspects of Blockchain.

UNIT-I

Lectures: 10

Introduction: Introduction to Blockchain, Blockchain Data structure, Hash chain, distributed database, Index structure, Transactions, Blockchain Architecture and Design: Ledgers, Blocks, Chaining Blocks, Peer to peer systems, centralized and decentralized systems.

Cryptographic Primitives: Cryptographic hash functions – collision free, Hash tree- Merkle Tree, Public Key cryptography, Digital signatures. Use of hash functions and digital signatures in blockchain. Asymmetric-Key Cryptography, Addresses and Address Derivation, Private Key Storage.

UNIT-II

Lectures: 09

Consensus and multiparty agreements: Requirements for the consensus protocols, Proof of Work (PoW), Scalability aspects of Blockchain consensus protocols, Proof of Work, Proof of Stake, Delegated Proof of Stake, Deposit based consensus, Proof of importance. Federated consensus or federated Byzantine consensus, Reputation-based mechanisms, Practical Byzantine Fault Tolerance. Permissioned Blockchains: Design goals, Consensus protocols for Permissioned Blockchains

UNIT-III

Lectures: 08

Blockchain implementation. Forking-Soft Fork, Hard Forks. Smart contract programming. Blockchain Platforms and Cryptocurrencies - Bitcoin, Litecoin, Ethereum, Ripple. Bitcoin: Basics (Structure of block, creation of coins), Double Spending.

UNIT-IV

Lectures: 09

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Blockchain Platforms: Hyperledger, Ethereum. Architecture. Decomposing the consensus process, Hyperledger fabric components, Chaincode Design and Implementation.

UNIT-V

Lectures: 09

Blockchain applications and case-study: Blockchain in Financial Software and Systems: Settlements, KYC, Blockchain in trade/supply chain, Blockchain for Government: Digital identity, land records and other entities.

Course Outcome: After successful completion of this course students will be able to:

S. No.	Course Outcome	Bloom's Taxonomy
1	CO1. Understand and become familiar with concepts of public digital ledger to share information in a trustworthy and secure way.	K1, K2
2	CO2. Interpret the uses of cryptographic techniques in Blockchain.	K1, K2
3	CO3. Explain, distinguish and compare various consensus mechanisms and their concept.	K1, K2
4	CO4. Demonstrate the use of platforms as Hyperledger, Ethereum and its components for implementation.	K2, K3
5	CO5. Analyze the use of Blockchain technology in various domains	K1, K2

Suggested Readings:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, Bitcoin and Cryptocurrency Technologies, Princeton University Press
2. Mark Gates, Blockchain ultimate Guide to understanding Blockchain, Bitcoin, Cryptocurrencies, Smart Contracts and Future of money, Wise Fox Publishing
3. Andreas M. Antonopoulos, Mastering Bitcoin - Programming the Open Blockchain, O'Reilly Media, Inc., 2017
4. Imran Bashir, Mastering Blockchain, 2017.
5. Vikram Dhillon, David Metcalf, Max Hooper, Blockchain Enabled Applications, Apress, ISBN No.13:978-1-4842-3081-7.
6. Alex Leverington, Ethereum Programming, Packt Publishing Limited, 2017
7. Roger Wattenhofer, The Science of the Blockchain, CreateSpace Independent Publishing Platform, 2016.
8. Don Tapscott, Alex Tapscott, Blockchain Revolution, ISBN No. 9781101980132
9. Don Tapscott, "Block chain and Crypto currency", 2016. Draft NISTIR 8202, Blockchain Technology Overview - NIST CSRC, 2018.
10. Abhijit Das and VeniMadhavan, C. E., Public-Key Cryptography: Theory and Practice: Theory and Practice, Pearson Education India, 2009.

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11. Melanie Swan, Blockchain Blueprint for a new economy, O'Reilly, First Edition, ISBN No.978-1-491-92049-7
12. Mayukh Mukhopadhyay, Ethereum Smart Contract Development, Packt publishing, First Edition, ISBN No.978-1-78847-304-0
13. Chris Dannen, Introducing Ethereum and Solidity, Apress, ISBN No.978-1-4842-2535-6
14. <https://www.ibm.com/blockchain/in-en/hyperledger.html>.

MCA Semester III (Elective-I)

MCAE13: Privacy & Security in Online Social Media

Credit: 04, IA Marks: 30, ESE Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE:

1. To study and understand the use of online social media and networks on the Internet with its exponential increase and its current need of society awareness.
2. To study, investigate and characterize Privacy and security of online social media from various perspectives (computational, cultural, psychological, etc.).
3. To familiarize students with how websites like Facebook, YouTube, LinkedIn, Twitter, Flickr, Instagram, Google+, Four Square, Pinterest, Tinder, and the likes have changed the way the Internet is being used.

UNIT-I

Lectures: 09

Various privacy and security concerns (spam, phishing, fraud nodes, identity theft) on Online Social Media, Introduction to Social Media API, OSM APIs and tools for data collection, Facebook API. Trust and Credibility on Twitter API.

UNIT-II

Lectures: 09

Data privacy in the context of social media, Social Tagging Information cascades and social Epidemics. Rumors and deception in social media, OSM Misinformation on Social Media, Privacy and Social Media. Internet safety, social networking apps. Trust, credibility, and reputations in social systems.

UNIT-III

Lectures: 09

Crime Prevention - Crime and sense of security - Social control and crime prevention - .Community, Privacy in online data collection, email, searches, online marketing and advertising, social media threats, MySQL, Mongo DB, Crowd sourcing.

UNIT-IV

Lectures: 09

Policing and Online social Media, Information privacy disclosure, revelation and its effects in OSM and online social networks, Phishing in OSM & Identifying fraudulent entities in online social networks.

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UNIT-V

Lectures: 09

E-Crime on Online Social Media, Social Network Analysis, Weblog analysis, Cyber laws: IT act 2000 overview.

Course Outcome: After successful completion of this course students will be able to:

S. No.	Course Outcome	Bloom's Taxonomy
1	CO1. Understand and become familiar with privacy and security concerns (spam, phishing, fraud nodes, identity theft) on Online Social Media	K1, K2
2	CO2. Acquire knowledge about Social Media API, OSM APIs and other tools for data collection	K1, K2
3	CO3. Acquire knowledge about data privacy on OSM, Internet safety and about trust, credibility, and reputations in social systems	K1, K2
4	CO4. Understand and learn about Policing and Online social Media, Information privacy disclosure and its effects in OSM, phishing in OSM & identifying fraudulent entities in online social networks.	K1, K2
5	CO5. Comprehend and explain about the nature of e-crime on Online Social Media, Cyber laws and Social Network and Weblog analysis,	K1, K2

Suggested Readings:

1. Toby Segaran, "Programming Collective Intelligence: Building Smart Web 2.0 Applications", O'Reilly.
2. Quentin Zervaas, "Practical Web 2.0 Applications with PHP", Apress.
3. Gavin Bell, "Building Social Web Applications: Establishing Community at the Heart of Your Site", O'Reilly.
4. Dafydd Stuttard, "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws", Wiley.

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MCA Semester III (Elective-I) **MCAE14: Mobile Computing**

Credit: 04, IA Marks: 30, ESE Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE:

1. To develop and fostering interest in the mobility of systems, users, data and computing.
2. To understand the data management issues in mobile environments.
3. To understand the integration of wired and mobile, wireless systems.

UNIT-I

Lectures: 09

Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.

UNIT-II

Lectures: 09

Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.

UNIT-III

Lectures: 09

Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations.

UNIT-IV

Lectures: 09

Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.

UNIT-V

Lectures: 09

Adhoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

Course Outcome: After successful completion of this course students will be able to:

S. No.	Course Outcome	Bloom's Taxonomy
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1	CO1. Understand basics of mobile computing and identify its issues.	K1, K2
2	CO2. Understand and become familiar with wireless telephony concepts, GSM/CDMA and channel allocation, its structure and other details.	K1, K2
3	CO3. Understand and get brief overview of Wireless Networking, Wireless LAN concepts and protocols, WAP architecture and other concepts.	K1, K2
4	CO4. Comprehend and understand data management issues for mobile computers, disconnected operations and adaptive clustering concepts for mobile networks.	K1, K2
5	CO5. Comprehend and understand data management issues for mobile computers, disconnected operations and adaptive clustering concepts for mobile networks.	K1, K2
6	CO6. Describe and comprehend working of Adhoc networks and related protocols.	K1, K2

Suggested Readings:

1. J. Schiller, Mobile Communications, Addison Wesley.
2. A. Mehrotra, GSM System Engineering.
3. M. V. D. Heijden, M. Taylor, Understanding WAP, Artech House.
4. Charles Perkins, Mobile IP, Addison Wesley.
5. Charles Perkins, Ad hoc Networks, Addison Wesley.

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MCA Semester-III (Elective-II)

MCAE21- Cloud Computing

Credit: 04, IA Marks: 30, ESE Marks: 70

Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE:

1. To analyze the components of cloud computing and its services show how business agility in an organization can be created.
2. To compare and contrast the economic benefits delivered by various cloud models based on application requirements, economic constraints and business requirements.
3. To identify data management, resource management, security and privacy issues in cloud computing.
4. To understand the recent research trends in cloud computing.

UNIT-I

Lectures: 09

Introduction to Cloud Computing

Overview of Computing, History and Evolution of Cloud Computing, Definition and Essential Characteristics of Cloud Computing, Key Cloud Service Providers and Their Services, Internet of Things in the Cloud, Artificial Intelligence on the Cloud, Blockchain and Analytics in the Cloud, Basics of Parallel and Distributed Computing, Overview of Cloud Delivery Models: Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service(SaaS); Overview of Cloud Deployment Models Deployment Models: Public, Private, Hybrid, Community; Cloud Applications,.

UNIT-II

Lectures: 09

Virtualization and Data Management in Cloud

Virtualization: Virtualization, Benefits of Virtualization, Virtualization Models: Bare metal, Hosted hypervisor, Types of Virtualization: Processor Virtualization, Memory Virtualization, Full Virtualization, Para virtualization, Device virtualization, Virtual Machines (VM) and its types, VM Migrations.

Data Management: Benefits of Cloud Data Management, Key Capabilities for Cloud Data Management, Cloud data management for healthcare, finance, Data Management Strategy, Data-Vendor Lock-in

UNIT-III

Lectures: 09

Resource Management (RM) in Cloud Computing

Service Level Agreements (SLAs), Cloud Economics, Resource Management Techniques in Cloud Computing, Energy aware RM Techniques, SLA-aware RM Techniques, Load-Balanced RM Techniques.

UNIT-IV

Lectures: 09

Cloud Security

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Basic Component of Security: Confidentiality, Integrity and Availability, Goals of Security, Security Stack, Data Security and Storage, Identity and Access Management, Cloud Encryption, Security Risk, Access Control, Trust, Reputation.

UNIT-V

Lectures: 09

Case Study on Open Source and Commercial Clouds, Cloud Simulator, Research trend in Cloud Computing, Fog Computing.

Course Outcome: After successful completion of this course students will be able to:

S. No.	Course Outcome	Bloom's Taxonomy
1	CO1. Demonstrate the knowledge of the basic structure, components, features, and various cloud models of cloud.	K1,K2
2	CO2. Illustrate the concept of virtualization, virtual machine and data management in cloud computing.	K1, K2
3	CO3. Identify, compare and examine the several resource management techniques under various quality of service parameters (QoS).	K3,K4
4	CO4. Demonstrate the concept of security component, access control, and risk associated to the cloud computing.	K2
5	CO5. Illustrate the emerging recent research trends and technologies in the field of Cloud Computing.	K1,K2

Suggested Reading:

1. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley, 2011
2. Enterprise Cloud Computing - Technology, Architecture, Applications, Gautam Shroff, Cambridge University Press, 2010.
3. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
4. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach" McGraw-Hill Osborne Media
5. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley- India, 2010
6. Smith, Jim, and Ravi Nair, "Virtual machines: versatile platforms for systems and processes", Elsevier.
7. Recent conference/journal papers as well as documentation from cloud providers.

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MCA Semester-III (Elective-II)

MCAE22- Internet of Things

Credit: 04, IA Marks: 30, ESE Marks: 70

Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE:

1. Understand the vision of IoT from a global context.
2. Understand the application of IoT in Industrial and Commercial Building Automation and Real World Design Constraints
3. Determine the Market perspective of IoT.
4. Use of Devices, Gateways and Data Management in IoT
5. Building state of the art architecture in IoT.Application of.

UNIT-I

Lectures: 09

INTRODUCTION

Introduction to Internet of Things, Definition and Characteristics of IoT, Physical Design of IoT: Things in IoT, IoT Protocols, IoT Enabled Technologies, Logical Design of IoT, IoT Communication Models, IoT Communication APIs, IoT Levels and Deployment Templates, Domain Specific IoTs: Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyle.

UNIT-II

Lectures: 09

IoT& M2M

Machine to Machine (M2M), Key Features of M2M, M2M vsIoT, M2M Protocols, Software Defined Networks (SDN), and its BussinesBanefit, Logical View of SDN, Network Function Virtualization (NFV) Architecture, SDN vs NFV, IoT System Management with NETCOZF, YANG- NETCONF, YANG, and SNMP.

UNIT-III

Lectures: 09

IoT&WSN

Introduction of Wireless Sensor Networks (WSN), WSN Types, WSN Applications, Sensors and its Characteristics in WSN, Security Integration Challenges, Integration Approaches, TCP/IP Adaption, Problems and Solutions in WSN

UNIT-IV

Lectures: 09

ENABLING TECHNOLOGIES, PROTOCOLS, AND APPLICATIONS

Market Opportunity, IOT Architecture, IoT Elements, IoTCommon Standards, QoS Criteria, IoTChallenges and Future Directions.

UNIT-V

Lectures: 09

ENABLING TECHNOLOGIES, PROTOCOLS, AND APPLICATIONS

IoT Ethics and Privacy

Ethical Challenges of the Internet of Things, Importance of the Internet of Things (IoT) in Society, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, Data Aggregation for the IoT in Smart Cities

Course Outcome: After successful completion of this course students will be able to:

S. No.	Course Outcome	Bloom's Taxonomy
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1	CO1. Understand the Definitions, technology, various designs, applications and significance of the Internet of Things.	K1, K2
2	CO2. Illustrate the concept of M2M (machine to machine) with necessary protocols and relationship between IoT and M2M.	K2
3	CO3. Illustrate the constraints and opportunities of wireless and mobile networks for Internet of Things.	K2
4	CO4. Identify the need of IoT, deployment challenges and potential business opportunities of the IoT.	K3
5	CO5. Identify the ethical challenges and privacy requirement in implementing web based services for IoT.	K3

Suggested Reading:

1. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
2. "Internet of Things: A Hands-on Approach", by ArshdeepBahga and Vijay Madisetti (Universities Press)
3. Recent conference/journal papers.

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MCA Semester-III (Elective-II) **MCAE23- Soft Computing**

Credit: 04, IA Marks: 30, ESE Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE:

1. Introduce and use the idea of Neural networks, fuzzy logic and use of heuristics based on human experience.
2. Understand the underlying principle of soft computing with its usage in various applications. .
3. Understand different soft computing tools to solve real life problems.
4. Introduce and use the concepts of Genetic algorithm and its applications to soft computing using some applications.

UNIT-I

Lectures: 09

Artificial Intelligence

Artificial Intelligence: a Brief Review, Pitfalls of Traditional AI, Need for Computational Intelligence, Importance of Tolerance of Imprecision and Uncertainty, Constituent Techniques, Overview of Artificial Neural Networks, Fuzzy Logic and Evolutionary Computation.

UNIT-II

Lectures: 09

Neural Network

Neural Network: Biological and Artificial Neuron, Neural Networks, Supervised and Unsupervised Learning. Single Layer Perceptron - Multilayer Perceptron – Backpropagation Learning.

UNIT-III

Lectures: 09

Genetic Algorithm

Concept of GA, GA Operators: Encoding, Selection, Crossover, Mutation, Solving optimization problems using GA Algorithms

UNIT-IV

Lectures: 09

Fuzzy Logic

Fuzzy Sets, Properties, Membership Functions, Fuzzy Operations, Fuzzy Logic and Fuzzy Inference System

UNIT-V

Lecture: 09

Evolutionary Computation

Introduction to EC, Overview of other Bio-inspired Algorithms, Swarm Intelligence Algorithms, MOEA Approaches

Course Outcomes: After successful completion of this course students will be able to:

S. No.	Course Outcome	Bloom's Taxonomy
1	CO1. Understand theoretical and practical aspects of Artificial Intelligence	K1
2	CO2. Study and identify various issues related to the development of Artificial neural networks and its applications.	K2
3	CO3. Analyze the concept and significance of genetic algorithms and	K3, K4

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	Solving optimization problems using GAs.	
4	CO4. Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.	K3
5	CO5. Solving multi-objective optimization problems using Evolutionary algorithms (MOEAs).	K3

Suggested Readings:

1. An Introduction to Genetic Algorithm, Melanic Mitchell (MIT Press)
2. Evolutionary Algorithm for Solving Multi-objective, Optimization Problems (2nd Edition), Collelo, Lament, Veldhnizer (Springer)
3. Fuzzy Logic with Engineering Applications Timothy J. Ross (Wiley)
4. Neural Networks and Learning Machines Simon Haykin (PHI)
5. Amit Konar, "Artificial Intelligence and Soft Computing", First Edition, CRC Press, 2000.
6. David E. Goldberg, Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley
7. George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications", Prentice Hall
8. Simon Haykin, "Neural Networks: A Comprehensive Foundation", Prentice Hall
9. Recent conference/journal papers.

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MCA Semester-III (Elective-II)

MCAE24- Software Quality Engineering

Credit: 04, IA Marks: 30, ESE Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE:

1. To understand the methodologies involved in the development and maintenance of software (i.e.) over the entire life cycle.
2. To learn about generic models of software development process.
3. To understand fundamental concepts of requirements engineering and Analysis Modeling.
4. To understand the different design techniques and their implementation.
5. To learn various testing and maintenance measures.
6. To understand Project management and Quality Assurance plan.

UNIT-I

Lectures: 09

Software Quality Concept

Software Perspective: Components, Characteristics, Types, Myths; Software Quality Overview: Concepts & Models; Software Quality Measurement and Metrics; Software Quality Assurance: Goals & Responsibilities; SQA Life Cycle & Activities. Value of a Quality Software: User's Perspective.

UNIT-II

Lectures: 09

Quality Assurance: Planning & Standards

Need for SQA plan: Tools & Techniques; Risk Management; Importance of Software Quality; Quality Standards and Best Practices; SQA Standards: Requirements & Activities; ISO 9000 series for Quality Standards.

UNIT-III

Lectures: 09

Software Quality Metrics and Models

Software Metrics: Definition & Examples; Quality Metrics: Features & Framework; Development & Selection of Quality Metrics using different approaches.

UNIT-IV

Lectures: 09

Software Quality Models

Need for Good Quality Model; Hierarchical and Non-Hierarchical Quality Models; Characteristics of Quality Models; Capability Maturity Model.

UNIT-V

Lectures: 09

Object Oriented Software Design: Quality Metrics & Measurement

Object Oriented Design & Paradigm; Metrics for Object Oriented Software Design & Selection Criterion; Quality Model for Object Oriented Design; Assessment of Object Oriented Design & Quality Attributes.

Course Outcome: After successful completion of this course students will be able to:

S. No.	Course Outcome	Bloom's Taxonomy
1	CO1 Outline software testing and software quality assurance principles.	K2, K3

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2	CO2. Prepare test case and test suites for completely testing all aspects of a system under test	K5, K6
3	CO3. Concept of quality assurance and quality control techniques and develop a QA plan and Test Plan	K5, K6
4	CO4. To carry out inspections and carry out testing in a production environment	K3
5	CO5. Compile findings of a quality assurance cycle.	K2, K6

Suggested Readings:

1. Software Quality: Concept and Practices, R A Khan, K Mustafa, S I Ahson
2. Software Quality Assurance: From Theory to Implementation, Daniel Galin
3. Metrics and Models in Software Quality Engineering, Stephen H. Kan
4. Quality Assurance: Software Quality Assurance Made Easy, Solis Tech.

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MCA Semester III

MCAIER 303: E-Commerce

(Inter-departmental course)

Credit: 04, IA Marks: 30, ESE Marks: 70

Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE:

1. To provide an introduction to information systems for business and management.
2. To familiarize students with organizational and managerial foundations of commerce and business systems and lay the technical foundation for understanding it.
3. To understand online business activities such as selling, purchasing, ordering etc.
4. To understand about financial activities such utilization of cards (Credit Card, Debit Card), Money transformation etc.
5. To Review ability of existing business portal to make the future plan for business

UNIT-I

Lectures: 10

Introduction to E-Commerce: The Scope of Electronic Commerce, Definition of Electronic Commerce, Electronic E-commerce and the Trade Cycle, Electronic Markets, Electronic Data Interchange, Internet Commerce, E-Commerce in Perspective Business Strategy in an Electronic Age: Supply Chains, Porter's Value Chain Model, Inter Organizational Value Chains, Competitive Strategy, Porter's Model, First Mover Advantage Sustainable Competitive Advantage, Competitive Advantage using E-Commerce,

Business Strategy: Introduction to Business Strategy, Strategic Implications of IT, Technology, Business Environment, Business Capability, Exiting Business Strategy, Strategy Formulation & Implementation Planning, E-Commerce Implementation, E-Commerce Evaluation.

UNIT-II

Lectures: 09

Business-to-Business Electronic Commerce: Characteristics of B2B EC, Models of B2B Ec, Procurement Management Using the Buyer's Internal Marketplace, Just in Time Delivery, Other B2B Models, Auctions and Services from Traditional to Internet Based EDI, Integration with Back-end Information System, The Role of Software Agents for B2B EC, Electronic marketing in B2B, Solutions of B2B EC, Managerial Issues, Electronic Data Interchange (EDI), EDI: The Nuts and Bolts, EDI & Business.

UNIT-III

Lectures: 09

Internet and Extranet: Automotive Network Exchange, The Largest Extranet, Architecture of the Internet, Intranet and Extranet, Intranet software, Applications of Intranets, Intranet Application Case Studies, Considerations in Intranet Deployment, The Extranets, The structures of Extranets, Extranet products & services, Applications of Extranets, Business Models of Extranet Applications, Managerial Issues.

UNIT-IV

Lectures: 08

Detailed Syllabus - MCA Semester III (Two Year Course)



ख्वाजा मुईनुद्दीन चिश्ती भाषा विश्वविद्यालय, लखनऊ, उत्तर प्रदेश (भारत)
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Electronic Payment Systems: Is SET a failure, Electronic Payments & Protocols, Security Schemes in Electronic payment systems, Electronic Credit card system on the Internet, Electronic Fund transfer and Debit cards on the Internet, Stored – value Cards and E-Cash, Electronic Check Systems, Prospect of Electronic Payment Systems, Managerial Issues.

UNIT-V

Lectures: 09

Public Policy: From Legal Issues to Privacy: EC- Related Legal Incidents, Legal Incidents, Ethical & Other Public Policy Issues, Protecting Privacy, Protecting Intellectual Property, Free speech, Internet Indecency & Censorship, Taxation & Encryption Policies, Other Legal Issues: Contracts, Gambling & More, Consumer & Seller Protection In EC. Infrastructure For EC : It takes more than Technology, A Network Of Networks, Internet Protocols, Web- Based client / Server, Internet Security, selling on the web, Chatting on the Web, Multimedia delivery, Analyzing Web Visits, Managerial Issues.

Course Outcome: After successful completion of this course students will be able to:

S. No.	Course Outcome	Bloom's Taxonomy
1	CO1. Provide foundations for understanding concepts of E-commerce and business strategy in current times.	K1, K2
2	CO2. Comprehend and understand the B2B electronic commerce model.	K1, K2
3	CO3. Explain the concept and use of Intranet and Extranet in relation to E-commerce.	K1, K2
4	CO4. Comprehend and understand the prospective of Electronic Payment Systems, concept, security and managerial issues.	K2
5	CO5. Describe, summarize and analyze Public policies from legal to privacy aspect, its infrastructure, related issues and incidents	K2, K4

Suggested Readings:

1. David Whiteley, "E-Commerce", Tata McGraw Hill.
2. Ravi Kalakota, Electronic Commerce, Pearson.
3. Goel Ritendra, E-Commerce, New Age.
4. K. C. Laudon and C. G. Traver, "E-commerce: business, technology, society", Addison Wesley
5. Eframi Turban, Jae Lee, David King, K. Michale Chung, "Electronic Commerce", Pearson.

Detailed Syllabus - MCA Semester III (Two Year Course)



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MCACC 304: Lab: Python Programming

Credit: 02, IA Marks: 30, ESE Marks: 70

OBJECTIVES OF THE COURSE:

1. To learn programs for solving problems in Python, handling Strings and text-files, implementing data structures as List and Dictionaries.
2. To learn programs for implementing concepts of Object Oriented Design.
3. To write programs for database handling, logging and multithreading in Python.
4. To learn implementation using Django framework.
5. To learn programs to be able to use Python Standard libraries as Numpy.

Programming exercise in Python:

- Problem solving, Strings and Text Files. List and Dictionaries.
- Object Oriented Design
- Python Database Interaction
- Python Multithreading
- Logging in python
- Introduction to Django framework
- Numpy

Note: The Instructor may add/delete/modify experiments, wherever he/she feels in a justified manner.

Course Outcome: After successful completion of this course students will be able to:

S. No.	Course Outcome	Bloom's Taxonomy
1	CO1. Write and execute programs for solving basic problems using Python	K3
2	CO2. Write programs for handling Strings, text-files, implementing data-structures as dictionaries and lists.etc.	K3
3	CO3. Write programs for implementing concepts of Object oriented design.	K3
4	CO4. Write programs using Database interaction/operations, logging and multi-threading.	K3
5	CO5. Implement programs using Django framework and standard Python libraries.	K3

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MCACC 305: Lab: Mini Project (Software/ Research)

Credit: 02, IA Marks: 30, ESE Marks: 70

OBJECTIVES OF THE COURSE:

1. To help students develop openness to new ideas in computer science.
2. To develop the ability to draw reasonable inferences from observations and learn to formulate and solve new computer science problems using analytical and problem-solving skills.
3. To help students develop a research project.
4. To help students acquire the necessary competences to build a real-life software system by completing different software life cycle phases (like, specification, architecture, design, implementation, validation, documentation, etc.)

Minor-Project using Web Engineering Tools: Design and Implementation of Web Applications, Web Services, Mobile Applications etc. Students are required to incorporate the followings: Dynamic Pages, Adding Dynamic Functionality Interactive User Interface Database in the back-end XML and Databases Provision for EDIs Adding Security Features, etc.

For developing the project, students may use the followings:

.NET Platform, J2EE Platform, Eclipse JAVA, C#, VC++, etc. XML, DHTML, CGI, CSS, PHP & MySQL, Scripting Languages (JSP, ASP), or Suitable Technologies.

OR

Research Project.

Course Outcome: After successful completion of this course students will be able to:

S. No.	Course Outcome	Bloom's Taxonomy
1	CO1. Design and develop mini-project following proper software development life-cycle.	K3, K4
2	CO2. Demonstrate capacity to develop research project, apply and evaluate methodologies throughout the project	K3, K4



MCA Semester IV

MCACC 401- Design and Analysis of Algorithms

Credit: 04, IA Marks: 30, ESE Marks: 70

Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE:

1. To introduce the basic concepts of Algorithm design.
2. To analyze the complexity of an Algorithm.
3. To develop an understanding of various Algorithm paradigms.
4. Explain fundamental computing algorithms
5. Analyze algorithms and identify key algorithmic strategies
6. Demonstrate knowledge of programming language design issues.

UNIT-I

Lectures: 9

Introduction, Growth Functions and Recurrences: Role of Algorithms in Computing, Analyzing and designing of algorithms, Mathematical Foundations, Growth Functions-Different Asymptotic Notations, Worst, Average and Best case Analysis, Recurrences- Substitution, Recursion Tree and Master Methods.

UNIT-II

Lectures: 9

Brute Force and Divide and Conquer Methods: Brute Force, Exhaustive Search-Travelling Salesman Problem, Knapsack Problem and Assignment problem. Divide and conquer method– Merge sort, Quick sort, Binary search, Strassen's Matrix Multiplication.

UNIT-III

Lectures: 9

Dynamic Programming, Greedy Techniques and Randomized algorithms: Elements of Dynamic Programming, Assembly Line Scheduling, Matrix Chain Multiplication, Elements of Greedy Algorithms, Prim's algorithm- Kruskal's Algorithm- Dijkstra's Algorithm-Huffman Trees. Randomized Algorithms.

UNIT-IV

Lectures: 9

Backtracking and Branch and Bound: Introduction, The Eight queen's problem, Knapsack problem, Travelling Salesman problem, Sum of subsets problem. String Matching: Introduction, The naive string matching algorithm, The Rabin-Karp algorithm

UNIT-V

Lectures: 9

Complexity Theory and Approximation algorithms: Introduction, P, NP, NP-Hard, NP Complete and Associated Problems, Approximation Algorithm- Vertex Cover and Travelling Salesman- Problem.

Course Outcome: After successful completion of this course students will be able to:

S. No.	Course Outcome	Bloom's
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		Taxonomy
1	CO1. Identify the problem given and design the algorithm using various algorithm design techniques	K2, K3
2	CO2. Implement various algorithms in a high level language	K3, K4
3	CO3. Analyze the performance of various algorithms	K2, K4
4	CO4. Compare the performance of different algorithms for same problem	K3
5	CO5. Able to describe the classes P, NP, and NP Complete and be able to prove that a certain problem is NPComplete.	K2, K4

Suggested Readings:

1. Thomas H Cormen Leiserson “Introduction to Algorithms”, PHI Learning.
2. Sara Baase and Allen Van Gelder ,Computer Algorithms : “Introduction to Design and Analysis”, Pearson Education
3. Jon Kleinberg and Eva Tardos “Algorithm Design”, Pearson Education
4. Brassard Bratley “Fundamental of Algorithms”, PHI Learning Private Limited, Delhi India.
5. M T Goodrich “Algorithms Design”, John Wiley
6. Aho, “Design and Analysis of Computer Algorithms”, Pearson Education.
7. Horowitz and Sahani , “Fundamentals of Computer Algorithms”, Galgotia Publications.
8. Tremblay & Sorenson, “An Introduction to Data Structures with Applications”, Mcgraw Hill.
9. J. P. Tremblay and R.B. Bunt, “An Introduction of Computer Science –An Algorithmic Approach”, Tata Mcgraw Hill.



MCA Semester IV (Elective-III)

MCAE31: Machine Learning

Credit: 04, IA Marks: 30, ESE Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE:

1. To understand the basics of machine learning and need for it, understand human learning aspects and relate it with machine learning concepts.
2. To understand implementation aspects of machine learning through Scikit learn and understand the concepts and importance of feature selection and filtering.
3. To learn about linear and logistic regression models, their concepts and methodologies.
4. To understand working of SVM, Bayes classifier and their methodologies.
5. To understand, evaluate and analyze different machine learning models such as decision trees, perceptron, clustering basics, etc.

UNIT-I

Lectures: 09

Introduction- Introduction to different types of learning, Supervised and Unsupervised learning – Reinforcement learning- Basics of Neural network models, beyond machine learning-deep learning and bio inspired adaptive systems, Machine learning and big data.

Important Elements of Machine Learning- Data Representation, Diversity of Data: Structured/Unstructured, Statistical learning approaches, Basic Linear Algebra in Machine Learning Techniques.

UNIT-II

Lectures: 08

Scikit- learn Dataset, Creating training and test sets, managing categorical data, Managing missing features, Data scaling and normalization, Feature selection and Filtering, Principle Component Analysis(PCA)-non negative matrix factorization, Sparse PCA, Kernel PCA. Atom Extraction and Dictionary Learning.

UNIT-III

Lectures: 09

Linear regression- Linear models, A bi-dimensional example, Linear Regression and higher Dimensionality, Ridge, Lasso and Elastic Net, Robust regression with random sample consensus, Polynomial regression, **Logistic Regression-**Linear classification, Implementation and Optimizations, Stochastic gradient descent algorithms.

UNIT-IV

Lectures: 10

Introduction to Bayes Decision Theory, Bayes Theorem, Maximum Likelihood hypotheses for predicting probabilities, class conditional probability distributions, Naïve Bayes Classifiers.

Support Vector Machines (SVM)- Introduction, Hyperplanes and Support Vectors, Linear Discriminant Functions for Binary Classification, Perceptron Algorithm, Large Margin Classifier for linearly separable data, Linear Soft Margin Classifier for Overlapping Classes, Kernel Induced Feature Spaces, Nonlinear Classifier, Regression by Support vector Machines.



UNIT-V

Lectures: 09

Decision Tree Learning: Introduction, Example of classification decision tree, measures of impurity for evaluating splits in decision trees, ID3, C4.5, and CART decision trees, pruning the tree, strengths and weakness of decision tree approach.

Clustering Fundamentals- Basics, Types of clustering methods, Clustering algorithms as K-means.

Multilayer Perceptron Networks and error back propagation algorithm, Radial Basis Functions Networks.

Course Outcome: After successful completion of this course students will be able to:

S. No.	Course Outcome	Bloom's Taxonomy
1	CO1. Understand and comprehend basics of machine learning techniques and design issues.	K1, K2
2	CO2. Learn and study about dataset for training and testing, managing categorical data, feature selection and filtering, etc. and understand their implementations.	K2, K3
3	CO3. Comprehend and understand linear and logistic regression models and their methodologies.	K2, K4
4	CO4. Understand basics of Bayes Decision Model and Support Vector Machines concepts and techniques.	K1, K2
5	CO5. Comprehend and understand working of Decision trees, fundamental concept of clustering and multilayer perceptron networks overview.	K1, K2

Suggested Readings:

1. T. M. Mitchell, Machine Learning, McGraw-Hill, 1997.
2. E. Alpaydin, Introduction to Machine Learning, Prentice Hall of India, 2006.
3. Applied Machine Learning, M. Gopal, McGraw Hill Education.
4. Machine Learning: A Probabilistic Perspective, Kevin Murphy, MIT Press, 2012.
5. Peter Harrington, Machine Learning in action, Wiley.
6. The Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer 2009.
7. Pattern Recognition and Machine Learning, Christopher Bishop, Springer, 2007.
8. Vladimir N. Vapnik, Statistical Learning Theory, John Wiley and Sons, 1998.
9. Shawe-Taylor J. and Cristianini N., Cambridge, Introduction to Support Vector Machines, University Press, 2000.
10. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", Cambridge University Press, Edition 2012, ISBN-10: 1107422221; ISBN-13: 978-1107422223.
11. Giuseppe Bonaccorso, "Machine Learning Algorithms", Packt Publishing Limited, ISBN10: 1785889621, ISBN-13: 978-1785889622.

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12. Stephan Marsland, "Machine Learning - An Algorithmic Perspective", Chapman and Hall, 1st Edition, 2009.
13. Nils Nilsson, "Introduction to Machine Learning", MIT Press, 1997.
14. Building Machine Learning Systems with Python – WilliRichert, Luis Pedro Coelho



MCA Semester IV (Elective-III)

MCAE32: Neural Network

Credit: 03, IA Marks: 30, ESE Marks: 70

Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE:

1. To understand the fundamental theory and concepts of computational intelligence methods, in particular neural networks, fuzzy systems, genetic algorithms and their applications in the area of machine intelligence.
2. To understand human learning aspects and relate it with machine intelligence.
3. To understand the concepts of Multi-layered network architecture, Recurrent Neural Network and their working.
4. To understand the basics of an evolutionary computing algorithms and its application to engineering optimization problems.

UNIT-I

Lectures: 09

Neuro computing and Neuroscience: Historical notes, human Brain, neuron Model, Knowledge representation, AI and NN. Learning process: Supervised and unsupervised learning, Error correction learning, competitive learning, adaptation, statistical nature of the learning process.

UNIT-II

Lectures: 09

Data processing: Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, covariance matrix, eigen values & eigen vectors. Basic Models of Artificial neurons, activation. Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.

UNIT-III

Lectures: 09

Multi-layered network architecture, back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptron.

UNIT-IV

Lectures: 09

Recurrent network and temporal feed-forward network, implementation with BP, self-organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and independent component analysis, application to image and signal processing.

UNIT-V

Lectures: 09

Complex valued NN and complex valued BP, analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Soft computing. Neuro-Fuzzy-genetic algorithm Integration.

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Course Outcome: After successful completion of this course students will be able to:

S. No.	Course Outcome	Bloom's Taxonomy
1	CO1. Understand and demonstrate knowledge of Neurocomputing and Neuroscience for understanding human learning aspects and relate it to machine intelligence.	K1, K2
2	CO2. Explain the concepts of data processing and attain the capability to apply them in various real life problem domains.	K2, K3
3	CO3. Describe and analyze the capability of Multi-layered network architecture, back propagation algorithm, multilayer perceptron, etc.	K2
4	CO4. Understand, describe and analyze Recurrent network, temporal feed-forward network, self-organizing map, Principal component, etc. and their applications.	K2, K4
5	CO5. Comprehend and attain capability to understand and analyze complex neural network models, fuzzy-systems, genetic algorithm, etc.	K1, K2

Suggested Readings:

1. J.A. Anderson, An Introduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning
3. R.L. Harvey, Neural Network Principles, PHI
4. Kosko, Neural Network and Fuzzy Sets, PHI



MCA Semester IV (Elective-III)

MCAE33: Artificial Intelligence

Credit: 04, IA Marks: 30, ESE Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE:

1. To learn and understand an overview of artificial intelligence (AI) principles and approaches.
2. To get an overview of different domains of AI as in Computer Vision, Machine Learning, Natural Language Possessing, etc.
3. To develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic, and learning.
4. To learn about different Machine Learning models and techniques.
5. To understand basics of Pattern Recognition approaches and techniques.

UNIT-I

Lectures: 09

Introduction- Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.

UNIT-II

Lectures: 09

Introduction to Search- Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

UNIT-III

Lectures: 09

Knowledge Representation & Reasoning- Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

UNIT-IV

Lectures: 09

Machine Learning- Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data - EM algorithm, Reinforcement learning.

UNIT-V

Lectures: 09

Pattern Recognition- Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbour (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

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Course Outcome: After successful completion of this course students will be able to:

S. No.	Course Outcome	Bloom's Taxonomy
1	CO1. Understand and become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.	K1, K2
2	CO2. Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents.	K1, K2
3	CO3. Analyze and formalize the problem and select amongst different search or game based techniques to solve them.	K2, K4
4	CO4. Experiment with machine learning models, explore the current scope, potential, limitations, and implications.	K2, K3
5	CO5. Attain the capability to understand pattern-recognition based techniques, solve problems with uncertain information using Bayesian approaches and some other types of classifiers.	K1, K2

Suggested Readings:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Education
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw-hill Education Pvt. Ltd.
3. E.Charniak and D McDermott, "Introduction to Artificial Intelligence", Pearson Education
4. Dan W. Patterson, "Artificial Intelligence and Expert Systems", Prentice Hall of India.
5. T. M. Mitchell, Machine Learning, McGraw-Hill, 1997.
6. E. Alpaydin, Introduction to Machine Learning, Prentice Hall of India, 2006.
7. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", 2nd Edition, John Wiley, 2006.



MCA Semester IV (Elective-III)
MCAE34: Pattern Recognition

Credit: 04, IA Marks: 30, ESE Marks: 70
Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE:

1. To learn the fundamentals of pattern recognition and its relevance to classical and modern problems.
2. To develop a basic understanding of the scientific discipline whose goal is the classification of objects into a number of categories or classes.
3. To introduce the student to the basic concepts and methods for the recognition of patterns in data. This is accomplished via the presentation of the underlying theory and algorithmic approaches for the detection and characterization of patterns in multidimensional data.

UNIT-I

Lectures: 09

Introduction: Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

UNIT-II

Lectures: 09

Statistical Pattern Recognition: Bayesian Decision Theory, Classifiers, Normal density and discriminant functions.

UNIT-III

Lectures: 09

Parameter estimation methods: Maximum- Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods-Principal Component Analysis(PCA),Fisher Linear discriminate analysis, Expectation-maximization(EM),Hidden Markov Models(HMM), Gaussian mixture models.

UNIT-IV

Lectures: 09

Nonparametric Techniques: Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.

UNIT-V

Lectures: 09

Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques:

Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.

Course Outcome: After successful completion of this course students will be able to:

S. No.	Course Outcome	Bloom's Taxonomy
1	CO1. Understand and become familiar with concepts of pattern recognition	K1, K2

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2	CO2. Explain and distinguish procedures, methods and algorithms related to pattern recognition	K1, K2
3	CO3. Summarize, analyze, relate and compare simple pattern classifiers, statistical pattern recognition techniques, non-parametric techniques, etc.	K2, K4
4	CO4. Understand and experiment with pattern recognition techniques using unsupervised learning and clustering.	K1, K2
5	CO5. Attain the capability to represent, design and develop pattern recognition systems for real-world problems.	K2, K3

Suggested Readings:

1. Richard O. Duda, Peter E. Hart and David G. Stork, “Pattern Classification”, 2nd Edition, John Wiley, 2006.
2. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, “Pattern Recognition”, 4th Edition, Academic Press, 2009.



MCA Semester IV (Elective-IV)

MCAE41- Data Warehousing & Data Mining

Credit: 04, IA Marks: 30, ESE Marks: 70

Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE:

1. To understand data warehouse concepts, architecture, business analysis and tools.
2. To understand data pre-processing and data visualization techniques.
3. To study algorithms for finding hidden and interesting patterns in data.
4. To understand and apply various classification and clustering techniques using tools.

UNIT-I

Lectures: 09

Data Warehousing and On-Line Analytical Processing: Data Warehouse basic concepts, Data Warehouse Modeling, Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute-Oriented Induction.

Data Cube Technology: Efficient Methods for Data Cube Computation, Exploration and Discovery in Multidimensional Databases.

UNIT-II

Lectures: 09

Introduction to Data Mining: Motivation, Importance, Definition of Data Mining, Kind of Data, Data Mining Functionalities, Kinds of Patterns, Classification of Data Mining Systems, Data Mining Task Primitives, Integration of A Data Mining System With A Database or Data Warehouse System, Major Issues In Data Mining, Types of Data Sets and Attribute Values, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity.

Preprocessing: Data Quality, Major Tasks in Data Preprocessing, Data Reduction, Data Transformation and Data Discretization, Data Cleaning and Data Integration

UNIT-III

Lectures: 09

Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods, Are All the Pattern Interesting, Pattern Evaluation Methods, Applications of frequent pattern and associations.

Frequent Pattern and Association Mining: A Road Map, Mining Various Kinds of Association Rules, Constraint-Based Frequent Pattern Mining, Extended Applications of Frequent Patterns

UNIT-IV

Lectures: 09

Classification: Decision Tree Induction, Bayesian Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Bayesian Belief Networks, Classification by Neural Networks, Support Vector Machines, Pattern-Based Classification, Lazy Learners (or Learning from Your Neighbors).

UNIT-V

Lectures: 09



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Clustering Analysis: Basic Concepts of Cluster Analysis, Clustering structures, Major Clustering Approaches, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Model Based Clustering - The Expectation-Maximization Method, Other Clustering Techniques, Clustering High-Dimensional Data, Constraint-Based and User-Guided Cluster Analysis, Link-Based Cluster Analysis, Semi-Supervised Clustering and Classification, Bi-Clustering, Collaborative Clustering.

Course Outcomes: After successful completion of this course students will be able to:

S. No.	Course Outcome	Bloom's Taxonomy
1	CO1. Demonstrate the concept of Data warehouse system and perform business analysis with OLAP tools	K1, K2
2	CO2. Understand and Apply suitable pre-processing and visualization techniques for data analysis	K2, K3
3	CO3. Apply frequent pattern and association rule mining techniques for data analysis	K3
4	CO4. Understand and Apply appropriate classification techniques for data analysis	K2, K3
5	CO5. Understand and apply various clustering techniques for data analysis	K2, K3

Suggested Readings:

1. Jiawei Han, Micheline Kamber, Jian Pei (2012), Data Mining: Concepts and Techniques, 3rd edition, Elsevier, United States of America.
2. Margaret H Dunham (2006), Data Mining Introductory and Advanced Topics, 2nd edition, Pearson Education, New Delhi, India.
3. Amitesh Sinha (2007), Data Warehousing, Thomson Learning, India.
4. Xingdong Wu, Vipin Kumar (2009), the Top Ten Algorithms in Data Mining, CRC Press, UK.



MCA Semester IV (Elective-IV)

MCAE42- Big Data Analytics

Credit: 04, IA Marks: 30, ESE Marks: 70

Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE:

1. To Understand the concepts of Big Data fundamentals.
2. To Learn the importance of Hadoop and SQL Languages.
3. To use Hive and NoSQL

UNIT-I

Lectures: 09

Introduction to Big Data: Types of digital data, history of Big Data innovation, introduction to Big Data platform, drivers for Big Data, Big Data architecture and characteristics, 5 Vs of Big Data, Big Data technology components, Big Data importance and applications, Big Data features – security, compliance, auditing and protection, Big Data privacy and ethics, Big Data Analytics, Challenges of conventional systems, intelligent data analysis, nature of data, analytic processes and tools, analysis vs reporting, modern data analytic tools.

UNIT-II

Lectures: 09

Hadoop: History of Hadoop, Apache Hadoop, the Hadoop Distributed File System, components of Hadoop, data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, Hadoop Echo System.

Map Reduce: Map Reduce framework and basics, how Map Reduce works, developing a Map Reduce application, unit tests with MR unit, test data and local tests, anatomy of a Map Reduce job run, failures, job scheduling, shuffle and sort, task execution, Map Reduce types, input formats, output formats, Map Reduce features, Real-world Map Reduce

UNIT-III

Lectures: 09

HDFS (Hadoop Distributed File System): Design of HDFS, HDFS concepts, benefits and challenges, file sizes, block sizes and block abstraction in HDFS, data replication, how does HDFS store, read, and write files, Java interfaces to HDFS, command line interface, Hadoop file system interfaces, data flow, data ingest with Flume and Scoop, Hadoop archives, Hadoop I/O: compression, serialization, Avro and file-based data structures. Hadoop Environment: Setting up a Hadoop cluster, cluster specification, cluster setup and installation, Hadoop configuration, security in Hadoop, administering Hadoop, HDFS monitoring & maintenance, Hadoop benchmarks, Hadoop in the cloud

UNIT-IV

Lectures: 09

Hadoop Eco System and YARN: Hadoop ecosystem components, schedulers, fair and capacity, Hadoop 2.0 New Features - NameNode high availability, HDFS federation, MRv2, YARN, Running MRv1 in YARN.

NoSQL Databases: Introduction to NoSQL

MongoDB: Introduction, data types, creating, updating and deleting documents, querying, introduction to indexing, capped collections



Spark: Installing spark, spark applications, jobs, stages and tasks, Resilient Distributed 09 Databases, anatomy of a Spark job run, Spark on YARN

SCALA: Introduction, classes and objects, basic types and operators, built-in control structures, functions and closures, inheritance.

UNIT-V

Lectures: 09

Hadoop Eco System Frameworks: Applications on Big Data using Pig, Hive and HBase

Pig: Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators,

Hive: Apache Hive architecture and installation, Hive shell, Hive services, Hive metastore, comparison with traditional databases, HiveQL, tables, querying data and user defined functions, sorting and aggregating, Map Reduce scripts, joins & subqueries.

HBase: Hbase concepts, clients, example, Hbase vs RDBMS, advanced usage, schema design, advance indexing, Zookeeper – how it helps in monitoring a cluster, how to build applications with Zookeeper. IBM Big Data strategy, introduction to Infosphere, BigInsights and Big Sheets, introduction to Big SQL.

Course Outcomes: After successful completion of this course students will be able to:

S. No.	Course Outcome	Bloom's Taxonomy
1	CO1. Understand and Identify Big Data and its business implications.	K2, K3
2	CO2. Make use various techniques for mining data stream.	K3
3	CO3. List the components of Hadoop and Hadoop Eco-System	K1
4	CO4. Apply Map Reduce programming model to access and process data on Distributed File System	K3
5	CO5. Manage job execution in Hadoop environment and develop Big Data solutions by applying Hadoop Eco System components	K3

Suggested Readings:

1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business, Intelligence and Analytic Trends for Today's Businesses", Wiley
2. Big-Data Black Book, DT Editorial Services, Wiley
3. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch, "Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill.



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4. Thomas Erl, WajidKhattak, Paul Buhler, “Big Data Fundamentals: Concepts, Drivers and Techniques”, Prentice Hall.
5. Bart Baesens “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)”, John Wiley & Sons
6. ArshdeepBahga, Vijay Madiseti, “Big Data Science & Analytics: A HandsOn Approach“, VPT
7. AnandRajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, CUP
8. Tom White, "Hadoop: The Definitive Guide", O'Reilly.
9. Eric Sammer, "Hadoop Operations", O'Reilly.
10. Chuck Lam, “Hadoop in Action”, MANNING Publishers
11. Deepak Vohra, “Practical Hadoop Ecosystem: A Definitive Guide to Hadoop-Related Frameworks and Tools”, Apress
12. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilly
13. Lars George, "HBase: The Definitive Guide", O'Reilly.
14. Alan Gates, "Programming Pig", O'Reilly.
15. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer
16. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons
17. Glenn J. Myatt, “Making Sense of Data”, John Wiley & Sons
18. Pete Warden, “Big Data Glossary”, O'Reilly



MCA Semester IV (Elective-IV)

MCAE43- Advanced Database Management System

Credit: 04, IA Marks: 30, ESE Marks: 70

Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE:

1. To Understand the principles of distributed databases and how they differ from centralized databases.
2. To enhance the previous knowledge of database systems by deepening the understanding of the theoretical and practical aspects of the database technologies and showing the need for distributed database technology to tackle deficiencies of the centralized database systems.
3. Focuses on understanding the concepts of designing and managing distributed databases.
4. To Provide a cohesive overview regarding the importance of data management and data analytics in the era we are living

UNIT-I

Lectures: 09

Introduction

Distributed Data Processing, Distributed Database System, Promises of DDBSs, Problem areas, Architectural Models for Distributed DBMS, DDMBS Architecture, Alternative Design Strategies, Distribution Design Issues, Fragmentation, and Allocation.

UNIT-II

Lectures: 09

Query Processing and Decomposition

Query processing objectives, characterization of query processors, layers of query processing, query decomposition, localization of distributed data, Query optimization, centralized query optimization, distributed query optimization algorithms.

UNIT-III

Lectures: 09

Transaction Management

Definition, properties of transaction, types of transactions, distributed concurrency control: serializability, concurrency control mechanisms & algorithms, time - stamped & optimistic concurrency control Algorithms, deadlock Management.

UNIT-IV

Lectures: 09

Distributed DBMS Reliability

Reliability concepts and measures, fault-tolerance in distributed systems, failures in Distributed DBMS, local & distributed reliability protocols, site failures and network partitioning. Parallel database system architectures, parallel data placement, parallel query processing, load balancing, database clusters.

UNIT-V

Lectures: 09

Distributed Object Database Management Systems

Detailed Syllabus – MCA Semester IV (Two Year Course)



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Fundamental object concepts and models, object distributed design, architectural issues, object management, distributed object storage, object query Processing, Inheritance, object identity, persistent programming languages, persistence of objects, comparison OODBMS and ORDBMS

Course Outcomes: After successful completion of this course students will be able to:

S. No.	Course Outcome	Bloom's Taxonomy
1	CO1. Understand theoretical and practical aspects of distributed database systems.	K1
2	CO2. Study and identify various issues related to the development of Query processing and decomposition in distributed database system.	K2
3	CO3. Illustrate the concept and significance of transactions in distributed database system.	K2
4	CO4. Identify the concept of Reliability, fault-tolerance and Parallel database system architectures.	K3
5	CO5. Understand the design aspects of object-oriented database system and related development.	K1

Suggested Readings:

1. M. Tamer OZSU and PatuckValduriez: Principles of Distributed Database Systems, Pearson Edn. Asia, 2001.
2. Stefano Ceri and Giuseppe Pelagatti: Distributed Databases, McGraw Hill.
3. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom: "Database Systems: The Complete Book", Second Edition, Pearson International Edition
4. Garcia-Molina, Ullman, Widom, ' Database System Implementation' Pearson Education
5. Silberschatz, Korth and Sudershan, DatabaseSystemConcept', McGrawHill



MCA Semester IV (Elective-IV)

MCAE44- Compiler Design

Credit: 04, IA Marks: 30, ESE Marks: 70

Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE:

1. To Explore the principles, algorithms, and data structures involved in the design and construction of compilers.
2. The course is intended to teach the students the basic techniques that underlie the practice of Compiler Construction.
3. To Introduce the major concept areas of language translation and compiler design and to develop an awareness of the functions.

UNIT-I

Lectures: 09

Introduction to Compiler: Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.

UNIT-II

Lectures: 09

Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables

UNIT-III

Lectures: 09

Syntax-directed Translation: Syntax-directed Translation schemes, Implementation of Syntaxdirected Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements.

UNIT-IV

Lectures: 09

Symbol Tables: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors

UNIT-V

Lectures: 09



Code Generation: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.

Course Outcomes: After successful completion of this course students will be able to:

S. No.	Course Outcome	Bloom's Taxonomy
1	CO1. Acquire knowledge of different phases and passes of the compiler and also able to use the compiler tools like LEX, YACC, etc.	K3
2	CO2. Understand the parser and its types i.e. Top-Down and Bottom-up parsers and construction of LL, SLR, CLR, and LALR parsing table.	K2, K3
3	CO3. Analyze the compiler using syntax-directed translation method and get knowledge about the synthesized and inherited attributes.	K4,
4	CO4. Acquire knowledge about run time data structure like symbol table organization and different techniques used in that.	K3
5	CO5. Understand the target machine's run time environment, its instruction set for code generation and techniques used for code optimization.	K12, K4

Suggested Readings:

1. K. Muneeswaran, Compiler Design, First Edition, Oxford University Press.
2. J.P. Bennet, "Introduction to Compiler Techniques", Second Edition, Tata McGraw-Hill, 2003.
3. Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001.
4. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education
5. V Raghvan, "Principles of Compiler Design", TMH
6. Kenneth Loudon, "Compiler Construction", Cengage Learning.
7. Charles Fischer and Ricard LeBlanc, "Crafting a Compiler with C", Pearson Education



MCA Semester IV

MCAIRA 402- Office Automation

(Intra-departmental Course)

Credit: 04, IA Marks: 30, ESE Marks: 70

Lectures: 45 Hours, Tutorials: 15 Hours

OBJECTIVES OF THE COURSE:

1. To understand the fundamental concept of computer.
2. To understand the basics concept of communication and network.
3. To explore various features of MS-Word and its applications.
4. To develop understanding of MS-Excel. To design the presentation using MS-power Point.
5. To understand the fundamental concept of database and working with MS-Access.

UNIT-I

Lectures: 06

Basics of Computers: Introduction, Functional Components of Computers (Input unit, CPU, Memory and Output unit), Block diagram of computer, Characteristics of Computers. Application of Computers, Types of Memory (Primary and Secondary), Introduction to software. Introduction to Data Communication and Networking, Introduction to Internet.

UNIT-II

Lectures: 09

MS-Word:

Working with Documents: Opening & Saving files, Editing text documents, Inserting, Deleting, Cut, Copy, Paste, Undo, Redo, Find, Search, Replace, Formatting page & setting Margins, Converting files to different formats, Importing & Exporting documents, Sending files to others, Using Tool bars, Ruler, Using Icons, using help

Formatting Documents: Setting Font styles, Font selection- style, size, colour etc, Type face - Bold, Italic, Underline, Case settings, Highlighting, Special symbols, Setting Paragraph style, Alignments, Indents, Line Space, Margins, Bullets & Numbering.

Setting Page style: Formatting Page, Page tab, Margins, Layout settings, Paper tray, Border & Shading, Columns, Header & footer, Setting Footnotes & end notes – Shortcut Keys; Inserting manual page break, Column break and line break, Creating sections & frames, Anchoring & Wrapping, Setting Document styles, Table of Contents, Index, Page Numbering, date & Time, Author etc., Creating Master Documents, Web page.

Creating Tables: Table settings, Borders, Alignments, Insertion, deletion, Merging, Splitting, Sorting, and Formula, Drawing - Inserting ClipArts, Pictures/Files etc.,

Tools: Word Completion, Spell Checks, Mail merge, Templates, Creating contents for books, Creating Letter/Faxes, Creating Web pages, Using Wizards, Tracking Changes, Security, Digital Signature.

Printing Documents: Shortcut keys.

UNIT-III

Lectures: 10

MS-Excel: Spread Sheet & its Applications, Opening Spreadsheet, Menus - main menu, Formula Editing, Formatting, Toolbars, Using Icons, Using help, Shortcuts, Spreadsheet types.



Working with Spreadsheets- opening, Saving files, setting Margins, Converting files to different formats (importing, exporting, sending files to others), Spread sheet addressing - Rows, Columns & Cells, Referring Cells & Selecting Cells – Shortcut Keys.

Entering & Deleting Data: Entering data, Cut, Copy, Paste, Undo, Redo, Filling Continuous rows, columns, Highlighting values, Find, Search & replace, Inserting Data, Insert Cells, Column, rows & sheets, Symbols, Data from external files, Frames, Clipart, Pictures, Files etc, Inserting Functions, Manual breaks

Setting Formula: finding total in a column or row, Mathematical operations (Addition, Subtraction, Multiplication, Division, Exponentiation), Using other Formulae.

Formatting Spreadsheets: Labelling columns & rows, Formatting- Cell, row, column & Sheet, Category - Alignment, Font, Border & Shading, Hiding/ Locking Cells, Anchoring objects, Formatting layout for Graphics, Clipart etc., Worksheet Row & Column Headers, Sheet Name, Row height & Column width, Visibility - Row, Column, Sheet, Security, Sheet Formatting & style, Sheet background, Colouretc, Borders & Shading – Shortcut keys.

Working with Sheets: Sorting, Filtering, Validation, Consolidation, and Subtotal.

Creating Charts: Drawing. Printing

Using Tools: Error checking, Spell Checks, Formula Auditing, Creating & Using Templates, Pivot Tables

UNIT-IV

Lectures: 10

MS-Power Point: Introduction to Presentation, Opening New Presentation, Different Presentation Templates, Setting Backgrounds, Selecting Presentation Layouts.

Creating a Presentation: Setting Presentation style, Adding text to the Presentation

Formatting a Presentation: Adding style, Colour, gradient fills, Arranging objects, Adding Header & Footer, Slide Background, Slide layout. Adding Graphics to the Presentation- Inserting pictures, movies, tables etc into presentation, Drawing Pictures using Draw.

Adding Effects to the Presentation: Setting Animation & transition effect.

Printing Handouts: Generating Standalone Presentation viewer

UNIT-V

Lectures: 10

MS-Access: Data and information – Limitations of Manual Data Processing – Advantages of databases. Introduction to MS-Access: Creating Tables, Modifying Table Structures, Data Entity, Edit, Delete, Importing – Exporting table.

Queries: Select Queries, Grouping, Parameters, Data Formatting, queries based on multiple sources, Cross Tab Queries, Action Queries, Make Table Queries, Append, Delete and Update Queries.

Forms and Reports: Forms – functions and uses – creating, Modifying labels List Boxes, Dialog Boxes. Reports: Creating, Modifying reports, Creating Reports.

Course Outcomes: Course Outcome: After successful completion of this course students will be able to:

S. No.	Course Outcome	Bloom's Taxonomy
1	CO1. Understand the basic component of computers, software and	K2

Detailed Syllabus – MCA Semester IV (Two Year Course)



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	hardware.	
2	CO2. Acquire knowledge about MS-Word and different formatting styles used in that.	K2, K3
3	CO3. Acquire knowledge about MS-Excel and different techniques used in that.	K2, K3
4	CO4. Acquire knowledge about MS-Power Point and formatting styles used in that.	K2, K3
5	CO5. Acquire knowledge about MS-Access and different techniques such as creating form, writing queries used in that.	K2, K3

Suggested Readings:

1. Fundamental of Computers – By V.Rajaraman, B.P.B. Publications
2. Fundamental of Computers – By P.K. Sinha
3. Microsoft Office 2007 Bible – John Walkenbach, Herb Tyson, Faith Wempen, Cary N. Prague, Michael R. Groh, Peter G. Aitken, and Lisa A. Bucki - Wiley India Pvt. Ltd
4. Discovering the Internet: Complete - Shelly Cashman 4th Edition - Course Technology
5. Introduction to Information Technology - Alexis Leon, Mathews Leon, and Leena Leon, Vijay Nicole Imprints Pvt. Ltd., 2013.
6. Office 2007 – By Shelly, Cengage Publication

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MCA Semester IV

MCAPD 403- Dissertation (Project)
(Software/Research)

Credit: 04, IA Marks: 30, Final Marks: 70

MCAPV 404- Project- Viva-Voce

Credit: 04, IA Marks: 30, Final Marks: 70

OBJECTIVES OF THE COURSE:

To help students develop openness to new ideas in computer science, develop the ability to draw reasonable inferences from observations and learn to formulate and solve new computer science problems using analytical and problem-solving skills; To help students develop the ability to synthesize and integrate information and ideas, develop the ability to think creatively, develop the ability to think holistically and develop the ability to distinguish between facts and opinion; To help students acquire the necessary competences to build a real-life software system by completing different software life cycle phases (like, specification, architecture, design, implementation, validation, documentation, etc. To help students acquire the necessary competences to build a Research Project.

Major-Project using Web Engineering Tools: Design and Implementation of Web Applications, Web Services, Mobile Applications etc. Students are required to incorporate the followings: Dynamic Pages, Adding Dynamic Functionality Interactive User Interface Database in the back-end XML and Databases Provision for EDIs Adding Security Features, etc.

For developing the project, students may use the followings:

J2EE Platform, .NET Platform, Eclipse JAVA, C#, VC++, Python, etc Microsoft Frontpage/Flash/PHP/Dreamweaver etc. XML, DHTML, CGI, Scripting Languages (JSP, ASP, PHP), PYTHON or Suitable Technologies.

Course Outcomes: After successful completion of this course students will be able to:

S. No.	Course Outcome	Bloom's Taxonomy
1	CO1. Understand project characteristics and various stages of a project.	K2
2	CO2. Understand the conceptual clarity about project organization and feasibility analyses – Market, Technical, Financial and Economic	K2, K3
3	CO3. Demonstrate a sound technical knowledge of the project.	K2, K4
4	CO4. Illustrate & Apply different software package for project	K4, K5