MCA – (2020 – 2021)

COURSE CODE	COURSE TITLE	HRS / WK	CREDIT	CIA Mks	ESE Mks	TOT. MKs
SEMESTER - I						
20MCA101	Mathematical Foundation of Computer Science	4	4	50	50	100
20MCA102	Software Engineering	4	4	50	50	100
20MCA103	Operating Systems	4	4	50	50	100
20MCA104	Programming in Python	4	4	50	50	100
*	Elective I – General	4	4	50	50	100
20MCA105	Lab I – Python Programming	4	2	50	50	100
20MCA106	Lab II - RDBMS	4	2	50	50	100
20MCA107	Skill Based lab I–Linux	2	1	25	25	50
20MCA108	Soft Skills I – Professional Communication	2	1	25	25	50
SEMESTER - II						
20MCA201	Data Structures and Algorithms	4	4	50	50	100
20MCA202	Web Technologies	4	4	50	50	100
20MCA203	Programming in Java	4	4	50	50	100
*	Elective I – Specialization	4	4	50	50	100
*	Elective II – General	4	4	50	50	100
20MCA204	Lab III – Web Technologies	4	2	50	50	100
20MCA205	Lab IV- Java Programming	4	2	50	50	100

COURSE CODE	COURSE TITLE	HRS / WK	CREDIT	CIA Mks	ESE Mks	TOT. MKs
20MCA206	Skill Based Lab II - R Programming	2	1	25	25	50
20MCA207	Soft Skills II – Aptitude Training	2	1	25	25	50
SEMESTER - III						
19MCA301	Graph Theory	4	4	50	50	100
19MCA302	Data Communication & Networking	4	4	50	50	100
19MCA303	Programming in Java	4	4	50	50	100
	Elective III – Specialization	4	4	50	50	100
	Elective IV - General	4	4	50	50	100
19MCA304	Lab V - PHP & MYSQL	6	3	50	50	100
19MCA305	Lab VI- Java Programming	6	3	50	50	100
19MCA306	Skill Based Lab III- Networking Tools	2	1	25	25	50
19MCA307	Soft Skills III – Quantitative Aptitude	2	1	25	25	50
SEMESTER - IV						
19MCA401	Compiler Design	4	4	50	50	100
19MCA402	Mobile Communication &Application development	4	4	50	50	100
19MCA403	Programming in Python	4	4	50	50	100
	Elective V – Specialization	4	4	50	50	100
	Elective VI – General	4	4	50	50	100
19MCA404	Lab VII - Mobile Application Development	6	3	50	50	100
19MCA405	Lab VIII- Python Programming	6	3	50	50	100
19MCA406	Skill Based Lab IV - Software Testing Tools	2	1	25	25	50
19MCA407	Soft Skills IV – Technical Aptitude	2	1	25	25	50

COURSE CODE	COURSE TITLE	HRS / WK	CREDIT	CIA Mks	ESE Mks	TOT. MKs
SEMESTER - V						
19MCA501	Software Project Management	4	4	50	50	100
19MCA502	Machine Learning	4	4	50	50	100
19MCA503	Enterprise Application Development	4	4	50	50	100
	Elective VII – Specialization	4	4	50	50	100
	Elective VIII - General	4	4	50	50	100
19MCA504	Lab IX - Python for Machine Learning	6	3	50	50	100
19MCA505	Lab X - Enterprise Application Development	6	3	50	50	100
19MCA506	Skill Based Lab V –R Programming	2	1	25	25	50
19MCA507	Soft Skills V – Interpersonal Skills for Corporate Readiness	2	1	25	25	50
SEMESTER - VI						
19MCA601	Major Project		12	100	100	200
19MCA602	Internet of Things – Self Learning Course		5	50	50	100
19MCAAL01	Human Computer Interaction (Self - Learning Extra Credit course For Advanced Learners)		4	50	50	100

SPECIALIZATION ELECTIVE - DATA ANALYTICS

S.NO	SEMESTER	COURSE CODE	COURSE TITLE	HRS / WK	CREDIT	CIA Mks	ESE Mks	TOT. MKs
1.	II	20MCADA01	Data Mining Techniques	4	4	50	50	100
2.	II	20MCADA02	Data Analytics and Visualization using Spreadsheets	4	4	50	50	100

SPECIALIZATION ELECTIVE – DISTRUIBUTED SYSTEM SECURITY

S.NO	SEMESTER	COURSE CODE	COURSE TITLE	HRS / WK	CREDIT	CIA Mks	ESE Mks	TOT. MKs
1.	II	20MCADS01	Data Communication & Networking	4	4	50	50	100
2.	II	20MCADS02	Wireless Communication & Security	4	4	50	50	100

SPECIALIZATION ELECTIVE – AI & MACHINE LEARNING

S.NO	SEMESTER	COURSE CODE	COURSE TITLE	HRS / WK	CREDIT	CIA Mks	ESE Mks	TOT. MKs
1.	II	20MCAAM01	Artificial Intelligence & Expert System	4	4	50	50	100
2.	II	20MCAAM02	Soft Computing	4	4	50	50	100

GENERAL ELECTIVES

S.NO	COURSE CODE	COURSE TITLE	HRS / WK	CREDIT	CIA Mks	ESE Mks	TOT. MKs
1.	20MCAGE01	Office Automation Tools	4	4	50	50	100
2.	20MCAGE02	Financial Management and Accounting	4	4	50	50	100
3.	20MCAGE03	Organizational Behaviour	4	4	50	50	100
4.	20MCAGE04	E-Commerce	4	4	50	50	100
5.	20MCAGE05	Ethics in Computing	4	4	50	50	100
6.	20MCAGE06	Resource Management Techniques	4	4	50	50	100
7.	20MCAGE07	Entrepreneurship Development	4	4	50	50	100
8.	20MCAGE08	Wireless Sensor Networks	4	4	50	50	100
9.	20MCAGE09	Research Methodology	4	4	50	50	100
10.	20MCAGE10	Digital Image Processing	4	4	50	50	100
11.	20MCAGE11	Cloud Computing	4	4	50	50	100
12.	20MCAGE12	Agile Software Engineering	4	4	50	50	100

ELECTIVES – II & III MCA

SPECIALIZATION ELECTIVE – DATA SCIENCE

S.NO	SEMESTER	SUBJECT CODE	SUBJECT TITLE
1	III	19MCADS01	Big Data Analytics
2	IV	19MCADS02	Big Data Security
3	V	19MCADS03	Data Analytics Using Pig & Hive

SPECIALIZATION ELECTIVE – NETWORKING

S.NO	SEMESTER	SUBJECT CODE	SUBJECT TITLE
1	III	19MCANW01	Cryptography & Network Security
2	IV	19MCANW02	Wireless Sensor Networks
3	V	19MCANW03	High Speed Networks

SPECIALIZATION ELECTIVE – APPLICATION DEVELOPMENT

S.NO	SEMESTER	SUBJECT CODE	SUBJECT TITLE
1	III	19MCAAD01	Web Programming Techniques
2	IV	19MCAAD02	Internet Programming Frameworks
3	V	19MCAAD03	Software Development Frameworks

GENERAL ELECTIVES

S.NO	SUBJECT CODE	SUBJECT TITLE
E-BUSINESS PROCESS		
1	19MCAGE01	Resource Management Techniques
2	19MCAGE02	Financial Management & Accounting
3	19MCAGE03	Management Information Systems
4	19MCAGE04	E-Commerce
5	19MCAGE05	Cyber Forensics
6	19MCAGE06	Ethics in Computing
7	19MCAGE07	Entrepreneurship Development
RESEARCH DOMAIN		
8	19MCAGE21	Research Methodology
9	19MCAGE22	Data Mining & Data warehousing
10	19MCAGE23	Digital Image Processing
11	19MCAGE24	Artificial Intelligence & Expert Systems
12	19MCAGE25	Soft Computing
13	19MCAGE26	Cloud Computing
14	19MCAGE27	Advanced DBMS Techniques

I MCA

SEMESTER –I

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
MCA	19MCA103	OPERATING SYSTEMS	MAJOR CORE	4	4

COURSE DESCRIPTION

This course provides knowledge on the concepts of abstraction, scheduling mechanisms, implementations and manages a computer's resources, especially the allocation of those resources among other programmes.

COURSE OBJECTIVES

❖ To be aware of the evolution and fundamental principles of operating system.

❖ To understand the various operating system components like process management, memory management, file management.

❖ To be familiar with distributed concepts and security issues.

UNIT – I INTRODUCTION (12 Hours)

What is Operating System? **–** System Organization – System Architecture – System Structure – Protection and Security – Distributed Systems – Special Purpose Systems – Process Overview – Process Scheduling – Process Operations – Inter process Communication.

SELF STUDY: Inter process Communication

UNIT – II PROCESS CO-ORDINATION (12 Hours)

CPU Basic Concepts – Scheduling Criteria – Algorithms – Synchronization - Background – Critical Section Problem – Peterson 's Solution - Synchronization Hardware –Semaphores – Problems – Monitors - Deadlock – System Model – Deadlock Characterization – Methods for Handling – Deadlock Prevention – Avoidance – Deadlock Detection – Recovery from Deadlock.

UNIT – III MEMORY MANAGEMENT   (12 Hours)

Memory Management - Background – Swapping – Contiguous Memory Allocation – Paging – Structure of Page Table - Segmentation – Virtual Memory - Background — Copy-on-Write - Page Replacement algorithms – Basic – FIFO – Optimal – LRU – LRU Approximation – Counting Based – Page Buffering.
SELF STUDY:Monitors - Demand Paging.

UNIT- IV STORAGE MANAGEMENT   (12 Hours)

File Concept – Access Methods – Directory Structure – File System Structure – File System Implementation – Directory Implementation - Allocation Methods – Free Space Management - Disk Scheduling – Disk Management – Swap-space Management – RAID Structure.
SELF STUDY:Free Space Management

UNIT – V DISTRIBUTED SYSTEMS AND SECURITY   20% (12 Hours)

Distributed System – Motivation – Types of Distributed Operating System - System Security – Security Problem – Trojan Horse – Trap door – Logic Bomb – Buffer Overflow –User Authentication – Passwords Vulnerabilities – Encrypted One –time Passwords – Biometrics – Implementing Security Defenses – Firewalling to Protect System and Networks.
SELF STUDY: Program Threats – Viruses.

REFERENCES:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating System Principles", Wiley Publication, 7th Edition, 2013.

2. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall, 2011.

3. Madnick&J.Donovan, "Operating Systems", McGraw, Hill Publication, 2nd Edition, 2013.

4. H.M.Deitel, "Operating systems", Addison Wesley Publication, 3rd Edition, 2013.

5. William Stallings, "Operating Systems ", Prentice Hall Publication, 7th Edition, 2014.

WEB REFERENCES:

1. http://Williamstallings.com/os/animations
2. https://www.tutorial.com/operating_system/

I MCA

SEMESTER – I

(For those who joined in 2020 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
MCA	20MCA103	OPERATING SYSTEMS	MAJOR CORE	4	4

COURSE DESCRIPTION

This course provides knowledge on the concepts of abstraction, scheduling mechanisms, implementations and manages a computer's resources, especially the allocation of those resources among other programmes.

COURSE OBJECTIVES

- ❖ To be aware of the evolution and fundamental principles of operating system.
- ❖ To understand the various operating system components like process management, memory management, file management.
- ❖ To be familiar with storage management.

UNIT - I INTRODUCTION   (12 Hours)

What is Operating System? **–** System Organization – System Architecture – System Structure – Protection and Security – Distributed Systems – Special Purpose Systems – Process Overview – Process Scheduling – Process Operations – Inter process Communication.

SELF STUDY: Inter process Communication

UNIT – II PROCESS CO-ORDINATION   (12 Hours)

CPU Basic Concepts – Scheduling Criteria – Scheduling Algorithms – Synchronization - Background – Critical Section Problem – Peterson's Solution - Synchronization Hardware – Semaphore Problems – Monitors Deadlock – System Model – Deadlock Characterization – Methods for Handling – Prevention – Avoidance – Detection – Recovery from Deadlock.

SELF STUDY: Monitors

UNIT – III MEMORY MANAGEMENT   **(12 Hours)**

Memory Management - Background – Swapping – Contiguous Memory Allocation – Paging – Structure of Page Table – Segmentation - Virtual Memory - Copy-on-Write - Page Replacement algorithms – Basic – FIFO – Optimal – LRU – LRU Approximation – Counting Based – Page Buffering.

SELF STUDY: Demand Paging.

UNIT - IV FILE SYSTEM MANAGEMENT   **10%**   **(12 Hours)**

File Concept – Access Methods – Directory and Disk Structure – File system mounting – File sharing - File System Structure – File System Implementation – Directory Implementation - Allocation Methods – Free Space Management.

SELF STUDY: Free Space Management

UNIT – V STORAGE MANAGEMENT   **10%**   **(12 Hours)**

Disk Structure – Disk Attachment - Disk Scheduling – Disk Management – Swap-space Management – RAID Structure – I/O Systems - I/O Hardware – I/O interface – I/O Subsystem - I/O Request to hardware operations.

SELF STUDY: Swap-space Management

REFERENCES:

6. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating System Principles", 7th Edition, Wiley Publication, 2013.

7. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall, 2011.

8. Madnick&J.Donovan, "Operating Systems", McGraw, 2nd Edition, Hill Publication, 2013.

9. H.M.Deitel, "Operating systems", 3rd Edition, Addison Wesley Publication, 2013.

10. William Stallings, "Operating Systems ", 7th Edition, Prentice Hall Publication, 2014.

WEB REFERENCES:

3. http://Williamstallings.com/os/animations

4. https://www.tutorial.com/operating_system/

II MCA

SEMESTER – III

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
MCA	19MCA302	DATA COMMUNICATION AND NETWORKING	MAJOR CORE	4	4

COURSE DESCRIPTION

This course provides the basic concepts, design principles and underlying technologies of networking.

COURSE OBJECTIVE

❖ To familiarize with the basic taxonomy & terminology of data communication.

❖ To analyze the function & design strategies of Physical, Datalink, Network and Transport layer.

❖ To acquire the basic knowledge of various Application protocols.

UNIT – I OVERVIEW (12 Hours)

Introduction:Data Communications **–** Networks -Network Models: Layered tasks- OSI Model- Layers in the OSI model- TCP/ IP protocols suite- Addressing.

SELF STUDY: OSI Model

UNIT – II PHYSICAL LAYER & MEDIA, DATA LINK LAYER (12 Hours)

Digital Transmission: Transmission Modes - Transmission Media- Guided Media- Unguided Media.

Switching – Circuit switched Network- Datagram Network- Virtual Circuit Network - Error detection and Correction- Introduction- Block Coding - Data link Control: Framing- Flow and Error control- Protocols- Noiseless Channels- Noisy Channels.

UNIT - III NETWORK LAYER   **(12 Hours)**

Internet Protocol **-** Internetworking- IPV4- IPV6- Transition from IPV4 to IPV6 - Delivery, Forwarding & Routing: Delivery- Forwarding - Unicast Routing Protocols - Multicast Routing Protocols.

UNIT – IV TRANSPORT LAYER   **(12 Hours)**

Process-to-Process delivery: UDP – TCP – SCTP.

Congestion Control and Quality of Service: Data traffic – Congestion - Congestion Control - QOS

SELF STUDY: Congestion – Congestion control

UNIT – V APPLICATION LAYER   **(12 Hours)**

Domain Name System :Name Space - Domain Name Space- Distribution of Name Space- DNS in the Internet – DNS Messages- Resolution - Remote Login – DNS Messages – Types of records.

Remote Logging, Electronic Mail and File Transfer: Remote Logging - Email- FTP.

SELF STUDY: Name Space – Domain name space – DNS Messages – Resolution- Remote Login – Email.

REFERENCES:

1. Behrouz A Forouzan,"Data Communication and Networking", 4th Edition, Tata McGraw Hill.
2. Andrew. S. Tanenbaum, "Data Communication and Networking", 4th Edition, Pearson Education.
3. MassoudMoussavi, "Data Communication and Networking", 2011

WEB REFERENCES:

1. http://www.omnisecu.com/basic-networking/
2. https://www.ece.uvic.ca/~itraore/elec567-13/notes/dist-03-4.pdf

I MCA

SEMESTER – II

(For those who join in 2020 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
MCA	20MCADS01	DATA COMMUNICATION & NETWORKING	SPECIALIZATION ELECTIVE – DISTRIBUTED SYSTEM SECURITY	4	4

COURSE DESCRIPTION

This course provides the basic concepts, design principles and underlying technologies of networking.

COURSE OBJECTIVE

❖ To familiarize with the basic taxonomy & terminology of data communication.
❖ To analyze the function & design strategies of Physical, Datalink, Network and Transport layer.
❖ To acquire the basic knowledge of various Application protocols.

UNIT – I OVERVIEW (12 Hours)

Introduction: Data Communications – Networks -Network Models: Layered tasks- OSI Model- Layers in the OSI model- TCP/ IP protocols suite- Addressing.

SELF STUDY: OSI Model

UNIT – II PHYSICAL LAYER & MEDIA, DATA LINK LAYER (12 Hours)

Digital Transmission: Transmission Modes - Transmission Media- Guided Media-Unguided Media.

Switching – Circuit switched Network- Datagram Network- Virtual Circuit Network - Error detection and Correction- Introduction- Block Coding - Data link Control: Framing- Flow and Error control- Protocols- Noiseless Channels- Noisy Channels.

UNIT - III NETWORK LAYER & TRANSPORT LAYER   (12 Hours)

Network Layer: Internet Protocol - Internetworking- IPV4- IPV4- Transition from IPV4 to IPV4 - Routing: Unicast Routing Protocols

Transport Layer: Process-to-Process delivery- UDP – TCP – SCTP.

SELF STUDY:Transition from IPV4 to IPV4

UNIT –IV APPLICATION LAYER   (12 Hours)

Domain Name System :Name Space - Domain Name Space- Distribution of Name Space- DNS in the Internet – DNS Messages- Resolution - Remote Login – DNS Messages – Types of records.

Remote Logging, Electronic Mail and File Transfer: Remote Logging - Email- FTP.

SELF STUDY: Name Space – Domain name space – DNS Messages – Resolution-Remote Login – Email.

UNIT –V NETWORK SIMULATOR (NS2)   20%   (12 Hours)

Introduction – Features of NS2 – Basic architecture – TCL & C++ - Installation of NS2 – Example on NS2 – Advantages and Dis advantages of NS2

NS Components – Basic Tcl – Simple two node wired network – Adding traffic to the Link – Simulate a topology – UDP Traffic – TCP Traffic

SELF STUDY: Advantages and Dis advantages of NS2

REFERENCES:

4. BEHROUZ A FOROUZAN, "Data Communication and Networking", 4th Edition, Tata McGraw Hill.

5. Andrew. S. Tanenbaum, "Data Communication and Networking", 4th Edition, Pearson Education.

6. Teerawat Issariyakul, Ekram Hossain, "Introduction to Network Simulator NS2", Springer, 2nd Edition

WEB REFERENCES:

3. http://www.omnisecu.com/basic-networking/

4. https://www.tutorialweb.com/ns2/NS2-1.htm

5. https://www.isi.edu/nsnam/ns/

GENERAL ELECTIVE - MCA

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
MCA	19MCAGE24	ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides the basic principles of artificial intelligence. It will cover problem solving paradigms, constraint propagation and search strategies in the areas of applications including knowledge representation, natural language processing, expert systems, vision and robotics.

COURSE OBJECTIVE

- ❖ To learn the methods of solving problems using Artificial Intelligence.
- ❖ To have an understanding of the basic issues of knowledge representation, blind and heuristic search.
- ❖ To have a basic proficiency in a traditional AI language and ability to write simple to intermediate programs in expert systems.

UNIT – I AI PROBLEMS AND PROBLEM CHARACTERISTICS   (12 Hours)

The AI Problems – The underlying assumption - AI techniques – The level of the model – Criteria for success - Problems , Problem space and search – Defining the problem as a state space search – Production Systems – Problem characteristics – Production system characteristics – Issues in the design of search programs- Additional problems.

SELF STUDY : Problem characteristics

UNIT II SEARCH TECHNIQUES   **(12 Hours)**

Heuristic search techniques – Generate and test – Hill climbing – Best first search – Problem reduction – Constraint satisfaction – Means ends analysis. Knowledge Representation Issues- Representations and Mappings- Approaches to Knowledge Representation – Issues in Knowledge Representation – The Frame Problem.

SELF STUDY : Constraint satisfaction

UNIT III USING PREDICATE LOGIC   **(12 Hours)**

Using predicate logic – Representing simple facts in logic – Representing instance and ISA relationship – Computable functions and predicates – Resolution – Natural deduction - Representing knowledge – Using rules – Procedural versus declarative knowledge – Logic programming – forward versus backward reasoning – Matching – Control knowledge.

SELF STUDY : Natural deduction

UNIT IV FILLER STRUCTURE AND GAME PLAYING   **(12 Hours)**

Weak Slot and Filler Structure: Semantic Nets- Frames. Strong Slot and Filler Structure: Conceptual Dependency- Scripts-CYC. Game playing- The minimax search procedure- Adding alpha beta cutoffs- additional refinements- Iterative Deepening.

SELF STUDY : Scripts

UNITV AI LEARNING AND EXPERT SYSTEMS   **(12 Hours)**

What is Learning – ROTE Learning - Learning by Taking Advice – Learning in Problem solving – Learning from Examples: Induction – Explanation-based Learning - Discovery – Analogy – Formal Learning Theory - Expert Systems – Representing and using domain knowledge – Expert System Shells – Explanation – Knowledge Acquisition.

SELF STUDY : Knowledge Acquisition

REFERENCES:

1. Elaine Rich, Kevin Knight, "Artificial Intelligence",McGraw Hill Education Pvt Ltd, III Edition.

2. Mishra Ravi Bhushan, "Artificial Intelligence", PHI learning Pvt. Ltd,2011

3. Kaushik saroj, "Artificial Intelligence" ,Cengage learning India Pvt. Ltd,2011.

WEB REFERENCES:

1.http://en.wikipedia.org/wiki/Artificial_intelligence

2.http://www.cee.hw.ac.uk/~alison/ai3notes/subsection2_6_2_3.html

3.http://starbase.trincoll.edu/~ram/cpsc352/notes/heuristics.html

I MCA

SEMESTER - II

(For those who join in 2020 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
MCA	20MCAAM01	ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS	SPECIALIZATION ELECTIVE – AI & MACHINE LEARNING	4	4

COURSE DESCRIPTION

This course provides the basic principles of artificial intelligence. It will cover problem solving paradigms, constraint propagation and search strategies in the areas of applications including knowledge representation, natural language processing, expert systems, vision and robotics.

COURSE OBJECTIVE

❖ To learn the methods of solving problems using Artificial Intelligence.

❖ To have an understanding of the basic issues of knowledge representation, blind and heuristic search.

❖ To have a basic proficiency in a traditional AI language and ability to write simple to intermediate programs in expert systems through scikit learn tools.

UNIT – I AI Problems and Problem Characteristics   (12 Hours)

The AI Problems – The underlying assumption - AI techniques – The level of the model – Criteria for success - Problems , Problem space and search – Defining the problem as a state space search – Production Systems – Problem characteristics – Production system characteristics – Issues in the design of search programs-Additional problems.

Self Study : Problem characteristics

UNIT II Search Techniques   **(12 Hours)**

Heuristic search techniques – Generate and test – Hill climbing – Best first search – Problem reduction – Constraint satisfaction – Means ends analysis. Knowledge Representation Issues- Representations and Mappings- Approaches to Knowledge Representation – Issues in Knowledge Representation – The Frame Problem.

Self Study : Constraint satisfaction

UNIT III Using predicate logic   **(12 Hours)**

Using predicate logic – Representing simple facts in logic – Representing instance and ISA relationship – Computable functions and predicates – Resolution – Natural deduction - Representing knowledge – Using rules – Procedural versus declarative knowledge – Logic programming – forward versus backward reasoning – Matching – Control knowledge.

Self Study : Natural deduction

UNIT IV Filler Structure and Game playing   **(12 Hours)**

Weak Slot and Filler Structure: Semantic Nets- Frames. Strong Slot and Filler Structure: Conceptual Dependency- Scripts-CYC. Game playing- The minimax search procedure- Adding alpha beta cutoffs- additional   refinements- Iterative Deepening.

Self Study : Scripts

UNIT V AI Learning, Expert systems and Scikit-Learn 20%   **(12 Hours)**

What is Learning – ROTE Learning - Learning by Taking Advice – Learning in Problem solving –Explanation-based Learning - Discovery – Analogy – Formal Learning Theory.

Expert Systems – Representing and using domain knowledge – Expert System Shells – Explanation- Scikit-Learn **–** Introduction - Modelling process - Data Representation - Estimator API – Conventions - Linear Modelling - Support Vector Machine - Classification with Naïve Bayes - Decision Trees - Clustering Methods.

Self Study : Knowledge Acquisition

REFERENCE BOOKS

1. Elaine Rich, Kevin Knight, "Artificial Intelligence", III Edition McGraw Hill Education Pvt Ltd.
2. Mishra Ravi Bhushan, "Artificial Intelligence", PHI learning Pvt. Ltd,2011
3. Kaushik saroj, "Artificial Intelligence" ,Cengage learning India Pvt. Ltd,2011.

WEB RESOURCES

1. http://en.wikipedia.org/wiki/Artificial_intelligence
2. http://www.cee.hw.ac.uk/~alison/ai3notes/subsection2_6_2_3.html

http://starbase.trincoll.edu/~ram/cpsc352/notes/heuristics.html

II MCA

SEMESTER – III

MAJOR CORE

19MCA303 - PROGRAMMING IN JAVA

(For those who join in 2019 onwards)

HRS/WEEK: 4   **CREDITS: 4**

COURSE DESCRIPTION

This course provides an exhaustive coverage of Core Java programming language features like OOPS and GUI programming.

COURSE OBJECTIVE

❖ To understand the basic Java programming constructs

❖ To develop program by using OOPS concept.

❖ To handle Packages, Exception , Basics of AWT and Applets

❖ To create and manipulate databases in Java using JDBC

COURSE OUTCOME

CO 1: Apply the basic Java constructs to develop solutions to real time problems.

CO 2: Analyze the hierarchy of java classes to develop object oriented programs.

CO 3: Design software in Java using Packages and Threads.

CO 4: Implement Concepts of AWT for creating GUI.

CO 5: Design a Software using JDBC.

UNIT I   **(12 Hours)**

An overview of Java – Object Oriented Programming – Lexical issues - Data types – Literals – Type conversion and casting - variables - arrays - Operators – arithmetic – Bitwise - Relational – Assignment – Ternary Operator – operator precedence - Control statements – selection statements – Iteration statements – Jump Statements.

UNIT II   **(12 Hours)**

Introduction to classes – Declaring Objects – Introducing Methods – Constructors – this Keyword – Garbage Collection – finalize () method – stack class – Method Overloading – Method Overriding – Constructor Overloading - - Inheritance – Multilevel Hierarchy – Abstract class – Final with Inheritance .

UNIT III   **(12 Hours)**

Defining Package Access protection – Importing Packages – Defining Interfaces – Implementing Interfaces – Nested Interface - Exception Handling – Exception Types – Using try and catch – Multiple catch – Nested try statements – Built-in Exceptions- Multithreaded Programming –Java Thread Model – Main Thread – Implementing Runnable – Extending Thread – Thread Priorities – Synchronization – Inter-thread communication

UNIT IV   **(12 Hours)**

The Applet class –Architecture – Skeleton – Applet display methods – HTML Applet tag -   AWT classes – Window fundamentals – Frame windows – Working with graphics – Color – Fonts – Using Font Metrics – Control fundamentals Labels – Buttons – Checkbox – Choice control – lists – Scroll Bars – Layout Managers and Menus – Dialog box – AWT Components.

UNIT V   **(12 Hours)**

Introduction to JDBC – Installing JDBC – Basic JDBC Programming Concepts.

SELF STUDY

Operators - Control statements - Constructors - Exception Handling - Working with graphics.

TEXT BOOKS

1. JAVA the Complete reference, 8th Edition, Tata McGraw Hill - Herbert Schildt -2014.

    UNIT 1   : Chapters: 2, 3, 4, 5

    UNIT II : Chapters: 6, 7, 8

    UNIT III : Chapters: 9, 10, 11, 15

    UNIT IV : Chapters: 22, 24, 25

2. The Complete Reference J2EE, Jim Keogh, 3rd Edition, Tata McGraw Hill, Reprint 2010.

    UNIT V : Chapter: 6

REFERENCE BOOKS

1. Programming with JAVA, 4th Edition, E. Balagurusamy
2. The JAVA Programming Language, 3rd Edition, Ken Arnold, David Holmes, James Gosling, Prakash Goteti.

E - RESOURCES

1. https://www.cs.cmu.edu/afs/cs.cmu.edu/user/gchen/www/download/java/LearnJava.pdf
2. https://lecturenotes.in/subject/73/java-programming-java

I MCA

SEMESTER – II

(For those who join in 2020 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
MCA	19MCA303	PROGRAMMING IN JAVA	MAJOR CORE	4	4

COURSE DESCRIPTION

This course provides an exhaustive coverage of Core Java programming language features like OOPS and GUI programming.

COURSE OBJECTIVE

- ❖ To understand the basic Java programming constructs
- ❖ To develop program by using OOPS concept.
- ❖ To handle Packages, Exception , Basics of AWT and Applets
- ❖ To create and manipulate databases in Java using JDBC and show how to create client-server programs using RMI.

UNIT – I INTRODUCTION   (12 Hours)

An overview of Java – Object Oriented Programming – Lexical issues - Data types – Literals – Type conversion and casting - Variables - Arrays – Arithmetic – Bitwise - Relational – Assignment – Ternary Operator – Operator precedence – Selection statements – Iteration statements – Jump Statements.

SELF STUDY : Operators, Control statements

UNIT - II CLASSES AND METHODS   (12 Hours)

Introduction to classes – Declaring Objects – Introducing Methods – this Keyword – Garbage Collection – finalize () method – Stack class – Method Overloading – Method Overriding – Constructor Overloading - - Inheritance – Multilevel Hierarchy – Abstract class – Final with Inheritance .

SELF STUDY : Constructors

UNIT - III PACKAGES AND THREADS   (12 Hours)

Defining Package Access protection – Importing Packages – Defining Interfaces – Implementing Interfaces – Nested Interface - Exception Types – Using try and catch – Multiple catch – Nested try statements – Built-in Exceptions - Multithreaded Programming – Java Thread Model – Main Thread – Implementing Runnable – Extending Thread – Thread Priorities – Synchronization – Inter-thread communication.

SELF STUDY : Exception Handling

UNIT - IV AWT CLASSES AND CONTROLS   (12   Hours) The

Applet class –Architecture – Skeleton – Applet display methods – HTML Applet tag - AWT classes – Window fundamentals – Frame windows – Color – Fonts – Using Font Metrics – Control fundamentals - Labels – Buttons – Checkbox – Choice control – Lists – Scroll Bars – Layout Managers and Menus – Dialog box – AWT Components.

SELF STUDY : Working with graphics

UNIT - V DATABASE AND RMI   20%   (12 Hours)

Introduction to JDBC – Installing JDBC – Basic JDBC Programming Concepts - Java RMI - RMI Concepts - Remote Interface - RMI process - Server side - Client side.

SELF STUDY : Passing Objects in RMI

REFERENCES:

1. Herbert Schildt, "JAVA the Complete Reference",9th Edition, Tata McGraw Hill,2016

2. Jim Keogh, "The Complete Reference J2EE", 3rd Edition, Tata McGraw Hill, Reprint 2010.

3. Ken Arnold, David Holmes, James Gosling,"The JAVA Programming Language", 3rd Edition, PrakashGoteti.

WEB REFERENCES:

3. https://www.cs.cmu.edu/afs/cs.cmu.edu/user/gchen/www/download/java/LearnJava.pdf

4. https://lecturenotes.in/subject/73/java-programming-java

SEMESTER – III

SPECIALIZATION ELECTIVE- DATA SCIENCE

19MCADS01 BIG DATA ANALYTICS

(For those who join in 2019 onwards)

HRS/WEEK: 4   **CREDITS: 4**

COURSE DESCRIPTION

This course provides familiarization to the important information technologies used in manipulating, storing and analyzing big data.

COURSE OBJECTIVE

- ❖ To explore the fundamental concepts of Big Data analytics
- ❖ To understand the various technology foundations for Big Data
- ❖ To learn the Hadoop and Map Reduce Concepts.

COURSE OUTCOMES

CO 1: Work with big data platform and Understand the fundamentals of various big data analysis techniques

CO 2: Analyze the big data analytic techniques for useful business applications.

CO 3: Design efficient algorithms for mining the data from large volumes.

CO 4: Examine the HADOOP and Map Reduce technologies associated with big data   analytics

CO 5: Explore the applications of Big Data

UNIT I   (12 Hours)

Grasping the Fundamentals of BIG DATA

Evolution of Data Management –Understanding the waves of managing data – Defining Big

Data – Building a Successful Big Data management architecture

Examining Big Data types

Defining Structured data- Defining Unstructured data- Real time and non- real – time

requirements – Managing Different data types – Integrating Data types

Big Data Technology Components

Exploring the Big Data stacks – Redundant physical Infrastructure – Security Infrastructure –

Operational Databases – Organizing data services and tools – Analytical data warehouses –

Big data analytics- Big data applications

UNIT II   (12 Hours)

Virtualization

Basics of Virtualization – Importance – Server Virtualization – Application Virtualization –Network Virtualization – Processor and Memory Virtualization – Data and storage Virtualization – Hypervisor –Abstraction and Virtualization – Implementing Virtualization.

Big Data Technology Components

Exploring the Big Data stacks – Redundant physical Infrastructure – Security Infrastructure –Operational Databases – Organizing data services and tools – Analytical data warehouses –Big data analytics- Big data applications

Defining Big Data Analytics

UNIT III (12 Hours)

Getting started with Hadoop : Introduction - Need for Hadoop – Origin and Design of – Examining the various offerings of Hadoop

Use Cases for Big Data in Hadoop

Adopting Hadoop – Log Data Analysis – Data Warehouse Modernization – Fraud Detection – Risk Modeling – Social Sentiment Analysis – Image Classification

Setting up the Hadoop environment – Choosing a Hadoop Distribution – Hadoop cluster architecture

UNIT IV (12 Hours)

Working of Hadoop : Storing data in Hadoop - Data Storage in HDFS – HDFS federation – HDFS High Availability

 Reading and Writing Data – Compressing Data – Managing files – Ingesting Log Data

 MapReduce programming - Importance – doing things in parallel – Writing Map Reduce Applications

 Frameworks for processing data in Hadoop

UNIT V (12 Hours)

Hadoop and Data warehouse – Extremely big tables - Integrating Hadoop with relational databases – Deploying Hadoop.

SELF STUDY

        Defining Structured data- Defining Unstructured data, Big data applications, Frameworks for processing data in Hadoop

TEXT BOOKS

1. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, Big Data, Wiley
India Pvt ltd, 2015
2. Dirk deRoos , "Hadoop for Dummies", John Wiley and sons , 2014

REFERENCE BOOKS

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, 2015.
2. Chris Eaton, Dirk deroos et al., "Understanding Big data", McGraw Hill, 2012.
3. Tom White, "HADOOP: The definitive Guide", O Reilly 2012.

E - RESOURCES

1. http://www.planetdata.eu/sites/default/files/presentations/Big_Data_Tutorial_part4.pdf
2. https://www.guru99.com/introduction-to-mapreduce.html
3. https://www.dezyre.com/hadoop-tutorial/hadoop-mapreduce-tutorial

II MCA

SEMESTER – III

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
MCA	19MCADS01	BIG DATA ANALYTICS	SPECIALIZATION ELECTIVE- DATA SCIENCE	4	4

COURSE DESCRIPTION

This course provides familiarization to the important information technologies used in manipulating, storing and analyzing big data.

COURSE OBJECTIVE

❖ To explore the fundamental concepts of Big Data analytics

❖ To understand the various technology foundations for Big Data

❖ To learn the Hadoop and Map Reduce Concepts

UNIT – I   **(12 Hours)**

GRASPING THE FUNDAMENTALS OF BIG DATA

Evolution of Data Management –Understanding the waves of managing data – Defining Big Data – Building a Successful Big Data management architecture

EXAMINING BIG DATA TYPES

Defining Structured data- Defining Unstructured data- Real time and non- real – time requirements – Managing Different data types – Integrating Data types

SELF STUDY: Managing Different data types

UNIT- II   **(12 Hours)**

BIG DATA TECHNOLOGY COMPONENTS

Exploring the Big Data stacks – Redundant physical Infrastructure – Security Infrastructure –Operational Databases – Organizing data services and tools – Analytical data warehouses –Big data analytics- Big data applications

DEFINING BIG DATA ANALYTICS

Using Big Data to Get Results – Modifying Business intelligence Products to Handle Big Data – Studying Big Data Analytics Examples – Big data Analytics Solutions

SELF STUDY: Organizing data services and tools

UNIT- III (12 Hours)

GETTING STARTED WITH HADOOP

Introduction - Need for Hadoop – Origin and Design of Hadoop – Examining the various offerings of Hadoop

USE CASES FOR BIG DATA IN HADOOP

Adopting Hadoop – Log Data Analysis – Data Warehouse Modernization – Fraud Detection – Risk Modeling – Social Sentiment Analysis – Image Classification

SETTING UP THE HADOOP ENVIRONMENT– Choosing a Hadoop Distribution – Hadoop cluster architecture

SELF STUDY: Fraud Detection

UNIT - IV (12 Hours)

STORING DATA IN HADOOP : THE HDFS

Storing data in Hadoop - Data Storage in HDFS – HDFS federation – HDFS High Availability

READING AND WRITING DATA

 Compressing Data – Managing files – Ingesting Log Data

MAPREDUCE PROGRAMMING

Importance – Doing things in parallel – Writing Map Reduce Applications

SELF STUDY: Compressing Data

UNIT - V <mark>20%</mark> **(12 Hours)**

HADOOP AND DATA WAREHOUSE

Compare & Contrast Hadoop with Relational Databases - Modernizing the warehouse with Hadoop

STORING DATA IN HBASE

HBase – Understanding HBase Data model – Understanding the HBase architecture – Test run – HBase and RDBMS –Deploying HBase

REFERENCES:

1. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, " Big Data", Wiley India Pvt ltd, 2015
2. Dirk deRoos , "Hadoop for Dummies", John Wiley and sons , 2014
3. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, 2015.
4. Chris Eaton, Dirk deroos et al., "Understanding Big data", McGraw Hill, 2012.
5. Tom White, "HADOOP: The definitive Guide", O Reilly 2012.

WEB REFERENCES:

4. http://www.planetdata.eu/sites/default/files/presentations/Big_Data_Tutorial_part4.pdf
5. https://www.guru99.com/introduction-to-mapreduce.html
6. https://www.dezyre.com/hadoop-tutorial/hadoop-mapreduce-tutorial

SEMESTER - IV

SPECIALIZATION ELECTIVE- NETWORKING

19MCANW02 WIRELESS SENSOR NETWORKS

(For those who join in 2019 onwards)

HRS/WEEK: 4   **CREDITS: 4**

COURSE DESCRIPTION

This course provides knowledge on the architectures, functions and performances of wireless sensor systems and platforms. It also describes and analyze the specific requirements for applications in wireless sensor networks regarding energy supply, memory, processing and transmission capacity.

COURSE OBJECTIVES

- ❖ To understand the fundamental concepts of wireless and sensor networks
- ❖ To be trained in the issues and challenges in the design of wireless ad hoc networks.
- ❖ To understand the characteristics, alternatives of WSN, MAC and Routing Protocols
- ❖ To be aware of the security issues in local and personal networks with solutions.

COURSE OUTCOMES

CO 1: Formulate the basic standardization of wireless networks.

CO 2: Analyze the implementation of technologies related to WSN.

CO 3: Identify and understand the security issues in ad hoc and sensor networks.

CO 4: Compare the protocols and to promote the research work in this area.

CO 5: Apply and solve problems in the applications of Wireless Networking Area.

UNIT I   **(12 Hours)**

Introduction and Characteristics of the Wireless Medium:

Elements of Information Networks – Evolution of Wireless Access to PSTN – Evolution of Wireless Access to the Internet – Evolution of Wireless localization technologies – Modelling of Large-scale RSS – Path Loss – Shadow fading – RSS Fluctuations – Doppler Spectrum – Wideband Modelling of Multipath Characteristics.

UNIT II   **(12 Hours)**

Deployment of Wireless Networks:

Introduction – Wireless Network Architectures – Topologies – Coverage – Interference in Wireless Networks – Range – Probability – Results – Deployment of Wireless LAN's – Cellular Topology – Cell Fundamentals – Frequency Reuse – Signal to Interference Ratio Calculation.

UNIT III   **(12 Hours)**

Wireless Network Operations and Security:

Introduction – Cellular Telephone Networks – Wireless LAN – Wireless PAN – Cell Search and Registration – Mobility Management – Location – Hand-off – Mobile IP and IMS. Security – General Threats – Cryptographic Protocols - Security in Wireless LAN –Security in Wireless PAN – Security in Wireless WAN.

UNIT IV   **(12 Hours)**

Wide Area Wireless Access: TDMA, CDMA, OFDM, MIMO

Introduction to TDMA – Services – Reference Architecture – Mechanisms – Registration – Call Establishment – Handoff – Security – Communication Protocols – CDMA Introduction – CDMA based Cellular Systems – OFDM Introduction – Robustness – Flexible Application – Challenges – MIMO – Diversity – Spatial Multiplexing – Beam forming – WiMax Architecture – MAC Layer – PHY Layer

UNIT V   **(12 Hours)**

Wireless Localization and Applications:

Geolocation Systems – Wireless Emergency Services – Performance Measures – Location Sensing and Positioning Methodologies – Generic Architecture – Positioning Algorithms and Standards – Services Architecture – Cellular Network Architecture – Location Services Architecture – Over the Air – Signaling – Mobile Location Protocol – Positioning in Adhoc and Sensor Networks.

SELF STUDY

Path Loss – Shadow fading - Cell Fundamentals - General Threats - CDMA based Cellular Systems - Signaling

TEXT BOOKS

1. Kaveh Pahlavan, Prashant Krishnamurthy, " **Principles of Wireless Access and Localization**" , John Wiley, 2013

        Unit I   – Chapters 1.1 – 1.5, 2.1 – 2.4

        Unit II   – Chapter 5.1 – 5.5

        Unit III   – Chapter 6.1 – 6.3, 7.1 – 7.4

        Unit IV   – Chapter 11.1 – 11.4, 12.1 – 12.3, 13.1 – 13.4

        Unit V   – Chapter 14.1 – 14.4

REFERENCES

1. Carlos De Morais Cordeiro, Dharma Prakash Agrawal, ―Ad Hoc and Sensor Networks: Theory and Applications (2nd Edition), World Scientific Publishing, 2011.

2. Waltenegus Dargie, Christian Poellabauer, ―Fundamentals of Wireless Sensor Networks Theory and Practice, John Wiley and Sons, 2010.

3. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

E- RESOURCES

1. https://www.elprocus.com/architecture-of-wireless-sensor-network-and-applications/

2. https://en.wikipedia.org/wiki/wireless_sensor_network

II MCA

SEMESTER – IV

(For those who join in 2019 onwards)

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
MCA	19MCANW02	WIRELESS SENSOR NETWORKS	SPECIALIZATION ELECTIVE - NETWORKING	4	4

COURSE DESCRIPTION

This course provides knowledge on the architectures, functions and performances of wireless sensor systems and platforms. It also describes and analyze the specific requirements for applications in wireless sensor networks regarding energy supply, memory, processing and transmission capacity.

COURSE OBJECTIVE

❖ To understand the fundamental architecture of wireless and sensor networks
❖ To analyse the role of physical and data link layer and its protocol.
❖ To understand the impact of time synchronization, localization and positioning in WSN.
❖ To learn the rules of routing protocols in WSN.

UNIT I   **15%**   **(12 Hours)**

INTRODUCTION - Challenges for Wireless Sensor Networks – Mobile ad hoc networks and wireless Sensor Networks – field buses and Wireless Sensor Networks – enabling Technologies for wireless sensor networks.

ARCHITECTURES – Single Node Architecture - Hardware Components – Energy Consumption of sensor nodes – Operating systems and execution environments - Examples of sensor nodes

NETWORK ARCHITECTURE– Sensor network scenarios – Optimization Goals and figures of merit – Design principles of WSN

SELF STUDY: Enabling Technologies for wireless sensor networks, Examples of sensor nodes

MAC PROTOCOLS– Fundamentals of MAC protocols - Low duty cycle protocols and wakeup concepts- contention based protocols – schedule based protocols – the IEEE 802.15.4 MAC protocol

LINK LAYER PROTOCOLS– Fundamentals - Error control - Framing – Link management

SELF STUDY: Link management

TIME SYNCHRONIZATION - Introduction – Protocols

LOCALIZATION AND POSITIONING –Properties of localization and positioning procedures – Mathematical basics for the lateration problem – single hop localization – Positioning in multi hop environment – Impact of anchor placement.

TOPOLOGY CONTROL– Motivation and basic ideas – Controlling topology in flat networks – power control – Hierarchical networks by dominating sets – hierarchical networks by clustering

SELF STUDY: Properties of localization and positioning procedures

ROUTING PROTOCOLS – Gossiping and agent based uni cast forwarding – energy efficient unicast – broadcastand multicast – Geographic routing – Mobile nodes - Data

centric and content based networking – Introduction – Data centric routing – data aggregation – data centric storage

SELF STUDY: Geographic routing – Mobile nodes

<mark>UNIT V</mark>   <mark>20%</mark>   **(12 Hours)**

TRANSPORT LAYER AND QUALITY OF SERVICE- Transport layer and QoS in wireless sensor networks – Congestion control and rate control

ADVANCED APPLICATION SUPPORT – advanced network processing – Security – Application specific support

SELF STUDY: Congestion control and rate control

REFERENCES :

1. Holger Karl & Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks" , John Wiley, 2006
2. Carlos De MoraisCordeiro, Dharma Prakash Agrawal, "Ad Hoc and Sensor Networks: Theory and Applications",2nd Edition, World Scientific Publishing, 2011.
3. WaltenegusDargie, Christian Poellabauer,"Fundamentals of Wireless Sensor Networks Theory and Practice",John Wiley and Sons, 2010.
4. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

WEB REFERENCES:

1. https://www.elprocus.com/architecture-of-wireless-sensor-network-and-applications/
2. https://en.wikipedia.org/wiki/wireless_sensor_network

GENERAL ELECTIVE

19MCAGE26 - CLOUD COMPUTING

(For those who join in 2019 onwards)

HRS/WEEK: 4   **CREDITS: 4**

COURSE DESCRIPTION

This course provides comprehensive study of cloud concepts and capabilities across the various Cloud service models including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), and Business Process as a Service (BPaaS).

COURSE OBJECTIVE

❖ Introduce the broad perceptive of cloud architecture and model

❖ Gain knowledge on the concept of Virtualization and design of cloud Services

❖ To understand the issues on cloud storage & security.

COURSE OUTCOME

CO 1: Compare the strengths and limitations of cloud computing.

CO 2: Identify the architecture, infrastructure and delivery models of cloud computing.

CO 3: Apply suitable virtualization concept.

CO 4: Choose the appropriate Cloud player, Programming Models and approach.

CO 5: Address the core issues of cloud computing such as security, privacy and interoperability.

UNIT I   **(12 Hours)**

Cloud Computing Basics – Overview – What is cloud computing - Cloud components- Infrastructure – services - Applications – storage - Database services- Intranets and the Cloud – Hypervisor applications - First movers in the cloud – Amazon – Google - Microsoft.

Organization and Cloud Computing – When you can use cloud computing – Benefits – Limitations – Security Concerns – Regulatory Issues.

Business Case for Going To the cloud – Cloud Computing Services – How applications help the business – Develop your Data Center – Salesforce.com.

UNIT II   **(12 Hours)**

Hardware and Infrastructure – Clients – Security – Network – Services.

Accessing the cloud – Platforms Web application framework-web hosting serviceproprietary methods– Applications –choices-sample applications- Web APIs –what are APIshow. APIs work-API creators- Web Browsers.

Cloud Storage – overview-basics-storage as service- providers-security-reliabilityadvantages- cautions-outages- theft- Storage providers-Amazon S3-Nirvanix-Google big table data store-Mobile me-Live mesh.

UNIT III   **(12 Hours)**

Standards – Applications – Client – Infrastructure – Services. **Software As A Service** – Overview – Driving forces – Company offerings – Industries.

UNIT IV   **(12 Hours)**

Local Clouds and Thin Clients – Virtualization in organization – Server Solutions – Thin Clients.

Migrating to the Cloud – Cloud services for individuals – cloud services aimed at the midmarket enterprise – Class Cloud offerings – Migration.

UNIT V   **(12 Hours)**

Security in the cloud – Overview - Cloud security challenges – SaaS Security.

Mobile Cloud – Working with mobile devices – Defining the mobile market – Using Smart Phones with the cloud.

Working with mobile web services – Understanding service types – performing service discovery – Using SMS – Defining WAP and other protocols – Performing Synchronization.

SELF STUDY

First movers in the cloud – Google Big Table Data Store – Cloud services for individuals – Using smart phones with the cloud.

TEXT BOOKS

1. Anthony T. Velte, Toby J. Velte, Rober Elsenpeter, Cloud Computing – A Practical
    Approach , Mc.Graw Hill publications, 2013.

                            Unit I – Chap. 1, 2, 4
                            Unit II – Chap. 5, 6,7
                            Unit III – Chap. 8,9

Unit IV – Chap. 12,13

2. John W.RittingHouse, James F.Ransome, Cloud Computing Implementation, Management and Security, CRC Press, 2013.

Unit V – Chap.6

3. Barrie Sosinsky, Cloud Computing Bible, Wiley India Pvt. Ltd, 2013.

Unit V- Chap. 20, 21.

REFERENCE BOOKS

1. Kris Jamsa, Cloud Computing , Jones & Bartlett Learning Publishers 2014.
2. Michael Miller, Cloud Computing , Pearson Education.
3. Rajkumar buyya, James Broberg, Andrzej Goscinski, Cloud Computing Principles & Paradigms, Wiley India Pvt. Ltd., 2013.

E - RESOURCES

1. https://lecturenotes.in/subject/366/cloud-computing-cc

2. https://www.guru99.com/cloud-computing-for-beginners.html

GENERAL ELECTIVE - MCA

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
MCA	19MCAGE26	CLOUD COMPUTING	GENERAL ELECTIVE	4	4

COURSE DESCRIPTION

This course provides a comprehensive study of cloud concepts and capabilities across the various Cloud service models including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), and Identity as a Service (IDaaS).

COURSE OBJECTIVES

- ❖ To introduce the broad perceptive of cloud architecture and model
- ❖ To Gain knowledge on the concept of Virtualization and design of cloud Services
- ❖ To understand the issues on cloud storage & security.

UNIT –I   10%   (12 HRS.)

BASICS OF CLOUD COMPUTING AND CLOUD ARCHITECTURE

Defining Cloud Computing - Cloud Types - The NIST model - The Cloud Cube Model Deployment models Service models -Examining the Characteristics of Cloud Computing - Paradigm shift Benefits of cloud computing Disadvantages of cloud computing - Assessing the Role of Open Standards

Understanding Cloud Architecture - Exploring the Cloud Computing Stack - Infrastructure - Platforms - Virtual Appliances - Communication Protocols – Applications

SELF STUDY : Connecting to Cloud - The Jolicloud Netbook OS - Chromium OS

UNIT –II CLOUD SERVICES AND APPLICATIONS   10%   (12 HRS.)

Understanding Services and Applications by Type - Defining Infrastructure as a Service (IaaS) - IaaS workloads - Pods, aggregation, and silos - Defining Platform as a Service (PaaS) - Defining Software as a Service (SaaS) - SaaS characteristics - Open SaaS and SOA - Salesforce.com and CRM SaaS

SELF STUDY : Defining Identity as a Service (IDaaS) - IDaaS interoperability - User authentication and Authorization

UNIT –III ABSTRACTION VS. VIRTUALIZATION   10%   (12 HRS.)

Understanding Abstraction and Virtualization - Using Virtualization Technologies - Load Balancing and Virtualization - Advanced load balancing - The Google cloud - Understanding Hypervisors -Virtual machine types - VMware vSphere - Understanding Machine Imaging - Porting Applications - The Simple Cloud API - AppZero Virtual Application Appliance

Using PaaS Application Frameworks – Drupal - Using SaaS Application Frameworks - Google App Engine – Using IaaS Application Frameworks - Amazon Elastic Compute Cloud (EC2) - Windows Azure.

SELF STUDY : Virtualization Practicum

UNIT –IV CLOUD MANAGEMENT AND CLOUD SECURITY 10%   (12 HRS.)

Managing the Cloud - Administrating the Clouds - Management responsibilities - Lifecycle management - Cloud Management Product - Emerging Cloud Management Standards - Cloud Security - Securing the Cloud - The security boundary - Security

service boundary - Security mapping - Securing Data - Brokered cloud storage access - Storage location and tenancy - Encryption - Auditing and compliance

SELF STUDY :DMTF cloud management standards - Cloud Commons and SMI

<mark>**UNIT –V**</mark>   <mark>**20%**</mark>   **(12 HRS.)**

CLOUD BASED STORAGE AND COMMUNICATING WITH CLOUD

Working with Cloud-Based Storage -- Cloud storage in the Digital Universe - Cloud storage definition - Provisioning Cloud Storage - Unmanaged cloud storage - Managed cloud storage - Creating cloud storage systems - Virtual storage containers -Exploring Cloud Backup Solutions - Backup types -Cloud backup features - Cloud attached backup - Cloud Storage Interoperability - Cloud Data Management Interface (CDMI) - Open Cloud Computing Interface (OCCI) - Communicating with the Cloud - Exploring Instant Messaging - Instant messaging clients - Instant messaging interoperability - Micro-blogs or Short Message Services - Exploring Collaboration Technologies

SELF STUDY : Using Social Networks - Features - List of social networking sites - Privacy and security - Interaction and interoperability

REFERENCES:

1. Barrie Sosinsky, "Cloud Computing Bible", Wiley India Pvt. Ltd, 2013.
2. John W.RittingHouse, James F.Ransome, "Cloud Computing Implementation, Management and Security", CRC Press, 2013.
3. Kris Jamsa, Jones &Bartlett , "Cloud Computing" , Learning Publishers 2014.
4. Anthony T. Velte, Toby J. Velte, RoberElsenpeter, "Cloud Computing – A Practical Approach" , Mc Graw Hill publications, 2013.
5. Rajkumarbuyya, James Broberg, Andrzej Goscinski, " Computing Principles & Paradigms", Wiley India Pvt. Ltd., 2013.

WEB REFERENCES :

1. https://lecturenotes.in/subject/366/cloud-computing-cc
    2. https://www.guru99.com/cloud-computing-for-beginners.html

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