Department of MCA

Programme Specific Outcomes (PSOs)

On the successful completion of the Postgraduate Programme, the students will be able to

PSO1 Disciplinary Knowledge	develop a strong understanding of core concepts in computer science, enabling the design and development of efficient software solutions.
PSO2 Communication Skills	effectively convey information, ideas, messages efficiently through various channels.
PSO 3 Problem Solving & Analytical Reasoning	design and implement efficient algorithms to tackle real-world challenges and to demonstrate strong analytical skills for computing solutions in a global, economic and societal context
PSO 4 Critical Thinking	demonstrate strong analytical skills, develop effective solutions and make informed decisions in IT-related fields
PSO 5 Research Skills	conduct research and evaluate information critically so as to draw reasoned conclusions from varied data sources.
PSO 6 Digital Literacy	navigate and focus on the use of digital technologies effectively for various professional and academic purposes.
PSO 7 Professional competencies	exhibit knowledge, expertise, capacity to adapt to change and soft skills in their profession.
PSO 8 Moral and Ethical Awareness/Reasoning	embrace moral/ethical values for an exemplary living and reflect their virtues wherever they are in.
PSO 9 Multicultural Competence	actively participate in a multicultural realm at work and life.
PSO 10 Self-directed & Lifelong Learning	engage in lifelong learning and professional development to keep pace with advancements in their respective fields.

Department of MCA

Learning Outcomes-based Curriculum Framework (LOCF)

(w.e.f 2024-2025)

Sem	Category	Course Code	Course Title	Hours /Wk.	Credits	Marks
1	CC	24MCA4401	Advanced C Programming	5	4	80
1	CC	24MCA4501	Digital Principles and Computer Organization	6	5	100
1	CC	24MCA4503	Mathematical Foundation for ComputerApplications–1	6	5	100
1	CC	24MCA4201	C Lab	4	2	40
1	DSE	24XXXNNNN	*Discipline Specific Elective-I*	5	4	80
1	GE	24XXXNNNN	*Generic Elective -I*	4	3	60
	Total			**30**	**23**	**460**
2	CC	24MCA4402	Design Analysis and Algorithm using C++ (TcL)	5	4	80
2	CC	24MCA4502	Agile Software Engineering	6	5	100
2	CC	24MCA4504	Mathematical Foundation for Computer Applications – 2	6	5	100
2	CC	24MCA4202	C++ Lab	4	2	40
2	DSE	24XXXNNNN	*Discipline Specific Elective-II*	5	4	80
2	GE	24XXXNNNN	*Generic Elective - II*	4	3	60
	Total			**30**	**23**	**460**
3	CC	24MCA5401	Computer Networks	5	4	80
3	CC	24MCA5301	Programming in Java	4	3	60
3	CC	24MCA5501	Dot Net Programming(TcL)	6	5	100
3	CC	24MCA5503	OOAD & UML (TcL)	6	5	100
3	CC	24MCA5201	Java Lab	4	2	40
3	DSE	24XXXNNNN	*Discipline Specific Elective-III*	5	4	80
3	IS	24MCA5233	Internship*	-	2	40
	Total			**30**	**25**	**500**
4	CC	24MCA5402	Mobile Application Development(TcL)	5	4	80
4	CC	24MCA5302	Python Programming	4	3	60
4	CC	24MCA5502	Data mining & Data	6	5	100

			Warehousing			
4	CC	24MCA5504	Project	6	5	100
4	CC	24MCA5202	Python Lab	4	2	40
4	DSE	24XXXNNNN	*Discipline Specific Elective - IV*	5	4	80
4	SEC	24MCA5244	Professional Competency Skill	-	2	40
	Total			**30**	**25**	**500**
Grand Total				**120**	**96**	**1920**

* Internship - First Year Vacation (30 Hrs.)

Discipline Specific Elective (DSE)

Sem	Category	Course Code	Course Title	Hours/Wk.	Credits	Marks
1	DSE	24MCA4403/ 24MCA4405	Advanced DBMS/ Data Analytics	5	4	80
2		24MCA4404/ 24MCA4406	Web Programming/ Cloud Computing	5	4	80
3		24MCA5403/ 24MCA5405	Artificial Intelligence/ Software Testing	5	4	80
4		24MCA5404/ 24MCA5406	Machine Learning/ Internet of Things	5	4	80

Generic Elective (GE)

Sem	Category	Course Code	Course Title	Hours/Wk.	Credits	Marks
1	GE	24MCA4301/ 24MCA4303	Operating System/ Human Computer Interaction	4	3	60
2		24MCA4302/ 24MCA4304	Cyber Security/ Data Visualization	4	3	60

Mapping with POs

MCA	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
	3	3	3	3	3	3	3	2	2	3

Mapping with PSOs

MCA	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
24MCA4401	3	3	3	3	2	3	3	2	3	3
24MCA4501	3	3	3	3	2	2	3	1	1	3
24MCA4503	3	3	3	3	3	3	3	2	2	2
24MCA4201	3	3	3	3	3	3	3	2	2	2
24MCA4403/ 24MCA 4405	3	3	3	3	2	3	2	1	2	2
24MCA4402	3	3	3	3	3	3	3	3	3	3
24MCA4502	3	2	3	2	2	3	3	1	1	3
24MCA4504	3	3	3	3	3	3	3	2	2	2
24MCA4202	3	3	3	3	3	3	3	3	3	3
24MCA4404/ 24MCA4406	3	3	3	3	2	2	2	2	2	3
24MCA5401	3	3	2	2	2	2	2	1	2	2
24MCA5301	3	3	3	2	2	3	2	2	2	2
24MCA5501	3	3	3	3	2	2	2	2	2	2
24MCA5503	3	2	3	2	2	3	3	1	1	3
24MCA5201	3	2	3	2	2	2	2	2	2	2
24MCA5403/ 24MCA5405	3	2	3	2	2	3	3	1	1	3
24MCA5402	3	2	3	2	2	3	3	1	1	3
24MCA5302	3	3	3	2	3	2	2	1	1	1
24MCA5502	3	2	3	3	3	2	3	1	1	3
24MCA5504	3	3	3	3	3	3	3	3	3	3
24MCA5202	3	2	3	2	2	2	2	2	2	2
24MCA5404/ 24MCA5406	3	3	3	2	2	3	2	1	2	2
24MCA5233	3	3	3	3	3	3	3	3	3	3
24MCA5244	3	3	3	3	3	3	3	3	3	3
Average	3.0	3.0	3.0	3.0	2.4	3.0	3.0	2.0	2.0	3.0

Mapping with POs

MCA	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
24MCA4301 / 24MCA4303	3	3	3	3	2	3	2	2	2	2
24MCA4302/ 24MCA4304	3	3	3	3	3	3	3	2	2	3
Average	3.0	3.0	3.0	3.0	3.0	3.0	2.5	2.0	2.0	3.0

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24MCA4401	Advanced Programming in C	Core	5	4

This course introduces programming concepts and helps them to write programs in an advanced level. It introduces control structures, arrays, functions, pointers, file handling. Also, gives Introduction to TSRs programs and interfaces programming using C.

Course Outcomes:

At the end of the course, students will be able to

CO1: classify data types, operators and Functions.

CO2: build code using Pointers and Arrays.

CO3: discover the role of pointers in DMA and examine its usage in OOP.

CO4: implement Structure and Data Files.

CO5: categorize BIOS functions and examines network and low level programming.

Unit I **15 hours**

C introduction – Operators and expressions – Data types – Arithmetic expressions - I/O statements –Control statements –Looping statements–Arrays–Strings and string functions–Procedures – Functions –User defined functions–Built-in-functions including all graphics commands.

Unit II **15 hours**

Introduction to pointers – Operators - expressions, passing on addressing to a function, function returning pointer - Pointers and Arrays – Passing an array element to a function – Multidimensional Arrays – array of pointers.

Unit III **15 hours**

Pointers and strings – Strings – Standard library functions - array of pointers to string - limitation of array of pointers - Pointers and structures – array of structure - structure pointer - dynamic memory allocations -Pointers and miscellaneous – Pointers to function - Command line arguments – Near, far and huge pointers.

Unit IV **15 hours**

Structure definition - processing a structure, user defined data types –type def array of structures – Self referential structures–More about structures –Union– Files–Cpre-processor.

Unit V   **15 hours**

Advanced concepts – pointers and type casting - ROM-BIOS Functions –Basics of TSR –Introduction to Network programming and Interface – introduction to Low level programming.

Learning Resources:

Text Books

1.YashwantKanetkar, "UnderstandingCpointers", BPBPublications,NewDelhi,2009.

References

1. HenryMullishHerbert L.Cooper,"The SpiritofC",JaicoPublishingHouse,1987.
2. LesHanCock,MorrisKriger,"Cprimer",3rdEdition,TataMcGrawHill,1991.
3. YashwantKanetkar,"WritingTSRsthroughC",BPBPublications,1995.
4. BarryNance,"NetworkProgramminginC",PHI,New Delhi,2002.

Websites/e-Learning Resources

1. https://codeforwin.org/c-programming
2. https://www.geeksforgeeks.org/c-programming-language/
3. https://en.cppreference.com/w/
4. http://learn-c.org/
5. https://www.cprogramming.com/

CO – PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO10
CO 1	3	3	2	2	1	2	2	2	3	2
CO 2	3	3	3	3	2	3	3	2	3	3
CO 3	3	3	3	3	2	3	3	2	3	3
CO 4	3	3	3	3	2	3	3	2	3	3
CO 5	3	3	3	3	2	3	3	2	3	3
Average	3	3	2.8	2.8	1.8	2.8	2.8	2	3	2.8

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24MCA4501	Digital Principles and Computer Organization	Core	6	5

To provide the fundamental concepts associated with the digital logic and circuit design and introduce the basic concepts and laws involved in the Boolean algebra and logic families in digital circuits. To familiarize with the different number systems, logic gates, and combinational and sequential circuits utilized in the different digital circuits and systems. Also to help in design and analysis of the digital circuit and system.

Course Outcomes:

At the end of the course, students will be able to

CO1: became familiar with the digital signal, positive and negative logic, number systems, codes and their conversion from to others

CO2: understand the Boolean algebra, logic gates, logical variables and the truth table

CO3: learn the minimization techniques to simply the hardware requirements of digital circuits, implement it, design and apply for real time digital systems.

CO4: understand the working mechanism and design guidelines of different combinational, sequential circuits and their role in the digital system design.

CO5: acquire knowledge on the Computer organization by familiarizing with the ALU Structure and Memory sub systems.

Unit I   **18 hours**

Number Systems: Decimal, Binary, Octal, Hexadecimal and their inter conversions, Representation of Data: Signed Magnitude, one's complement and two's complement, Binary Arithmetic, Fixed point representation and Floating point representation of numbers. Codes BCD, XS-3, Gray code, hamming code, alphanumeric codes (ASCII,EBCDIC,UNICODE),Error detecting and error correctingcodes.

Unit- II   **18 hours**

Boolean Algebra: Basic gates (AND, OR, NOT gates), Universal gates (NAND and NOR gates), other gates (XOR, XNOR gates). Boolean identities, theorems, De Morgan Laws, SOP and POS forms, Karnaugh map method.

Unit –III   **18 hours**

Combinational Circuits: Half adder, full adder, code converters, combinational circuit design, Multiplexers and de multiplexers, encoders, decoders, Combinational design using mux and demux, PLA.

Unit IV   **18 hours**

Sequential Circuit Design: Flipflops RS, Clocked RS,D,JK,JK MasterSlave,T, Counters, Shift registers and their types, Counters: Synchronous and Asynchronous counters.

Unit V   **18 hours**

Computer Organization: ALU Structure–Memory sub system: ROM, RAM, PROM, EPROM, EEPROM, Secondary Memory: Hard Disk and optical Disk, Cache Memory, I/O devices.

Learning Resources:

Text books:

1. ModernDigital Electronics byR.P.Jain, McGraw Hill,4th Edition, 2010.
2. DigitalDesignandComputerOrganizationbyDr.N.S.GillandJ.B.Dixit,University Science Press, Laxmi Publications; First Edition (1 January 2016)
3. Malvino AP & Leach DP, "Digital Principles and Applications", Tata McGrawHillPublications,McGrawHillEducation;Eighthedition(21 August 2014)
4. JohnDCarpinelli,ComputersystemsOrganization&Architecture,Pearson Education, 1st Edition, 2012

References:

1. TCBartee,"DigitalComputerFundamentals" ,TataMcGrawHill,6th Edition, 2011.
2. MorrisMano,"DigitalDesign",PrenticeHallofIndiaPvt. Ltd,2012.
3. JohnP.Hayes,ComputerArchitectureandOrganizati on,TataMcGrawHill, 2nd Edition, 2013.

Websites/e-Learning Resources

1. E-content from open source libraries

CO – PSO Mapping

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	3	2	1	1	2	1	1	3
CO2	3	3	3	3	2	2	3	1	1	3
CO3	2	3	3	3	3	2	3	1	1	3
CO4	3	3	3	3	3	2	3	1	1	3
CO5	3	3	2	2	2	2	3	1	1	3
Avg	2.8	2.8	2.8	2.6	2.2	1.8	2.8	1	1	3

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24MCA4503	Mathematical Foundation for Computer Applications–1	Core	6	5

This course will enable the students to know the logic and relation, graph theory and automata. Theorems are discussed with examples. This course explores various techniques in numerical methods for solving different mathematical models such as linear and non-linear equations.

Course Outcomes:

At the end of the course, students will be able to

CO 1: natural language encoded to proposition calculus and model design by relation.

CO 2: real world problem describe by diagram by means of vertex and edges and analyze the properties

CO 3: analyze abstract machines and automata, as well as the computational problems that can be solved using them.

CO 4: find the solution for algebraic and transcendental and system of equations

CO 5: find the unknown values from known values

Unit I **18 hours**

LOGIC-Connectives –Normal Form - Rules of Inference Theory in Statement Calculus - Relation – Equivalence Relation- Partial Order Relation - Relational Matrix - Relational Graph

Unit II **18 hours**

GRAPH – Walk – Path – Tree - Binary Tree - Kruskal Algorithm - Prims Algorithm – Connectivity- Planner Graph –Colouring.

Unit III **18 hours**

Finite Automata – Deterministic Finite Automata – Non-deterministic Finite Automata - Languages – Grammars - Push Down Automata.

Unit IV **18 hours**

Methods for finding roots of linear and non-Linear equations - Bisection Method- False Position Method Newton - Raphson Method – System of linear equations - Gauss-Elimination Method, Gauss - seidel.

Unit V   **18 hours**

Interpolation – Newton Forward and Backward differences interpolation methods –
Lagrange Interpolation – – Numerical Differentiation – Integration - Solving first
order ordinary differential equations using R-K method.

Learning Resources:
Text Book :
1. TremblayJP,ManoharR,"DiscreteMathematicalStructureswithapplicationto
   ComputerScience",McGrawHillPublication,2018.

References :
1. NarsinghDeo, "Graph Theory with applications to Engineering and
   Computer Science", Prentice Hall India, 2012.
2. HopcroftJEullman, JD, "Introduction to Automata Theory, Languages and
   Computation", Narosa Publishing House, 2013
3. M.K.Jain, S.R.K. Iyengar, R.K. Jain, "Numerical Methods Problems and
   Solutions", New Age International, 2008.
4. EBalagurasamy, "Numerical Methods", Tata McGraw Hill, 2012.

Websites/e-Learning Resources:
1. https://nptel.ac.in
2. https://online.stanford.edu/courses/cs103-
   mathematical-foundations-computing

CO – PSO Mapping

CO/ PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO10
CO 1	3	3	3	3	3	3	3	2	2	1
CO 2	3	3	2	3	3	3	2	1	2	2
CO 3	2	3	3	2	3	3	3	1	2	3
CO 4	3	3	3	3	3	3	3	2	2	2
CO 5	3	3	3	3	3	2	3	2	2	2
Average	2.8	3	2.8	2.8	3	2.8	2.8	1.6	2	2

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24MCA4201	C Lab	Core	4	2

This course aims at training the students in the developing of the following programs and enables them to develop a mini project.

Course Outcomes:

At the end of the course, students will be able to

CO1: apply different types of user defined functions and arrays.

CO2: summarize application software using pointers on different data types.

CO3: create code using structure and union.

CO4: solve problems using file handling techniques.

CO5: design TSR and simple network programs.

Lab Cycle

1. I/O Statements and Control Structures

2. Arrays and strings

3. Functions

    i) Call by Value

    ii) Call by Reference

    iii) User defined

    iv) Built-in

4. Pointers

    i) Operators &expressions

    ii) Pointers and arrays

    iii) Pointers and strings

    iv) Pointers and structures

    v) Pointers to function

5. Structures and Unions

6. C Preprocessors, Command line arguments

9. File Handling

10. TSR programs

11. Simple network programming

12. Program to implement Client/Server concepts

13. Interface programming

CO – PSO Mapping

CO/ PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO10
CO 1	3	3	3	3	3	3	3	2	2	1
CO 2	3	3	2	3	3	3	2	1	2	2
CO 3	2	3	3	2	3	3	3	1	2	3
CO 4	3	3	3	3	3	3	3	2	2	2
CO 5	3	3	3	3	3	2	3	2	2	2
Average	2.8	3	2.8	2.8	3	2.8	2.8	1.6	2	2

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk	Credits
24MCA4403	Advanced DBMS	DSE	5	4

This course aims to train the students to understand database concepts and its models. Relational algebra, SQL commands, functions and procedures. PL/SQL, Data Management Techniques and advanced DBMS concepts.

Course Outcomes:

At the end of the course, students will be able to

CO 1: obtain basic knowledge on database, relational database, data Models and ER model.

CO 2: demonstrate the DDL, DML, TCL using SQL constructs.

CO 3: apply PL/SQL using Programming language constructs.

CO 4: understand the Data Management concepts to organize the data.

CO 5: understand and Design Advanced Databases systems

Unit I   **15 hours**

Introduction to DBMS – Data Models – Database Languages – Database System Structures – ER Model – Relational Model

Unit II   **15 hours**

Introduction to RDBMS-SQL – Introduction to ORACLE – Data types - DDL – DML – TCL – QBE. Sub queries – Functions and Procedures – Triggers.

Unit III   **15 hours**

Packages - Types – Objects – Methods – Collectors – PL/SQL – Built in Functions – Programming constructs – Cursors – Error Handling-normalization.

Unit IV   **15 hours**

Data Storage and Indexing – File Organizations – Query Optimization – Security - Transaction Management – Concurrency Control – Crash Recovery.

Unit V   **15 hours**

Introduction to: Parallel and Distributed Databases – Internet Databases – Decision Support - Data Mining – Object Database Systems – ORDBMS – OODBMS.

Learning Resources:

Text Books:

1. Silberschatz, Sudharshan and Koth, "Database SystemConcepts", McGraw Hill Publications, 6th Edition, 2010.

References :

1. Ramakrishnan and Gehrke, "Database Management Systems", McGrawHill, 3rd Edition, 2012.

2. Loney and Koch, "ORACLE 9i - The Complete Reference", Tata McGraw Hill Edition, 2010.

3. Urman, "ORACLE PL/SQL programming", Tata McGraw Hill, 1997.

4. McFadden, Hoffer and Prescott, "Modern Database Management", Pearson Education, 5th Edition, 2001.

5. Nilesh Shah , Database Management Systems using Oracle, Pearson Education, 2015.

6. Arun Majumdar & Pritimoy Bhattacharya, Database Management systems, TMH publications,2007.

Websites/ e-Learning Resources

1. https://www.udemy.com/course/office-automation-certificate-course/
2. https://www.javatpoint.com/automation-tools

CO – PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO10
CO 1	3	2	3	3	3	2	2	1	2	2
CO 2	3	3	2	3	2	3	3	1	2	2
CO 3	2	3	3	3	3	2	2	2	2	3
CO 4	3	3	3	3	3	3	2	1	1	2
CO 5	3	2	3	2	3	3	3	2	2	1
Average	3	3	3	2.8	2.8	2.6	2.4	1.4	1.8	2

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24MCA4405	Data Analytics	DSE	5	4

This course gives an overview of Big Data and focus on the tools/algorithms for storage and processing. Also introduces a variety of analytics on data sets and tools required to manage big data using Hadoop, NoSql, Map Reduce

Course Outcomes:

At the end of the course, students will be able to

CO1: understand Big Data and its analytics in the real world

CO2: analyze the Big Data framework like Hadoop and NOSQL to efficiently store and process Big Data to generate analytics

CO3: design of Algorithms to solve Data Intensive Problems using Map Reduce Paradigm

CO4: design and Implementation of Big Data Analytics using pig and spark to solve data intensive problems and to generate analytics

CO5: to have skills that will help them to solve complex real-world problems in for decision support.

Unit I   **15 hours**

Data, Characteristics of data and Types of digital data, Sources of data, Working with unstructured data, Evolution and Definition of big data, Characteristics and Need of big data, challenges of big data; Overview of business intelligence, Data science and Analytics, Meaning and Characteristics of big data analytics, Need of big data analytics, Classification of analytics, Challenges to big data analytics, Importance of big data analytics, Basic terminologies in big data environment.

Unit II   **15 hours**

Introducing Hadoop, Need of Hadoop, limitations of RDBMS, RDBMS versus Hadoop, Distributed computing challenges, History of Hadoop, Hadoop overview, Use case of Hadoop, Hadoop distributors, HDFS (Hadoop Distributed File System) , Processing data with Hadoop, Managing resources and applications with Hadoop YARN (Yet another Resource Negotiator), Interacting with Hadoop Ecosystem.

Unit III   15 hours

Introduction, Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression, Real time applications using MapReduce, Data serialization and Working with common serialization formats, Big data serialization formats.

Unit IV   15 hours

Introduction to Hive, Hive architecture, Hive data types, Hive file format, Hive Query Language(HQL),User-Defined Function(UDF)in Hive.

Unit V   15 hours

The anatomy of Pig , Pig on Hadoop, Pig Philosophy, Use case for Pig; ETL Processing , Pig Latin overview , Data types in Pig , Running Pig , Execution modes of Pig, HDFS commands, Relational operators, Piggy Bank , Word count example using Pig.

Learning Resources:

Text Book(s)

1.SeemaAcharya,SubhashiniChellappan,"BigDataAnalytics", 1stEdition,Wiley,2015.

References

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional HadoopSolutions",1st Edition,Wrox, 2013.
2. ChrisEaton, DirkDerooset.al., "Understanding Bigdata", Indian Edition, McGraw Hill, 2015.
3. TomWhite,"HADOOP:ThedefinitiveGuide",3rdEdition,OReilly,2012.
4. VigneshPrajapati,"BigDataAnalyticswithRandHadoop",1stEdition,PacketPublishingLimited, 2013.

Websites/ e-Learning Resources

1. https://www.simplilearn.com

CO – PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO10
CO 1	3	2	2	2	1	3	2	1	2	2
CO 2	3	3	3	2	2	2	2	1	2	2
CO 3	3	3	3	3	1	2	2	1	3	2
CO 4	3	3	3	3	2	2	2	1	3	3
CO 5	3	3	3	2	2	3	3	2	2	3
Average	3	2.8	2.8	2.4	1.6	2.4	2.2	1.2	2.4	2.4

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24MCA4301	Operating System	GE	4	3

This course enables students to understand the basic concepts and functions of operating systems. They get an overview about Processes, Threads, Scheduling Algorithms, deadlock, memory, I/O and file management.

Course Outcomes:

At the end of the course, students will be able to

CO1: understand Operating system concepts and its basic functions.

CO2: understand threads, Multi Processing and handling deadlocks

CO3: compare and contrast various memory management schemes.

CO4: understand Storage structure and disk management.

CO5: understand the functionality of file system.

Unit I   **12 hours**

Introduction-OperatingSystems-ComputerSystemArchitecture-
OperatingSystemStructure- Operating System Services- User and Operating System Interface-System Calls- Types of System Calls-System Programs- Operating System Debugging–Operating System Generation- System Boot- Process - Process Scheduling- Inter process Communication-Examples of IPC Systems-Communication in Client–Server Systems.

Unit II   **12 hours**

Threads - Multicore Programming - Multithreading Model- Threading Issues-Process Synchronization – The Critical –Section Problem -Peterson's Solution - Synchronization Hardware - Mutex Locks- Semaphores- Monitors- CPU Scheduling-Scheduling Criteria-Scheduling Algorithm-Thread Scheduling-Multiple Processor Scheduling – System Model- Methods for Handling Deadlocks- Deadlock Prevention-Deadlock Avoidance-Deadlock Detection.

Unit III   **12 hours**

Main Memory – Swapping - Contiguous Memory Allocation- Segmentation-Paging-Structure of the Page Table- Example: ARM Architecture- Virtual Memory- Demand

Paging-Page Replacement - Thrashing - Memory - Mapped Files -Allocating Kernel Memory

Unit IV   **12 hours**

Mass – Storage Structure – Disk Structure – Disk Attachment – Disk Scheduling –V Disk Management – Swap Space Management RAID Structure–Stable Storage Implementation- File Concept -Access Methods -Directory and Disk Structure - File-System Mounting-File Sharing–Protection

Unit V   **12 hours**

File – System Structure File System Implementation – Directory Implementation - Allocation Methods - Free Space Management Efficiency and Performance - Recovery –NFS- I/O Hardware -Application I/O Interface- Kernel I/O Subsystem - Transforming I/O Requests to Hardware Operations.

Learning Resources:

Text Books

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, ―OperatingSystemConcepts‖,9thEdition, John Wiley and Sons Inc., 2012.
2. William Stallings, Operating Systems Internals and Design Principles, 9th Edition, Pearson,2018.

References

1. Ramaz Elmasri,A. GilCarrick, David Levine,―Operating Systems –A Spiral Approach‖, Tata Mc Graw Hill Edition, 2010.
2. AchyutS.Godbole,AtulKahate,―OperatingSystems‖,McGrawHillEducation, 2016.
3. Andrew S. Tanenbaum, ―Modern Operating Systems‖, Second Edition, Pearson Education,2004. CS8493 Notes Operating Systems
4. Gary Nutt, ―Operating Systems‖, Third Edition, Pearson Education, 2004.

Websites/ e-Learning Resources

1. https://applied-programming.github.io/Operating-Systems-Notes/
2. https://ecomputernotes.com/fundamental/disk-operating-system/what-is-operating-system

CO – PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	3	3	2	2	1	2	1	1	2	2
CO 2	3	3	3	3	2	3	2	1	2	2
CO 3	3	3	3	3	1	3	2	1	2	2
CO 4	3	3	3	3	2	3	2	1	2	2
CO 5	3	3	2	2	1	3	2	1	2	2
Average	3	3	2.6	2.6	1.4	2.8	1.8	1	2	2

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk	Credits
24MCA4303	Human Computer Interaction	GE	4	3

This course gives an overview of Human-Computer Interaction (HCI), with an understanding of user interface design in general, and alternatives to traditional key board and mouse computing, familiarize with the vocabulary associated with sensory and cognitive systems, apply models from cognitive psychology to predict user performance in various HCI interactions.

Course Outcomes:

At the end of the course, students will be able to

CO1: apply HCI and principles to interaction design.

CO2: design certain tools for blind or PH people.

CO3: describe the foundations of Human Computer Interaction.

CO4: design and use the software process technologies.

CO5: use the various types of Web Interface Design.

Unit I   **12 hours**

Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design - A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user–Interfacepopularity,characteristics-Principlesofuserinterface.

Unit II   **12 hours**

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions. Screen Designing: Design goals – Screen planning and purpose, organizing screen elements, ordering Of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

Unit III 12 hours

Windows – New and Navigation schemes selection of window, selection of devices based and screen- based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

Unit IV 12 hours

HCI in the software process, The software life cycle Usability engineering Iterative design and prototyping Design Focus: Prototyping in practice Design rationale Design rules Principles to support usability Standards Golden rules and heuristics HCI patterns Evaluation techniques, Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, Choosing an evaluation method. Universal design, Universal design principles Multi - modal interaction.

Unit V 12 hours

Cognitive models Goal and task hierarchies Design Focus: GOMS saves money Linguistic models The challenge of display-based systems Physical and device models Cognitive architectures Ubiquitous computing and augmented realities Ubiquitous computing applications research Design Focus: Ambient Wood – augmenting the physical Virtual and augmented reality Design Focus: Shared experience Design Focus: Applications of augmented reality Information and data visualization Design Focus: Getting the size right.

Learning Resources:
Text Books
1. The essential guide to user interface design, Wilbert O Galitz, Wiley Dream Tech. Units 1,2, 3
2. Human–Computer Interaction. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg, Pearson Education Units 4,5

References

1. Designingtheuserinterface.3rdEditionBen Shneider mann,Pearson Education Asia.

2. Interaction Design Prece Rogers,Sharps.WileyDreamtech.

3. User Interface Design, Soren Lauesen,PearsonEducation.

4. Human–Computer Interaction,D.R.Olsen,CengageLearning.

5. Human–Computer Interaction,Smith -Atakan, CengageLearning.

Websites/ e-Learning Resources

1. https://testbook.com/learn/computer-fundamentals

2. https://www.tutorialsmate.com/2020/04/computer-fundamentals-tutorial.html

3. https://www.javatpoint.com/computer-fundamentals-tutorial

4. https://www.tutorialspoint.com/computer_fundamentals/index.htm

5. https://www.nios.ac.in/media/documents/sec229new/Lesson1.pdf

CO – PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	3	3	2	2	2	2	2	2	1	1
CO 2	3	3	3	3	2	2	2	2	2	2
CO 3	3	3	3	2	2	2	2	2	1	2
CO 4	3	3	3	2	2	2	2	1	3	2
CO 5	3	3	3	2	3	2	2	1	2	2
Average	3	3	2.8	2.2	2.2	2	2	1.6	1.8	1.8

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk	Credits
24MCA4402	Design and Analysis of Algorithm using C++	Core	5	4

The aim of this course is to enable the student to understand and apply OOP features to solve different computer algorithms. This course also aims at making the student to implement and analyze the basic operations of data structures and the programming techniques such as Divide and Conquer, Greedy method, Dynamic programming, Graph Algorithms and Back Tracking.

Course outcomes:

At the end of the course, students will be able to

CO1: describe object oriented programming and its features

CO2: advanced features of OOP

CO3: understand the concepts of data types, data structures and linear structures analyze linear data sorting

CO4: sort and Searching algorithms.

CO5: greedy method and dynamic programming.

Unit I   **15 hours**

Introduction – Programming Paradigms –Advantages and Features of OOP – objects - classes- Data Abstraction-User Defined Types – Namespace -Abstract Types- Inline Functions - Friend function-Virtual Functions - Constructor and destructor functions – Overloading Functions -Passing objects and returning objects in functions – Using pointers to objects – the this pointer – Using new and delete functions.

Unit II   **15 hours**

Operator overloading – Inheritance –Types of inheritance –Virtual base classes - Pointers to derived classes – Virtual functions - Applying polymorphism + File Handling in C++ -Templates and exception handling - class templates-function templates.

Unit III   **15 hours**

Computer Algorithms - Introduction – Algorithm as technology – Designing an algorithm -Analyzing an algorithm –– Asymptotic notations – Standard notations and common functions -Elementary Data Structures – Types – Implementation Examples - Implementing pointers and objects - Trees – Hashing – Types of Sorting – Examples.

Unit IV   **15 hours**

Divide and Conquer-Merge sort – Quick Sort – performance of quick sort – randomized version of quick sort - Binary Search Tree – Insertion and deletion in Binary Search Tree – Red Black Trees – Implementations.

Unit V   **15 hours**

Greedy Method- Optimal Storage on Tapes – Knapsack Problem – Minimum Spanning Trees – Single Source Shortest Path- Bellman-Ford algorithm – Dijkstra's algorithm. Dynamic Programming - General Method – Multistage Graphs – Optimal Binary Search Trees – 0/1 Knapsack – Reliability Design – Travelling Sales Man Problem --Eight queen problem-backtracking.

Learning Resources:

Text Books

1. Herbert Schildt, "C++ Complete reference, Osborne McGraw Hill", 2ndEdition, 2012.

2. Thomas H Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein, "Introduction to algorithms ", 2nd edition,PHI,2011.

References

1. Robert Latfore, "Object Oriented Programming in Microsoft C++", Galgotia publication, 2009.

2. E Balagurusamy, "Object Oriented programming with C++", PHI 6th Edition

3. Debasish Jana, "C++ and Object Oriented Programming Paradigm", PHI, NewDelhi, 2010.

4. Ellis Horowitz, SartajSahni, "Fundamentals of Computer Algorithms", Galgotia Publications, 2010.

5. Donald E Knuth, "Fundamental algorithms -The art of computer programming", Pearson Education, 3rd Edition, 2002.

Websites/ e-Learning Resources

1. https://alison.com/course/introduction-to-c-plus-plus-programming

2. NPTEL & MOOC courses titled Data Structures

3. https://nptel.ac.in/courses/106106127/

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PS10
CO 1	3	3	2	2	2	2	2	2	2	3
CO 2	3	3	3	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3
Average	3	3	2.8	2.8	2.8	2.8	2.8	2.8	2.8	3

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk	Credits
24MCA4502	Agile Software Engineering	Core	6	5

To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software and a good understanding of software design and a set of software technologies and APIs. Also to do a detailed examination of Agile development and testing techniques so as to understand the benefits and pitfalls of working in an Agile team.

Course Outcomes:

At the end of the course, students will be able to

CO1: understand Agile Theories and Principles. Also compare, classify, apply Agile Project Management to drive Agility.

CO2: understand Lean Production Principles, Implement Scrum Framework, Apply Crystal Family Frameworks, Create Agile Work Products and Fulfill Agile Roles.

CO3: design Agile Information Systems, Apply Agile Decision Making, Understand Knowledge Management Schools, Implement Knowledge Evolution Cycle, Apply KM in Software Engineering, Address Challenges of Agile Migration, Facilitate Agile Knowledge Sharing, Assess Story-Card Maturity, Integrate Agility and KM.

CO4: analyze Agile Impact on RE, Apply Agile Practices in RE, Manage Unstable Requirements, Use Agile Requirements Abstraction Model, Prioritize Agile Requirements, Model and Generate Agile Requirements , Manage Concurrency in Agile RE, Integrate Agile and RE, and Improve RE Processes

CO5: develop Agile Products, Measure Agile Performance and Assure Quality in Agile

Unit I   **18 hours**

Theories for Agile Management–Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods–Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions –Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

Unit II 18 hours

Lean Production - SCRUM, Crystal, Feature Driven Development-Adaptive Software Development-Extreme Programming : Method Overview –Lifecycle– Work Products, Roles and Practices.

Unit III 18 hours

Agile Information Systems –Agile Decision Making-EarlS Schools of KM– Institutional Knowledge Evolution Cycle Development, Acquisition, Refinement, Distribution, Deployment, leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

Unit IV 18 hours

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model, Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation

Unit V 18 hours

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD –Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development.

Learning Resources:

Text Books

1. David J. Anderson and Eli Schragenheim, 2003, Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall.

2. Hazza and Dubinsky, 2009, Agile Software Engineering, Series: Undergraduate Topicsin Computer Science , Springer.

References Books:

1. Craig Larman, 2004,Agile and Iterative Development: A Manager‗s Guide, Addison-Wesley.

2. Kevin C. Desouza, 2007, Agile Information Systems: Conceptualization, Construction, and Management, Butterworth-Heinemann.

E-learning resources

1. https://www.youtube.com/watch?v=x90kIAFGYKE&t=8s

CO-PSO Mapping Table

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	2	3	3	3	2	3	2	1	3
CO2	3	2	3	3	2	3	3	1	1	3
CO3	3	2	3	2	3	3	3	1	1	3
CO4	3	2	3	2	2	3	3	1	1	3
CO5	2	3	3	1	1	2	3	2	1	3
Avg	2.8	2.2	3	2.2	2.2	2.6	3	1.4	1	3

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk	Credits
24MCA4504	Mathematical Foundation for Computer Application -II	Core	6	5

This course aims to solve the various statistical methods such as Distribution of Random variables, Distributions and analyse sample using different method. Solve the Linear programming problem, transportation problem and assignment problem and also help to understand network modelling for planning and scheduling the project activities and different models on queuing theory

Course Outcomes:

At the end of the course, students will be able to

CO1: illustrate the characterization of probability density functions

CO2: test and analyses mean and variance of small and large samples

CO3: management problems convert to L.P.P and find the optimum solution for it.

CO4: find the solution for transportation problem and Assignment problem and construct network diagram and obtain critical path and project length.

CO5: identify and analyze queue model and find the different values.

Unit I   **18 hours**

Distributions of Random Variables – probability set function – Distribution function – probability models – mathematical expectations – Some special mathematical Expectations – Conditional probability -marginal and conditional distributions.

Unit II   **18 hours**

Sampling theory - confidence intervals for means – confidence intervals for difference of variance – Hypothesis – Examples and Definitions – T_Tests – Chi_square Tests – F_Test – The Analysis of Variance.

Unit III   **18 hours**

Mathematical Formulation - Graphical Solution of linear programming models – Simplex method –Artificial variable Techniques- Two Phase Method.

Unit IV   **18 hours**

Transportation problem- assignment problem-Network Construction – Critical Path Method – Project Evaluation and Review Technique – Resource Analysis in Network Scheduling

Unit V   **18 hours**

Characteristics of Queuing Models – Poisson Queues - (M / M / 1) : (FIFO / ∞ /∞), (M / M / 1) : (FIFO/ N / ∞), (M / M / C) : (FIFO / ∞ / ∞), (M / M / C) : (FIFO / N / ∞) models.

Learning Resources:

Text Books

1. Freund, "Mathematical Statistics", 5th Edition, Prentice Hall India, 1997.

2. Taha H.A., "Operations Research: An Introduction", 8th Edition, Pearson Education, 2008

References

1. S.C. Gupta & VK Kapoor Sultan Chand, "Elements of Mathematical Statistics", New Delhi, 1992

2. A.M.Natarajan, P.Balasubramani, A.Tamilarasi, "Operations Research", Pearson Education, Asia, 2005

Websites/ e-Learning Resources

1. https://nptel.ac.in

CO –PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	3	3	3	3	3	2	2	1
CO 2	3	3	2	3	3	3	2	1	2	2
CO 3	2	3	3	2	3	3	3	1	2	3
CO 4	3	3	3	3	3	3	3	2	2	2
CO 5	3	3	3	3	3	2	3	2	2	2
Average	2.8	3	2.8	2.8	3	2.8	2.8	1.6	2	2

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk	Credits
24MCA4202	C++ Lab	Core	4	2

This course aims at training the student to implement the following problems which includes the important Computer Algorithms.

Course Outcomes:

At the end of the course, students will be able to

CO1: use different types of user defined functions through OOP.

CO2: create code using reusability techniques.

CO3: categorize different types of polymorphism.

CO4: solve problems using different data structures.

CO5:   implement different problem solving techniques such as divide and conquer, greedy method and dynamic programming.

Lab cycle Objectives:

1. Different User Defined Functions.

2. Function Overloading

3. Functions with default arguments

4. Constructors and Destructor

5. Passing objects to functions

    a. By Value and By Reference

    b. Friend functions and Inline functions

    c. Call by Reference and Return by Reference

6. Operator overloading

7. Virtual Function

8. Inheritance Types

9. Function and Class Templates

10. Implementations of linear Data Structures.

11. Implementations of nonlinear Data Structures.

12. Sorting Techniques

13. Implementation of Divide and Conquer method.

14. Implementation of Greedy method.

15. Implementation of Dynamic Programming approach.

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	2	2	2	2	2	2	2	3
CO 2	3	3	3	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3
Average	3	3	2.8	2.8	2.8	2.8	2.8	2.8	2.8	3

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/ Wk	Credits
24MCA4404	Web Programming	DSE	5	4

To learn Web Basics and HTML tags, DHTML and CSS, also learn XML and importance and JavaScript Language programming concepts and techniques. To learn PHP and MYSQL and create dynamic web pages.

COURSE OUTCOMES:

At the end of the course, students will be able to

CO 1: recall Web Basics, history of Internet and use HTML tags, attributes and write simple web pages

CO 2: apply DHTML to web pages and make it dynamic

CO 3: compare XML with HTML and develop xml documents.

CO 4: build interactive web pages using Java Script.

CO 5: define PHP commands, write programs and establish database connectivity in Mysql.

Unit I   15 hours

Introduction, Concept of Internet- History of Internet, Protocols of Internet, World Wide Web, URL, Web Server, Web Browser. Introduction, History of HTML, Structure of HTML Document: Text Basics, Structure of HTML Document: Images and Multimedia, Links and webs, Document Layout, Cascading Style Sheet- HTML 4 style sheet features, Creating Forms, Frames and Tables.

Unit II   15 hours

Introduction of DHTML- HTML vs. DHTML, Advantages of DHTML, CSS of DHTML, Event Handling, Data Binding, Browser Object Models.

Unit III   15 hours

Introduction of XML- Some current applications of XML, Features of XML, Anatomy of XML document, The XML Declaration, Element Tags- Nesting and structure, XML text and text formatting element, Table element, Mark-up Element and Attributes, Document Type Definition (DTD), types.

Unit IV   15 hours

JAVA SCRIPT – Introduction – Usage of variables – operations – control structures –

looping structures – predefined keywords – arrays – predefined functions – user defined functions – arrays and functions – mathematical functions – string functions – objects – expressions –pattern matching using RegEXp Class – String Class – Exception Handling – Built–in objects – Bgcolor / Fgcolor – Date Object – Events and Event Handling – Validations – Window – Confirmation, alert message.

Unit V   **15 hours**

Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Object Oriented Programming with PHP. Basic commands with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHPMyAdmin and database bugs.

Learning Resources:

Text Books

1. "HTML5 Black Book: Covers CSS3, JavaScript, XML, XHTML, Ajax, PHP and Jquery", Kogent Learning Solutions Inc 2016.
2. Jon Ducket, PHP & MySQL Server-side Development, Wiley, 2022.

References

1. EckyPutrady, "Practical Web Development with Haskell: Master the essential skills to build fast and scalable web applications", !st edition , Apress, 2018
2. Danny Goodman, "Dynamic HTML" 3rd Edition, O'reilly, 2006.
3. Media Paul Colton, R Allen Wyke, Richard Wagner, "JavaScript Unleashed", Sams Publication, 3rd Edition, 2000.
4. Eric. C Richardson, "Programming web server", Galgotia Publications, 1996.
5. Joe Fawcett, Danny Ayers, Liam R.E Quin, "Beginning XML", 5th Edition, Wrox, 2012
6. Jon Duckett, "PHP & MYSQL Server side development", 1st edition 2019.

Websites/ e-Learning Resources

1. NPTEL & MOOC courses titled Web Design and Development.
2. https://www.geeksforgeeks.org

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	POS8	PSO9	PSO10
CO 1	3	3	3	2	2	2	2	1	2	3
CO 2	3	3	3	2	2	2	2	1	2	3
CO 3	3	3	3	3	2	2	2	1	2	3
CO 4	3	3	3	3	2	2	2	1	2	3
CO 5	3	3	3	2	2	2	2	1	2	3
Average	3	3	3	2.4	2	2	2	1	2	3

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk	Credits
24MCA4406	Cloud Computing	DSE	5	4

To introduce the cloud computing concepts and its architecture, understand various cloud models. Cloud Applications and Map Reduce Programming model. To understand resource management and scheduling, cloud platforms and various cloud services and its features.

COURSE OUTCOMES:

At the end of the course, students will be able to

CO1: evaluate the principles and benefits of Cloud Computing in order to assess existing cloud infrastructures to choose an appropriate architecture that meets business needs.

CO2: decide a suitable model to capture the business needs by interpreting different service delivery and deployment models.

CO3: understand virtualization foundations to cater the needs of elasticity, portability and resilience by cloud service providers.

CO4: infer architectural style, work flow of real-world applications and to implement the cloud applications using map reduce programming models.

CO5: compare operation and economic models of various trending cloud platforms prevailing in IT industry.

Unit I   **15 hours**

Motivations from distributed computing predecessors –Evolution - Characteristics- Business Benefits – Challenges in cloud computing – Exploring the Cloud Computing Stack-Fundamental Cloud Architectures – Advanced Cloud Architectures-Specialized Cloud Architectures

Unit II   **15 hours**

Service Models(XaaS): Infrastructure as a Service(IaaS) –Platform as a Service(PaaS)-Software as a Service(SaaS)- Deployment Models: Types of cloud- Public cloud- Privatecloud-Hybridcloud–Servicelevelagreements-TypesofSLA–LifecycleofSLA-SLA Management

Unit III   **15 hours**

Virtualization as Foundation of Cloud – Understanding Hypervisors–
Understanding Machine Image and Instances – Managing Instances–Virtual
Machine Provisioning and Service Migrations Cloud Computing Applications and
Paradigms: Existing Cloud Applications and Opportunities for New Applications
- Architectural Styles for Cloud Applications - Workflows: Coordination of
Multiple Activities - Coordination Based on a State Machine Model: The
Zookeeper – The Map Reduce Programming Model-A Case Study: The Grep The
Web Application

Unit IV   **15 hours**

 Policies and Mechanisms for Resource Management–Stability of a Two – Level
Resource Allocation Architecture- Feedback Control Based on Dynamic
Thresholds - Coordination of Specialized Autonomic Performance Managers - A
Utility -Based Model for Cloud -Based Web Services – Resource Bundling:
Combinatorial Auctions for Cloud Resources – Scheduling Algorithms for
Computing Clouds-Resource Management and Dynamic Application Scaling

Unit V   **15 hours**

Comparing Amazon web services, Google App Engine, Microsoft Azure from the
perspective of architecture (Compute, Storage Communication) services and cost
models. Cloud application development using third party APIs, Working with
EC2 API – Google App Engine API - Facebook API, Twitter API. Advances is
Cloud: Media Clouds - Security Clouds - Computing Clouds - Mobile Clouds –
Federated Clouds – Hybrid Clouds

Learning Resources:

Text Books

   1. Rajkumar Buyya, James Broberg, Andrzej, M. Goscinski, Cloud
   Computing: Principles and Paradigms, Wiley, 1stEdition,2013.

   2. Sosinsk, Barrie, Cloud Computing Bible, John Wiley & Sons, 1st Edition,
   2011.

References

1. Marinescu, Dan C. Cloud Computing: Theory and Practice. Morgan Kaufmann, 2017.

2. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Mc Graw Hill Education, 1st Edition, 2017.

3. Buyya, Rajkumar, Christian Vecchiola, and S. ThamaraiSelvi. Mastering Cloud Computing: Foundations and Applications Programming, Tata Mcgraw Hill, 1st Edition, 2017.

Websites/ e-Learning Resources

1. https://en.wikipedia.org/wiki/Cloud_computing

2. https://link.springer.com/chapter/10.1007/978-3-030-34957-8_7

3. https://webobjects.cdw.com/webobjects/media/pdf/solutions/cloud-computing/121838-CDW Cloud-Computing-Reference-Guide.pdf

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	3	2	3	2	2	2	2	2
CO 2	3	3	3	3	3	3	2	2	2	2
CO 3	3	3	3	3	3	3	3	2	2	2
CO 4	3	3	3	3	3	3	3	3	2	2
CO 5	3	3	3	3	2	3	3	3	2	2
Average	3	3	3	2.8	2.8	2.8	2.6	2.4	2	2

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24MCA4302	Cyber Security	GE	4	3

To understand various types of cyber-attacks, cyber-crimes, threat sand risks within context of the cyber security, to give an overview of the cyber laws &concepts of cyber forensics, to study the defensive techniques against these attacks and describe various legal responses to cybercrime.

Course Outcomes:

At the end of the course, students will be able to

CO 1: analyze cyber attacks, types of cyber crimes, cyber laws and also how to protect themselves and ultimately the entire Internet commUnity from such attacks.

CO 2: interpret and forensically investigate security incidents

CO 3: apply policies and procedures to manage Privacy issues

CO 4: design and develop secure software modules

CO 5: understand different forms of hacking techniques

Unit I   **12 hours**

Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc. ,Comprehensive Cyber Security Policy.

Unit II   **12 hours**

Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics

Unit III   **12 hours**

Mobile and Wireless Devices :Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Fraud sin Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Setting for Mobile Devices, Authentication service Security, Attacks on Mobile/CellPhones, Organizational security Policies and Measures in Mobile Computing Era, Laptops.

Unit IV   **12 hours**

Organizational Implications: Introduction, cost of cyber crimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

Unit V   **12 hours**

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy indifferent domains-medical, financial, etc. Cybercrime: Case studies on recent threats and attacks.

Learning Resources:

Text Books

1. Nina God bole and Unit Belapure, 2011, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley

References

1. B.B.Gupta, D.P.Agrawal, Haoxiang Wang, 2018,Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press.
2. James Graham, Richard Howard and RyanOtson,2011, Cyber Security Essentials, CRC Press.
3. Chwan-Hwa(John)Wu,J.DavidIrwin,2016, Introduction to Cybersecurity, CRC Press T&F Group.

Websites/ e-Learning Resources

1. https://www.youtube.com/watch?v=6wi5DI6du-4&list=PL_uaeekrhGzJl B8XQBxU3zhDwT95xlk

CO – PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10
CO 1	3	3	2	1	3	2	2	1	1	2
CO 2	3	3	1	2	2	2	2	1	1	3
CO 3	3	3	3	2	3	2	1	2	1	2
CO 4	3	3	3	2	3	3	2	1	1	2
CO 5	3	3	3	2	2	3	2	1	2	2
Average	3	3	2.4	1.8	2.6	2.4	1.8	1.2	1.2	2.2

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24MCA4304	Data Visualization	GE	4	3

The aim of this course is to provide comprehensive introduction to data visualization, covering both theoretical concepts and practical applications.

COURSE OUTCOMES:

At the end of the course, students will be able to

CO1 : understanding Visualization and its necessities

CO2 : learn to use data visualization tools

CO3 : preparing data for visualization

CO4 : use visualization tools

CO5 : use R and Tableau tools

Unit I   **12 hours**

Introduction to Data Visualization – Why it is so relevant today? – Definition and importance of data visualization – Applications and significance in various fields - Types of data (quantitative, qualitative, categorical, ordinal) - Overview of visualization techniques suitable for different types of data.

Unit II   **12 hours**

Choosing the Right Visualization - Matching visualization types to data types - Examples and case studies of effective visualizations - Tools for Data Visualization - Introduction to popular data visualization tools (e.g., Tableau, Power BI, matplotlib, seaborn, ggplot2) - Overview of programming languages commonly used for visualization (e.g., Python, R).

Unit III   **12 hours**

Practical Applications and Design Principles – Data Preparation for Visualization - Data cleaning and preprocessing - Understanding data structures suitable for visualization - Introduction to visualization design principles- Gestalt Principles of Design – Color Theory

Unit IV   **12 hours**

Interactive Visualizations - Importance and benefits of interactive visualizations - Tools and techniques for creating interactive visualizations

Unit V   **12 hours**

Hands-on practice session using a chosen visualization tool or library (R, Tableau) - Guidance on creating effective visualizations from provided datasets.

Learning Resources:

Text books:

1. The visual display of quantitative information – by Edward R Tufte
2. Tamara Munzer, Visualization Analysis and Design -, CRC Press 20142. Stephen Few, Now You See It -, Analytics Press, 2009

References

1. Dr.Chun-hauh Chen, W.K.Hardle,A.Unwin, Handbook of Data Visualization, Springer publication,20082.
2. Ben Fry, Visualizing Data -, O'Reilly Media, 20083.
3. John Verzani, Simpler- Using R for introductory statistics, Taylor&Francis, 20054.
4. A little book of R for multivariate analysis-Avril Coghlan, 2013

Websites/ e-Learning Resources

1. https://www.tutorialspoint.com/modelling_and_simulation/index.htm
2. https://www.javatpoint.com/verilog-simulation-basics

CO – PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10
CO 1	3	3	2	2	2	2	2	2	3	3
CO 2	3	3	3	3	3	3	3	2	3	3
CO 3	3	3	3	3	3	3	3	2	3	3
CO 4	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	2	3	3
Average	3	3	2.8	2.8	2.8	2.8	2.8	2.2	3	3

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24MCA5401	Computer Networks	Core	5	4

The objective of the course is to equip the students with the standard models for the layered approach to communication between machines in a network and the protocols of the various layers.

Course Outcomes

At the end of the course, students will be able to

CO1: discuss the basic computer network technology.

CO2: explain the functions of each layer in the OSI and TCP/IP reference model.

CO3: obtain the skills of sub netting and routing mechanisms.

CO4: describe essential protocols of computer networks, and how they can be applied in network design and implementation.

CO5: develop skills necessary to help organization in security measures.

Unit I   **15 hours**

Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, NSFNET, Internet. Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless transmission.

Unit II   **15 hours**

Data link layer: Design issues, framing, Error detection and correction. Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel. Sliding Window protocols: A one-bit sliding window protocol, Go-Back- N, Selective Repeat, Example data link protocols. Medium Access sub layer: Channel Allocation Multiple Access protocols: ALOHA, CSMA, Collision free protocols. Wireless LANs, Data link layer switching - IEEE 802 Standards.

Unit III   **15 hours**

Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Congestion Control Algorithms, Quality of Service, Internetworking, The Network layer in the internet.

Unit IV   15 hours

Transport Layer: Transport Services, Transport protocols, Connection management, Internet Transport Protocols - TCP and UDP protocols – Performance issues.

Unit V   15 hours

Application Layer: Domain name system, SNMP, Electronic Mail, World Wide Web – HTTP – Streaming audio and video – Other Applications – Network Security – Basic Cryptography – Symmetric and symmetric Cryptography .

Learning Resources:

Textbook:

1. Computer Networks – Andrew S Tanenbaum, David. J. Wetherall, 5th Edition,2010. Pearson Education/PHI.

References:

1. An Engineering Approach to Computer Networks-S.Keshav,2ndEdition,Pearson Education

2. Behrouz Forouzan, Data Communications and Networking, McGraw Hill, 4thEdition,2017.

Websites/ e-Learning Resources

1. https://en.wikipedia.org/wiki/Computer_network
2. https://citationsy.com/styles/computer-networks

CO – PSO Mapping

CO/PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	2	1	2	2	2	1	2	2
CO 2	3	3	1	2	2	2	2	1	2	3
CO 3	3	3	3	2	2	2	1	1	2	2
CO 4	3	3	3	2	2	3	2	1	2	2
CO 5	3	3	3	2	2	3	2	1	2	2
Average	3	3	2.4	1.8	2	2.4	1.8	1	2	2.2

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24MCA5301	Programming in Java	Core	4	3

This course builds skills in java fundamentals, design object oriented applications. Also gain advanced java programming skills like java servlets, java server pages, jdbc and j2ee. Design dynamic web applications with data connectivity.

Course Outcomes:

At the end of the course, students will be able to

CO1:. write java programs using oops features

CO2: develop applets, windows based programs using awt controls and JFC

CO3: design simple web applications using java servlets

CO4: develop jsp applications with back end data access.

CO5: create J2EE applications

Unit I   **12 hours**

Introduction -Genesis of Java- Types of Java applications – Java Virtual Machine - Data types, Variables - Control statements - Arrays – String – Classes and Objects - Methods – Constructors - Inheritance - Interfaces - Packages – Exception Handling

Unit II   **12 hours**

AWT - Java Applets- Life Cycle of An Applet – AWT controls - Introduction to Java Foundation Classes(JFC) – Swings.

Unit III   **12 hours**

Java Server Technologies - Basics of Web Application, Architecture and challenges of Web Application, Introduction to servlet, Servlet life cycle, Developing and Deploying Servlets, Exploring Deployment , Descriptor (web.xml), Handling Request and Response Tracking Session.

Unit IV   **12 hours**

JSP Architecture ,JSP Standard / Implicit Objects, JSP Page Implementation Class, JSP Basics & Syntax, JSP Directive Tags, JSP Action Tags, JSP Script related Tags,

Using Java Beans from JSP, UseBean Tag, setProperty Tag, getProperty Tag, JSP Custom Tag Library. Database Programming using JDBC Introduction to JDBC, JDBC Drivers & Architecture, CURD operation Using JDBC, Connecting to non-conventional Databases.

Unit V   **12 hours**

J2EE Platform Introduction -Enterprise Architecture Styles - J2EE Architecture - J2EE Technologies -Developing J2EE Applications - Naming and directory services - Application Servers - Implementing the J2EE Specifications - J2EE packaging and Deployment - J2EE packaging overview - Configuring J2EE packages.

Learning Resources

Textbooks
1. Patrick Naoghton and Herbert Schidt, "The Complete Reference - JAVA" 9th Edition Tata McGraw Hill, 2014.
2. John Hunt and Chris Loftus, "Guide to J2EE: Enterprise Java", 2nd Edition, Springer, 2012

References
1. Santosh Kumar K., Kogent Solutions Inc., Santosh Kumar K. And Kogent Solutions Inc, "Jdbc Servlets, And Jsp Black Book," New Edition (With Cd) , Dreamtech Press, 2008
2. Bryan Basham, Kathy Sierra, Bert Bates, "Head First Sevlets and JSP: Passing the Sun Cetified Web Component", 2nd edition, O'Reilly Media, 2008
3. Kogent Solutions Inc, "JAVA SERVER PROGRAMMING , JAVA EE5", 1st edition, Dreamtech Press, 2008.
4. Ted Husted Cedric Dumoulin, "Struts in Action", 1st edition, Manning – Dreamtech Press, 2007.

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO 1	3	2	2	2	3	2	2	2	2	3
CO 2	3	2	2	2	1	2	2	2	2	2
CO 3	3	3	3	2	3	3	2	2	2	2
CO 4	3	3	3	3	2	3	3	2	1	1
CO 5	3	3	3	3	2	3	3	2	2	3
Average	3	2.6	2.6	2.4	2.2	2.6	2.4	2	1.8	2.2

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24MCA5501	Dot Net Programming	Core	6	5

Dot Net Programming course equips students with a comprehensive overview of the programming principles and using Visual Studio and key languages such as vb.net, c#.net. Students will delve into object-oriented programming techniques, manage data types and control program execution flows. The curriculum extends to web development with asp.net and crucial back-end programming with ODBC.

Course Outcomes:

At the end of the course, students will be able to

CO1: use dot net framework and write character user interface programs in vb.net

CO2: develop simple graphics user interface applications using vb.net

CO3: establish data connectivity between front end and back end and access data.

CO4: write c# programs applying oops concepts.

CO5: create web applications using asp.net'

Unit I   **18 hours**

Introduction to Dot Net platform-advantages of Dot Net-working of Dot Net- .basic architecture of net frame work-CLR, CLS, MSIL, JIT, Meta data, Assembly - VB.NET: Visual studio .net IDE-Programming concepts- operators – control and looping statements - arrays - writing procedures-sub procedure – function procedure – property procedure. – operator procedure – oops.

Unit II   **18 hours**

VB.Net - Inheritance-polymorphism-Interface –Namespace - Class Library - Exception handling-Working with forms- advanced controls – Menustrip – context menu Events – delegates.

Unit III   **18 hours**

Data access using ADO.NET: overview of ADO.NET Architecture – ADO.NET Components – Using ADO.NET – Data form wizard Components and Interoperability. Data connectivity – ODBC classes - -Connection –Command – data

adapter – dataset –data reader - error –data grid view - advantages of using ADO.net-data access using ADO-using ADO.net data form wizard.

Unit IV   **18 hours**

Overview to C# - C # Compilation and Execution Process – C# Fundamentals (Data types, Operators, Programming constructs) –Inheritance –Sealed Classes – Interface - Polymorphism – Method Hiding – C# Property –Exception Handling.

Unit V   **18 hours**

ASP.NET: Features of ASP.net-structure of an ASP.net page-creating simple web application-using common web control-ASP.net Objects – request – response – server – session – application – error – Master page – validation controls- ASP.net State Management – web configuration -create web application using data base connectivity-web   services.

Learning Resources:

Text Book(s)

1. Kogent Learning Solutions Inc., ".NET 4.5 Programming 6-in-1, Black Book", 1 st edition, Dreamtech Press, 2013.

References

1. EvangelosPetroutsos, "Mastering Visual Basic .NET" 3d Edition, SYBEX, 2006
2. Bill Hamilton, "ADO.NET 3.5 Cookbook: Building Data Centic .net Applications", 2nd edition , O'Reilly, 2008.
3. Joseph Albahari, Ben Albahari, "C# 7.0 in a nutshell: The Definitive Reference", 1st edition, O'Reilly Media, 2017.
4. Dino Esposito, "Programming ASP.NET Core (Developer Reference)", 1st edition, Microsoft Press, 2018
5. RadhaP.Ganesan, "VB.NET", 2nd edition, SCITECH, 2015.

CO – PSO Mapping

CO/PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	2	3	3	1	2	2	1	-	1
CO 2	3	3	3	3	1	1	3	2	1	1
CO 3	3	3	3	3	2	3	3	2	3	2
CO 4	3	3	3	3	3	3	2	1	1	2
CO 5	3	3	3	2	1	2	2	3	3	2
Average	3	2.8	3	2.8	1.6	2.2	2.4	1.8	2	1.6

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24MCA5503	OOAD and UML	Core	6	5

To enable the students to understand the existing system and to provide practical guidance on construction of Object-Oriented Systems. Here the basic concepts in systems analysis and design are introduced with emphasis to Object-Oriented Analysis and Design. UML is used for the realization of OOAD. In UML the basic structural, behavioural and architectural modelling are discussed.

Course Outcomes

At the end of the course, students will be able to

CO1: apply the software development life cycle concepts.

CO2: design and Analyze systems using the design principles.

CO3: design using the Object-Oriented Methodology.

CO4: apply UML for visualizing, specifying, constructing, and documenting information about software – intensive systems.

CO5: model the structure of the run-time system and their physical hardware elements.

Unit I   **18 Hours**

Systems - Role of System Analyst - SDLC – Feasibility Analysis – Fact Finding Techniques – SSAD - ER Diagrams – DFD – Decision Table – Decision Trees – Structured English.

Unit II   **18 Hours**

System Design - Application Architecture and Modelling – Database Design - Input and Output Design - User Interface Design – System Construction and Implementation – System Operations and Support.

Unit III   **18 Hours**

OOAD - Comparison of SSAD and OOAD - Modelling as a Design Technique – Object Modelling – Dynamic Modelling - Functional Modelling – Object Design – OOD Design Process.

Unit IV   **18 Hours**

Basic Structural Modelling – Classes – Relationships Common Mechanisms – Class

Diagrams – Behavioural Modelling – Interaction – Uses cases - Architectural Modelling.

Unit V   **18 Hours**

 Component Diagrams – Deployment Diagrams – Collaboration - Case Study.

Learning Resources:

Textbook

1.Sen, "System Analysis and Design", Tata McGraw Hill, 1989.

References

1. Jeffrey, "Structured System Analysis and Design", Tata McGraw Hill 2002.

2.Rumbaugh, Blaha, Premerlani, Eddy and Lorensen, "Object-Oriented Modeling and Design", PHI, 1997.

3.Booch, Rumbaugh and Jacobson, "The Unified Modeling Language User Guide", Pearson Education, 2003.

4.Jason, "UML - A Beginners Guide", Tata McGraw Hill, 2003.

5.Yourdon, "Object-Oriented Analysis", Pearson Education, 2nd Edition, 2001.

6.Object- Oriented Analysis and Design with Applications, Addison-Wesley Professional, 2nd Edition, 2007.

CO- PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	2	3	2	2	2	3	1	1	3
CO2	3	2	3	2	2	2	3	1	1	3
CO3	3	2	3	2	2	2	3	1	1	3
CO4	3	2	3	2	1	1	3	1	1	3
CO5	3	2	3	2	1	1	3	1	1	3
Avg	2.8	2	3	2	1.6	2.6	3	1	1	3

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24MCA5201	Java Lab	Core	4	2

The aim of this course is to train the Students on the use of the Java programming language to code and test applications, applets for the Java platform. To do this, they will need to utilize various features of the Java programming language, including language fundamentals, objective orientation, execution threads, and Java packages.

Course Outcomes

At the end of the course, students will be able to

CO1: illustrate the basic concept of Java programming

CO2: build Multithreading Java programs using predefined class libraries

CO3: develop Java Programs by applying Control Structures

CO4: create Java Applications using the concepts of interfaces, inheritance, packages and exceptions

CO5: construct Java database connectivity program using applet and swing concepts

EXERCISES

1. Declarations and access control
2. Flow control and exception handling
3. Garbage collection
4. Language fundamentals
5. Overloading, overriding, runtime type, and object orientation
6. Threads
7. The java.awt package – layout
8. The java.lang package
9. The java.util package
10. Demonstrate understanding of database connectivity (JDBC)
11. Access and manipulate database information in Java technology-based applications
12. Build form-based database applications using the development tool
13. Create and test applets.
14. Distribute applets and applications using jar files.

15. Construct applets using the development tools library of beans.

16. Write and deploy Enterprise JavaBeans (EJB) technology-based components.

17. Design and build reusable enterprise components.

18. Design and build web components for Java Server Pages (JSPs) and Servlets including vendor-specific features.

19. Develop clients that access the enterprise components.

20. Configure and package EJBs, Servlets, and JSP and deploy them in the application   server.

Learning Resources:
Text Book(s)
1. E. Balaguruswamy, Programming with Java A Primer, Tata McGraw Hill,5th Edition , 2017

References
1. Herbert Scheldt , Java - The Complete Reference, McGraw Hill Education; Tenth edition, 2017
2. R. Nageswara Rao, Core Java: An Integrated Approach, New: Includes All Versions up to Java 8, Dream tech Press ,2016
3. Troy Dimes, Java Programming: A Beginners Guide to Learning Java, Create Space Independent Publishing Platform, 2015.

Websites/ e-Learning Resources
1. www.tutorialspoint.com/javaexamples.
2. www.vogella.com/tutorials/JavaIntroduction/article.html.
3. www.udemy.com/java-tutorial.

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO 1	3	2	3	2	2	2	2	2	2	3
CO 2	3	2	2	2	2	3	2	2	2	2
CO 3	3	2	3	3	2	2	2	2	2	2
CO 4	3	1	2	2	1	3	2	2	2	3
CO 5	3	2	3	2	2	2	2	2	2	1
Average	3	1.8	2.6	2.2	1.8	2.4	2	2	2	2.2

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24MCA5403	Artificial Intelligence (T)	DSE	5	4

To impart knowledge about Artificial Intelligence and to give understanding of the main abstractions and reasoning for intelligent systems. To enable the students to understand the basic principles of Artificial Intelligence in various applications. To identify the scope of Artificial Intelligence in real life applications. To enable decoding of human thinking process and find the ways of making the machine decide intelligently in lieu of number crunching.

Course Outcomes:

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

CO1: relate basic AI based problems.

CO2: construct required algorithms for AI based applications .

CO3: apply AI techniques to real-world problems to develop intelligent systems.

CO4:analyze appropriately from a range of techniques when implementing intelligent systems.

CO5: recognize the basis of different machine learning techniques.

Unit I 15 hours

AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

Unit II 15 hours

Searching- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing ,A*, AO* Algorithms, Problem reduction, Game Playing- Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.

Unit III   **15 hours**

Knowledge representation issues, predicate logic - logic programming, semantic nets - frames and inheritance, constraint propagation, representing knowledge using rules, rules - based deduction systems. Reasoning under uncertainty, review of probability, Baye's probabilistic interferences and dempster Shafer theory.

Unit IV   **15 hours**

First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, Types of learning, learning from observation, Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Regression and Classification.

Unit V   **15 hours**

Expert systems:- Introduction, basic concepts, structure of expert systems, the human element in expert systems how expert systems works, problem areas addressed by expert systems, expert systems success factors, types of expert systems, expert systems and the internet interacts web, knowledge engineering, scope of knowledge, difficulties, in knowledge acquisition methods of knowledge acquisition, machine learning, intelligent agents, selecting an appropriate knowledge acquisition method, societal impacts reasoning in artificial intelligence, inference with rules, with frames: model based reasoning, case based reasoning, explanation & meta knowledge inference with uncertainty representing uncertainty.

Learning Resources:

Text Books

1. S. Russel and P. Norvig, 2003,"Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education.

References

1. David Poole, Alan Mackworth, Randy Goebel, 1998, "Computational Intelligence : a logical approach", Oxford University Press.

2. G.Luger,2001,"ArtificialIntelligence:StructuresandStrategiesforcomplexproblem solving",FourthEdition,Pearson Education.

3. J.Nilsson,1998,"Artificial Intelligence: A new Synthesis", Elsevier Publishers.

4. Elaine Rich, Kevin Knight and Shivashankar B Nair, 2010, Artificial Intelligence,

3rded.,Tata McGrawHill.

5. Dan W. Patterson, 1995, Introduction to Artificial Intelligence and Expert Systems, Pearson Education.

Websites/e-Learning Resources

1. https://artint.info/index.html

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	2	3	2	2	3	3	1	1	3
CO2	3	3	3	3	1	3	3	2	2	3
CO3	3	3	3	3	3	3	2	1	1	2
CO4	3	2	2	2	3	2	2	1	1	3
CO5	3	2	2	2	2	2	2	2	-	3
Average	3	2.4	2.6	2.6	2.2	2.6	2.4	1.4	1	2.8

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24MCA5405	Software Testing	DSE	5	4

To understand the principles of Software Testing and tools and enable the students to learn about the principles and improve knowledge in software testing tools.

Course Outcomes

At the end of the course, students will be able to

CO1: know the purpose and importance of software testing in ensuring software quality and reliability.

CO2: describe the fundamentals of software testing, including test case design, testing techniques, and testing types.

CO3: analyze transaction flows to identify testing points and techniques, Implement Transaction Flow Testing & Understand Data Flow Testing.

CO4: understand the motivational overview of logic based testing and its importance in software testing.

CO5: know various testing types, Develop Strategic Testing Approach & Identify Testing Issues.

Unit I 15 hours

Purpose of Software testing – Some Dichotomies – a model for testing – Playing pool and consulting oracles – Is complete testing possible – The Consequence of bugs – Taxonomy of Bugs.

Unit II 15 hours

Testing Fundamentals– Test case Design – Introduction of Black Box Testing and White Box testing – Flow Graphs and Path testing – Path testing Basics - Predicates, Path Predicates and Achievable Paths - Path Sensitizing – Path Instrumentation – Implementation and Application of Path Testing.

Unit III 15 hours

Transaction Flow testing – Transaction Flows – techniques – Implementation Comments – Data Flow Testing – Basics – Strategies – Applications, Tools and effectiveness – Syntax Testing – Why, What, How – Grammar for formats – Implementation – Tips.

Unit IV   **15 hours**

Logic Based Testing – Motivational Overview – Decision tables – Path Expressions – KV Charts – Specifications – States, State Graphs and transition Testing – State Graphs – Good &bad states – state testing Metrics and Complexity.

Unit V   **15 hours**

Testing Types -Testing GUIs – Testing Client – Server Architecture – Testing for Real-time System – A Strategic Approach to Software testing – issues – Unit testing – Integration Testing – Validation testing – System testing – The art of Debugging.

Learning Resources:

Text Books

1. Boris Beizer, Software testing techniques, DreamTech Press, Second Edition – 2003.

2. Myers and Glenford.J., The Art of Software Testing, John-Wiley & Sons,1979.

Reference Books:

1. Roger.S.Pressman, Software Engineering – A Practitioner's Approach, McGraw Hill, 5th edition, 2001. Marnie.L. Hutcheson, Software Testing Fundamentals, Wiley-India,2007.

2. Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

E-learning resources:

1. https://www.tutorialspoint.com/software_testing/index.htm

2. https://www.guru99.com/software-testing-introduction-importance.html

3. https://nptel.ac.in/courses/106/105/106105150/

CO – PSO Mapping

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	2	3	3	3	2	3	2	1	3
CO2	3	2	3	3	2	3	3	1	1	3
CO3	3	2	3	2	3	3	3	1	1	3
CO4	3	2	3	2	2	3	3	1	1	3
CO5	2	3	3	1	1	2	3	2	1	3
Avg	2.8	2.4	3	2.2	2.2	2.6	3	1.4	1	3

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/ Wk.	Credits
24MCA5233	Internship	IS	-	2

Course Outcomes

At the end of the course, students will be able to

CO1: understand the IT industry's current trends, challenges, and practices, familiarize with the organization's structure, policies, and culture.

CO2: gain knowledge of a specific business domain or industry.

CO3: establish professional connections and networks.

CO4: manage time effectively to meet project deadlines, Adapt to changing project requirements and technological advancements.

CO5: prepare and present project reports, documents, and presentations. Demonstrate ethical and professional behavior in the project's execution and delivery.

CO – PSO Mapping

CO/PO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PS10
CO 1	3	3	3	3	3	3	3	3	3	3
CO 2	3	3	3	2	3	2	3	2	3	3
CO 3	3	3	3	3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3
Average	3	3	3	2.8	3	2.8	3	2.8	3	3

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24MCA5402	Mobile Application Development	Core	5	4

To understand the mobile device software development methodologies and programming principles – to design, develop, deploy and debug applications for the Android platform and enhance the understanding of mobile development.

Course Outcomes:

At the end of the course, students will be able to

CO1: use for mobile applications development.

CO2: linking activities and create User Interface.

CO3: use various views, menu and connect with database

CO4: use Android environment

CO5: design web applications

Unit I   **15 hours**

Mobile Applications and Device Platforms-Alternatives for Building Mobile Apps -Comparing Native vs. Hybrid Applications -The Mobile Application Development Life cycle-The Mobile Application Front-End-The Mobile Application Back-End-Key Mobile Application Services-What is Android-Android version history-Obtaining the Required Tools- Launching Your First Android Application-Exploring the IDE-Debugging Your Application-Publishing Your Application

Unit II   **15 hours**

Linking Activities Using Intents-Fragments-Displaying Notifications-Understanding the Components of a Screen-Adapting to Display Orientation-Managing Changes to Screen Orientation- Utilizing the Action Bar-Creating the User Interface Programmatically Listening for UI Notifications

Unit III   **15 hours**

Using Basic Views-Using Picker Views -Using List Views to Display Long

Lists- Understanding Specialized Fragments - Using Image Views to Display Pictures -Using Menus with Views-Using Web View- Saving and Loading User Preferences-Persisting Data to Files-Creating and Using Databases.

Unit IV   **15 hours**

Sharing Data in Android-Creating Your Own Content Providers -Using the Content Provider- SMS Messaging -Sending Email-Displaying Maps- Getting Location Data- Monitoring a Location.

Unit V   **15 hours**

Consuming Web Services Using HTTP-Consuming JSON Services- Creating own applications -Services-BindingActivitiestoServices-UnderstandingThreading-Developingsimpleapplications that uses radio button, image button, Alert dialog box, Layout managers and to display personal details using GUI components etc.

Learning Resources:

Text Books

1.JeromeDiMarzio, "BeginningAndroid Programmingwith Android Studio", 4thEdition,2016.

Reference Books:

1. DawnGriffiths,DavidGriffiths,"HeadFirstAndroidDevelopment:A Brain-FriendlyGuide",2017.

2. NeilSmyth,"AndroidStudio3.0DevelopmentEssentials: Android",8thEdition,2017.

3. PradeepKothari,"AndroidApplicationDevelopment(WithKitkatSupport) ",BlackBook2014.

Web References:

1. https://developer.android.com/guide

2. https://en.wikipedia.org/wiki/Android_10

3. Develop App for Free

4. https://flutter.dev/

5. http://ai2.appinventor.mit.edu
6. https://aws.amazon.com/mobile/mobile-application-development/(Unit1)
7. https://flutter.dev/(Applications)
8. http://ai2.appinventor.mit.edu(Applications)

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	2	2	2	3	1	2	1	1
CO 2	3	3	3	3	2	3	2	2	1	1
CO 3	3	3	2	3	3	2	2	2	2	1
CO 4	3	3	2	2	2	3	2	2	2	1
CO 5	3	3	2	3	3	3	2	2	1	1
Average	3	3	2.2	2.6	2.4	2.8	1.8	2	1.4	1

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24MCA5302	Python Programming	Core	4	3

This course introduces the core concepts of programming in Python, Strings, List, Tuples, Recursion and File handling, Oops and graphics, database connectivity, mobile application for Android and Integrating with other languages and packages.

Course Outcomes:

At the end of the course, students will be able to

CO1: use python and write simple programs.

CO2: work with Objects, Strings, Lists, Tuples.

CO3: solve problems using recursion and handle files

CO4: develop oops applications using python

CO5: work with graphics, social media packages, data connectivity and integrate with other languages.

Unit I   **12 hours**

An Introduction - IDLE an Interpreter for Python, Python Strings, Relational Operators, Logical Operators, Bitwise Operators, Variables and Assignment Statements, Keywords, Script Mode. Functions - Built-in Functions, Function Definition and Call, Importing User-defined Module, Assert Statement, Command Line Arguments. Control Structures – if Conditional Statement, Iteration (for and while Statements).

Unit II   **12 hours**

Scope - Objects and Object ids, Scope of Objects and Names. Strings - Strings, String Processing Examples, Pattern Matching. Mutable and Immutable Objects – Lists, Sets, Tuples, Dictionary.

Unit III   **12 hours**

Recursive Solutions for Problems on Numeric Data, Recursive Solutions for Problems on Strings, Recursive Solutions for Problems on Lists, Problem of Tower of Hanoi. Files and Exceptions - File Handling, Writing Structures to a File, Errors and Exceptions, Handling Exceptions Using try…except, File Processing Example.

Unit IV   **12hours**

Classes and Objects, Person: An Example of Class, Class as Abstract Data Type, Date Class. Classes II - Polymorphism, Encapsulation, Data Hiding, and Data Abstraction, Modifier and Accessor Methods, Static Method, Adding Methods Dynamically, Composition, Inheritance, Built-in Functions for Classes.

Unit V   **12 hours**

2D Graphics, 3D Objects, Animation – Bouncing Ball. Applications of Python - Collecting Information from Twitter, Sharing Data Using Sockets, Managing Databases Using Structured Query Language (SQL), Developing Mobile Application for Android, Integrating Java with Python, Python Chat Application Using Kivy and Socket Programming.

Learning Resources:

Text Book:

Python Programming a Modular Approach with Graphics, Database, Mobile, and Web Applications – SheetalTaneja, Naveen Kumar – Pearson Publication, 2018.

Reference Books:

1. Python Programming - ReemaThareja, Oxford University Press, 2017

2. Fundamentals of Python Programming, Lambert – Cengage Publications, 2017

3. Problem Solving using Python – E. Balagurusamy, Mc Graw Hill Education Ltd., 2017

CO – PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO 8	PSO 9	PSO10
CO 1	3	3	3	3	3	2	1	1	1	1
CO 2	3	3	3	2	3	2	1	1	1	1
CO 3	3	3	3	3	3	2	2	1	1	1
CO 4	3	2	3	2	3	3	2	1	1	1
CO 5	3	2	3	f2	2	3	2	1	2	1
Average	3	2.6	3	2.4	2.8	2.4	1.6	1	1.2	1

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24MCA5502	Data mining and data warehousing	Core	6	5

To understand the principles of Data warehousing and Data Mining and be familiar with the Data warehouse architecture and its Implementation enabling them to perform classification and prediction of data.

Course Outcomes

At the end of the course, students will be able to

CO1: define the scope and necessity of Data Mining & Warehousing & Modelling and design of data warehouses.

CO2: understand Data Mining Functionalities, Preprocess Data, Design a Data Mining system, Apply Association Rule Mining and analyze Associations to solve Real-World Problems.

CO3: perform Classification and Prediction of data.

CO4: learn and analyze various Clustering methods.

CO5: able to Analyze Complex Data Objects, Mine Spatial Data, Extract Insights from Multimedia Data.

Unit I **18 Hours**

Data Warehousing and Business Analysis: - Data warehousing Components – Building a Data warehouse –Data Warehouse Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.

Unit II **18 Hours**

Data Mining: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation- Architecture of A Typical Data Mining Systems-Classification Of Data Mining Systems. Association Rule Mining: - Efficient and

Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.

Unit III 18 Hours

Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

Unit IV 18 Hours

Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

Unit V 18 Hours

Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.

Learning Resources:

Text Books:

1. Jiawei Han, MichelineKamber and Jian Pei, 2011,"Data Mining Concepts and Techniques", Third Edition, Elsevier.

Reference Books:

1. Alex Berson and Stephen J. Smith, 2007, "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint.

2. K.P. Soman, ShyamDiwakar and V. Ajay 2006, "Insight into Data mining Theory and Practice", Eastern Economy Edition, Prentice Hall of India.

3. G. K. Gupta, 2006, "Introduction to Data Mining with Case Studies", Eastern Economy Edition, Prentice Hall of India.

4. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, 2007, "Introduction to Data Mining", Pearson Education.

E-learning resources:

1. https://nptel.ac.in/courses/106105174

2. https://onlinecourses.nptel.ac.in/noc21_cs06/preview

3. https://onlinecourses.swayam2.ac.in/cec20_cs12/preview

CO – PSO Mapping

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO 1	3	2	3	3	3	2	3	2	1	3
CO 2	3	2	3	2	3	1	2	1	1	3
CO 3	3	2	3	3	3	2	3	1	1	3
CO 4	3	2	3	3	3	1	3	1	1	3
CO 5	3	2	3	3	3	2	3	2	1	3
AVG	3	2	3	2.8	3	1.6	2.8	1.4	1	3

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24MCA5504	Project	Core	6	5

Each student shall be required to take up a Project work in the fourth semester. The Director shall assign the Guide at the end of the third semester and each student in consultation with the respective Guides shall choose their topic and company for which he/she shall do the project. Two copies of the Dissertation shall be submitted to the Director on or before the due date fixed by the Director.

Each student shall be required to appear for the viva voce in support of the Project report.

The Dissertation will be evaluated both by the External examiner nominated by the Director and Internal Guide.

The marks for the Project work would be as follows:

Project Guide   :   Max 150 (Continuous assessment -100: Viva voce – 50)

External Viva voce   :   Max   50
                             _____

Total   :   Max 200
                             _____

Course Outcomes

At the end of the course, students will be able to

CO1: apply theoretical concepts and principles to real-world problems and Demonstrate in-depth knowledge of a specific domain or industry

CO2: proficiency in programming languages, tools, and technologies relevant to the project, Analyze problems, identify solutions, and design, develop, and test software applications or systems implement them effectively

CO3: effectively communicate project goals, progress, and outcomes to stakeholders, Work collaboratively with team members and stakeholders.

CO4: manage time effectively to meet project deadlines, Adapt to changing project requirements and technological advancements.

CO5: prepare and present project reports, documents, and presentations. Demonstrate ethical and professional behavior in the project's execution and delivery.

CO – PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	3	3	3	3	3	3	2	3
CO 2	3	3	3	3	3	2	3	2	3	3
CO 3	3	3	3	3	3	3	3	2	3	3
CO 4	3	3	3	3	3	3	3	3	2	3
CO 5	3	3	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	2.8	3	2.6	2.6	3

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24MCA5202	Python Lab	Core	4	2

The aim of this course is to train the Students on the use of the python language to code and test applications. To do this, they will need to utilize various features of the python programming language, including language fundamentals, objective orientation.

Course Outcomes

At the end of the course, students will be able to

CO1: use the basic concept of Python programming

CO2: writepython programs using predefined libraries

CO3: develop python Programs by applying Control Structures

CO4: create python Applications using the concepts of interfaces, inheritance

CO5: construct database connectivity program

EXERCISES

1. Create a list and perform the following methods

    1) insert() 2) remove() 3) append() 4) len() 5) pop() 6)clear()

2. Create a dictionary and apply the following methods

    1) Print the dictionary items 2) access items 3) use get() 4)change values 5) use len()

3. Create a tuple and perform the following methods

    1) Add items 2) len() 3) check for item in tuple4)Access items

4. Write a program to create a menu with the following options

    1. TO PERFORM ADDITITON

    2. TO PERFORM SUBSTRACTION

    3. TO PERFORM MULTIPICATION

    4. TO PERFORM DIVISION

Accepts users input and perform the operation accordingly. Use functions with arguments.

5. Write a Python function that takes two lists and returns True if they are equal otherwise false

6. Write a program to double a given number and add two numbers using lambda()?

7. Write a program for filter() to filter only even numbers from a given list.

8. Write a program for map() function to double all the items in the list?

9. Write a program to find sum of the numbers for the elements of the list by using reduce()?

10. Demonstrate a python code to implement abnormal termination?

11. Demonstrate a python code to print try, except and finally block statements

12. Write a python program to open and write "hello world" into a file?

13. Write a python program to write the content "hi python programming" for the existing file.

14. Write a python program to display a particular month of a year using calendar module.

15. Write a python program to create a package (college),sub package (all dept),modules(mca, cos) and create admin and cabin function to module?

16. Write a python Program to call data member and function using classes and objects

17. Using numpy module create an array and check the following: 1. Type of array 2. Axes of array

18. Shape of array 4. Type of elements in array using a numpy module create array and check the following: 1. List with type float 2. 3*4 array with all zeros 3. From tuple 4. Random values

19. Write a python program to concatenate the data frames with two different objects

20. Write a python code to read a csv file using pandas module and print the first and last five lines of a file.

CO – PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO10
CO 1	3	2	3	2	2	2	2	2	2	3
CO 2	3	2	2	2	2	3	2	2	2	2
CO 3	3	2	3	3	2	2	2	2	2	2
CO 4	3	1	2	2	1	3	2	2	2	3
CO 5	3	2	3	2	2	2	2	2	2	1
Average	3	1.8	2.6	2.2	1.8	2.4	2	2	2	2.2

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24MCA5404	Machine Learning	DSE	5	4

To provide mathematical base for Machine learning and to provide theoretical knowledge on setting hypothesis for pattern recognition. To impart Knowledge of machine learning techniques for data handling. To provide the skill to evaluate the performance of algorithms and to provide solution for various real-world applications. To impart the knowledge of identifying similarities and differences in various patterns of data.

Course Outcomes:

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

CO1: recognize the characteristics of machine learning strategies.

CO2: apply various learning methods to appropriate problems.

CO3: identify and integrate more than one technique to enhance the performance of learning.

CO4: create classification, clustering and probabilistic learning models for handling unknown pattern.

CO5: formulate the features for machine learning applications.

Unit I   **15 hours**

The Fundamentals of Machine Learning: The Machine Learning Landscape - Types of Machine Learning Systems - Main Challenges of Machine Learning - Testing and Validating. End-to-End Machine Learning Project - Look at the Big Picture - Get the Data - Discover and Visualize the Data to Gain Insights - Prepare the Data for Machine Learning Algorithms - Select and Train a Model – Fine – Tune Your Model -Launch, Monitor, and Maintain Your System.

Unit II   **15 hours**

Ingredients of machine learning: Tasks – Models – Features. Supervised Learning: Classification – Binary classification and related tasks – Scoring and ranking – class probability estimation – Multi-class classification. Unsupervised Learning: Regression – Unsupervised and descriptive learning. Concept Learning: The

hypothesis space – paths through the hypothesis space beyond conjunctive concepts– learn ability.

Unit III   **15 hours**

Tree Models: Decision trees – Ranking and probability estimation trees – tree learning as variance reduction. Rule Models: Learning ordered rule lists – learning unordered rule sets–descriptive rule learning – first–order rule learning. Linear Models: The least - squares method – The perceptron– Support vector machines.

Unit IV   **15 hours**

Distance-based Models: Neighbours and exemplars – Nearest-neighbour classification – Distance-based clustering – K-Means algorithm – Hierarchical clustering. Probabilistic Models: The normal distribution and its geometric interpretations – probabilistic models for categorical data - Naïve Bayes model for classification – probabilistic models with hidden values – Expectation-Maximization.

Unit V   **15 hours**

Features: Kinds of features – Feature transformations – Feature construction and selection. Model ensembles: Bagging and random forests – Boosting – Mapping the ensemble landscape. Machine Learning experiments: What to measure – How to measure it –How to interpret it.

Learning Resources:

Text Books

1. Flach, P, 2012, "Machine Learning: The Art and Science of Algorithms that Make Sense ofData", Cambridge University Press.

2. AurélienGéron, 2017, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", First Edition. (Chapters 1and 2)

References

1. John D.Kelleher, Brian Mac Namee, Aoife D'Arcy, 2012,"Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, and Case Studies", The MIT Press, First Edition.

2. KevinP.Murphy,2012, "Machine Learning: A Probabilistic Perspective", MIT Press.

3. EthemAlpaydin,2014,"IntroductiontoMachineLearning",   MIT   Press,   Third

Edition.

4. Tom Mitchell, 1997,"MachineLearning",Mc Graw-Hill.

5. Stephen Marsland, 2014, "Machine Learning –An Algorithmic Perspective", Chapmanand Hall/ CRC Press, Second Edition.

Websites/e-Learning Resources

1. https://www.youtube.com/watch?v=r4sgKrRL2Ys&list=PL1xHD4vteKYVpaIiy2 95pg6_SY5qznc77

CO – PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	3	3	3	2	2	3	3	1	1	3
CO2	3	3	3	3	1	3	3	1	2	3
CO3	3	3	3	2	3	3	3	1	1	3
CO4	3	2	3	2	3	2	2	1	1	3
CO5	3	3	2	2	2	2	2	1	-	3
Average	3	3	2.8	2.2	2.2	2.6	2.6	1	1	3

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk	Credits
24MCA5406	Internet of Things	DSE	5	4

This elective course is designed for state-of-the-art features to students and enable them to work in the industry where IoT is applied to a great extent. Students will also be introduced to the programming of embedded devices used in different levels of IoT application. Moreover, they will get exposed to sensor interfacing and uploading data to cloud services provided by different firms.

Course Outcomes

At the end of the course, students will be able to

CO1: describe the concepts of IoT and its working models

CO2: implement basic IoT applications on embedded platform.

CO3: understand the usage of IoT protocols for communication between various IoT devices

CO4: gain knowledge on Industry Internet of Things.

CO5: know about the privacy and Security issues in IoT.

UNIT I   **15 hours**

Definition and Characteristics of IoT, Sensors, Actuators, Physical Design of IoT – IoT Protocols, IoT communication models , IoT Communication APIs ,IoT enabled Technologies–Wireless Sensor Networks, Cloud Computing, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs–Home, City ,Environment, Energy, Agriculture and Industry.

Unit II   **15 hours**

A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

UNIT III   **15 hours**

Protocol Standardization for IoT–Efforts –M2MandWSNProtocols–SCADAandRFID Protocols– Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE802.15.4–BACNetProtocol–Modbus – KNX–Zigbee–Network layer–APSlayer–Security

Unit IV   **15 hours**

Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and GasIndustry, Opinions on IoT Application and Value for Industry, Home Management.

Unit V   **15 hours**

Security and Governance Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security

Learning Resources:

Text Books

1. Vijay Madisetti and ArshdeepBahga, "Internet of Things: (A Hands-on Approach)", Universities Press (INDIA) Private Limited 2014, 1st Edition.

Reference

1. Michael Miller, "The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World", kindle version.

2. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton, Jerome Henry, "IoTFundamentals,Networking Technologies,Protocols,and Use cases forthe Internet ofThings",CiscoPress,FirstEdition,2017.

3. ArshdeepBahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015

4. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", Apress Publications 2013, 1st Edition,.

5. WaltenegusDargie, ChristianPoellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice" 4..CunoPfister, "Getting Started with the Internet of Things", O"Reilly Media 2011

Web Resource

1. https://www.simplilearn.com
2. https://www.javatpoint.com
3. https://www.w3schools.com

CO – PSO Mapping

CO/PO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO10
CO 1	3	3	3	3	2	2	1	1	2	1
CO 2	3	3	3	3	2	2	1	1	2	1
CO 3	3	3	3	2	2	3	2	1	2	1
CO 4	3	2	3	2	2	3	2	1	2	1
CO 5	3	2	3	2	2	3	2	1	2	1
Average	3	2.6	3	2.4	2	2.6	1.6	1	2	1

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24MCA5244	Professional Competency Skill	SEC	-	2

Course Outcomes

At the end of the course, students will be able to

CO1: have foundational Knowledge (Understand the fundamentals of computer science, including data structures, algorithms, and software engineering)

CO2: apply core concepts to solve computational problems and demonstrate knowledge of

computer organization, architecture, and operating systems

CO3: programming and Software Development (Design, develop, test, and maintain software

applications using various programming languages and paradigms & Apply software engineering principles, patterns, and methodologies to build scalable and maintainable software. Also, understand software development life cycles, version control, and agile development)

CO4: data Management and Analytics (Design, implement, and manage databases for various applications and use cases & Apply data modelling, data warehousing, and business intelligence concepts to support decision-making. Also, understand data analytics, machine learning, and data visualization techniques)

CO5: computer Networks and Cybersecurity (Understand computer networks, protocols, and

architectures and Design and implement secure network architectures, protocols, and applications. Also, apply cybersecurity principles, threat modelling, and risk management to

protect information assets. Understand the fundamentals of artificial intelligence, machine learning, and deep learning & apply AI and ML techniques to solve complex problems, classify data, and make predictions. Also, design and develop intelligent systems, agents, and applications.

CO – PSO Mapping

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7	PSO8	PSO9	PSO10
CO 1	3	3	3	3	3	3	3	3	2	3
CO 2	3	3	3	3	3	2	3	2	3	3
CO 3	3	3	3	3	3	3	3	2	3	3
CO 4	3	3	3	3	3	3	3	3	2	3
CO 5	3	3	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	2.8	3	2.6	2.6	3

Strong – 3   Medium – 2   Low – 1

VALUE ADDED COURSES

Sem	Course Code	Course Title	Hours/Wk	Credits
2	24MCA422V	Robotics	2	2
3	24MCA521V	Introduction to Blockchain	2	2

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24MCA422V	Robotics	VAC	2	2

The aim of the course is to enable the students to design, organize and implement artificial intelligent through Robotics. Making them to understand how human relevant work could be accomplished through robot.

Course Outcomes:

At the end of the course, students will be able to

CO1: define kinematics

CO2: plan trajectories

CO3: categorize risks of different devices

CO4: appraise security measures in devices

CO5: apply Cyber security in various business

Unit I   **6 hours**

Historical developments - robot arm kinematics – direct –kinematics problem – invoke Kinematic Solution – robot arm dynamics – langrage – Euler formulation – Newton – Euler formulation – generalized D'Alembertls – equation of motion

Unit II   **6 hours**

Planning of manipulator trajectories – general considerations – joint – interpolated trajectories – Cartesian path trajectories – control of robot manipulators – control of the puma robot arm – computed torque technique – near – minimum – time control – variable structure control – non linear decoupled feedback control – resolved motion control – adaptive control

Unit III   **6 hours**

Sensing – range sensing – proximity sensing – touch sensors – force and torque sensing – low level vision – image acquisition – illumination prescription – recognition – interpretation

Unit IV   **6 hours**

Robot programming language – characteristics of robot level languages – characteristics of task level languages - robot intelligence and task planning –

Unit V   **6 hours**

State space search – problem reduction – use of predicate logic – means – ends analysis – robot learning and task planning

Learning Resources:

Text Books

1. R.D .Klaster, T.A ChmieleWski and Michael Negin, "Robotic Engineering – an integrated approach", Prentice Hall int.

2. E.L hall and B.C hall, Holt Saunders, "Robotics - A user friendly introduction", International editions.

CO – PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	3	2	2	2	2	3	3	1	1	3
CO 2	3	2	2	2	2	3	3	1	1	3
CO 3	3	2	2	2	2	2	3	1	1	3
CO 4	3	2	2	2	2	2	3	1	1	2
CO 5	3	2	2	3	2	2	3	1	1	2
Average	3	2	2	2.2	2	2.4	3	1	1	2.6

Strong – 3   Medium – 2   Low – 1

Course Code	Name of the Course	Category	Hours/Wk.	Credits
24MCA521V	Introduction to Block chain	VAC	2	2

Students will have an understanding of the emerging technology Blockchain and familiarise with the functional/operational aspects of it.

Course Outcomes:

At the end of the course, students will be able to

CO1: describe the basic concepts and technology used for blockchain

CO2: know how blockchain is used in IOT

CO3: analyze the applications of blockchain

CO4: appraise the features of blockchain

CO5: debate on the concept of Bitcoin.

Unit I   **6 hours**

Evolution of distributed computing, Distributed computing versus parallel computing, Evolution of Blockchain, types of block chain, logical components of blockchain, Core components of blockchain architecture, applications and implementation of blockchain, Building a block chain.

Unit II   **6 hours**

Understanding blockchain, blockchain for IOT, Blockchain technology for large scale IOT systems, Blockchain mechanisms for IOT security – Blockchain for IOT security and privacy – case study

Unit III   **6 hours**

Applications of Blockchain – optimized digital transformation in Government Services with Blockchain. Blockchain in Social Media, Social media opportUnities in Blockchain.

Unit IV   **6 hours**

Working of Blockchain – structure of blockchain – steps in creating a blockchain – Key attributes of blockchain, security features in blockchain.

Unit V   **6 hours**

Bitcoin blockchain, Challenges and solutions, proof of work, Proof of stake, alternatives to Bitcoin consensus, Bitcoin scripting language and their use.

Learning Resources:
Text Books
1. Blockchain Technology and Applications, Pethuru Raj, KavitaSiani and ChellammalSurianarayanan, CRC Press, 2021
2. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder, 2016

References:
1. Blockchain Basics A Non-Technical Introduction in 25 Steps, Daniel Drescher, Apress, 2017.
2. Mastering Bitcoin: Programming the Open Blockchain, Andreas M. Antonopoulos, O'Reilly Media, 2017.
3. Blockchain For Dummies, Tiana Laurence, John Wiley & Sons, 2017.
4. Mastering Blockchain, Lorne Lantz, Daniel Cawrey, "O'Reilly Media", 2020.
5. Blockchain Technology Explained: The Ultimate Beginner's Guide about Blockchain Wallet, Mining, Bitcoin, Ethereum, Litecoin, Zcash, Monero, Ripple, Dash, Iota and Smart Contracts, Alan T. Norman, 2017.

Websites/ e-Learning Resources
1. https://www.blockchainexpert.uk/book/blockchain-book.pdf

CO – PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	3	2	2	2	2	3	3	1	1	3
CO 2	3	2	2	2	2	3	3	1	1	3
CO 3	3	2	2	2	2	2	3	1	1	3
CO 4	3	2	2	2	2	2	3	1	1	2
CO 5	3	2	2	3	2	2	3	1	1	2
Average	3	2	2	2	2	2	3	1	1	3

Strong – 3   Medium – 2   Low – 1