THE NATIONAL INSTITUTE OF ENGINEERING MYSURU – 570 008
(Autonomous Institution under VTU)

Master of Computer Applications

Scheme

and

Blown up Syllabus

I – IV Semester MCA
(2 years Scheme)

(2021 – 2023)

Department of MCA
The National Institute of Engineering,
Manandavadi Road, Mysore – 570008.

Department of Master of Computer Applications

MISSION OF THE INSTITUTION

- To impart state-of-the-art engineering education through strong theoretical foundations and practical training to students in their choice of specialization.
- To create new knowledge through innovation and cutting-edge research in science and engineering.
- To provide a platform for inclusiveness and collaboration by following ethical and responsible engineering practices for long-term interaction with academia and industry.
- To encourage entrepreneurship and to develop sustainable technologies for the benefit of global society.

VISION OF THE INSTITUTION

- "MCA will be an outstanding department contributing significantly to teaching, research and consultancy, through well-equipped laboratories and well-trained staff to meet global challenges in the field of computer engineering & applications"

MISSION OF THE PROGRAM

- To impart quality technical education and provide skills in Computer Application through best of practices.
- To produce graduates who can contribute professionally to the society and widely as IT professionals or entrepreneurs.

GRADUATE ATTRIBUTES

1. **Computational Knowledge:**
   Apply knowledge of computing fundamentals, computing specialization, mathematics, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.
2. **Problem Analysis:**
   Identify, formulate, research literature, and solve complex computing problems reaching substantiated conclusions using fundamental principles of Mathematics, Computing Sciences and relevant domain disciplines.
3. **Design / Development of solutions:**
   Design and evaluate solutions for complex computing problems and evaluate systems, components or processes that meet specified needs with appropriate considerations for public health and safety, cultural societal and environmental considerations.
4. **Conduct Investigations of complex computing problems:**
   Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.
5. **Modern Tool Usage:**
   Create, select**,** adopt, and apply appropriate techniques, resources and modern computing tools to complex computing activities with an understanding of the limitations.
6. **Professional Ethics:**
   Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice.
7. **Lifelong Learning:**
   Recognize the need and have the ability to engage in independent learning for continual development as a Computing Professional.
8. **Project Management and Finance:**
   Demonstrate knowledge and understanding of the computing and management principles and apply these to once own work as a member and leader in a team to manage projects and in multidisciplinary environments.
9. **Communication Ecacy:**
   Communicate effectively with the computing community and society at large about complex computing activities by being able to comprehend and write effective reports and design documentation, make elective presentations and give and understand clear instructions.
10. **Societal and environmental concern:**
    Understand and assess societal, environmental, health safety, legal and cultural issues within local and global contexts and consequential responsibilities relevant to professional computing practice.

11. **Individual and Teamwork**

    Function effectively as an individual and as a member or leader in diverse teams in multi-disciplinary environments.

12. **Innovation and entrepreneurship**:

    Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

PROGRAM EDUCATIONAL OBJECTIVES

The Department will produce graduates who

PEO1 : Work productively as IT professional both at supportive and leadership roles.

PEO2 : Advance Successfully in their chosen career path utilizing technical abilities, leadership qualities, communication, and interpersonal skills with high regard to legal and ethical responsibilities.

PEO3 : Build their profession adopting to the changes in the technology with lifelong learning.

PROGRAM SPECIFIC OUTCOMES

PSO1 : MCA graduates will be able to understand and analyze computer systems, focused with hardware, software, and application needs.

PSO2 : Develop software and hardware systems/solutions, with a knowledge of software design life cycle process and skills with a broad range of programming tools and platforms.

PROGRAM OUTCOMES

Graduates will have an

PO1 **:** Ability to apply knowledge of mathematics, computer science and domain knowledge to solve problems in the computational world.

PO2 **:** Ability to analyze real world/scientific problems and convert them to computable algorithm.

PO3 **:** Ability to evaluate, analyze and use available technological solutions to design and implement the same.

PO4 : Ability to work with complex computing problem environment, use knowledge both technical and research to provide valid conclusions of experiments based on analysis and interpretation of data.

PO5 **:** Ability to use/evaluate the various software tools and networking requirements for solutions.

PO6 **:** Ability to adhere to the professional ethics, follow cyber rules and regulations and be a responsible citizen.

PO7 **:** Ability to be a lifelong learner in the field of computer science.

PO8 **:** Ability to demonstrate the knowledge and understanding hardware, software, networking and Finance requirements for the Society

PO9 : Ability to communicate effectively with the fellow members and also with other uses of the computing community and society.

PO10 : Ability to experience the industrial environment for understanding the impact of computational solutions in a global and societal context.

PO11 **:** Ability to function effectively as an individual and also work collaboratively in ateam.

PO12 **:** Ability to become leaders, entrepreneurs, and provide solutions to complex problems in life.

Suggested Plan of Study for Regular Students

Student has to earn 100 credits to get the degree of MCA

Semester	Credits
First semester	25
Second semester	25
Third semester	26
Fourth semester	24
Total Credits	100

Scheme

SEMESTER I

CourseCode	Course	Teaching Hours/week			Credits
		L	T	P	
2MFC1C01	Mathematical Foundation for Computer Application	3	0	0	3
2MCA1N01	Basics of Programming Concepts	3	0	0	0
2MCA1C01	Operating System	4	0	0	4
2MCA1C04	Data Structures with C	4	0	0	4
2MCA1C07	Web Technologies	3	0	0	3
2MCA1C08	Introduction to UNIX	3	0	2	4
2MCA1C09	Computer Organization and Architecture	4	0	0	4
2MCA1L01	Data Structures Lab	0	0	3	1.5
2MCA1L02	Web Technologies Lab	0	0	3	1.5
	Total	**24**	**0**	**8**	**25**

SEMESTER II

Course Code	Course	Teaching Hours/week			Credits
		L	T	P	
2MCA2C02	Computer Networks	4	0	0	4
2MCA2C03	Analysis and Design of Algorithms	3	2	0	4
2MCA2C05	Database Management Systems	3	0	0	3
2MCA2C06	Object Oriented Programming with Java	4	0	0	4
2MCA2E1XX	Elective –I	3	0	0	3
2MCA2E2XX	Elective –II	3	0	0	3
2MCA2L01	Java Programming Lab	0	0	3	1.5
2MCA2L03	DBMS Lab with Mini Project	0	0	3	1.5
2MCA2L04	Computer Networks Lab	0	0	2	1
	Total	**20**	**2**	**8**	**25**

Elective Group I

Course Code	Subjects	L	T	P	Credits
2MCA2E101	Cyber Security	3	0	0	3
2MCA2E102	Data Mining and Business Intelligence	3	0	0	3
2MCA2E103	Enterprise Resource Planning	3	0	0	3
2MCA2E104	Introduction to Artificial Intelligence	3	0	0	3

Elective Group II

Course Code	Subjects	L	T	P	Credits
2MCA2E201	Cryptography and Network Security	3	0	0	3
2MCA2E202	User Interface Design	3	0	0	3
2MCA2E203	Supply Chain Management	3	0	0	3
2MCA2E204	Distributed Operating Systems	3	0	0	3

SEMESTER III

Course Code	Course	Teaching Hours/week			Credits
		L	T	P	
2MCA3C02	C# and .NET	3	0	0	3
2MCA3C04	Internet-of-Things	3	2	0	4
2MCA3C06	Mobile Application Programming	3	0	0	3
2MCA3C07	Software Engineering	3	2	0	4
2MCA3C08	Data Analytics with Python	3	0	0	3
2MCA3E3XX	Elective –III	3	0	0	3
2MCA3E4XX	Elective –IV	3	0	0	3
2MCA3L01	Data Analytics with Python Lab	0	0	3	1.5
2MCA3L02	C# and .Net Lab	0	0	3	1.5
	Total	**21**	**4**	**6**	**26**

Elective Group III

Course Code	Subjects	L	T	P	Credits
2MCA3E301	Block Chain Technology	3	0	0	3
2MCA3E302	Digital Marketing	3	0	0	3
2MCA3E303	Software Testing	3	0	0	3
2MCA3E304	Cloud Computing	3	0	0	3

Elective Group IV

Course Code	Subjects	L	T	P	Credits
2MCA3E401	Multimedia Systems	3	0	0	3
2MCA3E402	Introduction to Machine Learning	3	0	0	3
2MCA3E403	Digital Image Processing	3	0	0	3
2MCA3E404	Soft Computing	3	0	0	3

SEMESTER IV

CourseCode	Course	Teaching Hours/week			Credits
		L	T	P	
2MCA4MXX	MOOC Elective	-	-	-	2
2MCA4C02	Industry Internship (4 Weeks)	-	-	-	2
2MCA4C03	Major Project (16 weeks)	-	-	-	20
	Total				**24**

MOOC ELECTIVE(Tentative)

CourseCode	Course	Teaching Hours/week			Credits
		L	T	P	
2MCA4M01	Introduction to Research	2	0	0	2
2MCA4M02	Big Data Computing	2	0	0	2
2MCA4M03	Data Mining	2	0	0	2
2MCA4M04	Cloud Computing and Distributed System	2	0	0	2

Guidelines for Internship:

- Individual student must carry out Internship training at industry. Student shall submit a detailed report on internship work (15 to 20 Pages) in a format as specified by the department. Internal guide and industry personnel will evaluate the student performance for 50 Marks. By taking demonstration and presentation of the work carried during internship.

- Internship to be carried out during 3rd Semester vacation only

Guidelines for Major Project:

Individual student, one project per student, must carry out major project. Student must submit a Detailed Project Report (60 to 80 Pages) in a format as specified by the department.Internal guides will evaluate the performance (Continuous Internal Evaluation) for 50 Marks. The Report will be evaluated for 100 marks by both internal and external evaluators.Internal and external examiners for 100 marks will evaluate final viva-voce which includes demonstration and presentation of project work jointly.

Guidelines for MOOC Elective:

- Students can register for MOOC Elective anytime during 2nd /3rd Semester and credit transfer happens only during 4th Semester after submission of this Certificate.
- Students can opt for any one course either from odd semester or from even semester as offered by NPTEL in the respective semester. The subject will be approved by DC.
- The list of SWAYAM based online credit courses for the ensuing semester shall be notified on the SWAYAM platform before the 1st November for the January semester and before the 1st June for the July semester, every year.
- The Department Co-Ordinator shall incorporate the marks or grades obtained by the student in the marks sheet that counts for final processing of the equivalent grading as per the regulation for the PG Programme. Details are shown in the following tables

MOOC Course Duration	**Credit Details**
8 Weeks	2

Guidelines for Equivalent Grading for PG programme:

Levels	**Outstanding**	**Excellent**	**Very Good**	**Good**	**Above Average**	**Poor**	**Fail**
Score/ Marks in MOOC Course	(90-100)	(80-89)	(70-79)	(60-69)	(55-59)	(50-54)	(0-49)
Grade Point	10	09	08	07	06	04	0
Grade	S	A	B	C	D	E	F

I Semester

Mathematical Foundation For Computer Applications (3:0:0)

Sub Code : 2MFC1C01 **CIE : 50%**
Hrs/Week : 03 **SEE : 50%**
SEE Hrs : 03 **Max. Marks : 100**

Course Outcome: On successful completion of the course the students will be able to

1. Solve problems using operation on sets, Inclusion - Exclusion principles and problems on basic probability.
2. Construct the matrix, digraphs of relations, Identify different types relations, functions, compute composition and inverse of a function and solve recurrence relations.
3. Operate elementary transformations on matrices to solve system of linear equations, compute eigen values, eigen vectors and diagonalise a square matrix.
4. Solve problems associated with discrete probability distributions and compute different measures of central tendency and dispersion for a given data.
5. Estimate the truth value of the propositions, Define and explain the basic concepts of graph theory and its applications and construct minimal spanning tree.

MODULE 1
Set Theory and Probability
Sets and Subsets, Set Operations and the Laws of Set Theory, Counting and Venn Diagrams. Set theory approach to basic probability- Addition and Multiplication theorem-problems

Self-Learning Exercise: *Conditional probability*

MODULE 2
Relations , functions and Recurrence relations
Binary relations, Matrix and Digraph representation of a relation, Operations on binary relations, Properties of relations, Equivalence relations. First order linear recurrence relation. The second order linear homogeneous recurrence relation with constant coefficients. Types of functions, composition of functions, Inverse of a function.

Self-Learning Exercise: *Counting functions.*

MODULE 3
Basic linear algebra
Elementary transformations of a matrix. Rank of a matrix by elementary row transformations, Consistency of a system of linear non homogeneous algebraic equations. Eigen values and Eigen vectors of a square matrix, Diagonalisation of a square matrix of order 2

Self-Learning Exercise: *Gauss elimination method, Gauss Jordan method*

MODULE 4
Probability and Statistics
Random variables – Discrete random variables, Binomial and Poisson Distributions. Measures of central tendency- mean, median for grouped data, Measures of dispersion, Mean deviation and Standard deviation. Simple application problems

Self-Learning Exercise: *Mode*

MODULE 5

Formal Logic and Graph Theory

Basics of propositional logic with truth table, logical equivalence, laws of logic, Graphs, Subgraphs, Isomorphic graphs, Walk, Path, Cycle and Circuits in a graph. Connected graphs. Euler's and Hamiltonian graphs (Definitions and simple problems), Trees, Minimal Spanning Tree, Kruskal's algorithm.

Self-Learning Exercise: Planar Graphs

Reference Books

1. Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th Edition, Tata McGraw Hill Publications, 2003.
2. Discrete Mathematics with Graph Theory, Edgar G Goodaire, and Michael M Paramenter, 3rd Edition, Pearson Education, 2002.
3. Discrete Mathematics, Semyour Lipschutz, Marc Lipson, 3nd Edition, Tata McGraw-Hill, 2006.
4. Discrete Mathematical Structures: Bernad Kolman, Robert C Busby, 6th Edition, Pearson Education, 2000.
5. Graph Theory with Applications to Engineering and Computer Science – Narsingh Deo, Prentice – Hall of India Pvt Ltd New Delhi, 1999

Basics of Programming Concepts (3:0:0)

Sub Code :2MCA1N01 **CIE : 50%**
Hrs/Week : 03 **SEE : 50%**
SEE Hrs : 03 **Max. Marks : 100**

Course Outcome: On successful completion of the course the students will be able to

1 Understand the salient features of C programming language.
2 Understand the salient features of C++ programming language.
3 Identify and compare the differences between C and C++ programming languages.
4 Exemplify the Object-Oriented pillars of C++.

MODULE 1 **8 Hours**

Introduction to C Language

Decision making with if statement, simple if statement, the if..else statement, nesting of if..else statements, the else..if ladder, the switch statement, the ?: operator, the goto statement, the break statement, programming examples. The while statement, the do...while statement, the for statement, nested loops, jumps in loops, the continue statement, programming examples. one dimensional and two dimensional arrays, declaration and initialization of arrays, reading , writing and manipulation of above types of arrays, structures.

Self-Learning Exercise: *Exercises on different conditional statements.*

MODULE 2 **8 Hours**

Introduction to C++

Class Specification, Class Objects, access members,defining member functions, data hiding, constructors, destructors, parameterized constructors, static data members, static member functions, scope resolution operator, Passing Objects to Functions, Returning Objects, ObjectAssignment.
Pointers, Pointer as function arguments, Dynamic Allocation Operators new and delete, Initializing Allocated Memory, Allocating Arrays, Allocating Objects

Self-Learning Exercise: *Exercises on constructors and destructor.*

MODULE 3 **8 Hours**

Pillars of Object-Oriented Programming

Functions and Operator overloading, Constructors, Inheritance, Polymorphism , Examples

Self-Learning Exercise: *Various examples*

MODULE 4 **8 Hours**

Standard C++ I/O classes

Old vs. Modern C++ I/O, C++ Streams, The C++ Stream, Classes, C++'s Predefined Streams, Formatted I/O, Formatting Using the ios Members, Setting the Format Flags, Clearing Format Flags, Overloading << and >>, manipulators.
Self-Learning Exercise: *Exercises on I/O formatting*

MODULE 5 **8 Hours**

Exception Handling and Templates

Exception Handling, Fundamentals, Catching Class Types, Using Multiple catch Statements, Handling Derived- Class Exceptions, Exception Handling Options, Catching

All Exceptions, Restricting Exceptions, Rethrowing an Exception, Understanding terminate( ) and unexpected( ), uncaught_exception( ) Function, The exception and bad_exception Classes, Applying Exception Handling.
Templates: Introduction, Generic functions, Generic classes, examples.

Self-Learning Exercise: *User defined exceptions*

Text books

1. C The Complete reference, Herbert Schildt, 4th edition, McGraw Hill Publications

2. The C++ Complete reference, Herbert Schildt, 4th edition, McGraw Hill Publications, 2014

Reference Books

1. C++ for Everyone, Cay S Horstmann, John Wiley & Sons, 2012 Edition

2. Object Oriented Programming with C++, E. Balguruswamy, Tata McGrawHill

Operating Systems (4:0:0)

Sub Code : 2MCA1C01 **CIE : 50%**
Hrs/Week : 04 **SEE : 50%**
SEE Hours : 3 Hrs **Max Marks : 100**

Pre-requisite: Nil

Course Outcomes:
On successful completion of the course, the students will be able to:

1. Describe the objectives and functions of modern operating systems.
2. Compare the different types of the process scheduling, and scheduling algorithms
3. Analyze the synchronization and deadlock prevention algorithms
4. Distinguish different types of memory management schemes.
5. Analyze the memory management schemes and disk space management..
6. Compare the different types of protection of the files in OS and Linux operating system with the general operating system.

MODULE 1
Introduction to Operating Systems, System structures
What operating systems do; Computer System architecture; Operating System structure; Protection and security; Distributed system; Special-purpose systems; Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating System design and implementation; Operating System generation;
Self Learning Component: Computer System organization; System boot,Virtual machines

MODULE 2
Process Management
Process concept; Process scheduling; Operations on processes; Inter-process communication. Multi-Threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling criteria; Scheduling algorithms; Multiple-Processor scheduling;
Self Learning Component: Multiple-Processor scheduling;Thread scheduling

MODULE 3
Process Synchronization
Synchronization: The Critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; **Deadlocks:** System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection.
Self Learning Component: recovery from deadlock

MODULE 4

Memory Management Memory Management Strategies: Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation. Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement;

Self Learning Component: Thrashing,Allocation of frames;

MODULE 5

File System, Implementation of File System File System: Directory structure; File system mounting; File sharing; Protection. Implementing File System: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management.

Secondary Storage Structures, Protection: Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management. File concept; Access methods

Self Learning Component:; Revocation of access rights, Capability-Based systems

MODULE 6

Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control

Case Study: The Linux Operating System Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory management, Input and output;.

Self Learning Component: Inter-process communication,File systems

TEXT BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin , Greg Gagne: Operating System Principles, 9th edition, Wiley-India, 2013.

REFERENCE BOOKS:

1. D.M Dhamdhere: Operating systems - A concept based Approach, 2nd Edition, Tata McGraw- Hill,
2002.
2. P.C.P. Bhatt: Operating Systems, 2nd Edition, PHI, 2006.

Data Structures with C (4:0:0)

Sub Code : 2MCA1C04 **CIE : 50%**
Hrs/Week : 04 **SEE : 50%**
SEE Hrs : 03 **Max. Marks : 100**

Course Outcome: On successful competition of the course the students will be able to

1 Identification of specific data structure for a given problem.
2 Implement and apply the stack as a data structure.
3 Design and implement the queue as a data structure.
4 Employ and understand the use of linked lists.
5 Understand and develop tree and graphs as a data structure.
6 Demonstrate different sorting and searching techniques.

MODULE 1 **8 Hours**

Introduction to Data Structures
Information and its meaning: Abstract Data Types, Sequences as Value Definitions, ADT for Varying-length Character Strings, Pointers in C, Data Structures and C: the Array as an ADT, Character Strings in C, Character String Operations. Structures in C: Implementing Structures, Unions, Structure Parameters, Allocation of Storage and Scope of Variables, Dynamic Memory Allocation and Cancellation in C

Self-Learning Exercise: Data Types in C, Arrays in C

MODULE 2 **10 Hours**

The Stack
Definition and examples, Primitive operations, Example, The stack as an ADT, Representing stacks in C, Implementing the pop operation, Testing for exceptional conditions, Implementing the push operation, Examples for infix, postfix, and prefix expressions, Basic definition and examples, Program to evaluate a postfix expression, Converting an expression from infix to postfix, Program to convert an expression from infix to postfix

Self-Learning Exercise: Implementing exceptional conditions of stack in C

MODULE 3 **8 Hours**

Recursion and Queues
Recursion: Recursive definition and processes, Factorial function, Multiplication of two natural numbers, Fibonacci sequence, Binary search. Recursion in C: Factorial in C, Fibonacci numbers in C, Binary search in C, Towers of Hanoi problem. Queues: The queue and its sequential representation, The queue as ADT, C implementation of queues, Insert operation, Priority queue, and Array implementation of a priority queue.

Self-Learning Exercise: Implementing exceptional conditions of stack in C

MODULE 4 **10 Hours**

Lists

Linked lists, Inserting and removing nodes from a list, getnode and freenode operations, Linked implementation of queues, Linked list as a data structure, primitive list operations, other list operations, Header nodes, Lists in C, Allocating and freeing dynamic variables, Linked lists using dynamic variables, Non-integer and Non-homogeneous lists, Primitive operations on circular lists, doubly linked lists, primitive list operations, other list operations.

Self-Learning Exercise: Linked implementation of stacks and Queues

MODULE 5 **8 Hours**

Trees and Graphs

Trees Binary trees, Operations on binary trees, Applications of binary trees, Binary tree representation, Node representation of binary tree, Internal and external nodes, Implicit array representation of binary trees, Choosing a binary tree representation, Binary tree traversal in C. Graphs Definitions, Application of graphs, C representation of graphs, Traversal methods for graph: Depth first traversal, Breadth first traversal

Self-Learning Exercise: Applications of Depth first traversal

MODULE 6 **8 Hours**

Sorting and Searching

Sorting: Exchange Sorts: Bubble Sort, Quick Sort, Tree Sorting: Binary Tree Sort, Heap Sort, Insertion Sorts: Simple Insertion, Address Calculation Sort, Merge Sort and Radix Sort; Searching: Searching an ordered table, Indexed sequential search, Binary search, Interpolation search, Tree searching: Binary Search Tree, Hashing: Resolving hash clashes by open addressing, Choosing a hash function.

Self-Learning Exercise: Selection Sort, Sequential Search

Textbooks

1. Data Structures using C and C++ by YedidyahLangsam and Moshe J. Augenstein and Aaron M Tenanbaum, 2nd Edition, Pearson Education Asia, 2002.

Reference Books

1. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, 2nd Edition, Pearson Education Asia, 1997.
2. Data Structures - A Pseudocode Approach with C, Richard F Giberg and Behrouz A Forouzan, 3rd Reprint, Thomson Course Technology, 2005.

Web Technologies (3:0:0)

Sub Code : 2MCA1C07 **CIE : 50%**
Hrs/Week : 03 **SEE : 50%**
SEE Hrs : 03 **Max. Marks :100**

Course Outcome: On successful completion of the course the students will be able to

1. Remember and recall the basics of Internet
2. Experiment with the power of XHTML/HTML, CSS and JavaScript and also develop applications using the same.
3. Analyze and examine how dynamic web applications can be designed and developed using Java script and HTML.
4. Demonstrate applications of JQuery for the given problem
5. Demonstrate applications of Angular JS

MODULE 1 **8 Hours**

Fundamentals and Introduction to HTML/XHTML

Brief introduction to the internet, WWW, Web Browsers, and Web Servers; URLs; MIME;HTTP; Security; The Web Programmers Toolbox. **Introduction to HTML/XHTML**: Origins and evolutionof HTML and XHTML; Basic syntax; Standard HTML document structure; Basic text markup; Images; Hypertext Links; Lists; Tables; Forms.

Self-Learning Exercise: *Syntactic differences between HTML and XHTML.*

MODULE 2 **8 Hours**

CSS Introduction

CSS Introduction; Levels of style sheets; Style specification formats; Selector forms; Property value forms; Font properties; List properties; Color; Alignment of text; The Box model; **Javascript** Overview of Javascript; Object orientation and Javascript; General syntactic characteristics; Primitives, operations, and expressions; Screen output and keyboard input; Control statements; Object creation and modification; Arrays; Functions; Constructor;

Self-Learning Exercise: *Background images; The and tags; Conflict resolution, Pattern matching using regular expressions.*

MODULE 3 **8 Hours**

JavaScript

JavaScript and HTML Documents, Dynamic Documents with Javascript The Javascript execution environment; The Document Object Model; Element access in Javascript; Events and event handling; Handling events from the Body elements, Button elements, Text box and Password elements; **Dynamic documents** Positioning elements; Moving elements; Element visibility; Locating the mouse cursor; Reacting to a mouse click

Self-Learning Exercise: *The DOM 2 event model, Changing colors and fonts.*

MODULE 4 **8 Hours**

Introduction to JQuery

Introduction to JQuery, Syntax, selectors, events, JQuery HTML, JQuery CSS.

Self-Learning Exercise: *JQuery Effects*

MODULE 5 **8 Hours**

Introduction to Angular JS

Introduction to Angular JS, Directives, Expressions, Directives, Controllers, Filters, Services, Events, Forms, Examples.

Self-Learning Exercise: *Validations.*

Text Books

1. Robert W. Sebesta: Programming the World Wide Web, Pearson Education-Seventh Edition
2. HTML5 Black Book by Dreamtech
3. Angular JS By Krishna Rungta
4. JQuery for Beginners by Tam Sel

Reference Books

1. Web Programming By Chris Bates , Wiley Publications
2. Robin Nixon, “Learning PHP, MySQL &JavaScript with jQuery, CSS and HTML5”, 4thEdition, O’Reilly Publications, 2015. (ISBN:978-9352130153)
3. Zak Ruvalcaba Anne Boehm, “Murach's HTML5 and CSS3”, 3rdEdition, Murachs/Shroff Publishers & Distributors Pvt Ltd, 2016. (ISBN:978-9352133246)

Introduction to UNIX(3:0:2)

Sub Code : 2MCA1C08 **CIE : 50%**
Hrs/Week : 05 **SEE : 50%**
SEE Hrs : 03 **Max. Marks : 100**

Course Outcome: On successful completion of the course the students will be able to

1. Understand and experience the UNIX environment, File system and hierarchy
2. Demonstrate commands to extract, interpret data for further processing.
3. Analyse the usage of different shell commands, variables to know better about the environment and processes running
4. Apply commands to perform different tasks on various applications
5. Evaluate different commands with sample shell scripts

MODULE 1 **8 Hours**

An Introduction to UNIX
History, Features of Unix, Architecture, Experience the Unix environment, Command arguments and options, Familiar with Basic UNIX commands ls, cat, cal, date, calendar, who, printf, tty, sty, uname, passwd, echo, tput, bc, script, spell and ispell, knowing the type of a command and locating it: The type command, the root login. Becoming the super user: su command.
UNIX File System: The file, what's in a filename? The parent-child relationship, The home directory and the HOME variable, Directory commands – pwd, cd, mkdir, rmdir commands,absolute pathnames, using absolute pathnames for a command, Relative pathnames, File related commands : cat, mv, rm, cp, wc and od commands

Self-Learning Exercise: Internal and external commands, Unix File System

MODULE 2 **8 Hours**

Basic File Attributes
ls – l, the –d option, File ownership &Permissions, chmod, chown, chgrp,Security and File Permission, users and groups, security level, changing file permission, directory permission, changing ownership and group, File Attributes, More file attributes, hard link, symbolic link, find.
The shells interpretive cycle:Pattern matching - Wild cards. Removing the special meanings of wild cards. Escaping & quoting, Three standard files and redirection. 2 special files, pipes, tee, command substitution, shell variable

Self-Learning Exercise: umask, vi editor basics

MODULE 3 **8 Hours**

Process and System Administration
Process basics, ps, system processes, mechanism of process creation, internal and external commands, running jobs in background, nice, at and batch, cron, time commands, Essential System Administration root, administrator's privileges, startup& shutdown, managing disk space, cpio, tar
Customizing the Environment : Environment Variables, profile, Aliases, Command History,set options

MODULE 4 **6 Hours**

Simple Filters:
pr, head, tail, cut, paste, sort, uniq, tr commands, pipe, Filters using Regular Expression : grep, Regular Expression, sed instruction, Line Addressing, Inserting and Changing Text, Context addressing, writing selected lines to a file, the – f option, Substitution

Self-Learning Exercise: egrep, Properties of Regular Expressions

MODULE 5 **10 Hours**

Introduction to Shell scripts& Advanced Shell Programming
Introduction to Shell Scripting, Shell Scripts, read, Command Line Arguments, Exit Status of a Command, The Logical Operators && and ||, exit, if, using test and [] to evaluate expressions, case conditional, expr, sleep and wait, while, until, for, $, @, The here << document, set and shift, trap, Sample Validation and Data Entry Scripts
A**dvanced Shell Programming** interface with the Shell, Control Flow. The sh command, export, cd, the **.** Command, expr, Conditional Parameter Substitution, Merging Streams, Shell Functions
Self-Learning Exercise: eval, exec Statement

List of Programs

1. Entering commands.

   1a. Working with Common Commands for Files and Directories
2. Commands to Search File
3. Commands about Listing Files
4. Working with Permission Commands
5. Commands to edit with vi Editor
6. Commands to find Patterns in Files
7. Commands to Compress and Pack Files
8. Commands to Counting Lines, words and File Size
9. Commands to Working with Columns and Fields
10. Commands to Sort the Contents of Files

    10a. Comparing Files
11. Commands to Edit and Format Files
12. Commans to Work with Dates and Times
13. Write a Shell Script that copies multiple files to a directory
14. Write a Shell Script (small calculator) that adds, subtracts, multiplies and divides the given two integers
15. Write a Shell script to read command line arguments, to execute logical operators

,if, while and to evaluate expressions

Textbooks

1. Your UNIX-The Ultimate Guide, Third edition, Sumitabha Das, Tata McGrawHill

Reference Books

1. UNIX: Concepts and Applications, Sumitabha Das, Tata McGrawHill
2. "Beginning Shell Scripting", Eric Foster-Johnson, JohnCWelch,MicahAnderson, Wroxpublication
3. "Unix Shell Programming", YashwantKanetkar

Computer Organization And Architecture (4:0:0)

Sub Code : 2MCA1C09 **CIE : 50%**
Hrs/Week : 04 **SEE : 50%**
SEE Hrs : 03 **Max. Marks : 100**

Course Outcome: On successful competition of the course the students will be able to

1. Understand the basics of computer structure and machine instructions
2. Understand the different ways of communicating with I/O Devices and Interfaces
3. Describe different kinds of memory and their hierarchy
4. Analyze the working of arithmetic operations
5. Understand the basic processing unit and its organization

MODULE 1 **10 Hours**

Basic Structure of Computers and Machine Instructions

Basic Structure of Computer: Computer Types, Functional Units, Basic Operational Concepts, Bus Structures, Software, Performance, Multiprocessing and Multicomputer; **Machine Instructions:** Memory Locations and Addresses, Instructions, and Instruction Sequencing, Addressing modes, Basic Input / Output Operations, Subroutines, Additional Instructions

Self-Learning Exercise: *Numbers, Arithmetic Operations, and characters*

MODULE 2 **8 Hours**

Input / Output Organization

Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Controlling Device Requests, Use of Interrupts in Operating Systems, Direct Memory Access, Buses, Interface Circuits: Parallel Port, Serial Port, Standard I/O Interfaces: PCI Bus, SCSI Bus, Universal Serial Bus

Self-Learning Exercise: *Exceptions*

MODULE 3 **8 Hours**

The Memory System

Some Basic Concepts, Semiconductor RAM memories, Read-Only Memories, Speed, Size and Cost, Cache Memories: Mapping functions, Replacement Algorithms, Virtual memories, Memory Management Requirements, Hardwired Control

Self-Learning Exercise: *Secondary Storage*

MODULE 4 **8 Hours**

Arithmetic

Addition and Subtraction of Signed Numbers, Design of Fast adders, Multiplication of Positive Numbers, Signed-Operand Multiplication, Fast Multiplication: Bit-Pair Recoding of Multipliers, Carry-Save Addition of Summands, Integer Division

Self-Learning Exercise: *Floating-Point Numbers and Operations*

MODULE 5 **8 Hours**

Basic Processing Unit

Basic Fundamental Concepts: Register Transfer, performing an arithmetic or logic operation, fetching word from Memory, Storing word in Memory, Execution of a Complete Instruction: Branch Instructions, Multiple-Bus Organization, Hardwired Control

Self-Learning Exercise: *Micro Instructions*

MODULE 6 **10 Hours**

Pipelining

Basic Concepts, Data Hazards: Operand Forwarding, Handling data hazards in software, side effects, Instruction Hazards: Unconditional Branches, Conditional Branches and Branch Prediction, Influence on Instruction Sets: addressing modes, condition codes, Superscalar Operation: Out-of-Order Execution, Execution Completion

Self-Learning Exercise: Dispatch Operation

Text books

1 Computer Organization, Carl Hamacher, Z Varnesic and S Zaky, 5th Edition, McGraw Hill, 2002.

Reference Books

1. Computer Organization and Architecture: Designing for performance, William Stallings, 9th Edition, Pearson Education Asia, 2014.
2. Computer Organization: Andrew S Thanenbaum, 6th Edition, PHI

Data Structures Laboratory (0:0:3)

Sub Code : 2MCA1L01 **CIE : 25 Marks**
Hrs/Week : 03 **SET : 25 Marks**
SEE Hrs : 03 **Max. Marks :50**

Course Outcome: On successful competition of the course the students will be able to

1. Design and employ appropriate data structures for solving computing problems
2. Propose a set of data structures and algorithms as an abstract data type

Programs on Pointers, Structures, Union, Stack and its applications, Queues, Dynamic Lists and its operations, Trees, Sorting: Quick sort, Insertion sort, Heap Sort, Merge Sort, BST Sort, Searching: Linear search, Binary search, Binary Search Tree search

Textbooks

1. Data Structures using C and C++ by YedidyahLangsam and Moshe J. Augenstein and Aaron M Tenanbaum, 2nd Edition, Pearson Education Asia, 2002

Reference Books

1. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, 2nd Edition, Pearson Education Asia, 1997.
2. Data Structures - A Pseudocode Approach with C, Richard F Giberg and Behrouz A Forouzan, 3rd Reprint, Thomson Course Technology, 2005.

Web Technologies Laboratory(0:0:3)

Sub Code : 2MCA1L02 **CIE : 25 Marks**
Hrs/Week : 03 **SET : 25 Marks**
SEE Hrs : 03 **Max. Marks :50**

Course Outcome:

On successful completion of the course the students will be able to:

1. Learn the usage of XHTML/HTML, design and implement simple applications, Demonstrate the development of HTML documents using JavaScript and CSS

2. Demonstrate applications of JQuery and Angular JS for the given problem

Programs on XHTML/HTML, Programs on usage of CSS with HTML, Programs on usage of Javascript for client side and demonstrating dynamic document concepts, Demonstrating application of JQuery and Angular JS for the given problem.

Text books

1. Robert W. Sebesta: Programming the World Wide Web, Pearson Education

2. HTML5 Black Book by Dreamtech

3. Angular JS By Krishna Rungta

Reference Books

1. Web Programming By Chris Bates , Wiley Publications

2. Robin Nixon, “Learning PHP, MySQL &JavaScript with jQuery, CSS and HTML5”, 4thEdition, O’Reilly Publications, 2015. (ISBN:978-9352130153)

3. Zak Ruvalcaba Anne Boehm, “Murach's HTML5 and CSS3”, 3rdEdition, Murachs/Shroff Publishers & Distributors Pvt Ltd, 2016. (ISBN:978-9352133246)

II Semester

Computer Networks (4:0:0)

Sub Code : 2MCA2C02 **CIE : 50%**
Hrs/Week : 04 **SEE : 50%**
SEE Hrs : 03 **Max. Marks : 100**

Course Outcomes
On successful completion of the course, the students will be able to:

1. List the different types of network architecture with their layers and functions.
2. Compare different types of encoding techniques and error detection techniques
3. Analyze different types of packet forwarding, routing techniques with their algorithms.
4. Understand internetworking.
5. Distinguish when to use UDP and TCP protocols and the applications of different type of application layer protocols.
6. Discuss the different applications of computer network.

MODULE 1

Foundation **10 Hours**

Building a Network Applications, class of application, Requirements, Network Architecture, layering and protocols, Internet architecture, Performance, Bandwidth and latency, Delay X bandwidth product.

Self Learning Exercise: High speed networks.

MODULE 2

Direct Link Networks **8 Hours**

Perspective on connection classes of Links, Encoding; Error detection Two dimensional parity, Internet ckecksum algorithm, CRC, Reliable transmission, Stop-and-wait,Slinding window, Ethernet (802.3), Physical properties, Experience with Ethernet;

Self Learning Exercise: Wireless (802.15.1, 802.11, 802.16, Cell Phone Technologies).

MODULE 3 **8 Hours**

Packet Switching Switching and bridging, datagrams, Virtual private switching, Bridges, basic internetworking ,Service model, Global address, Datagram forwarding in IP, Subnetting and classless Addressing,.
Self Learning Exercise: Source routing, LAN Switches.

MODULE 4

Internetworking **8 Hours**

ARP, ICMP, Routing, Network as a graph, Distance vector, Link state, Global Internet, Routing areas, Interdomain routing, IPV6.

Self Learning Exercise: DHCP**,** ARP in ATM, CIDR.

MODULE 5 **8 Hours**

End –to-End Protocols; Resource Allocation Issues
Simple de-multiplexer (UDP); Reliable byte stream (TCP), Segment Format, Connection establishment and termination, Issues in resource allocation.

Self Learning Exercise: End-to-end Issues

MODULE 6 **10 Hours**

Applications
Traditional applications, Multimedia applications,

Self Learning Exercise: Infrastructure services.

Text Books:

1. Larry L. Peterson and Bruce S. David: Computer Networks – A Systems Approach, 5th Edition, Elsevier, 2012.

References:
1. Behrouz A. Forouzan: Data Communications and Networking, 4th Edition, Tata McGraw-Hill, 2006.
2. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.
3. Alberto Leon-Garcia and IndraWidjaja: Communication Networks –Fundamental Concepts and Key architectures, 2nd Edition Tata McGraw-Hill, 2004.

Analysis and Design of Algorithms (3:2:0)

Sub Code : 2MCA2C03 **CIE : 50%**
Hrs/Week : 05 **SEE : 50%**
SEE Hrs : 03 **Max. Marks : 100**

Course Outcome: On successful completion of the course the students will be able to

1. Analyze Recursive and Non-recursive algorithms in terms of time and space complexities.
2. Understand and apply algorithm design techniques like Brute force and Divide-and-conquer to solve variety of problems.
3. Distinguish algorithm design strategies like Decrease-and-conquer and Transform-and-Conquer for effective problem solving and to negotiate space and time tradeoffs.
4. Implement dynamic programming and Greedy strategies to solve variety of problems.
5. Examine the limitations of algorithm power and choose suitable solutions like Backtracking and Branch-and-bound.

MODULE 1 **8 Hours**
Introduction
Introduction Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Fundamental data Structures Fundamentals of the Analysis of Algorithm Efficiency, Analysis Framework: Asymptotic Notations and Basic efficiency classes, Mathematical analysis of Recursive, Examples, Mathematical analysis of Non-recursive algorithms, Examples.

Self-Learning Exercise: *Important Problem Types.*

MODULE 2 **8 Hours**
Brute Force and Divide & Conquer
Selection Sort, Bubble Sort, Sequential Search and String Matching, Exhaustive Search, Merge sort, Quick sort, Binary Search, Binary tree Traversals and related properties, Stressen's Matrix Multiplication.

Self-Learning Exercise: *Multiplication of large integers.*

MODULE 3 **8 Hours**
Decrease-and-Conquer and Transform-and-Conquer, Space & Time Tradeoffs
Insertion Sort, Depth First and Breadth First Search, Topological sorting, Presorting, Balanced Search Trees, Heaps and Heap sort, Algorithms for Generating Combinatorial Objects, Problem Reduction, Sorting by Counting, Input Enhancement in String Matching.

Self-Learning Exercise: *Hashing*

MODULE 4 **8 Hours**
Dynamic Programming, Greedy Techniques and Limitations of Algorithm Power
Computing a binomial coefficient, Warshall's algorithm, Floyd's Algorithms, Knapsack Problem, Prim's Algorithm, Kruskal's Algorithm, Dijkstra's algorithm, Huffman Trees, Lower-Bound Arguments, Decision Trees, P, NP problems

Self-Learning Exercise: *NP-Complete Problems.*

MODULE 5 **8 Hours**

Coping with the Limitations of Algorithm Power. Backtracking, Branch & Bound
n-Queen problem, Assignment problem, Travelling Salesperson Problem.

Self-Learning Exercise: *Approximation Algorithm for NP Hard problems.*

Text books

1. Anany Levitin: Introduction to the Design and Analysis of Algorithms, Pearson Education, 2003.

Reference Books

1. Coremen T.H., Leiserson C.E., and Rivest R.L.: Introduction to Algorithms, PHI, 1998.
2. Horowitz E., Sahani S., Rajasekharan S.: Computer Algorithms, Galgotia Publications, 2001

Database Management System (3:0:0)

Sub Code :2MCA2C05 **CIE : 50%**
Hrs/Week : 03 **SEE : 50%**
SEE Hrs : 03 **Max. Marks :100**

Course Outcome: On successful competition of the course the students will be able to

1. Apply the basic concepts of database management in designing the database for the given problem.
2. Design entity-relationship diagrams to the given problem to develop database application with appropriate fields and validations.
3. Implement a database schema for a given problem domain.
4. Formulate SQL queries in Oracle to the give problem
5. Apply normalization techniques to improve the database design to the given problem
6. Build database for any given problem

Module-1 **10 Hours**

Characteristics of Database approach, Actors on the Scene, Workers behind the scene, Advantages of using DBMS approach, A Brief History of Database Applications, Data models, schemas and instances, Three-schema architecture and data independence, Database languages and interfaces, the database system environment, Centralized and client-server architectures.

Self-Learning Exercise: *Classification of Database Management systems.*

Module-2 **8 Hours**

Structure of Relational Databases, Database Schema, Keys, Relational Query Languages, Relational Operations. Entity-Relationship Model: Conceptual Database using high level conceptual data models for Database Design, A Sample Database Application, Entity types, Entity sets Attributes and Keys Relationship types.

Self-Learning Exercise: *Relationship Sets Functional Dependencies, Normal Forms based on Primary.*

Module-3 **8 Hours**

SQL data definition and data types, specifying constraints in SQL, basic retrieval queries in SQL, Insert, update and delete statements in SQL, aggregate functions in SQL.

Self-Learning Exercise: *Group by and having clauses.*

Module-4 **8 Hours**

Introduction to triggers in SQL, views in SQL, schema change statements in SQL.

Self-Learning Exercise: Stored procedures and functions

Module-5 **10 Hours**

Introduction to transaction processing, transaction and system concepts, desirable properties of transactions, transaction support in SQL. Concurrency control techniques: two-phase locking techniques, concurrency control based on timestamp ordering, multiversion concurrency control techniques, validation concurrency control techniques.

Self-Learning Exercise: *Database backup and recovery from catastrophic failures.*

Textbooks

2. Elmasri and Navathe: Fundamentals of Database Systems, 5tn Edition, Addison -WeSelf-Learning Exercisey, 2011.

3. Silberschatz, Korth and Sudharshan Data base System Concepts, 6tn Edition, Tata McGraw Hill, 2011.

Reference Books

3. C. J. Date. A. Kannan, S.Swamynatham: An Introduction to Database System 8th Edition,
4. Raghu Ramakrishnan and Johannes Gerhrke: Database Management System 3rd Edition, McGraw-Hill, 2003.

Object Oriented Programming with JAVA (4:0:0)

Sub Code : 2MCA2C06 **CIE : 50%**
Hrs/Week : 04 **SEE : 50%**
SEE Hrs : 03 **Max. Marks : 100**

Course Outcome: On successful competition of the course the students will be able to

1. Appraise Java Programming Fundamentals.
2. Explore and employ OOP concepts of Java for a given problem.
3. Choose and develop an appropriate Packages and Interfaces for a given problem.
4. Identify and employ multi-threaded programming and Handling exceptions.
5. Explore and apply Enumerations, Autoboxing and Generics
6. Design graphical user interfaces using applets/swings

MODULE 1 **8 Hours**

The Java Language and An Overview of Java

The Java Language, Java's Magic: The Bytecode, The Java Buzzwords, Java SE 8, The Three OOP Principles, A First Simple Program, Data Types, Variables and Arrays: A closer look at Literals, Type Conversion and Casting, Automatic Type Promotion in Expressions, Arrays, Operators: Arithmetic, Bitwise, Relational, Boolean, Logical, Assignment. ? Operators. Control Statements: Selection Statements, Iteration Statements, Jump Statements

Self-Learning Exercise: *Primitive Types, Variables*

MODULE 2 **8 Hours**

Introducing Classes

Class Fundamentals, Declaring Objects, Assigning Object References Variables, Introducing Methods, Constructors, The this keyword, Garbage Collections, The finalize( ) Method, Overloading Methods, Using Objects as Parameters, Returning Objects, Introducing Access Control, Understanding static, Introducing final, Arrays Revisited, Introducing Nested and Inner Classes, Exploring String Class, Using Command-Line Arguments

Self-Learning Exercise: *A closer look at Argument Passing, Recursion*

MODULE 3 **10 Hours**

Inheritance, Packages and Interfaces

Inheritance Basics, Using Super, Creating Multilevel Hierarchy, When Constructors are Executed, Method Overriding, Dynamic Method Dispatch, Using an Abstract Classes, Using final with Inheritance, Packages, Access Protection, Importing Packages, Interfaces, Use of static Methods in an Interface

Self-Learning Exercise:*Default Interface Methods*

MODULE 4 **8 Hours**

Exception Handling and Multithreaded Programming

Exception Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, thows, finally, Creating Your Own Exception Subclasses, Chained Exceptions, The Java Thread Model, The Main Thread, Creating a Thread, Multiple Threads, Using isAlive( ) and join( ), Synchronization, using Synchronized Method, The synchronized Statement

Self-Learning Exercise: *Java's Built-in Exceptions, Thread Priorities*

MODULE 5 **8 Hours**

Enumerations, Autoboxing and Generics

Enumerations: Enumeration Fundamentals, The values( ) and valueOf( ) Methods, Java Enumerations Are Class Types, Type Wrappers, Autoboxing: Autoboxing and Methods Generics: What Are Generics? , A Simple Generics Example, A Generic Class with Two Type Parameters, The General form of a Generic Class, Creating Generic Methods, Some Generic Restrictions

Self-Learning Exercise: *Generic Interfaces*

MODULE 6 **8 Hours**

Applets and Swings

The Applet Class: Two Types of Applets, Applet Basics, Architecture, Skeleton, Simple Applet Display Methods, Requesting Repainting, Using the status window, The HTML APPLET Tag, Passing Parameters to Applet, Introducing Swing, The Origins of Swing, Swing is Built on the AWT, Two Key Features, The MVC Connection, Components and Containers, The Swing Packages, A simple Swing Application

Self-Learning Exercise: *Passing Parameters to Applet*

Text books

1. Java The Complete Reference: Comprehensive Coverage of the Java Language by Herbert Schildt, McGrawHill Education (India) 9th Edition 2014.

Reference Books

1. Java Fundamentals, A comprehensive Introduction by Herbert Schildt, Dale Skrien. Tata McGraw Hill Edition 2013.
2. Introduction to Java Programming, Comprehensive Edition, by Y.Daniel Liang, Pearson Education, 2011.

Java Programming Lab (0:0:3)

Sub Code : 2MCA2L01 **CIE : 25 Marks**
Hrs/Week : 03 **SET : 25 Marks**
SEE Hrs : 03 **Max. Marks:50 Marks**

Course Outcome: On successful competition of the course the students will be able to

1. Gain exposure to state-of-the-art JAVA development tools that uses OOP Concepts.
2. Explore and design user interactive solutions in JAVA.

JAVA programs on classes, constructor overloading, method overloading, inner class anonymous inner classes, various access protections, Inheritance, method overriding, built-in and user-defined Exception handling programs, creation of interfaces, enumerations, generics, applets and swings.

Text books

1. Java The Complete Reference: Comprehensive Coverage of the Java Language by Herbert Schildt, McGrawHill Education (India) 9th Edition 2014.

Reference Books

1. Java Fundamentals, A comprehensive Introduction by Herbert Schildt, Dale Skrien. Tata McGraw Hill Edition 2013.
2. Introduction to Java Programming, Comprehensive Edition, by Y.Daniel Liang, Pearson Education, 2011.

DBMS Lab with Mini Project (0:0:3)

Sub Code : 2MCA2L03 **CIE : 25 Marks**
Hrs/Week : 02 **SEE : 25 Marks**
SEE Hrs : 03 **Max. Marks :50**

Course Outcome: On successful completion of the course the students will be able to

1. Create, Update and query on the database, Strong practice in SQL programming through a variety of database problems.
2. Build database for small project.

Basic Concepts of Sql, Library Database, Order Database, Company Database, College Database etc.

PART-A: **SQL Programming**
Design, develop, and implement the specified queries for the following problems using Oracle, Windows environment. Create Schema and insert at least 5 records for each table. Add appropriate database constraints.

PART-B: Mini Project
Use Java, C#, PHP, Python, or any other similar front-end tool. All applications must be demonstrated on desktop/laptop as a stand-alone or web based application (Mobile apps on Android/IOS are not permitted.)

Computer Networks Lab (0:0:2)

Sub Code : 2MCA2L04 **CIE : 25 Marks**
Hrs/Week : 02 **SEE : 25 Marks**
SEE Hrs : 03 **Max. Marks :50**

Course Outcome: On successful competition of the course the students will be able to

1. Design and implement the functionalities of various layers of the OSI model.
2. Simulate and analyze the network behavior against various parameters using CISCO Packet Tracer.

Introduction to NS2, XGraph, Awk and advanced, Three node point to point network Transmission of Ping messages, Ethernet Lan using n-nodes with multiple traffic, Simple ESS with wireless Lan , Performance of GSM using MAC layer, Performance of CDMA , CRC-CCITT, Bellman-Ford Algorithm, Client server using TCP/IP sockets, Client-Server Communication, RSA Algorithm to Encrypt and Decrypt the Data, Congestion Control Using Leaky Bucket Algorithm

Text books

1. Behrouz A. Forouzan, Data Communications and Networking, Fourth Edition, Tata McGraw-Hill, 2006.

Reference Books

1. **Communication Networks: Fundamental Concepts and Key Architectures -** Alberto Leon, Garcia and Indra Widjaja, 3rd Edition, Tata McGraw- Hill, 2004.
2. **Data and Computer Communication,** William Stallings, 8th tEdition, Pearson Education, 2007.
5. **Computer Networks: A Systems Approach** - Larry L. Peterson and Bruce S. David, 4th Edition, Elsevier, 2007.
6. **Introduction to Data Communications and Networking** – Wayne Tomasi, Pearson Education, 2005.
7. **Communication Networks – Fundamental Concepts and Key architectures –** Alberto Leon- Garcia and Indra Widjaja:, 2rd Edition, Tata McGraw-Hill, 2004
8. **Computer and Communication Networks –** Nader F. Mir:, Pearson Education, 2007.

III Semester

C# and .NET(3:0:0)

Sub Code: 2MCA3C02 **CIE : 50%**
Hrs/Week: 03 **SEE : 50%**
SEE Hrs : 03 **Max. Marks : 100**

Course Outcome: On successful competition of the course the students will be able to

1. Analyse C# using .Net FrameWork Components
2. Apply OOP concepts depending on the problem statement
3. Apply the concept of delegates and event and exception handling
4. Implement & develop a GUI based and Console based applications
5. Implement an application with Database connectivity

MODULE 1 **8 Hours**

Getting started with .NET Framework 4.0 and C#

Understanding Previous Technologies, Benefits of .NET Framework, Architecture of .NET Framework 4.0,.NET Execution Engine, Components of .NET Framework 4.0: CLR, CTS, Metadata and Assemblies, .NET Framework Class Library, Windows Forms, ASP .NET and ASP .NET AJAX, ADO .NET, Windows workflow Foundation, Windows Presentation Foundation, Windows Communication Foundation,

Introducing C#

Creating a Simple C# Console Application, Identifiers and Keywords. System Data Types, Variables and Constants: Value Types, Reference Types, Understanding Type Conversions, Boxing and UnBoxing. expressions and operators: operator precedence, using the ?? (null coalescing) operator, is and as operators, control flow, selection, iteration and jump statements.

Self-Learning Exercise: *Pre-processor Directives*

MODULE 2 **9 Hours**

Namespaces, Classes, Objects and Structures and OOP

The System namespace, .NET Array Types

Creating an Object, using this Keyword, Creating an Array of Objects, Using the Nested Classes, Defining Partial Classes and Method, Returning a Value from a Method and Describing Access Modifiers. Static Classes and Static Class Members. Properties: Read-only Property, Static Property, Accessibility of accessors and Anonymous types. Indexers, Structs: Syntax of a struct and Access Modifiers for structs.

Object- Oriented Programming: Encapsulation: Encapsulation using accessors and mutators, Encapsulation using Properties. Inheritance: **Inheritance** and Constructors, Extension methods. **Polymorphism:** Compile time Polymorphism/ Overloading, Runtime Polymorphism/ Overriding. Abstraction: Abstract classes, Abstract methods. Interfaces: Syntax of Interfaces, Implementation of Interfaces and Inheritance.

Self-Learning Exercise: *Sealed Classes and Sealed Methods, System.Object Class*

MODULE 3 **8 Hours**

Delegates and Events and Exception handling

Delegates: Creating and using Delegates, Muticasting with Delegates.
Events: Event Sources, Event Handlers, Events and Delegates, Multiple Event Handlers.
Exception Handling: The try/catch/throw/finally statement, Custom Exception, checked and unchecked statements

Self-Learning Exercise: *System.Exception class*

MODULE 4 **7 Hours**

Graphical User Interface with Windows Forms

Introduction, Windows Forms, Event Handling: A Simple Event- Driven GUI, Visual Studio Generated GUI Code, Control Properties and Layout, Labels, TextBoxes and Buttons, GroupBoxes and Panels, CheckBoxes and RadioButtons, ToolTips, Mouse-Event Handling, Keyboard-Event Handling. Menus, Month Calendar Control, LinkLabel Control, ListBox Control, ComboBox Control, TreeView Control, ListView Control, TabControl and Multiple Document Interface (MDI) Windows.

Self-Learning Exercise: *TimePicker Control*

MODULE 5 **8 Hours**

Data Access with ADO.NET :

Understanding ADO.NET: Describing the Architecture of ADO.NET, ADO.NET, ADO.NET Entity Framework. Creating Connection Strings: Syntax for Connection Strings. Creating a Connection to a Database: SQL Server Database, OLEDB Database, ODBC Data Source. Creating a Command Object. Working with Data Adapters: Creating DataSet from Data Adapter. , Updating with Data Adapters, Adding Multiple Tables to a DataSet,

Self-Learning Exercise: *Creating Data View.*

Text books

1. .NET 4.0 Programming (6-in-1), Black Book, Kogent Learning Solutions Inc., Wiely- Dream Tech Press.
2. Paul Deitel and Harvey Deitel: C# 2010 for Programmers, 4th Edition, Pearson Education.

Reference Books

1. Andrew Trolsen: Pro C# 5.0 and the .NET 4.5 Framework, 6th Edition, Wiely-Appress.
2. Bart De Smet: C# 4.0 Unleashed, Pearson Education- SAMS Series.
3. Hebert Shildt: Programming in C# 4.0, Tata McGraw Hill.

Internet of Things (3:2:0)

Sub Code : 2MCA3C04 **CIE : 50%**
Hrs/Week : 03 **SEE : 50%**
SEE Hrs : 03 **Max. Marks : 100**

Course Outcome: On successful completion of the course the students will be able to

1. Analyse the IoT architecture and design along with functional/compute stack and data management.
2. Apply IOT architecture for a given problem
3. Analyse the application protocol, transport layer methods for the given business case.
4. Analyse the application of data analytics for IOT for a given
5. Analyse the architecture and develop programming using modern tools for the given use case

MODULE 1 **9 Hours**

What is IoT?

What is IoT? Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT, Functional Stack

Self-Learning Exercise: *IoT Data Management and Compute Stack*

MODULE 2 **8 Hours**

Smart Objects

Smart Objects: The "Things" in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria IoT Access Technologies

Self-Learning Exercise: *IoT Access Technologies*

MODULE 3 **9 Hours**

IP as the IoT Network Layer

IP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer

Self-Learning Exercise: *IoT Application Transport Methods*

MODULE 4 **9 Hours**

Data and Analytics for IoT

Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR

Self-Learning Exercise: *The Phased Application of Security in an Operational Environment 10*

10 Hours

MODULE 5

IoT Physical Devices and Endpoints

IoT Physical Devices and Endpoints - Arduino UNO: Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming. IoT Physical Devices and Endpoints - RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi with Python, Wireless Temperature Monitoring System Using Pi, DS18B20 Temperature Sensor, Connecting Raspberry Pi via SSH, Accessing Temperature from DS18B20 sensors, Remote access to RaspberryPi, Smart and Connected Cities, An IoT Strategy for Smarter Cities, Smart City IoT Architecture, Smart City Security Architecture

Self-Learning Exercise: *Smart City Use-Case Examples.*

Text books

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1st Edition, Pearson Education (Cisco Press Indian Reprint).
2. Srinivasa K G, "Internet of Things", CENGAGE Leaning India, 2017

Reference Books

1. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1stEdition, VPT, 2014. (ISBN:978-8173719547)
2. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017. (ISBN: 978-9352605224)

Mobile Application Programming (3:0:0)

Sub Code : 2MCA3C06 **CIE : 50%**
Hrs/Week : 03 **SEE : 50%**
SEE Hrs : 03 **Max. Marks : 100**

Course Outcome: On successful competition of the course the students will be able to

1. Learn to setup Android application development environment
2. Illustrate user interfaces for interacting with apps and triggering actions
3. Interpret tasks used in handling multiple activities
4. Identify options to save persistent application data
5. Appraise the role of security and performance in Android applications

MODULE 1 **8 Hours**

Building first app: Introduction to Android, Create Your First Android App, Layouts, Views and Resources, Text and Scrolling Views, Resources to Help You Learn**; Activities**: Understanding Activities and Intents, The Activity Lifecycle and Managing State, **Activities and Implicit Intents:** Introduction, About implicit intents, Sending implicit intents, Receiving implicit intents
Self-Learning Exercise: The Android Studio Debugger: Testing your App, The Android Support Library.

MODULE 2 **8 Hours**

User interaction: User Input Controls:Interaction design for user input, Input controls and view focus, Usingbuttons, Using input controls for making choices, Text input, Menus, Screen Navigation, Recycler View;**Delightfuluser experience**: Drawables, Styles, and Themes
Self-Learning Exercise: Testing your UI: Testing the User Interface

MODULE 3 **8 Hours**

Background Tasks: AsyncTask and AsyncTaskLoader,: Connect to the Internet, Broadcast Receivers, Services; **Triggering, scheduling and optimizing background tasks**: Notifications. Introduction, What is a notification? Creating notifications, Delivering notifications, Reusing notifications, Clearing notifications

Self-Learning Exercise: Scheduling Alarms, Transferring Data Efficiently

MODULE 4 **8 Hours**

All about data Preferences and Settings: Storing Data, Shared Preferences, App Settings; Storing data using SQLite: SQLite Primer, SQLite Database; **Sharing data with content providers**: Share Data Through Content Providers: What is a Content Provider, What is a Content Resolver, Example of an app sharing data using a Content Provider, What Content Providers are good for, App Architecture with a Content Provider.

Self-Learning Exercise: Loading data using loaders: Loaders

MODULE 5 **8 Hours**

Permissions, Performance and Security: Permissions, Performance and Security; Firebase Firebase Analytics, Firebase Notifications, Firebase Realtime Database, Firebase Test Lab Firebase Demo, Publish: Prepare your app for release, What is an APK?, Test your app thoroughly, Make sure your app has the right filters.

Self-Learning Exercise: AdMob: AdMob

Textbooks

1. Google Developer Training, "Android Developer Fundamentals Course – Concept Reference", Google Developer Training Team, 2017. https://www.gitbook.com/book/google-developer-training/android-developerfundamentals-course-concepts/details (Download pdf file from the above link)

Reference Books

1. Erik Hellman, "Android Programming – Pushing the Limits", 1st Edition, Wiley India Pvt Ltd, 2014.
2. J F DiMarzio, "Beginning Android Programming with Android Studio", 4th Edition, Wiley India Pvt Ltd, 2016. ISBN-13: 978-8126565580
3. AnubhavPradhan, Anil V Deshpande, " Composing Mobile Apps" using Android, Wiley 2014, ISBN: 978-81-265-4660-2.

Software Engineering (3:2:0)

Sub Code : 2MCA2C07 **CIE : 50%**
Hrs/Week : 05 **SEE : 50%**
SEE Hrs : 03 **Max. Marks : 100**

Course Outcome: On successful completion of the course the students will be able to

1. Identifyanddefinedifferentrequirementsforthegivenproblemandpresentinthe IEEE format.
2. Use modern tool to create UML diagrams to create the design for the given problem.
3. Draw class diagram, analyze the different types of association that exists as per the given problem and represent them using UML notations.
4. Analyze the given system to identify actors, use cases to design use case diagrams for the given problem using RSA/open source tool.
5. Design the static/dynamic models to meet application requirements of the given system.

MODULE 1 **8 Hours**

Introduction

Introduction: Professional Software Development Attributes of good software, software Engineering diversity, IEEE/ACM code of software engineering ethics, case studies. Software Process and Agile Software Development.

Software Process models: waterfall, incremental development, reuses oriented, Process activities; coping with change, The Rational Unified Process. Agile Methods, Plan-Driven and Agile Development, Extreme Programming, Agile Project Management.

Self-Learning Exercise: *scaling agile methods.*

MODULE 2 **8 Hours**

Requirement Engineering

Functional and non-functional requirements, The Software requirements document, Requirements specification, Requirements engineering processes, Requirement elicitation and analysis, Requirement validation, Requirement management

Self-Learning Exercise: *Requirement Documentation*

MODULE 3 **8 Hours**

OO Development

What is object orientation? What is OO development? OO themes; Evidence for Usefulness of OO development; OO modelling history, modelling as design Technique: Modelling; abstraction; the three models. Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models; Practical tips. Advanced objects and class concepts; Association sends; N-array association; Aggregation, Abstract class; Multiple inheritance; Metadata; Reification; Constraints; Derived data; practical tips.

Self-Learning Exercise: *packages.*

MODULE 4 **8 Hours**

OO Models

State modelling: Events, States, Transitions and Conditions; State Diagram; State diagram

behaviour; Practical tips. Advanced State Modeling: Nested state diagram; Nested states; Signal generalization; Concurrency; A sample state model, Relation of class and state models; practical. Interaction modelling: Use Case models, Sequence models, Activity models, Use case relationships; Procedural sequence models.

Self-Learning Exercise: *Special constructs for activity models.*

MODULE 5 **8 Hours**

Project Design and planning

Process planning, Effort estimation, project scheduling and staffing, Software configuration Management plan, Risk Management, Project Monitoring plan Design: Design concepts, Function oriented design, detailed design, verification,

Self-Learning Exercise: *Quality Plan*

Text books

1. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education Ltd, 2011
2. Pankaj Jalote, Software Engineering, Wiley India Pvt Ltd (2010)
3. Paul C Jorgensen Software Testing A CraftMan's Approach, 2nd edition, CRC Press.
4. Michel Blaha, James Rumbaugh: Object-Oriented Modelling and Design with UML, 2nd edition, Pearson, 2007.

Reference Books

1. Stephan R. Schach, "Object oriented software engineering", Tata McGraw Hill, 2008
2. Craig Larman, Applying UML and Patterns, 3rded, Pearson Education, 2005.

Data Analytics with Python (3:0:0)

Sub Code : 2MCA3C08 **CIE : 50%**
Hrs/Week : 03 **SEE : 50%**
SEE Hrs : 03 **Max. Marks : 100**

Course Outcome: On successful completion of the course the students will be able to

1. Exemplify the need for data and analysis of data in today's context
2. Introduce the fundamentals of Python
3. Introduce and illustrate the usage of Numpy library.
4. Introduce and illustrate the usage of Pandas library.
5. Illustrate data visualizations using Matplotlib library.

MODULE 1 **8 Hours**

An Introduction to data analysis

Knowledge domains of data, Understanding the nature of data, The data analysis process, Qualitative data analysis

Self-Learning Exercise: *Examples for quantitative data analysis*

MODULE 2 **8 Hours**

Introduction to Python

Python the programming language, Python the interpreter, Py2 and py3, PyPi, Introduction to SciPy

Self-Learning Exercise: *Learning the IDEs available.*

MODULE 3 **8 Hours**

The NumPy library

History, Installation, NdArray, Basic operations, Indexing and slicing, Array operations

Self-Learning Exercise: *Python scripts on slicing*

MODULE 4 **10 Hours**

The Pandas Library

Introduction, the data analysis library, Installation, pandas data structures, series, data frames and others.

Pandas: Reading and writing data

I/O API tools, CSV and Textual files, Reading and writing data to csv and text files, read and write to HTML, XML and JSON files.

Self-Learning Exercise: *Database interaction and fundamentals.*

MODULE 5 **8 Hours**

Pandas in depth

Data Preparation, Data merging, data concatenation, data transformation.

Self-Learning Exercise: *String manipulation*

Text books

1. "Python Data Analytics", Fabio Nelli, 2nd edition, Apress Publications, 2018

Reference Books

1. "Data Analysis with Python: A modern approach", David Taieb, 1st edition, Packt publishers, 2018
2. "Data Analytics: Concepts, Techniques, and Applications", Mohiuddin Ahmed, 1st edition, Packt publishers, 2018

Data Analytics with Python Lab(0:0:3)

Sub Code : 2MCA3L01 **CIE : 25 Marks**
Hrs/Week : 03 **SEE : 25 Marks**
SEE Hrs : 03 **Max. Marks : 50**

Course Outcome: On successful completion of the course the students will be able to

1. Exemplify the need for data and analysis of data in today's context
2. Introduce and illustrate the usage of Numpy, pandas, scipy, matlplotlib libraries.

Hands on to simple python scripts, Understand the concept of data loading and data pre-processing, Hands on with datasets like: Iris flower dataset, world university rankings, movie datasets, few kaggle datasets and r/datasets, Apply NumPy and Pandas to these datasets, visualizations through maltplotlib

Text books

1. "Python Data Analytics", Fabio Nelli, 2nd edition, Apress Publications, 2018

Reference Books

1. "Data Analysis with Python: A modern approach", David Taieb, 1st edition, Packt publishers, 2018
2. "Data Analytics: Concepts, Techniques, and Applications", Mohiuddin Ahmed, 1st edition, Packt publishers, 2018

.Net and C# Laboratory (0:0:3)

Sub Code : 2MCA3L02 **CIE : 25 Marks**
Hrs/Week : 03 **SEE : 25 Marks**
SEE Hrs : 03 **Max. Marks : 50**

Course Outcome: On successful completion of the course the students will be able to

1. Display proficiency in C# by building stand-alone and distributed applications in the .NET framework using C#.

2. Design user interactive web pages, Windows applications using ASP.Net. and enable data binding using ADO.Net connectivity.

IDE: Microsoft Visual Studio-8. Initially work with simple programs in runtime environment .NET framework i.e., SDK command prompt. Simple programs in C#, Programs on Array processing in C#, interfaces, use of Virtual and override key words, collections, abstract classes and methods, exception handling etc.

Text books

1 .NET 4.0 Programming (6-in-1), Black Book, Kogent Learning Solutions Inc.,Wiley-DreamTech Press.
2 Paul Deitel and Harvey Deitel: C#2010 for Programmers, 4th Edition, Pearson Education.

Reference Books

1 Andrew Trolsen: Pro C# 5.0 and the .NET 4.5 Framework, 6th Edition,Wiley-Apress
2 Bart De Smet: C# 4.0 Unleashed, Pearson Education-SAMS Series.
3 Herbert Schildt: Complete Reference C# 4.0,Tata McGraw Hill, 2010.

IV Semester

MOOC Electives

Introduction to Research(2:0:0)

Sub Code :2MCA4MXX

Evaluation: By NPTEL/SWAYAM

Course Outcome: On successful competition of the course the students will be able to

1. Gain knowledge on research and Intellectual property.
2. Gain knowledge on Technical writing , group discussion.

Course Plan:

A group discussion on what is research; Overview of research, Literature survey , Experimental skills, Data analysis, Modelling skills, Technical writing; Technical Presentations; Creativity in Research, Creativity in Research; Group discussion on Ethics in Research, Design of Experiments, Intellectual Property, Department specific research discussions.

Course Coordinator: Prof. Prathap Haridoss, IIT Madras

Big Data Computing(2:0:0)

Sub Code :2MCA4MXX

Evaluation: By NPTEL/SWAYAM

Course Outcome: On successful competition of the course the students will be able to

1. Introduction to Big Data Storage Platforms.
2. Understanding the Big Data Applications and Machine Learning with spark.

Course Plan:

Introduction to Big Data, Enabling Technologies for Big Data, Introduction to Big Data Platforms, Introduction to Big Data Storage Platforms for Large Scale Data Storage, Introduction to Big Data Streaming Platforms for Fast Data, Introduction to Big Data Applications (Machine Learning), Introduction of Big data Machine learning with Spark, Introduction to Big Data Applications (Graph Processing):

Course Coordinator: By Prof. Rajiv Misra

Data Mining(2:0:0)

Sub Code :2MCA4MXX

Evaluation: By NPTEL/SWAYAM

Course Outcome: On successful competition of the course the students will be able to

1. Gain knowledge on Data Mining
2. Gain knowledge on Classification Algorithms

Course Plan:

Introduction, Data Preprocessing, Association Rule Mining, Classification Basics, Decision Tree, Bayes Classifier, K nearest neighbor, Support Vector Machine, Kernel Machine Clustering, Outlier detection, Sequence, mining, Evaluation, Visualization, Case studies.

Course Coordinator: By Prof. Pabitra Mitra

Cloud Computing and Distributed System(2:0:0)

Sub Code :2MCA4MXX

Evaluation: By NPTEL/SWAYAM

Course Outcome: On successful competition of the course the students will be able to

1. Understanding the visualization and distributed systems/Industry systems.
2. Understanding the cloud storage and cloud applications.

Course Plan:

Introduction to Clouds, Virtualization and Virtual Machine, Network Virtualization and Geo-distributed Clouds, Leader Election in Cloud, Distributed Systems and Industry Systems, Classical Distributed Algorithms and the Industry Systems, Consensus, Paxos and Recovery in Clouds, Cloud Storage: Key-value stores/NoSQL , P2P Systems and their use in Industry Systems, Cloud Applications: MapReduce, Spark and Apache Kafka

Course Coordinator: By Prof. Rajiv Misra

Industry Internship

Sub Code : 2MCA4C02 **CIE : 50 Marks**
No. of credits:2 **Max. Marks :50**

Course outcomes:

On successful completion of the course, the students will be able to

1. Exposure to industry environment.
2. Understands tools and technology for implementing real world problems
3. Select appropriate tools for solving problems.
4. Develop communication, inter-personality, and critical skills.

- Individual student must carry out Internship training at industry. Student shall submit a detailed report on internship work (15 to 20 Pages) in a format as specified by the department. Internal guide and industry personnel will evaluate the student performance for 50 Marks. By taking demonstration and presentation of the work carried during internship.
- Internship to be carried out during 3rd Semester vacation only.

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Major Project

Sub Code : 2MCA4C03 **CIE : 50 Marks**
SEE : 200 Marks **Max. Marks :250**

Course outcomes:

On successful completion of the course, the students will be able to

1. Analyze real world problems
2. Implement the different design methodologies
3. Select appropriate tools for solving problems
4. Implementing advanced programming techniques/languages
5. Perceive the art of verification and validation
6. Write technical reports

Individual student, one project per student, must carry out major project. Student must submit a Detailed Project Report in a format as specified by the department. Internal guides will evaluate the performance (Continuous Internal Evaluation) for 50 Marks. The Report will be evaluated for 100 marks by both internal and external evaluators. Internal and external examiners for 100 marks will evaluate final viva-voce which includesdemonstration and presentation of project work jointly

Electives

Cyber Security (3:0:0)

Sub Code : 2MCA2E101 **CIE : 50%**
Hrs/Week : 03 **SEE : 50%**
SEE Hrs : 03 **Max. Marks :100**

Course Outcomes: at the end students will be able to

1. Apply IT ACT (Cyber law) to the given case/problem and infer from the given case and analyze the gap if exists.
2. Analyze the working of cyber security principles in designing the system.
3. Analyze the given problem (cybercrime, vulnerability, threat), develop a strategy (physical, logical or administrative controls) to mitigate the problem and articulate consequences on Society and National Economy.
4. Examine relevant network defense / web application tool to solve given cyber security problem evaluate its suitability.
5. Investigate the influence of Block chain technology for the cyber security problem and evaluate its role.
6. Evaluate provisions available in Indian cyber law to handle infringement of intellectual property rights that happens on the cyber platform.

Module-1 **9 Hours**

Introduction to Cybercrime and Laws Introduction, Cybercrime: Definition and Origins of the word, Cybercrime and information Security, Who are Cybercriminals? Classifications of Cybercrimes. How Criminals Plan Them – Introduction, How Criminals Plan the Attacks, Cybercafé and Cybercrimes, Botnets, Attack Vector.

Self Learning Exercise : *The Indian IT ACT 2000 and amendments.*

Module-2 **8 Hours**

Tools and Methods used in Cybercrime Introduction, Proxy Server and Anonymizers, Password Cracking, Key loggers and Spyware, Virus and Warms, Trojan and backdoors, Steganography, DOS and DDOS attack.

Self Learning Exercise : *SQL injection, Buffer Overflow.*

Module-3 **9 Hours**

Phishing and Identity Theft Introduction, Phishing – Methods of Phishing, Phishing Techniques, Phishing Toolkits and Spy Phishing. Identity Theft – PII, Types of Identity Theft, Techniques of ID Theft. Digital Forensics Science, Need for Computer Cyber forensics.

Self Learning Exercise : *Digital Evidence, Digital Forensics Life Cycle.*

Module-4 **8 Hours**

Unix Command Lines, Backtrack Linux, Mac Ports, Cygwin, Windows Power Shell, Net Cat Commands, Net Cat Uses, SSH.

Self Learning Exercise : *Data Pipe, Fpipe.*

Module-5 **9 Hours**

Network Defense tools and block chain technology Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, How a Firewall Protects a Network, Packet Characteristic to Filter, Stateless Vs Stateful Firewalls, Network Address Translation (NAT) and Port Forwarding, the basic of Virtual Private Networks, Linux Firewall, Windows Firewall, Snort: Intrusion Detection System.

Self Learning Exercise : *Introduction to block chain technology (definition, tools used for implementation) and its applications.*

Text books

1. Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, Publication McGraw Hill. (Chapters: 2, 7, 8, 11)
2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and Sunit Belpure, Publication Wiley. (Chapters: 1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.5, 2.6, 2.7, 6.4, 5.2.1, 5.2.2, 5.2.5, 5.3.1, 5.3.2, 5.3.3, 4.2, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10, 4.11)

Reference books

1. Marjie T. Britz - Computer Forensics and Cyber Crime: An Introduction - Pearson
2. Chwan-Hwa (John) Wu,J. David Irwin - Introduction to Computer Networks and Cyber security - CRC Press
3. Bill Nelson, Amelia Phillips, Christopher Steuart - Guide to Computer Forensics and Investigations - Cengage Learning

Data Mining and Business Intelligence (3:0:0)

Sub Code : 2MCA2E102 **CIE : 50%**
Hrs/Week : 03 **SEE : 50%**
SEE Hrs : 03 **Max. Marks : 100**

Course Outcome: On successful competition of the course the students will be able to

1. Demonstrate data pre-processing techniques
2. Apply association rule mining algorithms for given problems
3. Apply various classification algorithms and perform evaluation of classifiers
4. Apply regression techniques for the given problem.
5. Analyze data mining for various business intelligence applications.

MODULE 1 **8 Hours**

Introduction to data mining(DM)

Motivation for Data Mining-Data Mining-Definition and Functionalities–Classification of DM Systems-DM task primitives-Integration of a Data Mining system with a Database or a Data Warehouse -Issues in DM –KDD Process Data Pre-processing: Why to pre-process data? Data cleaning: Missing Values, Noisy Data-Data Integration and transformation –Data Reduction: Data cube aggregation, Dimensionality reduction-Data Compression-Numerosity Reduction-Data Mining Primitives-: Task relevant data-Kind of Knowledge to be mined-Discretization and Concept Hierarchy.

Self-Learning Exercise: *DM Languages and System Architectures*

MODULE 2 **8 Hours**

Concept Description and Association Rule Mining

What is concept description?-Data Generalization and summarization-based characterization-Attribute relevance-class comparisons Association Rule Mining: Market basket analysis-basic concepts-Finding frequent item sets: Apriori algorithm- generating rules–Improved Apriori algorithm–Associative Classification – Rule Mining.

Self-Learning Exercise: *Incremental ARM*

MODULE 3 **8 Hours**

Classification

Classificationmethods:Decisiontree,BayesianClassification,Rulebased,Neural Network

Self-Learning Exercise: CART

MODULE 4 **8 Hours**

Prediction and DM Tools

Prediction methods: Linear and non linear regression, Logistic Regression. Introduction of tools such as DB Miner and WEKA.

Self-Learning Exercise: *DTREG DM Tools*

MODULE 5 **8 Hours**

Data Mining for Business Intelligence Applications

Data mining for business Applications like Balanced Scorecard, Fraud Detection, Click stream Mining, Market Segmentation, retail industry, telecommunications industry, Banking & finance and CRM etc., Data Analytics Life Cycle: Introduction to Big data Business Analytics-State of the practice in analytics role of data scientists Key roles for successful analytic project-Main phases of life cycle.

Self-Learning Exercise: *Developing core deliverables for stakeholders.*

Text books

1. J. Han, M. Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann

Reference Books

1. M.Kantardzic, "Datamining: Concepts, models, methods and algorithms, JohnWiley & SonsInc.

2. Paulraj Ponnian, "Data Warehousing Fundamentals", John Willey

3. M. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education.

4. G.Shmueli, N.R.Patel, P.C.Bruce, "Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XL Miner", Wiley India

Enterprise Resource Planning (3:0:0)

Sub Code : 2MCA2E103 **CIE : 50%**
Hrs/Week : 03 **SEE : 50%**
SEE Hrs : 03 **Max. Marks : 100**

Course Outcome: On successful completion of the course the students will be able to

1. Analyze the pros and cons of ERP, Data warehousing/Mining and OLAP for the given problem/application.
2. Analyze the implementation of ERP in the context of business of the different organization
3. Analyze and apply ERP for different business modules.
4. With the help of a case study explain ERP marketing
5. Analyze the design ERP with future E-commerce and internet.

MODULE 1 **8 Hours**
Introduction To ERP
Introduction To ERP Overview, Benefits of ERP, ERP and Related Technologies, Business Process Reengineering, Data Warehousing, Data Mining, Supply Chain Management

Self-Learning Exercise: *On–line Analytical Processing*

MODULE 2 **8 Hours**
ERP implementation basics
ERP Implementation: Implementation of Life Cycle, Implementation Methodology, Hidden Costs, Vendors, Consultants and Users, Contracts, Project Management and Monitoring

Self-Learning Exercise: *Organizing Implementation*

MODULE 3 **8 Hours**
Business Modules of an ERP Package
Business Modules: Business Modules in an ERP Package, Finance, Manufacturing, Human Resource, Plant Maintenance, Materials Management, Sales and Distribution

Self-Learning Exercise: *Quality Management*

MODULE 4 **8 Hours**
ERP Marketplace and Marketplace Dynamics
ERP Market : ERP Market Place, SAP AG, People Soft, Baan Company, JD Edwards World Solutions Company, Oracle Corporation, QAD .

Self-Learning Exercise: *System Software Associates.*

MODULE 5 **7 Hours**

ERP Present and Future

ERP–Present And Future : Turbo Charge the ERP System, EIA, ERP and E–Commerce, Future Directions in ERP.

Self-Learning Exercise: *ERP and Internet*

Text books

1. Alexis Leon, “ERP Demystified”, Tata McGraw Hill

2. Joseph A. Brady, Ellen F. Monk, Bret J. Wangner, “Concepts in Enterprise Resource Planning”, Thomson Learning.

Reference Books

1. Vinod Kumar Garg and N.K .Venkata Krishnan, “Enterprise Resource Planning concepts and Planning”, Prentice Hall
2. Jose Antonio Fernandz, “ The SAP R /3 Hand book”, Tata McGraw Hill

Introduction to Artificial Intelligence (3:0:0)

Sub Code : 2MCA2E104 **CIE : 50%**
Hrs/Week : 03 **SEE : 50%**
SEE Hrs : 03 **Max. Marks : 100**

Course Outcome: On successful completion of the course the students will be able to

1. Explain the fundamentals of Artificial Intelligence
2. Explain the search techniques and knowledge representation
3. Describe the Rules for knowledge representation.
4. Define and explore planning Machine Learning and common sense

MODULE 1 **10 Hours**

Introduction, Problems, Problem Spaces & Search

What is Artificial Intelligence? What is an AI Technique, The Level of the Model;**Problems, Problem Spaces & Search** Defining the problem as a state space search, Production Systems: Control strategies, Heuristic Search, Problem Characteristics: Is the problem decomposable? Can solution steps be ignored or undone? Is the Universe Predicate? Is a good solution Absolute or Relative? Is the solution a State or a Path? What is the role of knowledge? Does the task Require Interaction with a Person? Problem Classification, Production System Characteristics.

Self-Learning Exercise: *Issues in the design of search programs*

MODULE 2 **9 Hours**

Search Techniques

Heuristic Search Techniques: Generate-and-Test, Hill-Climbing Simple Hill climbing, Steepest Ascent Hill Climbing, Best-First search: OR Graphs, The A* Algorithm, Problem reduction: AND-OR Graphs, The AO* Algorithm. Constraint satisfaction, Means-ends analysis

Self-Learning Exercise: *Agendas, Algorithm: Agenda – driven search*

MODULE 3 **8 Hours**

Knowledge Representation and Representing knowledge using Rules

Knowledge Representation: Representations and Mappings, Approaches to knowledge representation, Issues in Knowledge Representation: attributes, relationships among attributes, choosing granularity of Representation, Representing set of objects. Representing knowledge using Rules: Procedural Vs Declarative Knowledge, Logic Programming, Backward Reasoning: Backward chaining rule systems, Forward chaining Rule systems, Combining Forward and Backward Reasoning, Matching: Indexing, Matching with variables, Complex and Appropriate Matching.

Self-Learning Exercise: *Finding right structures as needed, conflict resolution*

MODULE 4 **8 Hours**

Statistical Reasoning and Planning

Statistical Reasoning: Probability and Bayes' Theorem, Certainty and Rule-Based System, Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic; Planning: Components of Planning system, Hierarchical Planning.

Self-Learning Exercise: *Reactive Systems*

MODULE 5 **10 Hours**

Learning and Common Sense

What is learning? Rote Learning, Learning by taking advice, Learning in Problem-solving, Learning from Examples: Wintson Learning Program; Common Sense: Common Sense Onto logies: Time, Space, Materials, Memory Organization, Case Based Reasoning.

Self-Learning Exercise: *Explanation based learning*

Text books

1. Elaine Rich, Kelvin Knight, Shiva Shankar B Nair: Artificial Intelligence, 3rd Edition, Tata McGraw Hill, 2009.

Reference Books

1. Stuart Russel, Peter Norvig: Artificial Intelligence: A Modern Approach, 2nd Edition, Pearson Education, 2003.
2. George R Luger: Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Fifth Edition, Pearson Education

Cryptography and Network Security (3:0:0)

Sub Code : 2MCA2E201 **CIE : 50%**
Hrs/Week : 03 **SEE : 50%**
SEE Hrs : 03 **Max. Marks :100**

Course Outcome: On successful completion of the course the students will be able to
1. Understand the necessity of cryptography.
2.Encryption using the public key and private key cryptography.
3.Message authentication using cryptography.
4.Understanding Electronic mail security.
5.Understanding the web security.

Module-1 **8 Hours**

Introduction: OSI Security Architecture, Security Attacks, Security Services, Security Mechanism, model for Network Security.
Classical Encryption Technique: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques.

Module-2 **8 Hours**

Data Encryption and advanced encryption techniques:
Block Ciphers, Data Encryption Standard and Advanced Encryption Standard
Block Cipher Principles, The Data Encryption Standard, Block Cipher Design Principles and Modes of operation, Evaluation Criteria for AES, AES Cipher-Encryption and Decryption, Data Structure, Encryption Round.
Public Key Cryptography and Key Management: Principles of Public Key Crypto system, RSA algorithm, Key management, Diffie Hellman Key exchange.

Module-3 **8 Hours**

Message Authentication and Hash Function: Authentication Requirement, Authentication Functions, Message Authentication Code, Hash Functions, Digital Signatures, Digital Signature Standard.
Authentication Applications: Kerberos, X.509Authentication Service

Module-4 **8 Hours**

Electronic Mail Security: Pretty Good Privacy(PGP), S/MIME
IP Security: IP Security Overview; IP Security Architecture; Authentication Header; Encapsulating Security Payload; Combining Security Associations; Key Management.

Module-5 **8 Hours**

Web Security: Web security Considerations; Secure Socket layer (SSL)andTransportlayer Security (TLS); Secure Electronic Transaction (SET).
System Security: Intruders, Intrusion Detection, Firewall Design Principles-Characteristics, Types of Firewall and Firewall Configuration.

Textbooks

1.WilliamStallings,"Cryptography and Network Security–Principles and Practices", 4th Edition, Pearson Education,

References

1. Behrouz A. Forouzan and Debdeep Mukhopadhyay: "Cryptography and Network Security", 2nd Edition
2. Atul Kahate, "Cryptography and Network Security" 2nd Edition TMH.

User Interface and Design (3:0:0)

Sub Code : 2MCA2E202 **CIE : 50%**
Hrs/Week : 03 **SEE : 50%**
SEE Hrs : 03 **Max. Marks : 100**

Course Outcome: On successful completion of the course the students will be able to

1. Explain the Concept of Usability; design Principles, Guidelines of Human Computer Interface
2. Describe the Interaction design pattern and their applicability.
3. Illustrate a set of Requirements in terms of its user – interface implications.
4. Describe the usage scenario for a given set of user requirements and available technologies.
5. Explain User Documentation.

MODULE 1 **8 Hours**
Usability of Interactive System and Guidelines
Introduction, Usability goals, Motivations, Goals for our professions. Guidelines introduction, guidelines

Self-Learning Exercise: *Examples*

MODULE 2 **8 Hours**
Principles and Theories
Principles, Theories, Various Principles and various examples of theories where in User Interface is in usage.

Self-Learning Exercise: *Best theories examples*

MODULE 3 **8 Hours**
Design of User Interfaces
Introduction, Organizational support for design, The design process, Design frameworks, design methods, design tools
Self-Learning Exercise: *Legal issues*

MODULE 4 **8 Hours**
Evaluation and the User experience
Introduction, Expert reviews, testing, survey instruments, acceptance tests

Self-Learning Exercise: *Evaluation during active use and beyond*

MODULE 5 **8 Hours**
Devices and Advancing the user Experience
Introduction, Keyboards and Keypads, Pointing devices, Displays Display design, View, Animation, Webpage design, Color

Self-Learning Exercise: *Error Messages*

Text books

1. Designing the User Interface, Ben Shneiderman 6th edition, Pearson Publications.,2016

Reference Books

1. Human-Computer Interaction, Alan J Dix et. al. II Edition, Prentice – Hall, India,1998
2. Intercultural User Interface Design, Rüdiger Heimgärtner, Springer–HCI Book Series,2020

Supply Chain Management (3:0:0)

Sub Code : 2MCA2E203 **CIE : 50%**
Hrs/Week : 03 **SEE : 50%**
SEE Hrs : 03 **Max. Marks :100**

Course Outcome: On successful completion of the course the students will be able to

1. Demonstrate knowledge of the functions of logistics and supply chain management.
2. Illustrate the concepts and activities of the supply chain to actual organizations.
3. Analyze the role of technology in logistics and supply chain management.
4. Evaluate cases for effective supply chain management and its implementation.
5. Analyze the role of information technology in bringing transparency and execute smart contracts to maintain relationship management.

MODULE 1 **8 Hours**

Introduction to Supply Chain Management

Introduction to Supply Chain Management: Supply chain, objectives, importance decision phases, process view, achieving strategic fit, supply chain drivers, obstacles, framework, facilities, inventory, transportation ,information, sourcing, pricing.

Self-Learning Exercise: *Competitive and supply chain strategies,*

MODULE 2 **8 Hours**

Designing the supply chain network

Designing the supply chain network: Designing the distribution network, role of distribution , factors influencing distribution, design options, e-business and its impact, distribution networks in practice, network design in the supply chain, role of Network, modeling for supply chain.

Self-Learning Exercise: *Factors affecting the network design decisions*

MODULE 3 **8 Hours**

Designing and Planning Transportation Networks

Designing and Planning Transportation Networks.: Role of transportation , modes and their performance, transportation infrastructure and policies , design options and their trade- offs.

Self-Learning Exercise: *Tailored transportation.*

MODULE 4 **8 Hours**

Sourcing and Pricing

Sourcing and Pricing: Sourcing, In-house or Outsource, 3rd and 4th PLs , supplier scoring

and assessment, selection , design collaboration, procurement process, sourcing planning and analysis. Pricing and revenue management for multiple customers, perishable products.

Self-Learning Exercise: *Seasonal demand, bulk and spot contracts.*

MODULE 5 **8 Hours**

Information Technology in the supply chain

Information Technology in the supply chain: IT Framework, customer relationship Management, internal supply chain management, supplier relationship management, future of IT.

Self-Learning Exercise: *Transaction management.*

Text books

1. Sunil Chopra and Peter Meindl, Supply Chain Management – Strategy, Planning and Operation, Pearson/PHI, 3rd Edition
2. Coyle, Bardi, Longley, The management of Business Logistics – A supply Chain Perspective, Thomson Press
3. Supply Chain Management by Janat Shah Pearson Publication

Reference Books

1. Donald J Bowersox, Dand J Closs, M Bixby Coluper, Supply Chain Logistics Management, TMH, Second Edition
2. Wisner, Keong Leong and Keah-Choon Tan, Principles of Supply Chain Management A Balanced Approach, Thomson Press
3. David Simchi-Levi et al, Designing and Managing the Supply Chain – Concepts, ISBN-13: 978-0072357561

Distributed Operating System (3:0:0)

Sub Code: 2MCA2E204 **CIE: 50%**
Hrs/Week: 03 **SEE: 50%**
SEE Hrs : 03 **Max. Marks: 100**

Course Outcome: On successful completion of the course the students will be able to

1. Analyse, design issues and different message passing techniques in DOS, distributed system
2. Analyse RPC implementation and its performance in DOS and the major security issues associated with distributed systems and evaluate techniques available for increasing system security
3. Apply the concepts of distributed shared memory and resource management for the given problem/ case study.
4. Analyse distributed file systems and evaluate the performance in terms of fault tolerance, file replication as major factors
5. Apply modification to the existing algorithms to improve the performance of DOS

MODULE 1 **8 Hours**

Fundamentals:
What is Distributed Computing Systems? Evolution of Distributed Computing System; Distributed Computing System Models; What is Distributed Operating System? Issues in Designing a Distributed Operating System; Introduction to Distributed Computing Environment (DCE).
Message Passing: Introduction, Desirable features of a Good Message Passing System, Issues in PC by Message Passing, Synchronization, Buffering, Multi-datagram Messages, Encoding and Decoding of Message Data, Process Addressing, Failure Handling, Group Communication

Self-Learning Exercise: *Case Study: 4.3 BSD UNIX IPC Mechanism.*

MODULE 2 **8 Hours**

Remote Procedure Calls
Introduction, The RPC Model, Transparency of RPC, Implementing RPC Mechanism, Stub Generation, RPC Messages, Marshaling Arguments and Results, Server Management, Parameter-Passing Semantics, Call Semantics, Communication Protocols for RPCs, Complicated RPCs, Client-Server Binding, Exception Handling, Security, Some Special Types of RPCs, RPC in Heterogeneous Environments, Lightweight RP

Self-Learning Exercise: *Optimization for Better Performance, Case Studies: Sun RPC*

MODULE 3 **8 Hours**

Distributed Shared Memory:

Design and Implementation Issues of DSM, Granularity, Structure of Shared Memory Space, Consistency Models, Replacement Strategy, Thrashing, Other approaches to DSM, Heterogeneous DSM, Advantages of DSM. Synchronization: Introduction, Clock Synchronization, Event Ordering, Mutual Exclusion, Dead Lock, Election Algorithms

Self-Learning Exercise: *Hash function, The Pigeonhole-principle*

MODULE 4 **8 Hours**

Resource Management

Introduction, Desirable Features of a Good Global Scheduling Algorithm, Task Assignment Approach, Load – Balancing Approach, Load – Sharing Approach

Process Management: Introduction, Process Migration.

Self-Learning Exercise: *Threads*

MODULE 5 **8 Hours**

Distributed File Systems

Introduction, Desirable Features of a Good Distributed File System, File models, File– Accessing Models, File – Sharing Semantics, File – Caching Schemes, File Replication, Fault Tolerance.

Self-Learning Exercise: *Atomic Transactions and Design Principles*

Text books

1. Pradeep. K. Sinha: Distributed Operating Systems: Concepts and Design, PHI, 2007.

Reference Books

1. Andrew S. Tanenbaum: Distributed Operating Systems, Pearson Education, 2013.

Block Chain Technology(3:0:0)

Sub Code : **2MCA3E301** CIE : 50%
Hrs/Week : 03 SEE : 50%
SEE Hrs : 03 Max. Marks :100

Course Out Comes:
1. Demonstrate the basics of Block chain concepts using modern tools/technologies.
2. Analyze the role of block chain applications in different domains including cyber security.
3. Evaluate the usage of Block chain implementation/features for the given problem.
4. Exemplify the usage of bitcoins and its impact on the economy.
5.Analyze the application of specific block chain architecture for a given problem

Module-1 **9 Hours**
Introduction to Blockchain, How Blockchain works, Blockchain vs Bitcoin, Practical applications, public and private key basics.

Self-Learning Exercise: *pros and cons of Blockchain.*

Module-2 **8 Hours**
Blockchain :Architecture , versions ,variants , use cases, Life use cases of blockchain, Blockchain vs shared Database, Introduction to cryptocurrencies, Types, Applications.

Self-Learning Exercise: *Myths about Bitcoin*

Module-3 **8 Hours**
Concept of Double Spending, Hashing, Mining, Proof of work. Introduction to Merkel tree, Privacy , payment verification , Resolving Conflicts , Creation of Blocks.

Self-Learning Exercise: *Creation of Blocks.*

Module-4 **9 Hours**
Introduction to Bitcoin, key concepts of Bitcoin, Merits and De Merits Fork and Segwits, Sending and Receiving bitcoins, choosing bitcoin wallet.

Self-Learning Exercise: *Converting Bitcoins to Fiat Currency.*

Module-5 **8 Hours**
Introduction to Ethereum, Advantages and Disadvantages, Ethereum vs Bitcoin, Introduction to Smart contracts, usage, application, working principle.

Self-Learning Exercise: *Law and Regulations. Case Study.*

Text books

1. Beginning Blockchain: A Beginner's Guide to Building Blockchain Solutions by Arshdeep Bikramaditya Signal, Gautam Dhameja (Priyansu Sekhar Panda., APress.
2. Blockchain Applications: A Hands-On Approach by Bahga, Vijay Madisetti
3. Blockchain by Melanie Swan, OReilly

References

1. Bitcoin and Crypto currency Technologies by Aravind Narayan. Joseph Bonneau, princton
2. Bitcoin and Block chain Basics: A non-technical introduction for beginners by Arthu.T Books.

Digital Marketing (3:0:0)

Sub Code : **2MCA3E302** CIE : 50%
Hrs/Week : 03 SEE : 50%
SEE Hrs : 03 Max. Marks :100

Course Outcome: On successful competition of the course the students will be able to

1. Demonstrate the key concepts related to e-marketing for the given case..
2. Demonstrate the use of different electronic media for designing marketing activities.
3. Analyze the role of search engine in improving digital marketing
4. Analyze role of social media marketing for the given problem
5. Analyze technical solutions to overcome social media threatS

MODULE 1 **9 Hours**

Introduction to Digital Marketing Evolution of Digital Marketing from traditional to modern era, Role of Internet; Current trends, Info-graphics, implications for business & society; Emergence of digital marketing as a tool; Drivers of the new marketing environment; Digital marketing strategy; P.O.E.M. framework,

***Self-Learning Exercise**: Digital landscape, Digital marketing plan, Digital marketing models.*

MODULE 2 **8 Hours**

Internet Marketing and Digital Marketing Mix – Internet Marketing, opportunities and challenges; Digital marketing framework; Digital Marketing mix, Impact of digital channels on IMC; Search Engine Advertising: - Pay for Search Advertisements, Ad Placement, Ad Ranks, Creating Ad Campaigns, Campaign Report Generation Display marketing: - Types of Display Ads - Buying Models

***Self-Learning Exercise :**Programmable Digital Marketing - Analytical Tools - YouTube marketing.*

MODULE 3 **9 Hours**

Social Media Marketing – Role of Influencer Marketing, Tools & Plan– Introduction to social media platforms, penetration & characteristics; Building a successful social media marketing strategy Facebook Marketing: - Business through Facebook Marketing, Creating Advertising Campaigns, AdvertsContent Strategy, Analytics and Targeting Twitter Marketing: - Introduction to Twitter Marketing,

***Self-Learning Exercise :**how twitter Marketing is different than other forms of digital marketing, framing content strategy,*

MODULE 4 **8 Hours**

Introduction to SEO, SEM, Web Analytics, Mobile Marketing, Trends in Digital Advertising– - Introduction and need for SEO, How to use internet & search engines; search engine and its working pattern, On-page and off-page optimization, SEO Tactics - Introduction to SEM Web

***Self-Learning Exercise**: Analytics: - Google Analytics & Google AdWords;*

MODULE 5 **9 Hours**

Social Media Channels: Introduction, Key terms and concepts, Traditional media vs Social media. Social media channels: Social networking. Content creation, Bookmarking & aggregating and Location & social media. Tracking social media campaigns. Social media marketing: Rules of engagement. Advantages and challenges.

Self-Learning Exercise*: Social Media Strategy: Social media risks and challenges*

Text books

1.Seema Gupta "Digital Marketing" Mc-Graw Hill 1st Edition – 2017.

Reference Books

1. Ian Dodson "The Art of Digital Marketing" Wiley Latest Edition
2.Puneet Singh Bhatia "Fundamentals of Digital Marketing" Pearson 1st Edition – 2017
3.Prof. Nitin C. Kamat, Mr.Chinmay Nitin Kamat Digital Social Media Marketing Himalaya Publishing House Pvt. Ltd. Latest Edition

Software Testing(3:0:0)

SubCode:2MCA3E303 **CIE : 50%**
Hrs/Week : 03 **SEE : 50%**
SEE Hrs : 03 **Max. Marks : 100**

Course Outcome: On successful competition of the course the students will be able to

1. Acquire knowledge of basic principles and knowledge of software testing and debugging and test cases..
2. Will be able to understand the perceptions on testing like levels of testing, generalized pseudo code and with related examples.
3. To study the various types of testing.

4. Differentiate between functional testing and structural testing..
5. Analyze the performance of fault based testing, planning and Monitoring the process, Documentation testing.

MODULE 1 **8 Hours**

Basics of Software Testing, Basic Principles, Test case selection and Adequacy Testing Human Errors and Testing; Software Quality; Requirements, Behavior and Correctness; Correctness versus Reliability; Testing and Debugging; Test Metrics; Software and Hardware Testing; Testing and Verification; Defect Management; Execution History; Test-generation Strategies, Static Testing. Model-Based Testing and Model Checking; Control-Flow Graph;. Types of Testing

Self-Learning Exercise: The Saturation Effect

MODULE 2 **8 Hours**

Test Generation from Requirements, Structural Testing
Introduction; The Test-Selection Problem; Equivalence Partitioning; Boundary Value Analysis; Category-Partition Method. Cause-Effect Graphing, Test Generation from Predicates. Structural Testing: Overview; Statement testing; Path testing; Procedure call testing; Comparing structural testing criteria; The infeasibility problem.

Self-Learning Exercise: Branch testing; Condition testing

MODULE 3 **8 Hours**

Dependence, Data Flow Models, and Data Flow Testing
Definition-Use pairs; Data flow analysis; Classic analyses; From execution to conservative flow analysis; Data flow analysis with arrays and pointers; Inter-procedural analysis; Overview of data flow testing; Definition-Use associations; Data flow testing criteria;

Data flow coverage with complex structures.

Self-Learning Exercise: The infeasibility problem

MODULE 4 **8 Hours**

Test Case Selection and Adequacy, Test Execution
Overview; Test specification and cases; Adequacy criteria; Comparing criteria; Overview of test execution; From test case specification to test cases; Scaffolding; Generic versus specific scaffolding; Capture and replay.

Self-Learning Exercise: Test oracles; Self-checks as oracles

MODULE 5 **10 Hours**

Integration and component-based testing
Test and analysis activities within a software process: The quality process; Planning and monitoring; Quality goals; Analysis; Testing; Improving the process; Organizational factors.

Integration testing strategies; Testing components and assemblies. System, Acceptance and Regression Testing: Overview; System testing; Acceptance testing; Usability; Regression testing; Test case prioritization and selective execution.

Self-Learning Exercise: Test and analysis reports

Textbooks

1. Adithya P.Mathur " Foundations of Software Testing", Pearson Education India,

2. Mauro Pezze, Michael Young, Software testing and Analysis- Process, Principles and Techniques, Wiley India,

Reference Books

1. KshirasagaraNaik, PriyadarshiTripathy: Software Testing and Quality Assurance, Wiley India.
2. M.G.Limaye: Software Testing-Principles, Techniques and Tools – McGraw Hill

Cloud Computing (3:0:0)

Sub Code : 2MCA3E304 **CIE : 50%**
Hrs/Week : 03 **SEE : 50%**
SEE Hrs : 03 **Max. Marks : 100**

Course Outcome: On successful completion of the course the students will be able to

1. Identify and acquire the knowledge of types of clouds, service – level and Compliance
   – level agreements, and software licensing.
2. Discuss applications of cloud in science and engineering, biology research, and social computing.
3. Explain the concept of virtualization.
4. Compare different scheduling techniques in cloud.
5. Analyze the security risks posed by shared images and the management OS.

MODULE 1 **8 Hours**
Introduction
Cloud Computing, Network-centric computing, Cloud computing an old idea, Cloud delivery models, Ethical issues, Cloud vulnerabilities.

Self-Learning Exercise: *Case study on various ethical issues and examples*

MODULE 2 **8 Hours**
CLOUD SERVICE PROVIDERS AND THE CLOUD ECOSYSTEM
Cloud ecosystem, Cloud computing delivery models, AWS, Google Clouds, Windows Azure, Cloud storage diversity, SLA

Self-Learning Exercise: *Frame any 5 individual SLA at the student level*

MODULE 3 **8 Hours**
Cloud Resource Management and Scheduling
Policies and Mechanisms, Cloud resource utilization, Resource management, Control theory, 2-level resource allocation architecture, Feedback control, Utility Model, Scheduling algorithms, Start time fair queuing

Self-Learning Exercise: *Frame any 4 valid policy and mechanism at the student level*

MODULE 4 **8 Hours**
Cloud Resource Virtualization
Performance and Security, Vms, VM types, Hardware support for Vms, Xen, Kernel based VM, Open source software platforms

Self-Learning Exercise: *Examples of OSS Virtualization platforms*

MODULE 5 **8 Hours**

Cloud Security

Security, Cloud security risks, Privacy, Trust, Cloud data encryption, OS Security, VM Security

Self-Learning Exercise: *Security threats of the future in the areas of Cloud Computing*

Text books

1. Cloud Computing – Theory and Practice, Dan C Marinescu, 2nd Edition, Morgan Kaufman Publications, 2017

Reference Books

1. Cloud Computing Bible by Barrie Sosinsky, Wiley India
2. Cloud Security by Ronald Krutz and Russell Dean Vines, Wiley-India

Multimedia Systems(3:0:0)

Sub Code : 2MCA3E401 **CIE : 50%**
Hrs/Week : 03 **SEE : 50%**
SEE Hours : 3 Hrs **Max Marks : 100**

Pre-requisite : NA

Course Outcomes

On successful completion of the course, the students will be able to

1. Understand various elements of multimedia and its applications.
2. Analyze the different data compression techniques for both audio and video.
3. Explain the need for different type of storage media and its applications.
4. Illustrate design and implementation of different data file formats.
5. Apprise different applications of multimedia.

MODULE 1 **9 Hours**

Introduction, Media and Data Streams, Audio Technology Multimedia Elements;

Multimedia Applications; Multimedia Systems Architecture; Evolving Technologies for Multimedia Systems; Defining Objects for Multimedia Systems; Multimedia Data Interface Standards; The need for Data Compression; Multimedia Databases. Media: Perception Media, Representation Media, Presentation Media, Storage Media; Characterizing Continuous Media Data Streams. Sound: Frequency, Amplitude, Sound Perception and Psychoacoustics; Audio Representation on Computers.

Self-Learning Exercise: Three Dimensional Sound Projection; Music and MIDI Standards; Speech Signals; Speech Output; Speech Input; Speech Transmission.

MODULE 2 **9 Hours**

Graphics and Images, Video Technology, Computer-Based Animation Capturing Graphics and Images Computer Assisted Graphics and Image Processing; Reconstmctin; Images; Graphics and Image Output Options. Basics; Television Systems; Digitalization of Video Signals; Digital Television; Basic Concepts; Specification of Animations; Methods of Controlling Animation; Display of Animation.

Self-Learning Exercise: Transmission of Animation; Virtual Reality Modeling Language.

MODULE 3 **8 Hours**

Data Compression Storage Space; Coding Requirements; Source, Entropy, and Hybrid Coding; Basic Compression Techniques; JPEG: Image Preparation, Lossy Sequential

DCT based Mode.H.261 (Px64) and H.263: Image Preparation, Coding Algorithms, ME, DataStream, H.263+ and H.263L; MPEG: Video Encoding, Audio Coding,Data Stream, MPEG-2.

Self-Learning Exercise: Expanded Lossy DCT based Mode, Lossless Mode, Hierarchical Mode, MPEG-4, MPEG -7; Fractal Compression.

MODULE4 **9 Hours**

Optical Storage Media History of Optical Storage; Basic Technology; Video Discs and Other Worms; Compact Disc Digital Audio; Compact Disc Read Only Memory; CDROM Extended Architecture; Further CD-ROM-Based Developments; Compact Disc Recordable. Content Analysis Simple Vs. Complex Features; Analysis of Individual Images; Analysis of Image Sequences.

Self-Learning Exercise: Compact Disc Magneto- Optical; Compact Disc ReadJWrite; Digital Versatile Disc, Audio Analysis; Applications.

MODULE 5 **8 Hours**

Multimedia Application Design Multimedia Application Classes; Types of Multimedia Systems; Virtual Reality Design; Components of Multimedia Systems; Organizing Multimedia Databases.

Self-Learning Exercise: Application Work flow Design Issues; Distributed Application Design Issues.

Text Books

1. Ralf Steinmetz, KlaraNarstedt: Multimedia Fundamentals: Vol I-Media Coding and Content Processing, 2nd Edition, Pearson Education / PHI, 2003.
2. Prabhat K. Andleigh, KiranThakrar: Multimedia Systems Design, PHI, 2003

Reference Books

1. KR Rao, Zoran S- Bojkovic and Dragorad A. Milovanovic: Multimedia Communication Systems: Techniques, Standards, and Networks. Pearson Education, 2002.
2. Nalin K Sharad: Multimedia information Networking, PHI, 2002.

Introduction to Machine Learning (3:0:0)

Sub Code : 2MCA3E402 **CIE : 50%**
Hrs/Week : 03 **SEE : 50%**
SEE Hrs : 03 **Max. Marks : 100**

Course Outcome: On successful completion of the course the students will be able to

1. Understand the basics of machine learning and its types.
2. Illustrate the working of algorithms on classifications.
3. Understand the working of Support Vector Machines, Decision tree learning and other machine learning algorithms.
4. Understand the significance and importance of datasets in Machine Learning tasks.
5. Learn to compress data via Dimensionality Reduction techniques.

MODULE 1 **8 Hours**

Giving Computers the Ability to Learn from Data
The three different types of machine learning, Introduction to basic terminology and notations, A road map for building machine learning systems, Using Python for machine learning

Self-Learning Exercise: *Python functions usage*

MODULE 2 **8 Hours**

Training Machine Learning Algorithms for Classification
Glimpse into the early history of machine learning, perceptron learning algorithm in python, linear neurons and convergence of learning.

Self-Learning Exercise: *Decision tree learning examples*

MODULE 3 **8 Hours**

A Tour of Machine Learning Classifiers Using Scikit-learn
Choosing a classification algorithm, First steps with scikit-learn, Modelling class probabilities via logistic regression, margin classification with support vector machines, Decision tree learning, KNN.

Self-Learning Exercise: *Hash function, The Pigeonhole-principle*

MODULE 4 **8 Hours**

Building good training datasets – data preprocessing
Dealing with missing data, Handling categorical data, Concept of training and test datasets, Feature importance.

Self-Learning Exercise: *Understanding training and test split ratio working through scikit-learn*

MODULE 5 **8 Hours**

Compressing data via Dimensionality reduction
Unsupervised dimensionality reduction, Supervised data compression, Using kernel principal component analysis

Self-Learning Exercise: *One-hot encoder example using Python.*

Text books

1. "Python Machine Learning", Unlock deeper insights into machine learning with this vital guide to cutting-edge predictive analytics, Sebastian Raschka, 3rd Edition, Packt Publishing Ltd., 2019
2. Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems, Aurelien Geron, 2nd Edition, O'Reilly Publications, 2019

Reference Books

1. Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and machine learning) The MIT Press Cambridge, 3rd Edition, 2014
2. Simon Rogers, Mark Girolami, A first course in machine learning, Chapman, & Hall/CRC machine learning & pattern recognition, 2011

Digital Image Processing (3:0:0)

Sub Code : 2MCA3E403 **CIE : 50%**
Hrs/Week : 03 **SEE : 50%**
SEE Hrs : 03 **Max. Marks :100**

Course Outcome: On successful competition of the course the students will be able to

1. Understand digital image fundamentals
2. Apply the concepts of image enhancement with various filters
3. Describe image restoration techniques
4. Understand processing of pseudo and full colour images
5. Appraise image encoding and compression techniques

MODULE 1 **8 Hours**
Introduction:
Origins of Digital Image Processing, examples, Fundamental Steps in Digital Image Processing.

Self-Learning Exercise*: Components of an Image Processing System*

MODULE 2 **9 Hours**
Digital Image Fundamentals:
Elements of Visual Perception, Basic Concepts in Sampling and Quantization, A Simple Image Formation Model, Representing Digital Images, Zooming and Shrinking Digital Images, Some Basic Relationships Between Pixels.

Self-Learning Exercise*: Linear and Nonlinear Operations*

MODULE 3 **9 Hours**
Image Enhancement in the Spatial Domain:
Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters

Self-Learning Exercise*: Combining Spatial Enhancement Methods*

MODULE 4 **9 Hours**
Image Restoration:
A Model of the Image degradation / Restoration process, Noise Models, Restoration in the Presence of Noise Only–Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function
Self-Learning Exercise*: Minimum Mean Square Error (Wiener) Filtering*

MODULE 5 **8 Hours**

Image Compression:
Fundamentals, Image Compression Models, Error-Free Compression, Lossy Compression, Image Compression Standards

Self-Learning Exercise*: Elements of information theory*

Text Book

2. Rafel C Gonzalez and Richard Digital Image Processing, Second Edition, Prentice Hall.

Soft Computing (3:0:0)

Sub Code:2MCAE404 **CIE : 50%**
Hrs/Week: 03 **SEE : 50%**
SEE Hrs : 03 **Max. Marks : 100**

Course Outcome: On successful competition of the course the students will be able to

1. Analyzing Fuzzy theory concepts
2. Applying optimization techniques using genetic algorithms
3. Realize various types of neural networks
4. Model the neuro fuzzy logic using various learning methods
5. Investigate the application of computational intelligence

MODULE 1 **8 Hours**

History of Evolutionary Computing,
The Appeal of Evolution, Biological Terminology, Elements of Genetic Algorithm, Genetic Algorithms and Traditional Search Methods, Applications of Genetic Algorithm. **Genetic Algorithm in Problem Solving :**Evolving Computer Programs, Data Analysis and Prediction

Self-Learning Exercise: Examples of Genetic Algorithm.

MODULE 2 **9 Hours**

Theoretical Foundations of Genetic Algorithm
Schemas and the Two-Armed Bandit Problem, Royal Roads, Exact Mathematical Models of Genetic Algorithm. **Implementing a Genetic Algorithm:** When should a Genetic Algorithm be used , Encoding a Problem for a Genetic Algorithm, Adapting the Encoding, Selection Methods , Genetic Operators

Self-Learning Exercise: Parameters for Genetic Algorithm.

MODULE 3 **8 Hours**

Introduction to fuzzy set theory
Probabilistic reasoning, Fuzzy sets, Mathematics of fuzzy set theory, , Comparison of fuzzy and crisp set theory.

Self-Learning Exercise: Operations on fuzzy sets

MODULE 4 **7 Hours**

Fuzzy mapping and Membership Functions
Fuzzy mapping :One to one mapping, Max-min principle, Extension principle, Implication rules – mamdani implications. Membership functions: Universe of discourse, Mapping inside fuzzy domain, Fuzzy membership mapping methods, Application to real world problems.

Self-Learning Exercise: TimePicker Control

MODULE 5 **8 Hours**

Neural Networks and Fuzzy System
Neural and Fuzzy Machine Intelligence, Fuzziness as Multivalence, The Dynamical System Approach to Machine Intelligence: The Brain as a Dynamical System, Intelligent Behaviour as Adaptive Model Free estimation

Self-Learning Exercise: Neuron fields

Textbooks

1. Melanie Mitchell: An Introduction to Genetic Algorithms, Prentice-Hall of India, India Edition, 2004.
2. Timothy J. Ross : Fuzzy logic to engineering applications , McGraw Hill Inc, India Edition
3. Bart Kosko: Neural Networks and Fuzzy Systems – A Dynamical Systems Approach to Machine Intelligence, PHI Learning, India Edition, 2009. (Chapters: 1 and 2)

Reference Books

1. D.E. Goldberg, Genetic Algorithms in Search, Optimization and Machine Learning, Addison- Wesley,1989.
2. Z. Michalewicz , Genetic Algorithms + Data Structures = Evolution Programs, Springer- Verlag,1994.
3. N.K. Sinha & M.M Gupta(Eds), Soft Computing & Intelligent System: Theory & Applications, Academic Press, 2000.
4. S.N Sivanandam, S.N Deepa, Principles of Soft Computing, 2nd Edition, Wiley
5. M.T. Hagan, H.B. Demuth and M. Beale, Neural Network Design, Thompson Learning,1996.