RV COLLEGE OF ENGINEERING®

(Autonomous Institution Affiliated to VTU, Belagavi)

R.V. Vidyaniketan Post, Mysore Road

Bengaluru – 560 059

Scheme and Syllabus for I to VI Semesters

2018 SCHEME

MASTER OF COMPUTER APPLICATIONS

RV College of Engineering®

(Autonomous Institution affiliated to VTU, Belagavi)

Department of Master of Computer Applications

Scheme and Syllabus of Autonomous System w.e.f 2018

VISION

Pioneering in ICT Enabled Quality Education and Research with a focus on Sustainable and Inclusive Applications

MISSION

M1 To adapt novel methodologies for quality education through experiential learning

M2 To empower students with continuous, holistic education, emphasizing on discipline, ethics and social commitment

M3 To become a vibrant knowledge center for research and software development

M4 To continuously build capacity steering towards industry- institute collaborative research and entrepreneurial competencies

M5 To utilize and develop free and open source software tools for sustainable and inclusive growth

Program Outcomes (PO)

MCA graduates will be able to

PO1 **Computational Knowledge:** Acquire in-depth computational knowledge and mathematics with an ability to abstract and conceptualize models from defined problems and requirements

PO2 **Problem Analysis:** Identify, formulate, conduct literature survey and solve complex computing problems through analysis as well as provide optimal solutions

PO3 **Design / Development of Solutions:** Design and evaluate solutions for complex problems, components or processes that meet specified needs after considering public health and safety, cultural, societal, and environmental factors

PO4 **Conduct investigations of complex Computing problems:** Conduct literature survey to analyze and extract information relevant to unfamiliar problems and synthesize information to provide valid conclusions and interpret data by applying appropriate research methods, tools and design experiments

PO5 **Use of Modern Tool**: Create, select, adapt and apply appropriate techniques,resources, and modern IT tools to complex computing system activities, with an understanding of the limitations

PO6 **Professional Ethics:** Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practices

PO7 **Life-long Learning:** Engage in lifelong learning independently for continual development to improve knowledge and competence as a computing professional

PO8 **Project management and finance:** Demonstrate knowledge and understanding of management principles and apply these to multidisciplinary software development as a team member and manage projects efficiently as a leader considering economical and financial factors

PO9 **Communication Efficacy:** Understand and communicate effectively with the computing community and with society at large, regarding complex computing systems activities confidently and effectively by writing effective reports and design documentations by adhering to appropriate standards, make effective presentations and give / receive clear instructions

PO10 **Societal and Environmental Concern:** Understand responsibilities and consequences based on societal, environmental, health, safety, legal and cultural issues within local and global contexts relevant to professional computing practices

PO11 **Individual and Team Work:** Function effectively as an individual, as a member or leader in diverse teams in multidisciplinary environments

PO12 **Innovation and Entrepreneurship:** Identify a timely opportunity for entrepreneurship and use innovation to pursue and create value addition for the betterment of the individual and society at large

R. V. College of Engineering, Bengaluru – 59.

(An Autonomous Institution affiliated to VTU, Belagavi)

Department of Master of Computer Applications

I Semester MCA							
Sl. No	**Course Code**	**Course Title**	**BoS**	**Credit Allocation**			**Total credits**
				Lecture	**Tutorial**	**Practice**	
1.	18MAT11	Discrete Mathematics	MAT	3	1	0	4
2.	18MCA12	Computer Organization and Architecture	MCA	3	0	0	3
3.	18MCA13	Data Structures using C	MCA	3	1	1	5
4.	18MCA14	Object Oriented Programming	MCA	3	1	1	5
5.	18MCA15	Web Programming	MCA	3	1	1	5
		Total		**15**	**4**	**3**	**22**
		Contact (Hrs/week)+ Counseling		**15**	**8**	**6**	**30**

II Semester MCA							
Sl. No	**Course Code**	**Course Title**	**BoS**	**Credit Allocation**			**Total credits**
				Lecture	**Tutorial**	**Practice**	
1.	18MCA21	Software Engineering	MCA	3	0	0	3
2.	18MCA22	E-Commerce	MCA	3	1	0	4
3.	18MCA23	Data Base Systems	MCA	3	1	1	5
4.	18MCA24	Operating Systems	MCA	3	1	1	5
5.	18MCA25	Java Programming	MCA	3	1	1	5
		Total		**15**	**4**	**3**	**22**
		Contact (Hrs/week) +Counseling		**15**	**8**	**6**	**30**

III Semester MCA

Sl. No	Course Code	Course Title	BoS	Credit Allocation			Total credits
				Lecture	Tutorial	Practice	
1.	18MCA31	Research Methodology	MCA	3	0	0	3
2.	18MCA32	Analysis and Design of Algorithms	MCA	3	1	1	5
3.	18MCA33	Computer Networks	MCA	3	1	1	5
4.	18MCA34X	Elective I	MCA	3	1	0	4
5.	18MCA35X	Elective – II (With Practice)	MCA	4	0	1	5
		Total		**16**	**3**	**3**	**22**
		Contact (Hrs./week) + Counseling Placement Activity		**16**	**6**	**6**	**30 (28+2)**

III Semester Electives

Elective – I		Elective – II (With Practice)	
Course Code	**Course Title**	**Course Code**	**Course**
18MCA341	Non-Relational Databases (NOSQL)	18MCA351	Content Management System
18MCA342	Operations Research	18MCA352	Advanced OOPS
18MCA343	Machine Learning	18MCA353	Model View Controller Programming

IV Semester MCA							
Sl. No	**Course Code**	**Course Title**	**BoS**	**Credit Allocation**			**Total credits**
				Lecture	**Tutorial**	**Practice**	
1.	18MCA41	Software Testing	MCA	3	0	1	4
2.	18MCA42	Mobile Application Development	MCA	3	0	1	4
3.	18MCA43X	Elective III	MCA	3	0	0	3
4.	18MCA44X	Elective – IV	MCA	3	0	0	3
5.	18MCA45X	Elective – V (with Practice)	MCA	3	1	1	5
6.	18MCA46	Minor Project– I	MCA	0	0	3	3
		Total		**15**	**1**	**6**	**22**
		Contact (Hrs./week) +Counseling+ Placement Activities		**15**	**2**	**12**	**31 (29+2)**

IV Semester Electives					
Elective – III		**Elective – IV**		**Elective – V (With Practice)**	
Course Code	**Course Title**	**Course Code**	**Course Title**	**Course Code**	**Course Title**
18MCA431	Information Retrieval	18MCA441	Cyber Security	18MCA451	Computer Graphics
18MCA432	Pattern Recognition	18MCA442	Soft Computing	18MCA452	Advanced Computer Networks
18MCA433	Software Architecture	18MCA443	Unified Modeling Language	18MCA453	Enterprise Application Programming

V Semester MCA							
Sl. No	**Course Code**	**Course Title**	**BoS**	**Credit Allocation**			**Total credits**
				Lecture	**Tutorial**	**Practice**	
1.	18MCA51	Software Project Management	MCA	3	0	0	3
2.	18MCA52	Big Data Analytics	MCA	3	1	1	5
3.	18MCA53X	Elective – VI	MCA	3	0	0	3
4.	18MCA54X	Elective – VII (with Practice)	MCA	3	1	1	5
5.	18MCA55	Seminar-1	MCA	0	0	2	2
6.	18MCA56	Minor Project – II	MCA	0	0	4	4
7.		**Total**		**12**	**2**	**8**	**22**
		Contact (Hrs./week) + Counseling		**12**	**4**	**16**	**32**

Electives V Semester			
Elective – VI		**Elective VII (With Practice)**	
Course Code	**Course Title**	**Course Code**	**Course Title**
18MCA531	Wireless Mobile Networks	18MCA541	Cloud Computing
18MCA532	Software Performance Engineering	18MCA542	Internet of Things
18MCA533	Principles of UI/UX Design	18MCA543	Virtual Reality

VI Semester MCA							
Sl. No	**Course Code**	**Course Title**	**BoS**	**Credit Allocation**			**Total credits**
				Lecture	**Tutorial**	**Practice**	
1	18MCA61	Project & Viva Voce	MCA	-	-	20	20
2	18MCA62	Seminar-2	MCA	-	-	2	2
		Total		-	-	22	22

Proposed Credits for the MCA Programme					
Total Credits					
Semester	**Core**	**Elective**	**Project / Industry internship**	**Seminar**	**Total Credits**
I	22	00	00	00	22
II	22	00	00	00	22
III	13	09	00	00	22
IV	08	11	03	00	22
V	08	08	04	02	22
VI	00	00	20	02	22
Total	**73**	**28**	**27**	**04**	**132**

I - SEMESTER					
DISCRETE MATHEMATICS (Theory)					
Course Code	**:**	**18MAT11**	**CIE Marks**	**:**	**100**
Hrs/Week	**:**	**L:T:P 3:1:0**	**SEE Marks**	**:**	**100**
Credits	**:**	**4**	**SEE Duration**	**:**	**3 Hrs**

Unit – I	**10 Hrs**
Set Theory Sets and subsets, Set operations and the laws of set theory, Principle of inclusion and exclusion and Venn Diagrams, Generalization of principle of inclusion and exclusion.	
Unit – II	**10 Hrs**
Relations and Functions Cartesian Product and relations, Properties of Relations, Zero-one matrices and directed graphs, Hasse diagram, Equivalence relations and partitions, Functions-types of functions, Special Functions, Function composition and Inverse function.	
Unit – III	**10 Hrs**
Principle of counting The rules of sum and product, Permutations and Combinations-Combinations with repetitions, Derangements, Rook polynomials, Arrangements with Forbidden positions.	
Unit – IV	**08 Hrs**
Fundamentals of Logic Basic connectivity and Truth table, Logical equivalence, logical implications, Quantifiers – Definitions and Proofs of theorem.	
Unit – V	**10 Hrs**
Graph Theory Definitions and Examples, Sub graphs , complements and Graph Isomorphism, Vertex Degree, Planar Graphs, Hamiltonian paths and circuits, Matrix representation-Incidence matrix and Adjacency matrix.	

Course Outcomes:

After going through this course, the student will be able to:

CO1: Understand fundamental concepts of sets, counting, logic, relations, functions and graph theory

CO2: Apply fundamental concepts of sets, counting, logic, relations, functions and graph theory for different domains in computer science

CO3: Analyze mathematical concepts like sets, counting, reasoning, relational algebra and graph theory to solve the problems and optimize the solution

CO4: Implement overall mathematical knowledge gained to demonstrate and analyze the problems arising in practical situation

References Books:

1	Ralph P Grimaldi, B.V.Ramana, “Discrete and Combinatorial Mathematics. An applied Introduction”, 5th Edition, Pearson Education, 2007, ISBN-10:8177584243, ISBN-13:9788177584240.
2	Seymour Lipschutz, Marc Lipson, “Discrete Mathematics”, Schaum's Outlines, McGraw-Hill, 3rd Edition, 2007, ISBN: 978-0-161587-7.
3	Kenneth H Rosen, " Discrete Mathematics & its Applications", 7th Edition, McGraw-Hill, 2010, ISBN-10: 0073383090, ISBN-13: 978-0-073383095.
4	Geir Agnarsson & Raymond Greenlaw, “Graph Theory-Modeling, Applications and Algorithms”, Pearson Education, 2008, ISBN - 978-81-317-1728-8.

I – SEMESTER					
COMPUTER ORGANIZATION AND ARCHITECTURE (Theory)					
Course Code	**:**	**18MCA12**	**CIE Marks**	**:**	**100**
Hrs/Week	**:**	**L:T:P 3:0:0**	**SEE Marks**	**:**	**100**
Credits	**:**	**3**	**SEE Duration**	**:**	**3 Hr**

Unit – I — **08 Hrs**

Introduction to Boolean Algebra

Number systems and Boolean Algebra: Number systems, binary codes, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Expression simplification using Boolean theorem and K-map.

Unit – II — **07 Hrs**

Introduction to Digital Electronics

Logic gates: Basic Gates, Universal Gate , the exclusive OR gate, Equivalence Gates. Combinational circuits: Adders, Subtracters, Binary Parallel Adder, Decimal Adder, Decoders, Multiplexers. Sequential Circuits: Flip – Flops, Triggering of Flip- Flops.

Unit – III — **07Hrs**

Basic Structure of Computer and Machine Instructions.

Computer Types, Functional Units, Basic Operational Concepts Bus structures, Performance, Memory Location and Addresses , Machine Instruction and Program Memory Operations, Instructions, Instruction Sequencing, Basic Input/output Operations, Introduction to Microprocessor based computer system.

Unit – IV — **07Hrs**

IA-32 Architecture

IA-32 Register Structure, IA-32 Addressing modes, Machine Instructions format, IA-32 instructions

Unit – V — **07 Hrs**

IA-32 Programming

Program Flow Control: Conditional and Unconditional Jumps, Shift and Rotate Instructions Programming examples.

Course Outcomes

After going through this course, the student will be able to:
CO1: Illustrate the concepts of digital system, its organization and architecture
CO2: Apply basic concepts of digital system and assembly language in solving problems
CO3: Analyse the working of digital logic circuits and assembly language programs
CO4: Justify the solutions selected for a problem

Reference Books:

1	M. Morris Mano, " Digital Logic and Computer design", Pearson Education Ltd., 2016, ISBN: 13 9789332542525
2	Carl Hamacher, Z Varnesic and S Zaky, " Computer Organization" , Tata McGraw-Hill, 5th Edition 2012, ISBN: 13 9781259005275
3	Charles H. Roth, Jr. and Larry L. Kinney, "Fundamentals of Logic Design", Cengage Learning 7th Edition 2014, ISBN: 10:1-133-62847-8
4	Bob Colwell and Tom Shanley, "The Unabridged Pentium 4 IA32 Processor Genealogy", Addison-Wesley Professional, 2004, ISBN: 032124656X

I – SEMESTER					
DATA STRUCTURES USING C (Theory & Practice)					
Course Code	**:**	**18MCA13**	**CIE Marks**	**:**	**100+50**
Hrs/Week	**:**	**L:T:P 3:1:2**	**SEE Marks**	**:**	**100+50**
Credits	**:**	**5**	**SEE Duration**	**:**	**3 Hrs**

Course Objectives

Graduates shall be able to:

1. Understand the fundamentals of Data Structures
2. Implement different data structures like stacks, queues, linked lists, trees and graphs
3. Identify different data structures and its applications
4. Solve problems by using data structures for different applications

Unit – I	**06Hrs**

Introduction to Data Structures and its types

Types of Data Structures –Primitive , Composite and Abstract Data, Linear and Non-Linear Data Structures , Applications of Data Structures, Pointers and Dynamic Memory Allocation

Linear Data Structures – Arrays: Static and Dynamic, Multi-Dimensional Arrays, Basic Operations on Linear Data Structures

Unit – II	**08Hrs**

Stacks and Queues

Stacks, Applications of Stacks: Evaluations of Expressions, Queues, Circular Queues , Priority Queues

Unit – III	**08Hrs**

Linked Lists

Singly Linked lists, Linked Stacks and Queues, Doubly Linked Lists, Circular Linked Lists

Unit – IV	**08 Hrs**

Trees & Hashing

Binary Trees, Binary Tree Traversals, Binary Search Trees ,Heaps, Hashing: Static Hashing

Unit – V	**06Hrs**

Graphs and Sorting

Graph Abstract Data Type: Definitions, and Representations, Elementary Graph Operations: Depth First Search , Breadth First Search

Sorting: Bubble Sort, Insertion Sort, Selection Sort

Unit – VI (Lab Component)

Students are required to implement the following using C

1. Searching techniques using arrays (Linear and Binary)
2. Operations for a String based Stack
3. Evaluate postfix expression in a compiler
4. Basic queue operations
5. Task Scheduling using Priority Queues
6. Working of a singly linked list
7. Binary Search Tree traversal techniques
8. Sorting techniques (Bubble Sort, Insertion Sort, Selection Sort)
9. Depth First Search Traversal to identify the connectivity of a graph
10. Breadth First Search to display the reachable nodes

Note :

1. Experiment No.6, students are required to demonstrate any two operations specified by the examiners during CIE and SEE with display operation as a mandatory
2. Experiment No.8, students are required to demonstrate any two sorting technique specified by the examiners during CIE and SEE

Course Outcomes

After going through this course the student will be able to:

CO1: Understand data abstraction and data structures

CO2: Identify relevant data structures to develop solutions for a particular problem

CO3: Apply relevant data structures for different applications

CO4: Examine the use of different data structures in various applications

Reference Books

1.	Horowitz, Sahni, Anderson-Freed: "Fundamentals of Data Structures in C", 2nd Edition, University Press,2012 ISBN: 978-81-7371-605-8
2.	Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, "Data Structures and Alogorithms in Python"2013, Wiely Publications *ISBN*-10: 1118290275
3.	YedidyahLangsam, Moshe J. Augenstein, Aaron M. Tannenbaum, "Data Structures Using C and C++", 2006, PHI publications, ISBN 10: 0130369977
4.	Brian W. Kernighan , Dennis M. Ritchie , "The C Programming Language" , 2nd Edition, PHI Publications, ISBN-10: 0131103628 ISBN-13: 978-0131103627

I - SEMESTER

Object Oriented Programming
(Theory &Practice)

Course Code	**:**	**18MCA14**	**CIE Marks**	**:**	**100 + 50**
Hrs/Week	**:**	**L: T: P 3:1:2**	**SEE Marks**	**:**	**100 + 50**
Credits	**:**	**5**	**SEE Duration**	**:**	**3 Hrs**

Unit – I — **8 Hrs**

Object oriented programming: Introductions, OOP, classes, class attributes, instances, instance attributes, Encapsulation, Basics of polymorphism: Operator and function overloading, Constructor and Destructor

Unit – II — **8 Hrs**

Introduction to Python Programming Language
Introduction to python, program output, input, comments, operators, variables and assignment, numbers, if statement, while loop, for loop, and the range()
Data Types, Functions and Modules: Lists and tuples, working with strings, dictionaries, Functions and Functional programming,

Unit – III — **8 Hrs**

Modules: What are modules, modules and files, Importing modules, packages.
Inheritance: Introduction, types of inheritance, sub classing and scope, overriding methods

Unit – IV — **6 Hrs**

Error and Exceptions: Lists and tuples, Working with Strings, Dictionaries, Introduction to exceptions in python, detecting and handling exceptions, context management, exceptions as strings, raising exceptions, assertions, standard exceptions.

Unit – V — **6Hrs**

Reading and Writing Files- Introduction to File operation, opening a File, Techniques for Reading Files, Writing Files.
Magic Methods - Magic method syntax, Available Methods

Unit – VI(Lab Component)
Student should implement using Python Language

1. Implement importing of modules using OOPs concepts
2. Implement 10 operations on string and Tuple
3. Implement 10 operations on sets and dictionary
4. Design and develop pay band scale for N employees using dictionary
5. Implement Hierarchical Inheritance
6. Implement Multilevel Inheritance
7. Implement overriding concept
8. Demonstrate the magic methods usage: i)__getattr__ ii) __setattr__
9. Write a program to implement string manipulation using files
10. Demonstrate any five-exception handling mechanism

Course Outcomes
After going through this course, the student will be able to:
CO1: Relate and recall object oriented and structured programming concepts
CO2: Demonstrate competency in object-oriented concepts
CO3: Utilize object-oriented concepts for real world problem
CO4: Analyze solutions using OOPs concepts for real world applications

Reference Books	
1	Hetland, Magnus Lie. “Beginning Python: from novice to professional”. 3rd Edition, Apress, ISBN 978-1-4842-0029-2, 2017
2	Sneeringer, Luke,” Professional Python”, John Wiley & Sons, ISBN -978-1-119-07085-6, 2016.
3	Paul Gries, Jennifer Campbell, Jason Montojo, “Practical Programming”, 2nd Edition An Introduction to Computer Science Using Python 3, SHROFF Publishers and Distributors Pvt Ltd, ISBN: 13:978-93-5110-469-8, 2014
4	Wesley J Chun, “Core Python Programming”, second edition, Pearson Education, ISBN 81-317-1188-9, 2007

I – SEMESTER

Web Programming
(Theory and Practice)

Course Code	**:**	**18MCA15**	**CIE Marks**	**:**	**100 + 50**
Hrs/Week	**:**	**L: T: P 3:1:2**	**SEE Marks**	**:**	**100 + 50**
Credits	**:**	**5**	**SEE Duration**	**:**	**3 Hrs**

Unit – I **07 Hrs**

Introduction to Web Technologies Internet, WWW, Web Browsers, Web Servers, URLs, MIME, HTTP, Security, the Web Programmers Toolbox. Multi-tier Application Architecture, Client-Side Scripting versus Server-Side Scripting.
Markup Language : **HTML5 tags** - Formatting, Commenting, Code, Anchors, Backgrounds, Images, Hyper-links, Lists, Tables, Multimedia, Forms

Unit – II **07 Hrs**

Front End Design : Cascading Style Sheet (CSS): Introduction to CSS – Basic syntax and structure, In-line Styles, Embedding Style Sheets, Linking External Style Sheets, Backgrounds, manipulating text, Margins and Padding, Positioning using CSS.
XML: Introduction, syntax, Document structure, Document Type Definitions, Namespaces, XML schema, displaying raw XML documents, Displaying XML documents with CSS, XSLT style sheets

Unit – III **07 Hrs**

Basics of JavaScript: Overview of JavaScript, Object orientation and JavaScript, Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions.

Unit – IV **07 Hrs**

Document Object Model: The JavaScript Execution Environment, The Document Object Model, Elements Access in Java Script, Events and Event Handling, The DOM 2 Event Model, DOM Tree Traversal and Modification

Unit – V **08 Hrs**

Introduction to PHP: Origins and Uses of PHP, Overview of PHP , General Syntactic Characteristics, Primitives, Operations and Expressions, Output , Control Statements, Arrays, Functions, Pattern Matching, Form Handling, Files, Cookies, Session Tracking

Unit – VI : Lab Component

1. Create an HTML5 page to demonstrate the usage of :
    a. Text Formatting tags,
    b. Links
    c. Images
    d. Tables
2. Create a web page with all types of selectors and Cascading style sheets.
3. Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, Name of the College, Branch, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.
4. Develop and demonstrate a calculator using HTML5 file that includes JavaScript.
5. Write PHP code to change the background color of the page and display a welcome message including the given name submitted in the html form.
6. Write a Javascript program to display a digital clock which displays the current time of the server.
7. Develop and demonstrate, using JavaScript script, a HTML5 document that collects the USN (the valid format is: A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by two upper-case characters followed by three digits; no embedded spaces

allowed) of the user. Event handler must be included for the form element that collects this information to validate the input. Messages in the alert windows must be produced when errors are detected.

8. Write a PHP Program to demonstrate all the file operations
9. Demonstrate a login page using HTML5 and validate the username and password using PhP
10. Write a PHP program to store current date-time in a COOKIE and display the 'Last visited on' date-time on the web page upon reopening of the same page. Also, store page views count in SESSION, to increment the count on each refresh, and show the count on web page.

Course Outcomes

After going through this course the student will be able to:

CO1: Illustrate the fundamentals of web programming

CO2: Apply the mark-up and scripting language concepts to build web applications

CO3: Analyze appropriate content layout design and event handling techniques

CO4: Implement server side utilities for dynamic real world environment

Reference Books

1	Robert W. Sebesta," Programming the World Wide Web", Pearson Education, 8th Edition, 2015. ISBN: 9780133775983
2	M. Srinivasan, "Web Technology Theory and Practice", Pearson Education, 1st Edition, 2012, ISBN: 9788131774199
3	Harvey & Paul Deitel & Associates, Harvey Deitel and Abbey Deitel, "Internet and World Wide Web - How to Program", Pearson Education, 5th Edition, 2011, ISBN: 9780132151009
4	Chris Bates, "Web Programming Building Internet Applications", Wiley India, 3rd Edition, 2006, ISBN: 9780470017753

II - SEMESTER					
SOFTWARE ENGINEERING (Theory)					
Course Code	**:**	**18MCA21**	**CIE Marks**	**:**	**100**
Hrs/Week	**:**	**L:T:P 3:0:0**	**SEE Marks**	**:**	**100**
Credits	**:**	**3**	**SEE Duration**	**:**	**3 Hrs**

Unit – I — **10 Hrs**

Introduction & Software Process Models

Introduction: Professional Software Development, Software engineering and the Web, IEEE/ ACM code of software engineering ethics, Software Process models: waterfall, incremental development, Process activities: Coping with change, Plan-driven and Agile Development, Extreme Programming, Scrum; Case study- Develop Software Requirement Specification for any real world application (IEEE format)

Unit – II — **08 Hrs**

System Modeling, Design and implementation

System Modeling: Context models, Interaction models, Structural models, Behavioral models: Architectural Design: Architectural design decisions, Architectural patterns; Case Study-Develop Object oriented models for real world application

Unit – III — **06 Hrs**

Advanced Software Engineering

Component-based Software Engineering: Components and component models, CBSE processes, Component composition; Distributed Software Engineering: Distributed systems, Client–server computing, SaaS

Unit – IV — **06 Hrs**

Software Testing, Project Planning and Management

Software Testing: Development testing, Test driven development, Release testing, User testing; Project Planning and Management: Risk management, Plan-driven development, Project scheduling, Estimation techniques; Case study-Generate test cases, cost and effort estimation for the problem identified

Unit – V — **06 Hrs**

Software Quality Assurance

Elements of Software quality assurance, SQA Tasks, Goals & Metrics, ISO 9001:2015 standards, quality management resources, Six Sigma

Expected Course Outcomes

After going through this course the student will be able to:

CO1: Interpret the basic concepts of Software Engineering and development process

CO2: Demonstrate the phases of software development Life cycle, Concept of professional ethics using various system models

CO3: Analyze and apply various testing techniques and Software project management strategies to build Quality Software products

CO4: Examine Emerging Software Engineering concepts and methods for construction of efficient Software systems

Reference Books	
1	Ian Summerville, "Software Engineering", Pearson Education Ltd, 10th Edition, 2015, ISBN : 9780133943030
2	Roger S Pressman, Bruce R. Maxim, "Software Engineering- A Practitioner's Approach", McGraw-Hill, 8th Edition, 2015, ISBN: 9780078022128
3	E-Book: Guide to the Software Engineering body of Knowledge version 3.0 SWEBOK,2014,ISBN:9780769551661
4	Pankaj Jalote, "An Integrated Approach to Software Engineering", Narosa Publishing House, 3rd Edition, 2013, ISBN: 81-7319-702-4

II - SEMESTER					
E-COMMERCE (Theory)					
Course Code	**:**	**18MCA22**	**CIE Marks**	**:**	**100**
Hrs/Week	**:**	**L:T:P 3:1:0**	**SEE Marks**	**:**	**100**
Credits	**:**	**4**	**SEE Duration**	**:**	**3 Hrs.**

Unit – I	**8 Hrs**
Introduction to E-Commerce Eight unique features of E-Commerce technology, Types of E-Commerce, E-Commerce Business Models, B2C Business Model, B2B Business Model, Case studies	
Unit – II	**7 Hrs**
Technology Infrastructure for E-Commerce Building an E-Commerce presence, Software and Hardware requirement, Case studies on Developing a mobile web site and building mobile applications, Case studies	
Unit – III	**7 Hrs**
Marketing and advertising Concepts Digital commerce marketing and advertising strategies, Internet marketing technology, Cost and benefits of online marketing communications, Social mobile and local marketing, Case studies	
Unit – IV	**7Hrs**
e-Commerce Security and Payments Security threats in the e-commerce environment, Management policies, business procedures, E-commerce payment systems, Social, Mobile and Local marketing, Case studies	
Unit – V	**7 Hrs**
Ethical and Social issues in E-Commerce Understanding Ethical and social issues in e-Commerce, Privacy and information rights, Intellectual Property rights, Case studies	
Expected Course Outcomes After going through this course the student will be able to: CO1: Understand the fundamentals of e-commerce in business CO2: Apply e-commerce initiatives in various Business applications CO3: Analyze challenges for e-commerce models CO4: Evaluate E-commerce business applications	

Reference Books	
1	Kenneth C. Laudon, Carol Guercio Traver, "E-commerce BusinessTechnology Society. Pearson,10th edition,2016,ISBN 978-93-325-5673-7.
2	Gary P. Schneider, Ecommerce strategy, Technology & Implementation 2008, ISBN-13 : 978-81-315-0533-5.

II - SEMESTER

Database Systems
(Theory and Practice)

Course Code	**:**	**18MCA23**	**CIE Marks**	**:**	**100 + 50**
Hrs/Week	**:**	**L:T:P 3:1:2**	**SEE Marks**	**:**	**100 + 50**
Credits	**:**	**5**	**SEE Duration**	**:**	**3 Hrs**

Unit – I — **07 Hrs**

Basic Concepts

Introduction to data, information, databases, database management system; Characteristics of database approach, Actors on the Scene, Advantages of using DBMS approach , Classification of Database Applications, Data models, Schema and instances, Three schema architecture and independence, DBMS Environment, Client/ Server Architectures of DBMS, E-R Model – E-R Diagrams

Unit – II — **08 Hrs**

Data Models and Basic SQL

Introduction to Data Models, Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Keys, Dealing with Constraint Violations, E-R to Relational Mapping, Advantages of SQL, Data Definition Language and Data Types

Unit – III — **07 Hrs**

Structured Query Language

Data Manipulation language, Data Control Language, Data Query Language and all related commands. Queries using Group by and Order by clause & Join, Operators, Aggregate Functions, Commit, Rollback, Save point. Views: Introduction

Unit – IV — **07 Hrs**

Database Design Theory and Normalization

Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Multi-valued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form

Unit – V — **07 Hrs**

Transaction Processing and Concurrency Control

Introduction-Properties of Transaction, Serializability, Concurrency Control, Locking Mechanisms, Two Phase Commit Protocol, Dead lock

Unit – VI: Lab Component

1. Consider a scenario on Employee Management Database and perform the following
   i. Identify the Entities, attributes, relationships, cardinality and participation
   ii. Design the ER diagram and map it to schema diagram
   iii. Create the tables and populated them with appropriate data
   iv. Design the solution for the following
      a. List the employee name and salary is increased by 25% and expressed as Dollars.
      b. Display the average salaries of all the employees who works as ANALYST
      c. List the employees who are not working in the department FINANCE

d. List the details of the departments where maximum number of employees are working
e. List the name, salary, and commission for those employees whose net pay are greater than or equal to the salary of any other employee in the company.
f. List the department where there are no employees (use Join)

Additional queries

1. List the managers who are senior to ALEX and who are junior to ANDREW.
2. Display the unique department of the employees
3. List the details of the senior employees as on year 1991.
4. List the name and average salary of employees in department wise.
5. list the name and salary of ANEESA if her salary is equal to maximum salary of her grade
6. List the department number, name, designation, salary, and net salary (salary + commission) of the SALESMAN who are earning maximum net salary
7. Find the most recently hired employees in each department order by joining date
8. List the name of the employees for their manager LENIN and also the name of the manager of LENIN
9. List the name of the managers who is having maximum number of employees working under him
10. list the name of the departments where more than average number of employees are working

2. Consider a scenario on Movie Database and perform the following
   i. Identify the Entities, attributes, relationships, cardinality and participation
   ii. Design the ER diagram and map it to schema diagram
   iii. Create the tables and populated them with appropriate data
   iv. Design the solution for the following
      a. Find the movies which was released before 1998
      b. Find the name of the director (first and last names) who directed a movie that casted a role for 'Eyes Wide Shut'
      c. Find the reviewer's name and the title of the movie for those reviewers who rated more than one movie
      d. Find all the years which produced at least one movie and that received a rating of more than 3 stars
      e. List all the actors who acted in a movie before 1990 and also in a movie after 2000 (use Join)
      f. Compute a report which contains the genres of those movies with their average time and number of movies for each genre (use Join)

Additional Queries

1. Find the titles of all movies directed by the director whose first and last name are Ronnie William
2. Find the titles of all movies that have no ratings
3. Find the titles of all movies directed by carl Hamacher.
4. Find the names of all reviewers who have ratings with a NULL value

5. Retrieve the reviewer name, movie title, and stars for those movies which reviewed by a reviewer and must be rated. Sort the result by reviewer name
6. Find the movie title, and the highest number of stars that movie received and arranged the result according to the group of a movie and the movie title appear alphabetically in ascending order
7. Find the titles of all movies which have been reviewed by anybody except by Allen Timpson
8. list all the information of the actors who played a role in the movie 'SILVER LINE'
9. Find the movie title, actor first and last name, and the role for those movies where one or more actors acted in two or more movies

   Retrieve the reviewer name, movie title, and stars in an order that reviewer name will come first, then by movie title, and lastly by number of stars (use join)

3. Consider a scenario on Hospital Database and perform the following
    1. Identify the Entities, attributes, relationships, cardinality and participation
    2. Design the ER diagram and map it to schema diagram
    3. Create the tables and populated them with appropriate data
    4. Design the solution for the following
        a. Find the name and medication for those patients who did not take any appointment
        b. Find out the floor where the minimum no of rooms are available
        c. Obtain the nurses and the block where they are booked for attending the patients on call (use Join)
        d. Find the name of the patients who taken an advanced appointment, and also display their physicians and medication
        e. Find the name of the patients, their treating physicians and medication
        f. Generate a report which will show - name of the patient, name of the physician who is treating him or her, name of the nurse who is attending him or her, which treatment is going on to the patient, the date of release, In which room the patient has admitted and which floor and block the room belongs to respectively

Additional Queries

1. Find the floor and block where the room number 104 belongs to
2. Count the number of unavailable rooms
3. Find the name of the nurse who are the head of their department
4. Find all the information of the nurses who are yet to be registered
5. Obtain the name of the physicians who are trained for a special treatment
6. Count the number of patients who taken appointment with at least one physician
7. Obtain the name of the physicians who are not a specialized physician
8. Obtain the name of the physicians with department who are yet to be affiliated
9. Count number of unique patients who got an appointment for examination room C
10. Find the name of the patients and the number of physicians they have taken appointment

Course Outcomes

After going through this course the student will be able to:

CO1: Explain the basic concepts of data models, database design for transaction processing and Query Language

CO2: Analyze an information storage problem and derive an information model expressed in the form of an entity relation diagram

CO3: Transform high-level conceptual model to relational data model, populate database and formulate queries based on principles of normalization

CO4: Design and Implement a relational database for any given problem

Reference Books

1	Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Pearson Addison Wesley, 6th Edition, 2011, ISBN 13: 978-0-136-08620-8
2	Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database Systems Concepts", McGraw-Hill Education, 6th Edition, 2010, ISBN 0-07-352332-1
3	Raghu Ramakrishnan, Johannes Gehrke, "Database Management System", Mc Graw-Hill, 3rd Edition, 2003, ISBN-10: 0072465638
4	Jeffrey A. Hoffer, Mary B. Prescott, Fred R. McFadden, "Modern Database Management", Prentice Hall, 8th Edition, ISBN-13: 978-0-13-033969-0

II SEMESTER					
OPERATING SYSTEMS (Theory and Practice)					
Course Code	**:**	**18MCA24**	**CIE Marks**	**:**	**100 +50**
Hrs/Week	**:**	**L-T-P : 3: 1: 2**	**SEE Marks**	**:**	**100 +50**
Credits	**:**	**05**	**SEE Duration**	**:**	**3 HOURS**

Unit – I — **7 Hrs**

Introduction to Operating Systems
Operating system objectives and functions, Unix – architecture, features, General purpose utilities, File system, Basic file attributes, Simple filters: head, tail, cut, paste, fork, sort, tr, grep, sed

Unit – II — **7 Hrs**

Process Management
Process, Process States, Process Description, Process Control, System call – fork, exec Process Scheduling: Basic Concept, Scheduling Criteria and Algorithms

Unit – III — **8 Hrs**

Concurrency Control
Principles of Concurrency, Semaphore, Message Passing, Principles of Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Dining Philosopher's problem using semaphores

Unit – IV — **7 Hrs**

Memory Management
Swapping, Contiguous Memory Allocation, Paging, Segmentation, Demand Paging, Page Replacement and Allocation of Frames

Unit – V — **7 Hrs**

File and Disk Management
Implementing File systems: Directory Implementation, Allocation Methods, Free Space Management, Secondary Storage Structure: Disk Structure, Disk Scheduling and Disk Management, Case Study - RTOS

Unit – VI (Lab Component)

1. Write a shell script to implement the following tasks
   a) Count the files with read only permission for all users.
   b) Display directory/file properties with formatted output
   c) Display the current week of the month, with replacement of current date to '*'
   d) Convert range of lines from a file into toggle case and store it in another file
2. Write a program to implement copy command
3. Write a program using fork() system call that generates Fibonacci series in the child process.
4. Implement future knowledge algorithm and non preemptive SJF and make the comparison
5. Implement FCFS and Round Robin algorithms
6. Implement producer-consumer problem using semaphore
7. Write a program to simulate the MFT (Multiprogramming with Fixed number of tasks) memory management technique
8. Write a program to implement FIFO, LRU and Optimal Page Replacement algorithm with a memory reference string with three frames
9. Implement Linked List File Allocation techniques
10. Implement disk scheduling Algorithms

(Note : For Program No: 8 and 10 Implement Any Two in CIE/SEE)

Expected Course Outcomes:
After going through this course the student will be able to:

CO1: Define the structure of an operating system components and its responsibilities CO2: Analyze the structure and design decisions involved in the implementation of an operating system CO3: Design and Demonstrate general solutions for the issues involved in the management of an operating system CO4: Implement and manage the computer resources like memory, storage devices, processes, file systems and users	
Reference Books:	
1.	William Stallings, "Operating Systems – Internals and Design Principles", Pearson, Seventh Edition, 2012, ISBN:978-93-325-1880-3
2.	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating System Concepts" , John Wiley, Eighth Edition, 2010, ISBN :978-81-265-205-0
3.	Sumitabha Das, "Unix Concepts and Applications", Mc Graw Hill, Fourth Edition, 2012,ISBN:978-0-07-063546-3
4.	Jonathan W Valvano, Real –Time Operating Systems For ARM Cortex-M Microcontrollers - Embedded Systems, Volume 3, 4th Edition, 2017, ISBN: 978-1463590154

II Semester

JAVA Programming
(Theory and Practice)

Course Code	**:**	**18MCA25**		**CIE Marks**	**:**	**100+50**
Hrs/Week	**:**	**L:T:P 3:1:2**		**SEE Marks**	**:**	**100+50**
Credits	**:**	**5**		**SEE Duration**	**:**	**3 Hrs**

Unit – I — **6 Hrs**

Java Programming Fundamentals: Introduction to Java Programming, Applications of Java Programming, The Java Development Kit, The Java Keywords, Identifiers in Java, User input using Scanners, The Java Class Libraries. Java's Primitive Types, The Scope and Lifetime of Variables, operators, Type Casting, Operator Precedence, Expressions, Conditional and Control Statements, Arrays, String Handling

Unit – II — **6 Hrs**

Classes, Objects and Methods: Class Fundamentals, How Objects are Created, Reference Variables and Assignment, Methods, Returning from a Method, Returning Value, Using Parameters, Constructors, The new operator Revisited, Garbage Collection and Finalizers, this Keyword, Recursion, Understanding Static.

Unit – III — **10 Hrs**

Inheritance, Interface, Packages: Inheritance: Fundamentals, Overloading, Overriding, super keyword, Using final. Interface: Fundamentals, Creating an Interface, Implementing an Interface, Using Interface References, Implementing Multiple Interfaces. Package : Fundamentals, Importing Packages, Creating user defined packages

Unit – IV — **6 Hrs**

Exception Handling and Multithreading: Exception Handling: Fundamentals, Hierarchy, Catching subclass Exceptions, try blocks can be nested, Throwing an Exception, Throwable, using finally, using throws, Java's Built-in Exceptions. Multithreaded Programming: fundamentals, Thread Class and Runnable Interface, Creating Thread, Creating Multiple Threads, Thread Priorities, Thread Synchronization, Thread Communication using notify(), wait() and notify All(), suspending, Resuming and stopping Threads.

Unit – V — **8 Hrs**

I/O, Applets: The Java I/O Classes and Interfaces, File Handling, Input stream and Output stream.Applet: fundamentals, Architecture, Applet Skeleton, Applet Initialization and Termination, Requesting Repainting, using the status window, Passing parameters to Applets, event handling, Layouts.

Unit –VI: Lab Component

1. Write a JAVA Program to demonstrate Constructor Overloading and Method overloading
2. Write a Java program to demonstrate the methods in String and StringBuffer
   a. Write a JAVA Program to demonstrate Inheritance
   b. Write a Java program to demonstrate Multiple inheritance using interface.
3. Demonstrate the usage of packages in java programing by creating a package containing geometrical figures and calculating their area. Import and compile classes in other program
4. Write a JAVA program to demonstrate the usage of user defined Exception Handling (also make use of throw, throws.)
5. Write a JAVA program using Synchronized Threads, which demonstrates Producer Consumer concept
6. Write a JAVA program to demonstrate the Thread priority by creating three different thread and changing its priority in another program.

7. Write a JAVA Program to demonstrate read, write and append operations on files
8. Write a JAVA applet program, which handles keyboard event.
9. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the + – * % operations. Add a text field to display the result.

Course Outcomes

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

CO1: Understand the fundamentals of Java Programming

CO2: Design a Java program efficiently by using its features

CO3: Implement and Develop software using Java programming

CO4: Demonstrate various Java features in building applications

Reference Books

1.	Herbert Schildt, Dale Skrien, "Java Fundamentals, A Comprehensive Introduction ", Tata McGraw Hill Edition, 2013, McGraw Hill Publication, ISBN-13:9781249006593
2.	Schildt, Herbert. Java: The Complete Reference 9th . McGraw-Hill Education Group, 2014, McGraw-Hill Education Group, ISBN:0071808558 9780071808552
3.	Danny Poo, Derek Kiong, Swarnalatha Ashok, "Object-Oriented Programming and Java", second edition Springer science and business media, 2009, ISBN: 978-81-8489-235-2
4.	Krishna, P. Radha "Object oriented programming through Java" CRC Press, Inc., 2007,ISBN: 8173715726