



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)

SCHEME OF INSTRUCTION

Department: Computer Applications

Semester: I

Sl. No.	Course Code	Course Title	Credits				Contact Hrs./Wk.	Marks		
			L	T	P	Total		CIE	SEE	Total
1.	18MCA1PCUC	Unix & Advanced C Programming	3	1	1	5	7	50	50	100
2.	18MCA1PCCO	Computer Organization	3	0	0	3	3	50	50	100
3.	18MCA1BSDM	Discrete Mathematics	3	1	0	4	5	50	50	100
4.	18MCA1PCWD	Web Application Development	3	0	1	4	5	50	50	100
5.	18MCA1PCOS	Operating System	3	0	1	4	5	50	50	100
6.	18MCA1HSPE	Professional Communication and Ethics	1	1	0	2	3	25	25	50
Total			16	3	3	22	28	275	275	550

Abbreviations used:

L:	Lecture	PC:	Program Core
T:	Tutorial	PE:	Program Elective
P:	Practical	HS:	Humanities, Social Science, Management
S:	Self-Study	PW:	Project Work
CIE:	Continuous Internal Evaluation	SR:	Seminar
SEE:	Semester End Examination	NT:	Internship
		NC:	Non-Credit
		BS:	Basic Science



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
SCHEME OF INSTRUCTION

Department: Computer Applications

Semester: II

Sl. No.	Course Code	Course Title	Credits				Contact Hrs./Wk.	Marks		
			L	T	P	Total		CIE	SEE	Total
1.	18MCA2PCOP	Object Oriented Programming with C++	3	0	1	4	5	50	50	100
2.	18MCA2PCDS	Data Structures using C	3	0	1	4	5	50	50	100
3.	18MCA2PCDB	Database Management System	3	0	1	4	5	50	50	100
4.	Elective-I									
	18MCA2PEST	Statistics	3	1	0	4	5	50	50	100
	18MCA2PEOR	Operations Research								
	18MCA2PENM	Numerical Methods								
	18MCA2PEGT	Graph Theory								
5.	18MCA2PCSE	Software Engineering	3	0	0	3	3	50	50	100
6.	18MCA2HSES	Entrepreneurship	1	1	0	2	3	25	25	50
7.	18MCA2SRS1	Seminar -1*	-	-	1	1	2	25	25	50
Total			16	2	4	22	28	300	300	600

*Students should present a seminar on any of the current technologies in the field of Computer Science and Applications for about 30 minutes and submit the write up on the same.



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
SCHEME OF INSTRUCTION

Department: Computer Applications

Semester: III

Sl. No.	Course Code	Course Title	Credits				Contact Hrs./Wk.	Marks		
			L	T	P	Total		CIE	SEE	Total
1.	18MCA3PCML	Machine Learning	3	0	1	4	5	50	50	100
2.	18MCA3PCJP	Programming using Java	3	0	1	4	5	50	50	100
3.	18MCA3PCNW	Computer Networks	3	0	1	4	5	50	50	100
4.	Elective II									
	18MCA3PECC	Cloud Computing	3	1	0	4	5	50	50	100
	18MCA3PEUI	UI & UX								
	18MCA3PEAS	Agile Software Development								
	18MCA3PEUP	Unix System Programming								
5.	Elective III									
	18MCA3PEIS	Management Information Systems	2	1	0	3	4	50	50	100
	18MCA3PEDM	Digital Marketing								
	18MCA3PERP	Enterprise Resource Planning								
	18MCA3PEOB	Organizational Behaviour								
6.	18MCA3PWM1	Mini Project - I	0	0	3	3	6	50	50	100
7.	1BMCA3NCCMC *	MOOC Course								
Total			14	2	6	22	30	300	300	600

*Mandatory Non-credited course. The students are required to pass.



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
SCHEME OF INSTRUCTION

Department: Computer Applications

Semester: IV

Sl. No.	Subject Code	Course Title	Credits				Contact Hrs./ Wk.	Marks		
			L	T	P	Total		CIE	SEE	Total
1.	18MCA4PCAD	Analysis and Design of Algorithms	3	0	0	3	3	50	50	100
2.	18MCA4PCAJ	Advanced Java Programming	3	0	1	4	5	50	50	100
3	18MCA4PCPY	Programming using Python	3	0	1	4	5	50	50	100
4.	Elective IV									
	18MCA4PEBD	Big data Analytics	3	1	0	4	5	50	50	100
	18MCA4PEAI	Artificial Intelligence								
	18MCA4PEMC	Mobile Computing								
	18MCA4PEGC	Green Computing								
5	Elective V									
	18MCA4PEAW	Advanced Web Programming	3	0	1	4	5	50	50	100
	18MCA4PEMA	Mobile Application Development								
	18MCA4PEIT	Internet of Things								
	18MCA4PENS	NOSQL								
6.	18MCA4PWM2	Mini Project-II	0	0	3	3	6	50	50	100
7.	18MCA4NCSS	Soft Skills *								
TOTAL			15	1	6	22	29	300	300	600

*Mandatory Non-credited course. The students are required to pass.



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
SCHEME OF INSTRUCTION

Department: Computer Applications

Semester: V

Sl. No.	Course Code	Course Title	Credits				Contact Hrs./Wk.	Marks		
			L	T	P	Total		CIE	SEE	Total
1.	18MCA5HSSM	Software Project Management	3	0	0	3	3	50	50	100
2.	18MCA5PCWP	Windows Application Programming using C#. Net	3	0	1	4	5	50	50	100
3.	18MCA5PCMU	Modelling with UML	2	0	1	3	4	50	50	100
4.	Elective VI									
	18MCA5PEDL	Deep Learning	3	1	0	4	5	50	50	100
	18MCA5PEAN	Advanced Computer Networks								
	18MCA5PEST	Software Testing								
	18MCA5PEWS	Web Services								
5.	Elective VII									
	18MCA5PESC	Soft Computing	3	1	0	4	5	50	50	100
	18MCA5PECS	Cyber Security								
	18MCA5PESA	Software Architecture & Patterns								
	18MCA5PEBC	Block Chain Technology								
6.	18MCA5PWM3	Mini Project III	0	0	2	2	4	50	50	100
7.	18MCA5SRS2	Seminar 2	0	0	2	2	4	25	25	50
			14	2	6	22	30	325	325	650



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
SCHEME OF INSTRUCTION

Department: Computer Applications

Semester: VI

Sl. No.	Course Code	Course Title	Credits	Marks		
				CIE	SEE	Total
1.	18MCA6NTI1*	Internship 1	2	50	50	100
2.	18MCA6NTI2*	Internship 2	2	50	50	100
3.	18MCA6PWMP	Major Project	16	100	100	200
4.	18MCA6HSPR	Cyber Regulations and IPR L:T:P = 2:0:0	2	25	25	50
			22	225	225	450

18MCA6NTI1- Internship 1 will be carried out for 3 weeks at the end of 1st year in NGO/ Professional bodies/ NSS/ NCC

18MCA6NTI2 - Internship 2 will be carried out for 6 weeks at the end of 2nd year in any company/R & D organization/ Academic Institution.

**BMS COLLEGE OF ENGINEERING BENGALURU-19**

(Autonomous College under VTU)

Department of Computer Applications**SEMESTER – I**

COURSE TITLE	Unix & Advanced C Programming	Credits	5
COURSE CODE	18MCA1PCUC	L-T-P	3-1-1
CIE	50	SEE	50

Prerequisites: None

UNIT 1:

Structures and Unions: Defining a structure, processing a structure, User defined data type: typedef, Passing Structures to functions, Self-Referential structures, Unions, Programming examples.

Pointers: Fundamentals, Pointer declarations, passing pointers to a function, Pointers and one dimensional array, Operations on pointers, Arrays of pointers, Programming examples

Dynamic Memory Allocation: Dynamic Memory Allocation, programming examples.

(07 Hrs.)

UNIT 2:

Navigating the File System: The file, what's in a filename? the parent-child relationship, pwd, the Home directory, Absolute pathnames, using absolute pathnames for a command, cd, mkdir, rmdir, Relative pathnames, ls, The UNIX file system

Handling Ordinary Files: cat, cp, rm, mv, more, lp, file, wc, od, split, cmp, comm., diff.

(07 Hrs.)

UNIT 3:

Basic File Attributes: ls -l, the -d option, File Ownerships, File Permissions, chmod, Directory permissions, Changing File Ownership

Essential Shell Programming : Shell Scripts, read : Making Scripts Interactive, Using Command Line Arguments, exit and Exit Status of Command, The Logical Operators && and || - Conditional Execution, The if Conditional, Using test and [] to Evaluate Expressions, The case Conditional, expr: Computation and String Handling, While, for, set and shift

(07 Hrs)

UNIT 4:

The Process: Process basics, ps: Process Status, System Processes (-e or -a), Mechanism of Process Creation, Running Jobs in background, nice: Job Execution with Low Priority, Killing Process with Signals, Job Control, at and batch, cron, time commands

More file attributes: File Systems and Inodes, Hard links, symbolic link and ln, The Directory, umask, Modification and Access Times, find

(07 Hrs.)

UNIT 5:

Simple filters: Pr, head, tail, cut, paste, sort, uniq, tr, Filters using Regular Expressions – grep AND sed : grep, egrep, fgrep

Awk-Advanced Filters : Simple awk Filtering, Splitting a line into fields, printf, variables and expressions, The comparison operator, number processing, variables, the -f option, the Begin and End sections, Built-in variables, Arrays, Functions, Control flow, Looping with for, while.

(08 Hrs.)

Text Books:

SL No	Content
1	Byron Gottfried: Programming with C, Third Edition, 2014.
2	Sumitabha Das: UNIX Concepts and Applications, 4 th Edition, Tata McGraw Hill, 2006

Reference Books:

SL No	Content
1	ANSI C: The C Programming Language, Second Edition, Brian W Kernighan, Dennis M Ritchie, Pearson.
2	Unix, Shell Programming Yashavant P Kanetkar, BPB Publications, 1996.

Course Outcomes:

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

CO1	Describe the concepts of C & Unix.
CO2	Apply the concepts of Unix and C to solve computing problems.
CO3	Analyse a problem and obtain a solution.
CO4	Implement programs using C & Unix for a given problem.



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
SEMESTER - 1

COURSE TITLE	Computer Organization	Credits	3
COURSE CODE	18MCA1PCCO	L-T-P	3-0-0
CIE	50	SEE	50

Prerequisites: None

UNIT 1: Basic Structure of Computers

Basic Operational Concepts, Bus Structures, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement

(7 Hrs)

UNIT 2: Machine Instructions and Programs

Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language

(7 Hrs)

UNIT 3: Input/output Organization

Accessing I/O Devices, Interrupts- Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Controlling Device Requests, Direct Memory Access, Buses

(7 Hrs)

UNIT 4: Memory System

Basic Concepts, Semiconductor RAM Memories, Read Only Memories

(7 Hrs)

UNIT 5: Arithmetic Unit

Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed Operand Multiplication, Fast Multiplication, Integer Division

(8 Hrs)

Text Books:

Sl. No.	Content
1	Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer Organization, 5th Edition, Tata McGraw Hill, 2011.

Reference Books:

Sl. No.	Content
1	William Stallings, Computer Organization & Architecture, 7th Edition, PHI, 2006

2	Kai Hwang, Advanced Computer Architecture, Tata McGraw-Hill, 2001
3	Vincent P. Heuring, Harry F.Jordan, Computer Systems Design and Architecture, 2 nd Edition, Pearson Education, 2004.

E- Books and Online Course Materials:

Sl. No.	Content
1.	Prof. Jatindra Kumar deka, Computer Organization and Architecture (Web Course), http://nptel.ac.in/courses/106103068/ Course Available From : 31-DECEMBER-2009, Course Co-ordinated by: IIT Guwahati

Online Courses and Video Lectures:

Sl. No.	Content
1.	Prof.S,Raman, Computer Organization, http://nptel.ac.in/courses/106106092/ Course Available From : 31-DECEMBER-2009, Course Co-ordinated by : IIT Madras
2.	Prof. Anshul Kumar, Computer Architecture, http://nptel.ac.in/courses/106102062/ Course Available From : 31-DECEMBER-2009, Course Co-ordinated by : IIT Delhi

Course Outcomes:

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

CO1	Describe the organization of Digital Computer.
CO2	Apply the concepts of Computer Organization for a given problem.
CO3	Design memory organization for a computing system.



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER - I

COURSE TITLE	Discrete Mathematics	Credits	4
COURSE CODE	18MCA1BSDM	L-T-P	3-1-0
CIE	50	SEE	50

Prerequisites: None

UNIT 1: The Language of Logic

(7 hrs)

Propositions, Logical Equivalences, Quantifies, Arguments, Proof Methods., *Applications:* Logical operators in Programming Languages, Logic circuit design.

UNIT 2: The Language of Sets, Functions and Matrices

(7 hrs)

The Concept of a Set, Operations with Sets, *Computer Operations with Sets*, The Cardinality of a Set, Recursively defined Sets. The concept of a function, Special Functions, Properties of Functions, Pigeonhole Principle, Composition of Functions, Matrices, Boolean Matrices, *Computer Representations of Relations*.

UNIT 3: Functions, Matrices and Relations

(8 hrs)

Relations and Digraphs, Properties of Relations, Operations on Relations, Transitivity Closure, Equivalence Relations, Partial and Total Orderings

UNIT 4: Combinatorics

(7 hrs)

The Fundamental counting principles, Permutations, Combinations, Permutations and Combinations with Repetitions, Binomial Theorem, Generalized Inclusion-Exclusion Principle.

UNIT 5: Recursion

(7 hrs)

Recursively defined functions, Solving recurrence relations, Generating Functions, Recursive Algorithms, *Applications:* Lucas Numbers, Tower of Brahma, Hand Shake Problem

Text Books:

Sl. No.	Content
1.	Thomas Koshy: Discrete Mathematics with Applications, Elsevier, 2004.

Reference Books:

Sl. No.	Content
1	Kenneth Rosen, Discrete Mathematics and Its Applications, 7 th Edition, TMH, 2012
2	Jean-Paul Tremblay, R Manohar, Discrete Mathematical Structures With Applications To Computer Science, McGraw Hill Education; 1 edition (2 February 2001)

E- Books and Online Course Materials:

Sl. No.	Content
1	Sudarshanlyengar, Discrete Mathematics, https://onlinecourses.nptel.ac.in/noc18_cs53/course
2	Kamala Krithivasan, Discrete Mathematical Structures, http://nptel.ac.in/courses/106106094/

Course Outcomes:

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

CO1	Demonstrate the concepts of Discrete Mathematical Structures.
CO2	Apply the concepts of Discrete Mathematical Structures to solve problems.
CO3	Formulate a recurrence relation for a given sequence of numbers/pseudo code adopting counting principles.
CO4	Work in a team and solve the given set of problems.



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER –I

COURSE TITLE	Web Application Development	Credits	4
COURSE CODE	18MCA1PCWD	L-T-P	3-0-1
CIE	50	SEE	50

Prerequisites: None

UNIT 1 :

(7 Hrs.)

Introduction to HTML / XHTML, CSS

Origin and Evolution of HTML and XHTML, Basic Syntax and text markup, Images, Links, Lists, Tables, Forms. HTML5 elements: audio, video and organizational and time elements.

Cascading Style Sheets: Introduction, Levels of Style Specification Formats; Selector forms; Property value forms; Font properties; List properties; Alignment of text, Color. The Box model; Background images; span and div tags.

UNIT 2:

(7Hrs.)

Introduction to Scripting Language: JavaScript – I

JAVASCRIPT: Overview of JavaScript, Syntactic Characteristics, Primitives, Operations and Expressions: Primitive Types, Declaring Variables, Numeric Operators, Type Conversions, type of operator and Assignment statement, Screen Output and Keyboard Input.

Object Creation and Modification. Handling Math, Number, Data and String Objects. Arrays, Functions, Constructors. Pattern Matching using Regular expressions, handling errors in JavaScript.

UNIT 3:

(8 Hrs.)

JavaScript –II and introduction to Framework

The Document Object Model, Event and Event Handling: Handling events from Body element, button element, textbox and password elements. DOM 2 event model. navigator Object.

Dynamic Documents with JavaScript: Positioning elements, moving elements, element visibility, changing colors and fonts, dynamic content, stacking elements, slow movement of elements.

Introduction to JavaScript based Framework: Angular JS: Getting started, Model View Controller Architecture, Benefits and Philosophy of Angular. Building and Bootstrapping Angular JS Applications.

UNIT 4:**(7 Hrs.)****Introduction to Server Side programming**

An Introduction to PHP: Overview and uses of PHP, General Syntactic structure, Primitives, Operations and Expressions. Control statements, Arrays, Functions, Pattern Matching, Form Handling, Cookies and Session Tracking.

Database Access with PHP and MySQL.

UNIT 5:**(7 Hrs.)****Handling structured and unstructured data store**

Introduction to XML: Syntax of XML, XML Document Structure, Document Type Definitions (DTDs), Namespace, XML Schema Documents, Displaying Raw XML Documents, Displaying XML documents with CSS.

JSON: Introduction to JSON, Array literals, Object literals, Mixing literals, JSON Syntax, JSON Encoding and Decoding, JSON versus XML.

Text Books:

Sl. No.	Content
1.	Programming the World Wide Web by Robert W. Sebesta, 7th Edition, Pearson Education, 2014.
2.	ShyamSeshadri, Brad Green ,Angular JS: Up and Running: Enhanced Productivity with Structured Web Apps, , O'Reily Media, 2015

Reference Books:

Sl. No.	Content
1.	Ben Henick, O'Reilly, HTML & CSS: The Good Parts, First edition, O'Reilly Media, Original first release 2010
2.	Crockford, O'Reily , JavaScript: The Good Parts, First edition, O'Reily Media, First Original release 2008
3.	Nicholas C. Zakas , Professional Javascript for Web Developers, Third edition, WROX, 2011
4.	Kogent Learning Solutions Inc., HTML 5 Black Book: Covers CSS3, Javasvript, XML, XHTML, AJAX, PHP and jQuery, Fifth Paperback, Dreamtech, 2013
5.	Adam Trachtenberg, PHP Cookbook: Solutions and Examples for PHP Programmers, Third edition, O'ReilyMedia, 2014
6.	ValeriKarpov , Diego Netto, Professional Angular JS, WROX Publication, 2015

Online Courses and Video Lectures:

Sl. No.	Content
1.	www.w3schools.com/html
2.	http://www.tutorialspoint.com/xml/index.htm
3.	http://www.tutorialspoint.com/xslt/index.htm
4.	http://www.tutorialspoint.com/php/index.htm
6.	http://www.learn-angular.org/#!/lessons/the-essentials
7.	https://in.udacity.com/course/intro-to-html-and-css--ud001-india

List of Lab Programs

Note: All the programs are to be developed using HTML 5 tags, CSS 2 / 3 and test the programs on current versions of Mozilla Firefox, Google Chrome and Microsoft Edge.

1. Programs to demonstrate the usage of basic tags in HTML
2. Program to build form based interface in HTML
3. Programs to implement various style sheet properties and selectors.
4. Programs to demonstrate the usage of core components of JavaScript which includes
 - a. variable declaration
 - b. popup box
 - c. control structures
 - d. objects creation and modification
 - e. built-in Objects (Math, Date, Array, String Object)
 - f. regular expressions
 - g. input field validation
5. Programs to demonstrate the feature of event handling in JavaScript
6. Program in PHP to demonstrate the features of
 - a. Declaring Scalar variables
 - b. Numeric Array
 - c. Associative Array
 - d. Functions
 - e. Cookies
7. Program to build XML and JSON structure
8. Program to build a form based interface with HTML and PHP

Course Outcomes:

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

CO1	Describe the concepts of web programming, client side and server side scripting
CO2	Apply the knowledge of client and server-side technologies using structured and unstructured data.
CO3	Analyse the impact of the Web components, client side and server side scripting techniques for building web pages.
CO4	Design and validate web pages using scripting languages for a given scenario
CO5	Implement programs using web development technologies for various use cases.



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER – I

COURSE TITLE	Operating System	Credits	4
COURSE CODE	18MCA1PCOS	L-T-P	3-0-1
CIE	50	SEE	50

Prerequisites: None

UNIT 1: (7 Hrs.)

Introduction to Operating Systems: What Operating Systems Do; Computer-System Architecture; Operating-System Structure; Process Management; Memory Management; Storage Management; Protection and Security; Computing Environments.

Operating System Structure: Operating system services; System Calls; Types of System Calls; Operating-System Structure.

UNIT 2: (8 Hrs.)

Process management: Process Concept; Process Scheduling; Operations on Processes; Inter-process Communication.

Multithreaded Programming: Overview, Multithreading Models; Thread Libraries; Threading Issues.

Process Scheduling: Basic Concepts; Scheduling Criteria; Scheduling Algorithms; Multiple-Processor Scheduling.

UNIT 3: (7 Hrs.)

Process Synchronization: Background; The Critical-Section Problem; Peterson's Solution; Synchronization Hardware; Semaphores; Classic Problems of Synchronization.

Deadlocks: System Model; Deadlock Characterization; Methods for Handling Deadlocks; Deadlock Prevention; Deadlock Avoidance; Deadlock Detection; Recovery from Deadlock.

UNIT 4: (7 Hrs.)

Memory management: Background; Swapping, Contiguous memory allocation, segmentation, paging.

Virtual Memory Management: Background; Demand Paging, Page replacement, Allocation of Frames, Thrashing.

UNIT 5: (7 Hrs.)

File System: File concepts, Access methods, Directory Structures.

Implementing File Systems: File system implementation, directory implementation, and allocation method.

Mass-Storage Structure: Overview; Disk Structure, Disk Scheduling; Disk Management.

Text Books:

Sl. No.	Content
1.	Abraham Silberschatz, Peter B.Galvin and Greg Gagne, <i>Operating System Concepts</i> , Ninth Edition, 2014

Reference Books:

Sl. No.	Content
1.	D. M. Dhamdhere, Operating Systems - A Concept Based Approach, Third Edition, Tata McGraw-Hill, 2012
2.	Andrew S. Tanenbaum, Modern Operating Systems, Fourth Edition, Pearson Education, Inc., 2014.

E- Books:

Sl. No.	Content
1.	http://materias.fi.uba.ar/7508/MOS4/Operating.Systems.4th.Edi.pdf
2.	http://www.iu.hio.no/~haugerud/minne.pdf

Online Courses and Video Lectures: title author & URL

Sl. No.	Content
1.	Introduction to Operating Systems Udacity, https://www.udacity.com/wiki/ud923
2.	NPTEL :: Computer Science and Engineering - Operating Systems
3.	Operating system by MIT-Opencourseware http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-828-operating-system-engineering-fall-2012/

Course Outcomes:

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

CO1	Explain the structure and concepts of an Operating System
CO2	Apply the Algorithmic techniques to solve problems related to Operating System.
CO3	Implement the concepts related to Operating System
CO4	Perform in a team to simulate different Operating System concepts

List of Programs – Integrated with Operating System Concepts Theory:

1. Program to implement CPU Scheduling Algorithm.
2. Program to implement multilevel queue Scheduling Algorithm.
3. Program to implement Classical Problems of Synchronization.
4. Program to implement Deadlock Avoidance Algorithm(Banker's Algorithm)
5. Program to implement the following contiguous memory allocation techniques:
a) Worst-fit b) Best-fit c) First-fit
6. Program to implement Page Replacement Algorithm.
7. Program to implement the File Allocation Strategies.
8. Program on Directory structure implementation.
9. Program to implement Disk Scheduling Algorithm.



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER –I

COURSE TITLE	Professional Communication and Ethics	Credits	2
COURSE CODE	18MCA1HSPE	L-T-P	1-1-0
CIE	50	SEE	50

Prerequisites: None.

UNIT 1: (2 Hrs.)

Introduction to Communication: Importance, Basics, purpose & audience, cross cultural communication, Language as a tool, Communicative Tools LSRW, Modes of Communication, **Barriers to Communication:** Noise, Classification of barriers, **Effective Presentation Strategies:** Planning, outlining, structuring, Nuances of Delivery, Controlling nervousness & stage Fright, Visual aids in presentation.

UNIT 2: (3 Hrs.)

Group Communication: Forms of group communication, use of body language, discussion, group discussion.

Paragraphs & Essays: Expressing idea, Paragraph construction, Paragraph length, paragraph pattern, Kinds of paragraph, Writing first draft, revising & finalising, Essay, **Letters & Email:** Letter writing, business letter, cover letter, resume, Email

UNIT 3: (3 Hrs.)

Reports: Importance, objectives, characteristics, categories, structure, types, **Research Papers:** Characteristics, Components,

Referencing: Evaluating sources of information, Bibliography, referencing

UNIT 4: (2 Hrs.)

Ethics: Overview, What is ethics? Ethics for business world, Ethics for Information Technology, Ethics for IT professionals & IT users.

UNIT 5:**(2 Hrs.)**

Privacy: Privacy protection & laws. Key privacy & anonymity issues, Intellectual Property: What is Intellectual Property? Key intellectual property issues

Text Books:

Sl. No.	Content
1.	"Technical Communication-Principles & Practice", Meenakshi Raman & Sangeetha Sharma, 2 nd Edition, Oxford University Press
2.	" Ethics in Information Technology", George Reynolds, 2 nd Edition, Thomson

Reference Books:

Sl. No.	Content
1.	Basic Business communication – Skills for Empowering the Internet generation" 10 th Edition, Lesikar&Flatley, Tata McGraw Hill

Course Outcomes:

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

CO1	Explain concepts of Oral & Written communication.
CO2	Apply oral & written communication skill for various use cases.
CO3	Perform in a team, to prepare a report & make an effective oral presentation on topics related to legal, ethical, society, environment and health issues



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER - II

COURSE TITLE	Object Oriented Programming With C++	Credits	4
COURSE CODE	18MCA2PCOP	L-T-P	3-0-1
CIE	50	SEE	50

Prerequisites: 18MCA1PCUC

UNIT 1:

(7 Hrs.)

Introduction to C++: A Review of Structures, Procedure-Oriented Programming, Object-Oriented Programming Paradigm, Basic Concepts of Object-Oriented Programming, Structure of C++ Program, Basic and User-Defined Data Types, Reference Variables, Operators in C++, Memory Management Operators, Type Cast Operator, Function Prototyping, Call-by Reference, Return-by Reference, Inline Functions, Default Arguments, Function Overloading.

Classes and Objects: Introduction to Classes and Objects, Defining Data Members and Member Functions within the class and outside the class, Scope Resolution Operator, Access Modifiers, Arrays within a Class, Memory Allocation for Objects, Static Data Members, Static Member Functions, Arrays of Objects, Objects as Function Arguments, Friend Functions, Returning Objects, const. Member Functions, Pointers to Members, Namespaces, Nested Classes.

UNIT 2:

(7 Hrs.)

Constructors and Destructors: Constructors, Parameterized Constructors, Multiple Constructors in a Class, Constructors with Default Arguments, Dynamic Initialization of Objects, Copy Constructors, Dynamic Constructors and Destructors.

Operator Overloading and Type Conversions: Defining Operator Overloading, Overloading Unary Operators, Overloading Binary Operators, Overloading Binary Operators using Friends, Manipulation of Strings using Operators, Rules for Overloading Operators, Type Conversions.

UNIT 3:**(7 Hrs.)**

Inheritance: Introduction, Defining Derived Classes. Single Inheritance, Making a Private Member Inheritable, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Virtual Base Classes, Abstract Classes, Constructors in Derived Classes.

UNIT 4:**(8 Hrs.)**

Pointers, Virtual Functions and Polymorphism: Introduction, Pointers to Objects, this Pointer, Pointers to Derived Classes, Virtual Functions, Pure Virtual Function, Virtual Constructors and Destructors.

Managing Console I/O Operators: Introduction, C++ Streams, C++ Stream Classes, Unformatted I/O Operators, Formatted Console I/O Operators, Managing Output with Manipulators.

Working with files: Introduction, Classes for File Stream Operations, Opening and Closing a File, Detecting End-of-File, More about Open(): File Modes, File Pointers and their Manipulations, Sequential Input and Output Operations, Updating a File: Random Access.

UNIT 5:**(7 Hrs.)**

Templates: Introduction, Class Templates, Class Templates with Multiple Parameters, Function Templates, Function Templates with Multiple Parameters, Overloading of Template Functions, Member Function Templates, Non-Type Template Arguments.

Exception Handling: Introduction, Basics of Exception Handling, Exception Handling Mechanism, Throwing and Catching Mechanism, Rethrowing an Exception, Specifying Exceptions, Exceptions in Constructors and Destructors.

Text Books:

Sl. No.	Content
1.	E Balaguruswamy, Object Oriented Programming with C++, Tata McGraw Hill Education, Seventh Edition, 2017.
2.	K R Venugopal, RajkumarBuyya, Mastering C++, Tata McGraw Hill, Second Edition, 2013.

Reference Books:

Sl. No.	Content
1.	Stanley B. Lippmann, C++ Primer, Addison-Wesley Professional, Fifth Edition, 2013.
2.	BjarneStroustrup, The C++ Programming Language, Pearson, Addison-Wesley Professional, Fourth Edition, 2015.

Online Courses and E- Books

Sl. No.	Content
1.	https://onlinecourses.nptel.ac.in/noc16_cs17/preview
2.	www.Learncpp.com

List of Lab Programs – Integrated with OOP with C++ Theory:

Students shall execute programs, which supplement the theory concepts on classes and objects, Constructors and Destructors, Operator overloading, Type conversions, Inheritance, Pointers, Virtual functions and polymorphism, working with files and real time problems.

AAT: Open Ended Experiment

Course Outcomes:

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

CO1	Describe the features of Object Oriented concepts in C++
CO2	Apply object oriented concepts to solve computing problems.
CO3	Analyse the problem and obtain a solution.
CO4	Develop Programs for a use case using any modern tools.



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
SEMESTER – 2

COURSE TITLE	Data Structures Using C	Credits	4
COURSE CODE	18MCA2PCDS	L-T-P	3-0-1
CIE	50	SEE	50

Prerequisites: 18MCA1PCUC

UNIT 1: **(8 Hrs)**

Stacks

Definition and examples, Representing stacks, operations on stacks, Infix, postfix, prefix expressions, Recursion

Queues

Queues: Definition and examples, Representation, Operations on queue, Priority queue, Circular queue, Dequeue.

UNIT 2: **(7 Hrs)**

Linked lists: Definition, operations on linked list, Linked implementation of stacks and queues, Array implementation of lists, Linked lists using dynamic variables

UNIT 3: **(7 Hrs)**

Linked lists: Header nodes, Non integer and non homogeneous lists, Circular lists, Doubly linked lists: operations on doubly linked lists

UNIT 4: **(7 Hrs)**

Trees

Introduction, binary trees, Binary tree traversals, Representation of Binary trees using arrays and lists, General expressions as trees, Binary search trees, AVL trees

UNIT 5: **(7 Hrs)**

Sorting

Quick sort, Selection sort, Heap Sort, Simple Insertion Sort, Merge sort

Searching

Binary Search, Indexed sequential search, Interpolation Search Hashing: Resolving hash clashes by open addressing, Choosing a hash Function.

Text Books:

Sl. No.	Content
1	YedidyahLangsam and Moshe J. Augensteinand Aaron M Tenanbanum, Data Structures Using C and C++, 2nd Edition, Pearson Education Asia, 2002

Reference Books:

Sl. No.	Content
1	Richard F. Gilberg and Behrouz A. Fourouzan, Data structures-A pseudocode approach with C, 2nd Edition, Cengage Learning, 2005
2	Jean-Paul Tremblay, Paul G. Sorenson, An Introduction to Data Structures With Application, 2nd Edition, Mcgraw Hill Computer Science Series, 2001

E- Books and Online Course Materials:

Sl. No.	Content
1	SchaumLipschutz, Data Structures With C, https://archive.org/details/DataStrucuresWithCBySchaumLipschutz
2	ISRD group, Data Structures With C, http://ebooksfree678.blogspot.in/2012/09/data-structures-using-c-mcgraw-hill.html
3	Data structure through C, YashavantKanitkar, http://e-book-expedition.blogspot.in/2012/07/download-data-structure-through-c-by.html

Online Courses and Video Lectures:

Sl. No.	Content
1.	C Programming and Data structures, Prof. P Chakraborty, http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures
2	Data structures and algorithms, Dr. Naveen Garg, http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html
3	2016: Programming, Data structures and Algorithms, Dr. Shankar Balachandran, Dr. N S Narayanswamy, Dr.Hema A Murthy, https://onlinecourses.nptel.ac.in/noc16_cs06/preview

List of Lab Programs – Integrated with Data Structures using C Theory

1. Program to convert an expression from one form to another.
2. Program to evaluate a given expression and its values for the variables.
3. Program to simulate the working of circular queue.
4. Program to demonstrate recursion.
5. Simulate the working of dequeue
6. Simulate the working of a singly linked list.
7. Programme using Circular list
8. Simulate the working of a doubly linked list to implement stack and queue.
9. Create a binary tree and implement the tree traversal techniques.
10. Implement quick sort.
11. Implement Heap sort.
12. Implement search using BST.

Course Outcomes:

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

CO1	Explain the concepts of data structures
CO2	Apply concepts of data structures for various problems
CO3	Implement data structures, sorting and searching methods using C
CO4	Solve a problem in teams by choosing an appropriate data structure



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER – II

COURSE TITLE	Database Management System	Credits	4
COURSE CODE	18MCA2PCDB	L-T-P	3-0-1
CIE	50	SEE	50

Prerequisites: None

Unit 1: (7Hrs.)

Introduction: An example; Characteristics of Database approach; Actors on the screen; workers behind the scene; Advantages of using DBMS approach; when not to use a DBMS.

Database System Concepts and Architecture: Data models, Schemas and instances; Three schema architecture and Data independence; Database languages and Interfaces; The database system environment; Centralized and client-server architecture of DBMS; Classification of DBMS.

Unit 2: (7 Hrs.)

Data Modeling Using the Entity–Relationship (ER) Model: Using High level conceptual Data model for database design; A sample database application; Entity types, Entity sets, attributes and keys; Relationship types, Relationship sets, Roles and Structural constraints, Weak Entity types, Refining an ER design for COMPANY database, ER diagrams, Naming conventions and Design issues.

Relational Database Design by ER-to-Relational Mapping

Unit 3: (8 Hrs.)

Relational Data Model: Relational model concepts, Relational model constraints, Relational database schema, Update operations Update operations and dealing with constraint violations.

SQL: SQL data definition and data types; Specifying constants in SQL; Basic Retrieval Queries in SQL; Insert, Delete and Update Statements in SQL; Additional Features of SQL;

More SQL: More Complex SQL Retrieval Queries; Specifying constraints as Assertion and Actions as Triggers; View(Virtual tables) in SQL; Schema Change Statements in SQL.

Unit 4: (7 Hrs.)

Basics of Functional Dependencies and Normalization for Relational Databases: 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;

Unit 5:**(7 Hrs.)**

Transaction Management: Transaction concept; A simple transaction model; Storage structure; Transaction atomicity and durability; Transaction isolation; Serializability; Transaction isolation and atomicity; Transaction isolation levels; Implementation of isolation levels; Transaction as SQL statements.

Concurrency control: Lock based protocols; Deadlock handling; Multiple granularity; timestamp based protocols; validations based protocols; Multi-version schemes; snapshot Isolation; Insert and delete operations; weak level of consistence.

Text Books:

Sl. No.	Content
1.	RamezElmasr, Shamkant B. Navathe, Fundamentals of Database Systems ,7th Edition, Pearson Education, 2016
2.	AbrahamaSilerscharz, Hernry F Korth, S Sudershan, Database system concepts,SixthEditon, McgrawHill, 2011

Reference Books:

Sl. No.	Content
1.	Raghu Ramakrishnan, Johannes Gehrke,Database Management Systems, 3rd Edition, McGraw-Hill,2003.
2.	Coronel, Morris, Rob, Database principles fundamentals of design, Implementation and Management, Cengage Learning, 2014
3.	C J Date, A Khannan, S Swaminathan, An Introduction to Database Systems, 8 th edition, Pearson Education, 2008

E- Books and Online Course Material:

Sl. No.	Content
1.	Silbertschat, Database system concepts, www.mhhe.com/silbertschat , 2011
2.	ElmaSri and Navathe : Fundamentals of Database Systems, http://www.aw.com/elmasri , http://www.aw.com/cssupport
3.	P .S. Gill, Database Management System, http://www.amazon.in/Database-Management-Systems-P-Gill/dp
4.	Raghu Ramakrishnan, Database Management system, http://www.amfastech.com/2013/01/database-management-system-by-raghu.html

Course Outcomes:

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

CO1	Explain the concepts of Database system.
CO2	Apply the concepts of relational Database for a scenario.
CO3	Analyze and develop Data models for a scenario.
CO4	Formulate and implement queries, using a RDBMS package.
CO5	Design and build simple real-world database applications in a team and prepare a report.

List of Lab Programs – Integrated with Database Management System Theory**Instructions for the Exercises:**

1. Draw ER diagram for the given Problem with various Constraints.
2. Create Relational Database Schema for the problem using Mapping rules.
3. Create Tables and insert suitable tuples for each of the table.
4. Execute and display the result for the given queries using any RDBMS Environment.



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER - II

COURSE TITLE	Statistics	Credits	4
COURSE CODE	18MCA2PEST	L-T-P	3-1-0
CIE	50	SEE	50

Prerequisites: None

UNIT 1: (8 Hrs.)

Introduction: Characteristics, Functions, Limitations, Scope of Statistics.

Statistical Terms and Concepts: Data, Variable, Random Variable, Population, Sample, Random Sample, Sampling without Replacement, Sample with Replacement, Random Number Tables, Descriptive Statistics, Inferential Statistics.

Data Collection: Measurement Scales, Data Gathering, Using a Questionnaire, Types of Samples, Non-probability Sampling, Sampling and Non-sampling Errors.

Data Presentation: Classification of Data, Frequency distribution, Constructing a Frequency Distribution, Cumulative Frequency Distribution, Relative Frequency Distribution, Cumulative Relative Frequency Distribution, Stem and Leaf Display, Graphic Presentation.

UNIT 2: (7 Hrs.)

Descriptive Measures: Measures of Central Location, Characteristics of the Mean, Some measures of Non-central Location, Measures of Dispersion, Grouped data, Quartiles, Mode in Grouped data, Shape of the Data, Measures of Skewness.

Basic Concepts of Probability: Definition of Terms, Basic Relationships of Probability, Venn Diagrams, Union of Events, Independent Events, Multiplication Rule, Conditional Probability.

UNIT 3: (7 Hrs.)

Probability Distribution: Mean and Variance of a Probability Distribution, Concepts related to Binomial Distribution, Poison Distribution, Normal Distribution, Normal Approximation to the Binomial Distribution.

Sampling Distribution: Sampling Distribution of the Mean, Central Limit Theorem, Standard Error of the Mean, Sampling Distribution of Proportions, The Mean of Sampling Distribution of Proportions.

Statistical Inference: Estimation-Concepts Related to Point Estimation and Interval Estimation, Confidence Interval Estimation of Population Proportions

UNIT 4: (7 Hrs.)

Hypothesis Testing: One Sample Tests (Large Samples): Introduction, Hypothesis Testing, Procedure for Hypothesis Testing, All types of One-tailed and Two-tailed Tests.

Chi-Square Test: Chi-Square one Sample Test, Steps involved in the Process, Contingency Tables, Testing Hypothesis for Independence of Two Categories.

UNIT 5: (7 Hrs.)

Regression and Correlation Analysis: Scatter Diagram, Linear Regression Equation, Standard Error of the estimate, Correlation Analysis, Measures of Variation, Coefficient of Determination.

Multiple Regression: Multiple Regression, Explained, Unexplained and Total variation, Formulae for Calculating the various variations, Standard Error of the Estimate, Correlation analysis

Text Books:

Sl. No.	Content
1.	JIT S Chandan, Statistics for Business and Economics, First Edition, Vikas Publishing House Pvt. Ltd, 1998.

Reference Books:

Sl. No.	Content
1.	Kishor S. Trivedi, Probability & Statistics with Reliability, Queuing and Computer Science Applications, Wiley India Pvt. Ltd., 2002
2.	Richard I. Levin, David S. Rubin, Statistics for Management, Seventh Edition, Prentice-Hall of India, Pvt. Ltd., 2000
3.	S.P.Gupta, Statistical Methods, Sultan Chand & Sons, Forty Third Edition, 2014
4.	Murray R Spiegel, John J Schiller, R AluSrinivasan, DebasreeGoswami, Probability and Statistics, Tata McGraw Hill Education Pvt. Ltd., 2010

E- Books and online Course Material:

Sl. No.	Content
1.	Somesh Kumar, IIT Kharagpur, http://www.nptelvideos.in/2012/11/probability-and-statistics.html , 2012

Course Outcomes:

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

CO1	Explain the Concepts of Statistics
CO2	Solve problems using various statistical concepts.
CO3	Analyze the data using statistical techniques
CO4	Design prediction model for a given data using Regression.
CO5	Interpret the data for various scenarios or contexts.



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER –II

COURSE TITLE	Operations Research	Credits	4
COURSE CODE	18MCA2PEOR	L-T-P	3-1-0
CIE	50	SEE	50

Prerequisites: None

UNIT 1:

(7 Hrs)

Introduction and Overview of the OR Modeling Approach

The origin of OR, the nature of OR, the impact of OR, defining the problem and gathering data, Formulating a mathematical model, deriving solutions from the model, testing the model, preparing to apply the model, implementation .

Introduction to Linear Programming

Formulation of linear programming problem (LPP), examples, Graphical solution, the LP Model, Special cases of Graphical method, assumptions of Linear Programming (LP), additional example.

UNIT 2:

(8 Hrs)

Solving LPP - the Simplex Method

The essence of the simplex method, setting up the simplex method, algebra of the simplex method, the simplex method in tabular form, special cases in the simplex method, tie breaking in the simplex method, adopting to other model forms (Two Phase method, Big-M method), post optimality analysis.

UNIT 3:

(7 Hrs)

Transportation and Assignment Problems

The transportation problem, a stream line simplex method for the transportation problem, the assignment problem, a special algorithm for the assignment problem

UNIT 4:

(7 Hrs)

Project Management: PERT and CPM

Basic difference between PERT and CPM, Phases of Project management, CPM, PERT

UNIT 5:**(7 Hrs)****Game Theory**

The formulation of two persons, zero sum games, solving simple games- a prototype example, games with mixed strategies, graphical solution procedure, solving by linear programming.

Text Books:

Sl. No.	Content
1.	Frederick S. Hillier & Gerald J. Lieberman: Introduction to Operations Research, 9e Edition, Tata McGraw Hill, 2014
2.	J K Sharma: Operations Research theory and applications, 5th Edition, McMillan Publications, 2013

Reference Books:

Sl. No.	Content
1.	Wayne L. Winston: Operations Research Applications and Algorithms, 4th Edition, Thomson Course Technology, 2003.
2.	Hamdy A. Taha: Operations Research- An Introduction, 9 th Edition, Pearson Publications, 2013

Course Outcomes:

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

CO1	Explain the concepts of operation research.
CO2	Apply different linear programming techniques to solve the mathematical model.
CO3	Formulate a mathematical model for a given problem.
CO4	Apply CPM and PERT techniques to plan, schedule, and control project activities.



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER –II

COURSE TITLE	Numerical Methods	CREDITS	4
COURSE CODE	18MCA2PENM	L-T-P	3-1-0
CIE	50	SEE	50

Prerequisites: None

Unit 1: (7 Hrs)

Errors in Numerical Calculations: –Errors and their computations, A general error formula, Error in a series approximation.

Solution of Algebraic and Transcendental Equations: Introduction, The Bisection methods, The method of False Position, Iteration method, Newton Raphson Methods, Ramanuja's Method, The Secant method. Solution to system of Nonlinear equations.

Unit 2: System of Linear algebraic equations and Eigen values problems

(7 Hrs)

Introduction, Direct methods, Error analysis for direct methods, Iteration methods, Eigen values and Eigen vectors, Bounds of Eigen values, Jacobi method for symmetric metrics, Power method, Inverse Power Method.

Unit3: (8 Hrs)

Solutions of Systems of Linear Equations - Direct Methods: Matrix Inversion method, Gauss- Jordan Method, Gauss Elimination method, Modification of the Gauss methods to compute the Inverse, Number of arithmetic operations, LU decomposition. LU decomposition from Gauss Elimination

Unit 4: Numerical Differentiation and Integration: (7 Hrs)

Introduction, Numerical differentiation – Errors in numerical differentiation, Maximum and minimum values of tabulated function.

Numerical Integration - covers Trapezoidal rule-Simpson's one third rule-Simpson's three eight rule, Weddle's rule and trapezoidal rule.

Unit-5:Numerical Solution of Ordinary Differential Equations**(7 Hrs)**

Introduction, Runge-Kutta method -Runge-Kutta second order method-Runge-Kutta fourth order method, Predictor Corrector Method: Milne's method and Adams-Moulton's method.

Text BOOKS:

1. S S Sastry, Introductory methods of Numerical Analysis, 4th Edition, PHI learning Private limited 2009.
2. M K Jain, S R K Iyengar, R K Jain, "Numerical Methods for scientific and Engineering Computations", 6th edition, New age International publishers

Reference Books

1. Steven C Chapra, Raymond P canale, Numerical methods for Engineers, Fifth edition, The McGraw Hill.
2. Stanton Ralph G., "Numerical Methods for Engineering", Englewood cliffs, N.J., Prentice Hall Inc., 1961

Course Outcomes:

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

CO1	Explain the concept of Numerical methods
CO2	Apply different methods to find solutions for system of equations
CO3	Choose a suitable method to solve the problems of differential equations.



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER –II

COURSE TITLE	Graph Theory	Credits	4
COURSE CODE	18MCA2PEGT	L-T-P	3-1-0
CIE	50	SEE	50

Prerequisites: 18MCA1BSDM

UNIT 1: (8 Hrs)

Graphs – Introduction, Application, Finite and Infinite graph, Incidence and Degree, Isolated Vertex, Pendent Vertex, and Null Graph.

Paths and circuits- Isomorphism, Subgraphs, Walks, Paths and Circuits, Connected and Disconnected Graphs, Euler Graphs, Hamiltonian Paths and Circuits.

Trees – Properties of trees, Pendent Vertices, Distance and Centers in a Tree, Rooted and Binary Trees, Spanning Trees, Finding all Spanning Trees of a Graph, Spanning Trees in a weighted Graph.

UNIT 2: (7 Hrs)

Cut-Set and Cut-Vertices- Properties of Cut-Set, All Cut-Sets in a Graph, Fundamental Circuits and Cut-Sets, Connectivity and Separability, Network Flows, 1-Isomorphism, 2-Isomorphism.

Planar Graphs- Combinational and Geometric Graphs, Planar Graphs, Different Representations of a planar Graph, Detection of Planarity.

UNIT 3: (7 Hrs)

Coloring, Covering and Partitioning- Chromatic Number, Chromatic Partitioning, Chromatic Polynomial, Matching, Covering, Four Color problem.

Directed Graphs-Types of Directed Graph, Digraphs and Binary Relations, Directed paths and Connectedness, Euler Digraphs, Fundamental Circuits in Digraph, Adjacency Matrix of a Digraph, Tournament.

UNIT 4: (7 Hrs)

Algorithms- Computer representation of a Graph, Spanning Tree, Directed Circuits, Shortest-path Algorithm, Depth-first search on a Graph, Planarity Testing, Isomorphism.

UNIT 5: (7 Hrs)

Graph Theory in Operations research- Transport Networks, Minimal Cost Flows, Multicommodity Flow, Activity Networks in project planning.

Text Books:

Sl. No.	Content
1.	NarsinghDeo, "Graph Theory: With Application to Engineering and Computer Science", Prentice Hall of India, 2014.

Reference Books:

Sl. No.	Content
1.	Clark J. and Holton D.A, "A First Look at Graph Theory", Allied Publishers, 1995.
2.	Douglas B. West "Introduction to Graph Theory".

Course Outcomes:

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

CO1	Explain the concepts of Graph Theory
CO2	Apply graph theory based techniques in solving problems
CO3	Formulate graph theoretic models to solve real world problems



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER - II

COURSE TITLE	Software Engineering	CREDITS	3
COURSE CODE	18MCA2PCSE	L-T-P	3-0-0
CIE	50	SEE	50

Prerequisites: None

UNIT – 1

(7 Hrs)

Introduction: Professional software development, Software engineering ethics, Case studies

Software processes: Software process models, Process activities, coping with change, the rational unified process

Agile software development: Agile methods, Plan-driven and agile development, Extreme programming, Agile project management, Scaling agile methods

UNIT – 2

(8 Hrs)

Requirements engineering: Functional and non-functional requirements, the software requirements document, Requirements specification, Requirements engineering processes,

Requirements elicitation and analysis: Requirements validation, Requirements management

System modelling: Context models, Interaction models, Structural models, Behavioural models, Model-driven engineering,

UNIT – 3

(7 Hrs)

Architectural design: Architectural design decisions, Architectural views, Architectural patterns, Application architectures

Design and implementation: Object-oriented design using the UML, Design patterns, Implementation issues, Open source development

Software testing Development testing, Test-driven development, Release testing, User testing, Software evolution processes, Program evolution dynamics, Software maintenance.

UNIT – 4

(7 Hrs)

Software reuse. The reuse landscape, Application frameworks, Software product lines, COTS product reuse

Component based software engineering. Components and component models, CBSE processes.

Distributed software engineering. Distributed systems issues, Client–server computing, Architectural patterns for distributed systems, Software as a service

UNIT – 5**(7 Hrs)**

Project management Risk management, Managing people, Teamwork

Project planning: Software pricing, Plan-driven development, Project scheduling, Agile planning, Estimation techniques

Quality management: Software quality, Software standards, Reviews and inspections, Software measurement and metrics

Configuration management: Change management, Version management, System building, Release management

Text book:

1. SOFTWARE ENGINEERING, Ninth Edition, Ian Somerville, Pearson

Reference Book:

1. Software Engineering A PRACTITIONER'S APPROACH, EIGHTH EDITION, Roger S. Pressman, Ph.D., Bruce R. Maxim, Ph.D. McGraw Hill.

Course Outcomes:

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

CO1	Explain the concepts of Software Engineering
CO2	Apply the concepts of requirement engineering to prepare SRS document.
CO3	Analyze various models in software design
CO4	Estimate Software Costs for a given scenario
CO5	Describe professional and ethical responsibilities of a Software Engineer



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER - II

COURSE TITLE	Entrepreneurship	CREDITS	2
COURSE CODE	18MCA2HSES	L-T-P	1-1-0
CIE	25	SEE	25

Prerequisites: None

UNIT 1: (2 Hrs.)

Innovation

Definition, Myths, Phases of Innovation, How to spot an innovation opportunity? Different types of innovation: Incremental, radical, disruptive, architectural, Social innovation

UNIT 2: (3 Hrs.)

Entrepreneur

Introduction, Evolution, Characteristics of successful Entrepreneur, Charms of becoming an Entrepreneur, functions, need, types, Distinction between an Entrepreneur & a manager, Intrapreneur

Entrepreneurship

Concept, growth of Entrepreneurship in India, Role of Entrepreneurship in Economic Development

UNIT 3: (3 Hrs.)

Women Entrepreneurship

Concept, Functions, Growth, Problems, Developing, Limitation of Women Entrepreneurship

Rural Entrepreneurship

Meaning, need, problems, developing, NGO & Rural Entrepreneurship

Social Entrepreneurship

Introduction, meaning, perspective, Social Entrepreneurship in practice, boundaries of Social Entrepreneurship

UNIT 4: (2 Hrs.)

Micro & Small Enterprise

Small Enterprise: Meaning, Micro & Macro Units, Essentials, Features & Characteristics, Relationship between Micro & Macro Enterprises, Rationale behind Micro & small enterprises, Scope of Micro & small enterprises & objectives of Micro enterprises

Financing of Enterprise

Meaning & need of financial planning, sources of finance, capitalisation, term loans, sources of short term finance, Venture capital

Forms of business ownership

Sole proprietorship, partnership, company, cooperative, selection of appropriate form of ownership structure

UNIT 5:

(2 Hrs.)

Identification of Business opportunities:

Introduction, Mobility of Entrepreneurs, Business opportunities in India, Models for opportunity evaluation

Business Plan

Introduction, purpose, contents, presenting, Why do some plans fail? Procedure for setting up an enterprise

Institution supporting business enterprises

Introduction, central level institutions, state level institutions, other institutions, Institutions supporting women entrepreneurs

Text Books:

Sl. No.	Content
1.	Ram Chandran, 'Entrepreneurial Development', Tata McGraw Hill, New Delhi
2.	Saini, J. S., 'Entrepreneurial Development Programmes and Practices' , Deep & Deep Publications (P), Ltd.

Course Outcomes:

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

CO1	Explain the concept of Innovation & Entrepreneurship
CO2	Apply the knowledge of entrepreneurship to various scenarios
CO3	Perform in a team, to prepare a report & make effective oral presentation on topics related to Entrepreneurship



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER - II

COURSE TITLE	Seminar 1	CREDITS	1
COURSE CODE	18MCA2SRS1	L-T-P	0-0-1
CIE	25	SEE	25

Prerequisites: None

Seminar-I Guidelines:

- Select a topic of your interest to address legal/ Ethical/ societal/ Environmental/ Health issues in Information Technology within Local or Global context.
- Prepare a presentation for duration of 20 minutes.
- Write a report based on the topic selected.
- Submit Plagiarism report with similarity score less than 25%

Course Outcomes:

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

CO1	Present a topic in Computer Science to address Legal, Ethical, Societal, Environmental, and Health issues.
CO2	Apply professional ethics during preparation of report.
CO3	Demonstrate life-long learning skills.
CO4	Demonstrate oral and written communication skills.



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications

SEMESTER – III

COURSE TITLE	Machine Learning	Credits	4
COURSE CODE	18MCA3PCML	L-T-P	3-0-1
CIE	50	SEE	50

Prerequisites: 18MCA2PEST

UNIT 1:

Machine Learning basics and applications: What is machine learning? Key terminology, Key tasks of machine learning, How to choose the right algorithm?, Steps in developing a machine learning application, *Machine learning applications in Data mining*: Financial data analysis, Retail and Telecommunication Industries, Science and Engineering, Intrusion detection and Prevention, Recommender Systems. Getting to Know Your Data: Data Visualization, Measuring Data Similarity and Dissimilarity.

(07 Hrs.)

UNIT 2:

Data Pre-processing: An Overview, Data Cleaning, Data Reduction - Overview of Data Reduction Strategies, PCA, Attribute Subset Selection, Histograms, Clustering, Sampling; Data Transformation and Data Discretization - Data Transformation by Normalization, Discretization by Binning, Discretization by Histogram Analysis, Discretization by Cluster, Decision Tree, and Correlation Analyses.

(07 Hrs.)

UNIT 3:

Mining Frequent Patterns, Associations, and Correlations: Basic Concepts, Frequent Item set Mining Methods, Which Patterns Are Interesting? Pattern Evaluation Methods, Mining Rare Patterns and Negative Patterns.

(07 Hrs.)

UNIT 4:

Classification: Basic Concepts: Basic Concepts, Decision Tree Induction, Bayes Classification Methods, k-Nearest Neighbour method.

Model Evaluation and Selection: Metrics for Evaluating Classifier Performance, Cross-validation, Bootstrap.

Techniques to Improve Classification Accuracy: Ensemble Methods, Bagging, Boosting, AdaBoost, Random Forests, Class-Imbalanced data.

UNIT 5:

Cluster Analysis: Basic Concepts and Methods: Cluster Analysis, Partitioning based methods: k-Means; Hierarchical Methods: Agglomerative versus Divisive Hierarchical Clustering, Density-Based Methods: DBSCAN, Grid based methods: STING, Outlier Detection: Outliers and Outlier Analysis, Overview of Outlier Detection Methods.

(07 Hrs.)

Lab Experiments: Use Python or R to implement the following:

1. Programs related to Data Visualization
2. Programs related to Frequent Pattern Mining
3. Programs related to Classification
4. Programs related to Cluster Analysis

Text Books:

Sl. No.	Content
1.	Peter Harrington, Machine Learning in action, Dreamtech press, 2015
2.	Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques", Third Edition, (The Morgan Kaufmann Series in Data Management Systems), 2012.

Reference Books:

Sl. No.	Content
1.	Ethem Alpaydin, Introduction to Machine Learning 3 rd edition, 2014 MIT Press
2.	Nina Zumel, and John Mount, "Practical Data Science with R", Manning Publications Co., NY, 2014, URL: https://www.manning.com/books/practical-data-science-with-r
3.	Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining", Pearson education 2016.
4.	K.P. Soman, Shyam Diwakar, and V. Ajay, "Insight into Data mining: Theory and Practice", Prentice Hall of India Ltd, New Delhi, 2009.
5.	Ian H. Witten, Eibe Frank, Mark A. Hall, "Data Mining: Practical Machine Learning Tools and Techniques", Elsevier, 2011.

Online Courses and E- Books:

Sl. No.	Content
1.	Yanchang Zhao, R and Data Mining: Examples and Case Studies, http://www.RDataMining.com , 2015
2.	Zico Kolter, Carnegie Mellon University, Practical Data Science, http://www.datasciencecourse.org/
3.	Nandan Sudarsanam, IITM, Introduction to Data analytics, http://nptel.ac.in/courses/110106064/1
4.	Data mining courses, https://www.coursera.org/specializations/data-mining

Course Outcomes:

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

C01	Explain the concepts related to Machine Learning.
C02	Apply Pre-processing techniques for the data related to a scenario.
C03	Design Machine learning models for a scenario
C04	Interpret the data/model to draw conclusions related to a scenario under study
C05	Develop ML programs using a modern tool like Python or R



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER – III

COURSE TITLE	Programming using Java	Credits	4
COURSE CODE	18MCA3PCJP	L-T-P	3-0-1
CIE	50	SEE	50

Prerequisites: None

UNIT 1:

Introducing Classes, Class Fundamentals, The General Form of a Class, A Simple Class, Declaring Objects, A Closer Look at new, Assigning Object Reference Variables, Introducing Methods: Adding a Method to the Box Class, Returning a Value, Adding a Method That Takes Parameters, Constructors, Parameterized Constructors, this Keyword, Instance Variable Hiding, Garbage Collection, The finalize() Method.

A Closer Look at Methods and Classes, Overloading Methods, Overloading Constructors

Using Objects as Parameters, A Closer Look at Argument Passing, Returning Objects, Recursion, Introducing Access Control, Understanding static, Introducing final, Arrays Revisited, Introducing Nested and Inner Classes, Exploring the String Class, Using Command-Line Arguments, Varargs: Variable-Length Arguments, Overloading Vararg Methods, Varargs and Ambiguity

(8 Hrs.)

UNIT 2:

Inheritance, Inheritance Basics, Member Access and Inheritance, A More Practical Example, A Superclass Variable Can Reference a Subclass Object, Using super, Using super to Call Superclass Constructors, A Second Use for super, Creating a Multilevel Hierarchy, When Constructors Are Executed, Method Overriding, Dynamic Method Dispatch, Why Overridden Methods, Applying Method Overriding, Using Abstract Classes, Using final with Inheritance, Using final to Prevent Overriding, Using final to Prevent Inheritance, The Object Class, String Handling.

Packages and Interfaces: Packages, Defining a Package, Finding Packages and CLASSPATH, A Short Package Example, Access Protection, An Access Example, Importing Packages, Interfaces, Defining an Interface, Implementing Interfaces, Nested Interfaces, Applying Interfaces, Variables in Interfaces, Interfaces Can Be Extended, Default Interface Methods, Default Method Fundamentals, A More Practical Example, Multiple Inheritance Issues, Use static Methods in an Interface, Final Thoughts on Packages and Interfaces.

(7 Hrs.)

UNIT 3:

Exception Handling, Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Displaying a Description of an Exception, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating Your Own Exception Subclasses, Chained Exceptions, Three Recently Added Exception Features, Using Exceptions.

Multithreaded Programming: The Java Thread Model, Thread Priorities, Synchronization Messaging, The Thread Class and the Runnable, The Main Thread, Creating a Thread, Implementing Runnable, Extending Thread, Choosing an Approach, Creating Multiple Threads, Using is Alive() and join(), Thread Priorities, Synchronization, Using Synchronized Methods, The synchronized Statement, Interthread Communication, Deadlock , Suspending, Resuming and Stopping, Obtaining A Thread's, Using Multithreading.

Enumerations, Autoboxing, Enumeration Fundamentals, The values () and value Of() Methods, Type Wrappers, Character, Boolean, The Numeric Type Wrappers, Autoboxing, Autoboxing and Methods, Autoboxing / Unboxing Occurs in Expressions ,Autoboxing / Unboxing Boolean and Character Values, Autoboxing / Unboxing Helps Prevent Errors, A Word of Warning.

(7 Hrs)

UNIT 4:

I/O: I/O Basics Streams, Byte Streams and Character Streams, The Predefined Streams, Reading Console Input, Reading Characters, Reading Strings, Writing Console Output, The PrintWriter Class, Reading and Writing Files.

Generics: What Are Generics, A Simple Generics Example, Generics Work Only with Reference Types, Generic Types Differ Based on Their Type Arguments, How Generics Improve Type Safety, A Generic Class with Two Type Parameters, The General Form of a Generic Class.

(7 Hrs)

UNIT 5:

The Collections Framework, Collections Overview, JDK 5 Changed the Collections Framework, Generics Fundamentally Changed the Collections Framework, Collection Interfaces: The Collection Interface, The List Interface, The Set Interface , The Sorted Set Interface, The Navigable Set Interface, The Queue Interface, The Collection Classes, The Array List Class, The Linked List Class, The Hash Set Class, The Linked Hash Set Class, The Tree Set Class, Accessing a Collection via an Iterator, Using an Iterator, Vector, Stack.

Input/Output: Exploring java.io, Networking, The Applet Class, Event Handling, Introducing the AWT: Working with Windows, Graphics, and Text, Using AWT Controls, Layout Managers, and Menus, Introducing Swing, Exploring Swing, Introducing Swing Menus.

(7 Hrs.)

Text Books:

Sl. No.	Content
1.	Herbert Schildt, "Java The Complete Reference", 9thEdition, Comprehensive Coverage of Java Language, Oracle Press, McGraw Hill Education (India Edition) 2014.

Reference Books:

Sl. No.	Content
1.	C Xavier, "Java Programming – A Practical Approach", Tata McGraw Hill, 2011
2.	Hari Mohan Pandey, "Java Programming", 1stImpression, Pearson, 2012
3.	Ralph Bravaco, Shai Simonson, "Java Programming – From the Ground Up", Tata McGraw Hill 2012.
4.	T V Suresh Kumar, B Eshwara Reddy, P Raghavan, "Programming with Java", Sanguine Technical Publishers, 2011.

Course Outcomes:

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

CO1	Explain the concepts of Java Programming
CO2	Develop Java Programs for a given scenario.
CO3	Design GUI's using Java Collections and Libraries
CO4	Conduct experiments using Java programming language



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER –III

COURSE TITLE	Computer Networks	Credits	4
COURSE CODE	18MCA3PCNW	L-T-P	3-0-1
CIE	50	SEE	50

Prerequisites: None

UNIT 1:

Computer Networks and the Internet: What is Internet? The network Edge, The Network Core, Delay, Loss, and Throughput in Packet-Switched Networks, Protocol Layers and their Service Models, Networks under Attack, History of Computer Networking and the Internet.

(8 Hrs.)

UNIT 2:

Application Layer: Principles of Network Applications, The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, DNS-The Internet's Directory Service, Peer-to-Peer Applications, Socket Programming: Creating Network Applications.

(7 Hrs.)

UNIT 3:

Transport Layer: Introduction and Transport-Layer Services, Multiplexing and Demultiplexing, Connectionless Transport: UDP, Principles of Reliable Data Transfer, Connections-Oriented Transport: TCP, Principles of Congestion Control, TCP Congestion Control.

(7 Hrs.)

UNIT 4:

The Network Layer: Introduction, Virtual Circuit and Datagram Networks, What's inside a Router? The Internet Protocol (IP): Forwarding and Addressing in the Internet, Routing Algorithms, Routing in the internet, Broadcast and Multicast Routing.

(7 Hrs.)

UNIT 5:

The Link Layer: Links, Access Networks, and LANs: Introduction to the link layer, Error-Detection and Correction Techniques, Multiple Access Links and Protocols, Switched Local Area Networks, Link Virtualization: A network as a Link Layer, Data Center Networking, Retrospective: A day in the life of a Web Page Request.

(7 Hrs.)

Text Books:

Sl. No.	Content
1.	James F Kurose and Keith W Ross "Computer Networking": A Top-Down Approach (6th Edition), Pearson Publication 2017.

Reference Books:

Sl. No.	Content
1.	Andrew S. Tanenbaum and David J. Wetherall, "Computer Networks", 5th edition, Prentice Hall, 2014.
2.	Larry L Peterson and Bruce S. Davie, "Computer Networks": A Systems Approach 6 th Edition, Morgan Kaufmann. 2016.
3.	Cisco Networking Academy Program, CCNA 1 and 2 Companion Guide 2016.

List of Lab Programs – Integrated with Computer Network Theory:

1. Introduction to Wireshark Lab.
2. HTTP, DNS
3. TCP, UDP.
4. IP, ICMP.
5. ARP, DHCP.
6. Socket Programming with TCP, UDP

Course Outcomes:

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

CO1	Explain concepts related to computer networks.
CO2	Apply the network concepts/algorithms/protocols for given problem.
CO3	Conduct experiments to demonstrate understanding of network concepts using simulation tool.
CO4	Perform in a team, prepare a report on the impact of computer networks on health and environment.



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER – III

COURSE TITLE	Cloud Computing	Credits	4
COURSE CODE	18MCA3PECC	L-T-P	3-1-0
CIE	50	SEE	50

Prerequisites: None

UNIT 1:

Introduction & Concepts: Introduction to Cloud Computing: Introduction: Definition of Cloud Computing, Characteristics of Cloud Computing, Cloud Models: Service Models, Deployment Models, Cloud Service Examples: IaaS: Amazon EC2, Google Compute Engine, Azure VMs, PaaS: Google App Engine, SaaS: Salesforce, Cloud-based Services & Applications : Cloud Computing for → Healthcare, Energy Systems, Transportation Systems, Manufacturing Industry, Government, Education, Mobile Communication.

(8 Hrs)

UNIT 2:

Cloud Concepts & Technologies: Virtualization, Load Balancing, Scalability & Elasticity, Deployment, Replication, Monitoring, Software Defined Networking, Network Function Virtualization, MapReduce, Identity and Access Management, Service Level Agreements, Billing.

(7 Hrs.)

UNIT 3:

Cloud Services & Platforms: Compute Services: Amazon Elastic Compute Cloud, Google Compute Engine, Windows Azure ,Storage Services: Amazon Simple Storage Services, Google Cloud Storage, Database Services: Amazon Relational Data Store, Amazon DynamoDB, Google Cloud SQL, Google Cloud Datastore, Application Services: Application Runtimes & Frameworks, Queuing Services, e-mail services, Notification Services, Content Delivery Services : Amazon Cloud Front, Windows Azure Content Delivery Network, Analytics Services : Amazon Elastic MapReduce, Google MapReduce Services, Google BigQuery, Deployment & Management Services: Amazon Elastic Beanstalk, Amazon CloudFormation, Identity & Access Management Services : Amazon Identity & Access Management, Windows Azure Active Directory,

(7 Hrs.)

UNIT 4:

DEVELOPING FOR CLOUD: Cloud Application Design: Introduction, Design Considerations for Cloud Applications, Scalability, Reliability & Availability, Security, Maintenance & Upgradation, Performance, Reference Architectures for Cloud Applications , Cloud Application Design Methodologies : Service Oriented Architecture, Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller, RESTful Web Services, Data Storage Approaches : Relational (SQL) Approach , Non-Relational (No-SQL) Approach

(7 Hrs.)

UNIT 5:

Cloud Security : Introduction, CSA (Cloud Security Architecture) Authentication : Single Sign-on(SSO), Authorization, Identity & Access Management, Data Security : Securing Data at Rest, Securing Data in Motion, Key Management, Auditing.

Cloud for Industry, Healthcare & Education : Cloud Computing for : Healthcare, Energy Systems, Transportation Systems, Manufacturing Industry, Education.

(7 Hrs.)

Text Books:

Sl. No.	Content
1.	CLOUD COMPUTING A Hands-on Approach, Arshdeep Bahga, Vijay Madisetti, University Press, 2014

Reference Books:

Sl. No.	Content
1.	Cloud Computing , Web-Based Applications That Change the Way You Work and Collaborate Online , Michael Miller, PEARSON , 2008
2.	Cloud Computing A Practical Approach , Anthony T Velte, Toby J Velte, Robert Elsenpeter, India Edition, McGrawHill Education, Reprint in 2015

Course Outcomes:

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

CO1	Explain the cloud computing concepts and technologies.
CO2	Choose appropriate cloud delivery & service model for a given scenario.
CO3	Perform in a team, make an oral presentation for a real time scenario.



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER –III

COURSE TITLE	UI & UX	Credits	4
COURSE CODE	18MCA3PEUI	L-T-P	3-1-0
CIE	50	SEE	50

Prerequisites: None

UNIT 1:

What Users Do: A Means to an End, the Basics of User Research, Users' Motivation to Learn, The Patterns – Safe Exploration, Instant Gratification, Satisficing, Changes in Midstream, Deferred Choices, Incremental Construction, Habituation, Micro breaks, Spatial Memory, Prospective Memory, Streamlined Repetition, Keyboard Only, Other People's Advice, Personal Recommendations.

(7 Hrs)

UNIT 2:

Information Architecture and Application Structure: The Big Picture, The Patterns – Feature, Search and browse, News Stream, Picture Manager, Dashboard, Canvas Plus Palette, Wizard, Setting Editor, Alternative Views, Many Workspaces, Multi-Level Help

Making it Look Good: Visual Style and Aesthetics: Same content, Different styles, The Basics of Visual Design, What This Means for Desktop Applications, The Patterns: Deep Background, Few Hues, Many Values, Corner Treatments, Borders That Echo Fonts, Hairlines, Contrasting Font Weights, Skins and Themes.

(8 Hrs)

UNIT 3:

Design and UX: Users Vs Life Cycles, Visual Design, Web standards, Potential Barriers to sustainable UX, Designing for Emerging Technologies: Design for Disruption, Eight Design Tenets for Emerging Technology, Changing Design and Designing Change, Fashion with Function: Designing for wearable devices, The next big wave in Technology, The wearable market segments, Wearables are not able, UX (and Human) Factors to consider.

(7Hrs)

UNIT 4:

An Ecosystem of connected device: The concept of an Ecosystem, The 3Cs Frame work: Consistent, Continuous and Complementary, Single Device Design is History, It's an Eco system, The Consistent Design Approach: What is consistent Design, Consistency in Minimal Interface,

Progressive Disclosure in Consistent Design, Beyond Device Accessibility, Devices are means not an end.

(7Hrs)

UNIT 5:

The Continuous and Complementary Design Approach: The continuous Design Approach: What is Continuous Design? Single Activity flow and the Sequenced Activity Flow. What is Complementary Design? Collaboration: Must-Have, Collaboration: Nice to have, Control: Nice to Have, Fascinating Use Cases: What do they mean for my work? Integrated Design Approaches: 3 Cs as building blocks: Beyond the Core Devices: The Internet of Things, The Internet of Things already there?

(7hrs)

Text Books:

Sl. No.	Content
1.	Jenifer Tidwell, "Designing Interfaces", 2 nd Edition, Oreilly, 2015.
2.	Jonathan Follet, "Designing for Emerging Technologies- UX for Genomics, Robotics and The Internet of Things", 1 st Edition, Oreilly, 2014.
3.	Michal Levin, "Designing Multi-Device Experiences", 1 st Edition, Oreilly, 2014.
4.	Tim Frick, "Designing for Sustainability", 1 st Edition, Oreilly 2016.

Reference Books:

Sl. No.	Content
1.	Ben Shneiderman, Plaisant, Cohen, "Jacobs: Designing the User Interface", 5th Edition, Pearson Education, 2010
2.	Unger and Chandler, "A Project Guide to UX Design", 2 nd Edition, New Riders, 2012

Course Outcomes:

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

CO1	Describe the concepts related to User interface or User Experience.
CO2	Apply the knowledge of features, approach, patterns of User Interface or User Experience for a given scenario.
CO3	Analyze the given features, parameters and patterns of User Interface or User Experience for a real world scenario.
CO4	Perform in a team, make a oral presentation on the effects of Wearable devices on health and environment.



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER – III

COURSE TITLE	Agile Software Development	Credits	4
COURSE CODE	18MCA3PEAS	L-T-P	3-1-0
CIE	50	SEE	50

Prerequisites: 18MCA2PCSE

UNIT1:

Introducing Agile: WHATISAGILE?-The history of Agile, The Agile Manifesto, Agile Principles, THE FOUNDATIONS OF AGILE-The Agile mind set, Delivery environments and Agile suitability, Thelifecycleofproductdevelopment, The „IronTriangle“, Workingwithuncertainty and volatility, Empirical and defined processes, Common agile roles-The customer, the team, the Agile lead, the stakeholders.

(7Hrs.)

UNIT2:

Common Agile Techniques:-Stories and backlog refinement, Agile estimation, Agile Planning, Agile testing.

Agile frame works: Major agile frameworks- eXtreme programming (XP), Kanban.

Scrum Framework: Introduction- What Is Scrum? Scrum Origins, Why Scrum? Scrum Framework-Overview, Scrum Roles, Product Owner, Scrum Master, Development Team, Scrum Activities and Artifacts, Product Backlog, Sprints, Sprint Planning, Sprint Execution, Daily Scrum, Done, Sprint Review, Sprint Retrospective.

(8Hrs.)

UNIT3:

Sprints–Time boxed, Short Duration, NoGoal-Altering Changes and Definition of Done.

UserStories: Requirements and User Stories- Using Conversations, Progressive Refinement, What Are User Stories? Card, Conversation, Confirmation, Level of Detail, INVEST in Good Stories, Independent, Negotiable, Valuable, Estimable, Sized Appropriately (Small), Testable, Gathering stories, User-story-Writing Workshop, Story Mapping.

(7 Hrs.)

UNIT 4:

Product Backlog – Product Backlog Items, Good Product Backlog Characteristics- Detailed Appropriately, Emergent, Estimated, Prioritized. Grooming- What is Grooming, Who Does the Grooming, When Does Grooming Take place? Definition of Ready.

Estimation and Velocity – What and when we Estimate – Portfolio Backlog Item Estimates, Product Backlog Estimates, Task Estimates. PBI Estimation Concepts, PBI Estimation Units, Planning Poker, What is velocity, calculate a Velocity Range, Forecasting Velocity, Affecting Velocity, and Misusing Velocity.

(7 Hrs.)

UNIT5:

DevOps – What is DevOps? DevOps Tools, How DevOps Works or The Process of Work Flows Automation, Principles of DevOps, Benefits of Implementing DevOps Process.

(7 Hrs.)

Text Books:

Sl. No.	Content
1.	PeterMeasey,“AgileFoundations-Principles,practicesandframeworks”, BCSLearning&DevelopmentLimited,2015.
2.	Rubin,KennethS,“Essential Scrum: A Practical Guide to the Most Popular Agile Process”, Addison-Wesley Signature Series (Cohn)). Pearson
3.	DevOps for Beginners: DevOps Software Development Guide for Software Developers and IT Professionals – By Joseph Joyner, 2015

Reference Books:

Sl. No.	Content
1	Robert C. Martin Publisher, “Agile Software Development, Principles, Patterns and Practices”, Prentice Hall.
2	KenSchawber, Mike Beedle,“Agile Software Development with Scrum”,
3	Jonathan Rasmusson, Publisher ,“The Agile Samurai, How Agile Masters Deliver Great Software”, SPD.
4	MikeCohn,“User Stories Applied: For Agile Software”,(Addison-Wesley

Course Outcomes:

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

CO1	Describe the concepts of Agile Software Development
CO2	Apply best practices to manage Agile projects.
CO3	Formulate project backlogs, measure and monitor the User Stories / Velocity for a given scenario.
CO4	Choose a tailored Agile process that best fits the technical and market demands of a modern software project.



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER – III

COURSE TITLE	UNIX System Programming	Credits	4
COURSE CODE	18MCA3PEUP	L-T-P	3-1-0
CIE	50	SEE	50

Prerequisites: 18MCA1PCUC

UNIT 1:

Introduction: The POSIX Standards, The POSIX.1 FIPS Standard, The X/Open Standards. UNIX and POSIX APIs: The POSIX APIs, The UNIX and POSIX Development Environment, API Common Characteristics.

File Types, The UNIX and POSIX File System, Application Program Interface to Files, UNIX Kernel Support for Files, Directory Files, Hard and Symbolic Links.

(7 Hrs.)

UNIT 2:

General File APIs, File and Record Locking, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs.

(8 Hrs.)

UNIT 3:

UNIX Processes: Introduction, main function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp. Functions, getrlimit, setrlimit Functions.

(7 Hrs.)

UNIT 4:

Introduction, Process Identifiers, Fork, Vfork, Exit, Wait, Waitpid, wait3, wait4, Functions, Race Conditions, exec Functions, Changing User IDs and Group IDs, Interpreter Files, System Function, Process Accounting, User Identification, Process Times.

(7 Hrs.)

UNIT 5:

Network IPC: Sockets: Introduction, Socket Descriptors, Addressing, Connection establishment, Data transfer, Socket options, Out-of-band data, Nonblocking and asynchronous I/O.

(7 Hrs.)

Text Books:

Sl. No.	Content
1.	Terrence Chan, "Unix System Programming Using C++", Prentice-Hall of India / Pearson Education, 2008.
2.	W.Richard Stevens, Stephen A. Rago, "Advanced Programming in the UNIX Environment", 2nd Edition, Pearson Education / Prentice-Hall of India, 2013.

Reference Books:

Sl. No.	Content
1.	Your UNIX-The Ultimate Guide, Sumitabha Das, Tata McGraw Hill, 2006
2.	W. Richard Stevens: UNIX networking Programming, Prentice-Hall of India, 1998.

Course Outcomes:

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

CO1	Explain the concepts of Unix System Programming
CO2	Apply UNIX/POSIX standards for solving problems
CO3	Implement Unix commands using Unix System programming API's



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER – III

COURSE TITLE	Management Information Systems	Credits	3
COURSE CODE	18MCA3PEIS	L-T-P	2-1-0
CIE	50	SEE	50

Prerequisites: None

UNIT-1

(5 Hrs)

What is an information system? Dimensions of information systems Global E-Business: How Businesses Use Information Systems Business processes & information systems .How information technology enhances business processes: efficiency and transformation. Types of Business Information Systems from a Functional perspective Systems from a constituency perspective Relationship of systems to one another The Information Systems Function in Business The information systems department organizing the information systems function

UNIT-2

(5 Hrs)

Information Systems, Organizations, and Strategy Organizations and Information Systems What is an organization? Features of organizations, How Information Systems Impact Organizations and Business Firms, Economic impacts Organizational and behavioral impacts. The Internet and organizations Implications for the design and understanding of information systems Using Information Systems to Achieve Competitive Advantage PORTER'S Competitive Forces Model Information system strategies for dealing with competitive forces.

UNIT-3

(5 Hrs)

Telecommunications, the Internet, and wireless technology Telecommunications & networking in today's business world Networking and communication trends. The WWW, Intranets and extranets, Technologies and tools for communication and E-business.

UNIT- 4

(5 Hrs)

E-Commerce: Digital markets, Digital Goods Electronic commerce & the internet E-commerce today, why E-commerce is different, Key concepts in E-commerce: Digital markets and digital goods Internet business models. Electronic commerce Types of E-commerce Achieving customer intimacy: Interactive marketing, personalization, and self-service B2B E-commerce: New efficiencies and relationships M-commerce services and applications Accessing information from

the wireless web M-commerce challenges Electronic commerce payment systems Types of electronic payment systems

UNIT-5

(4 Hrs)

Enhancing Decision Making: Decision making & information systems, Business value to improve decision making. Types of decisions, The decision making process Managers and decision making in the real world Systems for decision support Management information systems (MIS) Decision-support systems (DSS) Group decision-support systems (GDSS) What is a GDSS? Overview of a GDSS meeting Business value of GDSS Building Information

Text Book:

1. Kenneth C Laudon, Jane P Laudon - Management Information Systems, 10th Edition, PEARSON Prentice Hall, 2008.

Reference Books:

1. James A O'Brein, George M Marakas - Management Information Systems, 7th Edition, TMH publication, 2007.
2. W. S. Jawadekar - Management Information Systems, Tata McGraw Hill Edition, 3rd edition, 2004

Course Outcomes:

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

CO1	Explain the role of Data and Information in Business Management Systems.
CO2	Apply emerging technologies for Business Organizations.
CO3	Analyse the Decision Support System for Business firm.
CO4	Work in team, and prepare a report for a given case study.



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER – III

COURSE TITLE	Digital Marketing	Credits	3
COURSE CODE	18MCA3PEDM	L-T-P	2-1-0
CIE	50	SEE	50

Prerequisites: None

UNIT 1:

E-Marketing in Context: Past, Present and Future: E-Marketing Landscape: What works? Internet, E-Marketing is Bigger than Web, E-Marketing is Bigger than Technology, E-Marketing's Past: Web 1.0: The E Drops from E-Marketing, Marketing Implications of Internet Technologies, E-Marketing Today: Web 2.0: Power Shift from Sellers to Buyers, Customer Engagement, Content Marketing, Inbound Marketing, New Technologies, Exciting New Technology-Based Strategies, Other Opportunities and Challenges in Web 2.0, The Future: Web 3.0: Semantic Web, Stepping Stones to Web 3.0
(5 Hrs.)

UNIT 2:

Strategic E-Marketing and Performance Metrics : Strategic Planning : Environment, Strategy, and Performance Strategy, From Strategy to Electronic Strategy, From Business Models to E-Business Models, E-Business Models: Value and Revenue, Menu of Strategic E-Business Models, Performance Metrics Inform Strategy, The Balanced Scorecard: Four Perspectives, Applying the Balanced Scorecard to E-Business and E-Marketing , Social Media Performance Metrics: Awareness/Exposure Metrics, Brand Health Metrics, Engagement Metrics, Action Metrics, Innovation Metrics, Measurement Tools.
(5 Hrs.)

UNIT 3:

The E-Marketing Plan : Overview of the E-Marketing Planning Process, Creating an E-Marketing Plan : The Napkin Plan, The Venture Capital E-Marketing Plan, A Seven Step E-Marketing Plan : Step-1 – Situation Analysis, Step 2- E-Marketing Strategic Planning, Step-3 – Objectives, Step 4 – E-Marketing Strategies : The offer : Product Strategies, The Value: Pricing Strategies, Distribution Strategies, Marketing Communication Strategies, Relationship Strategies, Step 5 – Implementation Plan, Step 6 – Budget : Revenue Forecast, E-Marketing Costs, Step 7 – Evaluation Plan
(5 Hrs.)

UNIT 4:

E-Marketing Environment: Global E-Markets 3.0: Overview of Global E-Marketing Issues : Global Markets, Emerging Economies, Importance of Information Technology, Country and Market Opportunity Analysis : Diaspora Communities, E-Commerce Payment and Trust Issues, Infrastructure Considerations , Technological Tripping Points : Legacy Technologies: Computers and Telephones, Wireless Internet Access : Mobile Phones, Smartphones, Broadband, The Digital Divide, Building Inclusive E-Markets, Social Networking. **(5 Hrs.)**

UNIT 5:

Ethical and Legal Issues :Overview of Ethics and Legal Issues, Ethics and Ethical Codes, The Problem of Self-Regulation, Privacy : Privacy within Digital Contexts, International Privacy Issues, Digital Property : Patents, Copyright, Trademarks, Licenses, Trade Secrets, Data Ownership, Online Expression, Emerging Issues: Online Governance and ICANN, Jurisdiction, Fraud **(4 Hrs.)**

Text Books:

Sl. No.	Content
1.	E-Marketing, Judy Strauss, Raymond Frost, Pearson Publications, Seventh Edition.

Course Outcomes:

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

CO1	Explain the concepts of Digital Marketing
CO2	Apply the concept of Digital Marketing for Business problems.
CO3	Identify legal, ethical issues within local and global contexts associated with Digital Marketing.
CO4	Analyze the process of Digital Marketing for a given case study in a team.



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER – III

COURSE TITLE	Enterprise Resource Planning	Credits	3
COURSE CODE	18MCA3PERP	L-T-P	2-1-0
CIE	50	SEE	50

Prerequisites: None

UNIT 1:

Enterprise – An Overview, ERP Introduction: Introduction; Business Functions and Business Processes ; Integrated Management Information ; The Role of the Enterprise ; Business Modeling ; Integrated Data Model ; A Brief History of ERP ; Reasons for the Growth of the ERP Market ; The Advantages of ERP Market ; How is ERP different ? Over-Expectations in ERP ; The Role of ERP packages ;
(5 Hrs.)

UNIT 2:

ERP and Related Technologies : Introduction; BPR (Business Process Reengineering); BI(Business Intelligence) ; BA (Business Analytics) ; Data Warehousing ; Data Mining ; OLAP (On-Line Analytical Processing) ; Product Life Cycle Management (PLM) ; Supply Chain Management (SCM) ; Customer Relationship Management (CRM) ; Geographic Information Systems (GIS) ; Intranets and Extranets;
(5 Hrs.)

UNIT 3:

ERP Implementation Basics: Why ERP? Technological, Operational, and Business Reasons for Implementing ERP ; Challenges to Successful ERP Implementation ; The Implementation Challenges ; ERP Implementation Life Cycle ; Objectives of ERP Implementation ; Different Phases of ERP Implementation ; Why do many ERP Implementations Fail ? ERP Deployment Models.
(5 Hrs.)

UNIT 4:

ERP and E-Business: ERP and E-Business ; E-Business : Supply Chain Integration ; The E-Business Process Model ; Components of the E-Business Supply Chain ; ERP/E-Business Integration
Business Modules of an ERP package: Introduction, Functional models of ERP software, Integration of ERP, Supply chain and Customer relationship applications
(5 Hrs.)

UNIT 5:

Future Directions and Trends in ERP: Introduction, New markets and channels, Faster implementation methodologies, Reduction of implementation time, Growth of third party service, Growth of BA and BI solutions. **(04 Hrs)**

Text Books:

Sl. No.	Content
1.	Enterprise Resource Planning, Third Edition, Alexis Leon, McGraw Hill Education (India) Pvt Ltd.
2.	Enterprise Resource Planning Concepts and Practices, Second Edition, Vinod Kumar Garg, N K Venkatakrishnan, PHI Learning Pvt Ltd
3.	Concepts in Enterprise Resource Planning, Ellen Monk, Bret Wagner, 4 th Edition, Cengage Learning

Reference Books:

Sl. No.	Content
1.	ERP Demystified, Third Edition, Alexis Leon, McGraw Hill Education (India) Pvt Ltd.

Course Outcomes:

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

CO1	Explain the concepts of Enterprise Resource Planning.
CO2	Apply the ERP concepts for a given scenario.
CO3	Identify the functional modules of a ERP system
CO4	Analyze the ERP process for a given case study in a team.



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER – III

COURSE TITLE	Organizational Behaviour	Credits	3
COURSE CODE	18MCA3PEOB	L-T-P	2-1-0
CIE	50	SEE	50

Prerequisites: None

UNIT 1: (4 Hrs.)

Introduction: What is organizational behaviour: What managers do? Enter organizational behaviour, challenges and opportunities of OB; Diversity in organization: Attitudes and job satisfaction

UNIT 2: (5 Hrs.)

Personality and Values: Personality, Values, Values and Ethical Behaviour in Asian Countries, Linking an individual's Personality and values to the workplace. **Perception and Individual Decision Making:** What is Perception? Person Perception, Link between Perception and Individual Decision Making, Decision Making in Organizations **Motivational concepts:** Motivation, contemporary theories of motivation, Integrating contemporary theories of motivation, Motivation concepts to applications

UNIT 3: (5 Hrs.)

Foundations of Group Behaviour: Stages of Group Development, Group Properties, Group Decision making.

Understanding Work Teams: Differences between Group and Team, Types of teams, Turning Individuals into Team players, Team Building and Team-based Work.

Basic Approaches to Leadership: what is leadership? Trait Theories, Behavioural Theories, Contingency Theory, Leader Member exchange (LXM) Theory, Decision Theory

UNIT 4: (5 Hrs.)

Power and Policies: Definition of power, constraining leadership and power, How power affects people, politics: power in action, The ethics of behaving politically.

Conflict and negotiation: Definition of conflict, types and loci of conflicts, conflict process, negotiation, implications for managers

UNIT 5:

(5 Hrs.)

Foundations of Organization Structure: Definition, Common Organizational Designs, New Design Options, why do Structures Differ? Organizational Designs and Employee Behaviour.

Organizational Culture: What is Organizational Culture? What do Cultures Do? Creating and Sustaining Culture, How Employees Learn Culture? Creating an Ethical and Positive Organizational Culture, Spirituality and Organizational Culture.

Text Books:

Sl. No.	Content
1.	Organizational Behaviour- Stephen P. Robbins, Timothy A Judge, Neharika Vohra, , Pearson Publications, 16 th Edition.

Reference Books:

Sl. No.	Content
1.	Organizational Behaviour- Fred Luthans, 9 th Edition, McGraw Hill International Edition, 2011.
2.	Organizational Behaviour – Hellriegel, Srocum & Woodman, Thompson Learning, 9 th Edition, PHI 2001.

Course Outcomes:

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

CO1	Describe the concepts of organizational behavior.
CO2	Apply concepts of organization behavior for different cases and issues.
CO3	Perform in a team as a team leader or a member in decision making process of the organization and prepare a report



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER – III

COURSE TITLE	Mini Project-I	Credits	3
COURSE CODE	18MCA3PWM1	L-T-P	0-0-3
CIE	50	SEE	50

Prerequisites: None

Course Details:

- Students are expected to take up mini project with a team size not exceeding 2*. The objective of this course is to work toward solving problems using latest technologies.
- The title, relevance, novelty, synopsis and technologies used for developing an application/ research will be scrutinized by respective guides.
- The application project / research work may be carried out at phases spread across 3 semesters as part of Mini Project-I (18MCA3PWM1), Mini Project-II (18MCA4PWM2) and Mini Project-III (18MCA5PWM3).

• **Rules and Regulations:**

1. The project must be carried out with a team of TWO students. However during the examination, each student must demonstrate the project individually.
2. The team must submit a brief project report (25-30 pages).
3. The sample contents for both application project or the research project is shown below:

<i>Sample contents for application development include the following chapters:</i>	<i>Sample contents of the Report include the following for Research work:</i>
• Introduction • Project Plan • Software Requirements Specifications (SRS) • Analysis and Design • Implementation (screenshots with description to be included) • Testing • Conclusion • Future enhancements • Bibliography	• Title, Abstract, Keywords • Introduction • Literature Survey • Objectives of Investigation • Research findings (e.g. Proposed method or Process, or System) • Validation (Experimental Results or Theoretical Analysis) • Conclusion & References

Note: * May vary with prior approval from Head of the Department.

Course Outcomes:**At the end of the course, student will be able to:**

CO1	Apply the computing knowledge for the chosen problem domain
CO2	Analyse the problem and identify the requirements / objectives
CO3	Design and develop a model / process / algorithm
CO4	Conduct required experiments and validate the input and draw valid conclusions
CO5	Implement using various software tools / technology
CO6	Adhere to ethics during the project development
CO7	Function effectively to engage in independent learning
CO8	Apply the principles of project management
CO9	Work in team, prepare a report and demonstrate the project / paper presentation



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER – III

COURSE TITLE	MOOC Course	Credits	Non Credited Course
COURSE CODE	18MCA3NCCMC	L-T-P	0-0-0
CIE	-	SEE	-

Prerequisites: None

Rules and regulations:

- This is not a team work; a student has to register and complete the course individually.
- Students shall take up any online courses (paid / unpaid) which is chosen in either technical or non-technical stream.
- The course duration must span from 4-6 weeks. Student must produce the hardcopy of the registration detail / send mail to the **faculty coordinator** about the confirmation details of registration for the online course taken up at the beginning of the semester.
- This course does not have any CIE or SEE; however, student must produce the completion certificate for the course taken up in this semester / period. The result is declared either pass or fail, based on the completion of the course in the stipulated time.

Course Outcome:

At the end of this course students will be able:

CO1: Work effectively to engage in a lifelong learning – PO7 (3)



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER – IV

COURSE TITLE	Analysis and Design of Algorithms	Credits	3
COURSE CODE	18MCA4PCAD	L-T-P	3-0-0
CIE	50	SEE	50

Prerequisites: None

Unit 1

Fundamentals of the Analysis of Algorithm Efficiency : Notion of Algorithm, Fundamentals of Algorithm problem solving, Important Problem types, Fundamentals of Data Structures, Analysis frame work, Asymptotic Notations, Basic Efficiency classes, Mathematical analysis of Recursive and Non Recursive algorithms, Examples. **(8 Hrs)**

Unit 2

Brute Force :Selection sort, Bubble sort, Sequential Search, String Matching and Exhaustive Search **Divide and Conquer** : Merge Sort, Quick Sort, Binary Search, Max-Min Problem **(7 Hrs)**

Unit 3

Decrease-and-Conquer : Insertion Sort, Depth First Search, Breadth First Search, Topological sorting, Algorithms for Generating combinatorial Objects

Greedy Technique : Prim's algorithm, Kruskal's Algorithm, Dijkstra's Algorithm and Huffman codes **(7 Hrs)**

Unit 4

Dynamic Programming : Binomial coefficient, Warshall's Algorithm, Floyd's Algorithm for the All-Pairs Shortest Paths Problem, Knapsack Problem and Memory functions

Space-Time Tradeoffs :Sorting by Counting, Input Enhancement in String Matching, Hashing **(7 Hrs)**

Unit 5

Coping with the Limitations of Algorithmic Power : Backtracking: n-Queens problem, Hamiltonian Circuit Problem, Subset–Sum Problem. Branch-and-Bound: Assignment Problem, Knapsack Problem, Traveling Salesperson Problem. Approximation Algorithms for NP-Hard Problems – Traveling Salesperson Problem, Knapsack Problem, Lower-Bound Arguments, Decision Trees, P, NP, and NP-Complete Problems. **(7 Hrs)**

Text Books:

Sl. No.	Content
1.	AnanyLevitin, “Introduction to the Design and Analysis of Algorithms”, Third Edition, Pearson Education, 2012.
2	Howrowitz E., Sahani S., Rajasekharan S. : Computer Algorithms, Galgotia Publication 2001.

Reference Books:

Sl. No.	Content
1	Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, “Introduction to Algorithms”, Third Edition, PHI Learning Private Limited, 2012.
2	Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, Reprint 2006.
3	KantiSwarup, P.K. Gupta, Manmohan, Operations Research, S Chand & Sons, 2002
4	Donald E. Knuth, “The Art of Computer Programming”, Volumes 1& 3 Pearson Education, 2009.
5	Steven S. Skiena, “The Algorithm Design Manual”, Second Edition, Springer, 2008.

E- Books and Online Course Materials:

Sl. No.	Content
1	Tom Cormen and Devin Balkcom, Algorithms, https://www.khanacademy.org/computing/computer-science/algorithms
2	Prof. Abhiram G Ranade, Design and Analysis of Algorithms, http://nptel.ac.in/courses/106101060/

Course Outcomes:

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

C01	Explain the concepts of Algorithmic design.
C02	Apply algorithmic design techniques for a given problem.
C03	Analyze algorithm for its correctness / time complexity
C04	Develop an Algorithm and prepare a report for a problem.



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER –IV

COURSE TITLE	Advanced Java Programming	Credits	4
COURSE CODE	18MCA4PCAJ	L-T-P	3-0-1
CIE	50	SEE	50

Prerequisites: 16MCA3DCJ1

UNIT 1:

Servlets: Servlet Structure, Servlet packaging, HTML building utilities, Lifecycle, Single Thread model interface, Handling Client Request : Form Data, Handling Client Request: HTTP Request Headers. Generating server Response: HTTP Status codes, Generating server Response: HTTP Response Headers, Handling Cookies, Session Tracking. **(7 Hrs.)**

UNIT 2:

JSP: Overview of JSP Technology, Need of JSP, Benefits of JSP, Advantages of JSP, Basic syntax, Invoking java code with JSP scripting elements, creating Template Text, Invoking java code from JSP, Limiting java code in J S P, using jsp expressions, comparing servlets and jsp, writing scriptlets. For example Using Scriptlets to make parts of jsp conditional, using declarations, declaration example. Controlling the Structure of generated servlets: the JSP page directive, import attribute, session attribute, isElignore attribute, buffer and auto flush attributes, info attribute, errorPage and is errorPage attributes, is Thread safe Attribute, extends attribute, language attribute, Including files and applets in jsp Pages, using java beans components in JSP documents. Integrating servlets and JSP: The Model View Controller (MVC) architecture. **(7 Hrs.)**

UNIT 3:

Java Beans and Annotations: Creating Packages, Interfaces, JAR files and Annotations. The core java API package, New java. Lang Sub package, Built-in Annotations. Working with Java Beans. Introspection, Customizers, creating java bean, manifest file, Bean Jar file, new bean, adding controls, Bean properties, Simple properties, Design Pattern events, creating bound properties, Bean Methods, Bean an Icon, Bean info class, Persistence, Java Beans API. **(7 Hrs.)**

UNIT 4:

JDBC: Talking to Database, Immediate Solutions, Essential JDBC program, using prepared Statement Object, Interactive SQL tool. JDBC in Action Result sets, Batch updates, Mapping, Basic JDBC data types, Advanced JDBC data types, immediate solutions. **(7 Hrs.)**

UNIT 5:

Spring Framework: Introduction to spring, Overview of the spring framework, Spring Framework Architecture, Getting Started, Configuring Beans: Using XML, Aspect oriented Programming: Classic Spring proxy-based AOP. **(8 Hrs.)**

Text Books:

Sl.No.	Content
1.	Marty Hall, Larry Brown, "Core Servlets and Java Server Pages", Volume 1: Core Technologies. 2 nd Edition.
2.	"Java 6 Programming Black Book", Dreamtech Press, 2012.
3.	Sharanam Shah, Vaishali Shah, "Spring 3 for Beginners", 1 st Edition

Reference Books:

Sl.No.	Content
1.	Herbert Schildt, "Java The Complete Reference", Comprehensive Coverage of Java Language, Oracle Press, McGraw Hill Education (India) Edition, 9 th Edition, 2014.
2.	Jim Keogh, "J2EE The Complete Reference", McGraw Hill Education (India) Edition 2002.
3.	Sharanam Shah, Vaishali Shah, "Spring 3 with Hibernate 4 Project for Professionals", 1 st Edition, 2012.

List of lab programs integrated with Java programming theory:

1. Programs using Servlets.
2. Programs using JSP.
3. Programs using Javabeans with JSP.
4. Programs using JDBC.
5. Programs using Spring.

Note:

1. Total number of programs up to 12.
2. Programs needs to be executed as per the requirements and expected output.

Course Outcomes:

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

CO1	Demonstrate an understanding of event-driven programming and graphical user interfaces with database.
CO2	Design and develop distributed business applications.
CO3	Develop and deploy MVC based application.



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER –IV

COURSE TITLE	Programming using Python	Credits	4
COURSE CODE	18MCA4PCPY	L-T-P-S	3-0-1
CIE	50	SEE	50

Prerequisites: Fundamentals of programming language.

UNIT 1:

Fundamentals of Python Programming: Introduction to Python: Features, Python Virtual Machine (PVM), Frozen Binaries, Memory Management and Garbage Collection, Installing Python, Writing First program in Python.

Fundamentals of Python Programming: Data types in Python, Operators in Python, Input and Output statements and Control structures.

Arrays: Creating, Processing Array Elements and handling Array Operations.

Strings Characters: Creating, Indexing, Slicing, Repeating and Concatenation, Comparing, Removing spaces, Finding sub strings in String. **(7 Hrs.)**

UNIT 2:

Functions, Lists, Tuples and Dictionaries in Python: Functions: Defining, Calling Returning results from a function. Pass by Object Reference, Formal, Actual, Positional, Keyword, Default, Variable Length Arguments. Local and Global Variables, Recursive Functions.

Lists: Creating List using range() function, Updating the elements of a list, Concatenation of two list, Repetition of lists, Membership in lists, Aliasing and Cloning lists, Sorting list elements, Nested lists.

Tuples: Crating and Accessing Tuple Elements, Basic Operation on Tuples, Nested Tuples, Inserting, Modifying and Deleting Elements of a Tuple.

Dictionaries: Operation on Dictionaries, Dictionary Methods, Sorting Elements of a Dictionary, Converting Lists in to Dictionary. **(7 Hrs.)**

UNIT 3:

Object Oriented Approach in Python: Classes and Objects: Creating Class, The Self Variable, Constructor, Types of Variables, Namespaces, Types of Methods, Passing members between class, Inner Classes.

Inheritance and Polymorphism: Constructor in Inheritance, Overriding Super Class Constructors and Methods, The super() Method, Types of Inheritance, Method Resolution Order(MRO), Polymorphism, Duck Typing Philosophy of Python, Operator and Method Overloading and Method Overriding.

Abstract Classes and Interfaces: Abstract Methods and Class, Interfaces in Python, Abstract Classes vs. Interfaces. **(8 Hrs.)**

UNIT 4:

Exceptions and Date and Time: Exceptions: Types of Errors, Exceptions, Exception Handling, Types of Exceptions, The except Block, assert Statement, User-Defined Exceptions, Logging the Exceptions.

Files in Python: Files, Types of Files in Python, Opening a File, Closing a File, Working with Text Files Containing Strings, Knowing Whether a File Exists or Not, Working with Binary Files, The with Statement, Pickle in Python, The seek() and tell() Methods. Zipping and Unzipping Files.

Data Structures in Python: Linked Lists, Stacks, Queues, Deques **(7 Hrs.)**

UNIT 5:

Graphical User Interface development and Database in Python: GUI in Python, the Root Window, Font and colors, working with Containers, Canvas, Frames. Widgets.

Fundamental concepts of database, installing MySQL, Using MySQL from Python, Retrieving All Rows from a table, Inserting Rows in a Table, Updating Rows in a Table, Deleting Rows in a Table, Creating Database Tables through python. **(7 Hrs.)**

Text Books:

Sl. No.	Content
1.	R Nageswara Rao, "Core Python Programming", Dreamtech Press, 2017 Edition.

Reference Books:

Sl. No.	Content
1.	Mark Lutz, "Programming Python", 4 th Edition, O'Reilly Media.
2.	Timothy A. Budd, "Exploring Python", , McGraw Hill Education, 2 nd Reprint 2015
3.	Paul Greis, Jennifer Campbell, Jason Montojo, "Practical Programming – An Introduction to Computer Science Using Python 3", 2 nd Edition SPD.
4.	E Balaguruswamy, "Introduction to Computing and Problem Solving Using Python", McGraw Hill Education.

E- Books:

Sl. No.	Content
1.	http://greenteapress.com/thinkpython/thinkpython.pdf
2.	https://www.cs.uky.edu/~keen/115/Haltermanpythonbook.pdf
3.	http://www.souravsengupta.com/int2pro2014/python/LPTHW.pdf

Online Courses and Video Lectures:

Sl. No.	Content
1.	http://chimera.labs.oreilly.com/books/1230000000393/index.html
2.	https://docs.python.org/3/tutorial/
3.	http://www.tutorialspoint.com/python3/python_tutorial.pdf
4.	http://ciar.org/ttk/public/book.programming_in_python_3.summerfield.pdf
5.	http://chimera.labs.oreilly.com/books/1230000000393/index.html

List of lab programs integrated with Web application development -II theory:

1. Program to demonstrate the usage of basic Data types and Operators.
2. Program to demonstrate the usage of Arrays and List.
3. Program to demonstrate the usage of Dictionaries and Tuples.
4. Program to demonstrate the usage of Function.
5. Program to demonstrate the usage of Class and Objects.
6. Program to demonstrate the usage of Inheritance.
7. Program to demonstrate the usage of Polymorphism.
8. Program to demonstrate the usage of Abstract Class and Interface.
9. Program to demonstrate Exception Handling.
10. Program to demonstrate using Files.
11. Program to demonstrate on Data Structures.
12. Program to demonstrate working with Canvas.

To be considered for Alternative Assessment

Build an application using Python, which includes the following features:

1. User and navigation friendly interfaces.
2. Database connectivity and handling data store.
3. Deployment on the web server.

Tutorial: Introduction to standard packages, tools for python programming and problem solving in Python.

Course Outcomes:

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

CO1	Demonstrate the programming concepts of python.
CO2	Apply the object-oriented approach in python programming.
CO3	Analyse the problem and obtain a solution.
CO4	Build web application with graphical user interfaces and database.



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER –IV

COURSE TITLE	Big-Data Analytics	Credits	4
COURSE CODE	18MCA4PEBD	L-T-P	3-1-0
CIE	50	SEE	50

Prerequisites: None

UNIT 1:

Getting an Overview of Big Data: What is Big Data, History, Structuring data, Elements of Big Data, Big Data Analytics, Careers in Big data.

Exploring the Use of Big Data in Business Context: Use of Big data in Social Networking, Preventing fraudulent activities, Detecting fraudulent activities in Insurance sector, Retail industry.

Introducing Technologies for Handling Big Data: Distributed and parallel computing for big data, Introducing Hadoop, Cloud computing and Big Data, In-memory computing technology for Big Data.

Understanding Hadoop ecosystem: Hadoop ecosystem, HDFS, Mapreduce, YARN, HBase, Hive, Sqoop, Zookeeper, Flume, Oozie.

(8 Hrs.)

UNIT 2:

Understanding Map Reduce Fundamentals and HBase: The Map Reduce Framework, Techniques to Optimize Map Reduce jobs, Uses of Map Reduce, Role of HBase in Big data processing.

Understanding Big data Technology Foundations: Exploring the Big Data stack, Virtualization and Big data, Virtualization approaches.

(7 Hrs.)

UNIT 3:

Exploring Hive: Introduction, Data types, Built-in functions, Hive DDL, Data manipulation, Data retrieval queries, Joins in Hive.

Big Data Analysis Techniques: Quantitative analysis, Qualitative analysis, Data mining. Statistical analysis – A/B Testing, Correlations, Regression, Machine Learning – Classification, Clustering, Outlier detection, Filtering, Semantic analysis, Visual analysis, Case-study.

Variety of NoSQL Databases: Data management with distributed databases, ACID and BASE, Types of eventual consistency, Four types of NoSQL databases: Key-value pair databases, Document databases, Column family databases, Graph databases.

(7 Hrs.)

UNIT 4:

Introduction to MongoDB: Introduction, Getting Started: Documents, Collections, Dynamic Schemas, Naming, Databases, Getting and Starting MongoDB, Introduction to the MongoDB Shell, Running the Shell, A MongoDB Client, Basic Operations with the Shell, Data Types, Basic Data Types, Dates, Arrays, Embedded Documents_id and ObjectIds, Creating, Updating, Deleting Documents, Querying

(7 Hrs.)

UNIT 5:

Graph Databases – Overview, Getting Started with Neo4j, Importing data into Neo4j: The four fundamental data constructs, How to start modeling for graph databases, What we know – ER diagrams and relational schemas, Introducing complexity through join tables, A graph model – a simple, high-fidelity model of reality, Graph modeling – best practices and pitfalls, Graph modeling best practices, Design for query-ability, Align relationships with use cases, Look for n-ary relationships, Granulate nodes, Use in-graph indexes when appropriate, Graph database modeling pitfalls, Using "rich" properties, Node representing multiple concepts

(7 Hrs.)

Text Books:

Sl. No.	Content
1.	DT Editorial Services, "Big Data Black Book", Dreamtech press, New Delhi, 2016.
2.	Dan Sullivan, "NOSQL for mere mortals", Pearson education, 1st edition, 2015
3.	Kristina Chodorow "MongoDB: The Definitive Guide", Second Edition, Oreilly
4.	Rik Van Bruggen "Learning Neo4j - Run blazingly fast queries on complex graph datasets with the power of the Neo4j graph database " PACKT Publishing

Reference Books:

Sl. No.	Content
1.	ShashankTiwari, "Professional NOSQL", John Wiley India Pvt. Ltd., 2011.
2.	Chris Eaton, Dirk Deroos, Tom Deutsch, George Lapis, and Paul Zikopoulos, "Understanding Big data", McGraw Hill Education India Pvt. Ltd., 2012.

Online Courses and E- Books:

Sl. No.	Content
1.	NandanSudarsanam, IITM, Introduction to Data analytics, http://nptel.ac.in/courses/110106064/1
2.	Data science Central, http://www.datasciencecentral.com
3.	Data Science and Big data courses, https://www.udacity.com/courses/data-science

Course Outcomes:

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

C01	Explain the concepts of Big data and NoSQL databases
C02	Apply Big Data concepts for a scenario
C03	Apply NoSQL for Data Management
C04	Design a Map-Reduce model to process the data for a use case and write a report



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER –IV

COURSE TITLE	Artificial Intelligence	Credits	4
COURSE CODE	18MCA4PEAI	L-T-P	3-1-0
CIE	50	SEE	50

Prerequisites: None

UNIT–1

What is AI? Intelligent Agents: Agents and environment, Rationality, The nature of environment, The structure of agents.

(6 Hrs)

UNIT–2

Solving Problems by Searching: Problem-solving agents; Example problems; Searching for Solutions; Uninformed Search Strategies: Breadth First search, Depth First Search, Iterative deepening depth first search; Informed Search Strategies: Heuristic functions, Greedy best first search, A*search.

(8 Hrs)

UNIT–3

Logical Agents: Knowledge-based agents, The Wumpus world, Logic-Propositional logic, Propositional theorem proving, Effective propositional model checking Agents based on propositional logic.

(8 Hrs)

UNIT–4

Predicate Logic: Using predicate logic: Representing simple facts in logic, Computable functions and predicates, Resolution, Forward reasoning, Backward reasoning.

(8 Hrs)

UNIT–5

Uncertain Knowledge & Reasoning: Forms of Learning; Inductive learning; Learning decision trees; Ensemble learning.

(6 Hrs)

Text Books:

1. **Artificial Intelligence: A Modern Approach** by Stuart Russel, Peter Norvig, 3rd Edition, Pearson Education, 2015.
2. **Artificial Intelligence**, by Elaine Rich, Kevin Knight, Shivashankar B Nair: Tata McGraw Hill 3rd edition. 2013

Reference Book:

1. **Artificial Intelligence** & Soft Computing for Beginners, 3rd Edition, Shroff Publishers and Distributors Pvt Ltd, 2018.

Course Outcomes:

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

C01	Describe the basic concepts of Artificial Intelligence
C02	Apply Artificial Intelligence concepts for a given scenario
C03	Work in a team to present a case study on Artificial Intelligence



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER –IV

COURSE TITLE	Mobile Computing	Credits	4
COURSE CODE	18MCA4PEMC	L-T-P	3-1-0
CIE	50	SEE	50

Prerequisites: 18MCA3PCNW

UNIT 1: Mobile Computing Architecture, Access Procedures and Emerging Technologies

Mobile Computing Architecture: History of Computers, History of Internet, Internet – The Ubiquitous Network, Architecture for Mobile Computing, Three-tier Architecture, Design Considerations for Mobile Computing.

Access Procedure: Evolution of Telephony, Multiple Access Procedure – FDMA, TDMA, CDMA and SDMA.

Emerging Technologies: Introduction, Bluetooth, Radio Frequency Identification (RFID), Wireless Broadband (WiMAX), Mobile IP.

(7 Hrs)

UNIT 2: Wireless Networks1- GSM

Global Systems for Mobile Communication (GSM) and Short Message Services (SMS)

GSM : GSM Architecture, Entities, Call routing in GSM, PLMN Interface, GSM Addresses and Identities, Network Aspects in GSM, Mobility Management

SMS : Mobile Computing over SMS, Short Message Service, Value added services through SMS
(7 Hrs.)

UNIT 3: Wireless Networks2- GPRS, CDMA and 3G

General Packet Radio Services (GPRS): GPRS and Packet Data Network, GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS, Applications for GPRS, Limitations of GPRS and Billing and Charging in GPRS.

CDMA and 3G: Spread Spectrum technology, IS-95, CDMA versus GSM, Wireless Data, Third Generation Networks, Applications on 3G

(7 Hrs.)

UNIT 4: Mobile Client, Mobile OS and Computing Environment

Client Programming: Introduction, moving beyond the desktop, mobile phones, features of mobile phones, design constraints in applications for handheld devices.

Smart Client Architecture: The Client- User Interface, Data Storage, Performance, Data Synchronization and Messaging. The Server – Data Synchronization, Enterprise Data Source, Messaging. Mobile Operating System: WinCE, PalmOS, Symbian OS, Linux and Proprietary OS Client Development

Smart Client Development: The development process, Need Analysis Phase, Design Phase, Implementation and Testing Phase, Deployment Phase.

(8 Hrs)

UNIT 5: Mobile Internet Applications and Security issues in Mobile Computing

Mobile Internet Applications: Thin client: Architecture, the client, Middleware, Messaging Servers, Processing a Wireless request, Wireless Applications Protocol (WAP) Overview.

Security Issues in Mobile Computing: Introduction, Information Security, Security Techniques and algorithms, Security protocols, Security Framework for Mobile Environment.

(7 Hrs)

Text Books:

Sl. No.	Content
1.	Dr. Ashok Talukder, MsRoopaYavagal ,Mr . Hasan Ahmed “Mobile Computing, Technology, Applications and Service Creation”, 2d Edition, Tata McGraw Hill, 2015.
2.	MartynMallick,” Mobile and Wireless Design Essentials”, Edition 2014, Wiley.

Reference Books:

Sl. No.	Content
1.	Raj Kamal, “Mobile Computing”, 2ndEdition, Oxford University Press, 2007.
2.	ItiSahaMisra,” Wireless Communications and Networks, 3G and Beyond ”, 2nd Edition, Tata McGraw Hill, 2013.
3.	Reza B’Far, “ Mobile Computing Principles – Designing and Developing Mobile Applications with UML and XML”, 5th Edition, Cambridge University Press, 2006.
4.	UweHansmann, LothatMerk, Martin S Nicklous and Thomas Stober: “Principles of Mobile Computing”, 2nd Edition, Springer International Edition,2003.
5.	Schiller, ” Mobile Communication”, Pearson Publication, 2004

Online Courses and Video Lectures:

Sl. No.	Content
1.	https://onlinecourses.nptel.ac.in/noc16_cs13
2.	http://www.nptelvideos.in/2012/12/wireless-communication.html

Course Outcomes:

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

CO1	Define the concepts of Mobile Computing
CO2	Apply the concepts of Mobile Computing for a given wireless network
CO3	Analyse the issues in developing a smart and thin client applications for Mobile devices
CO4	Perform in team and prepare report on various security threats in Mobile Computing environment



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER –IV

COURSE TITLE	Green Computing	Credits	4
COURSE CODE	18MCA4PEGC	L-T-P	3-1-0
CIE	50	SEE	50

Prerequisites: None

UNIT 1:

Green IT: An Overview, Introduction, Environmental Concerns and sustainable Development, Environmental Impacts of IT, Green IT, Holistic Approach to Greening IT, Greening IT, Applying IT for Enhancing Environmental Sustainability, Green IT standards and Eco-Labeling of IT, Enterprise Green IT Strategy, Green IT: Burden or Opportunity?

Green Devices and Hardware: Introduction, Life Cycle of a Device or Hardware, Reuse, Recycle and Dispose

(7 Hrs.)

UNIT 2:

Green Software: Introduction, Energy Saving Software Techniques, Evaluating and Measuring Software Impact to platform Power.

Sustainable Software Development: Introduction, Current Practices, Sustainable Software Development, Software Sustainability Attributes, Software Sustainability Metrics, Sustainable Software Methodology, Defining Actions, Case Study

(7 Hrs.)

UNIT 3:

Green Data Centres: Data centres and Associated Energy Challenges, Data Centre IT Infrastructure, Data Centre Facility Infrastructure: Implications for Energy Efficiency, IT Infrastructure Management, Green Data Centre Metrics, Datacentre Management Strategies: A Case Study.

Green Data Storage: Introduction, Storage Media power Characteristics, Energy Management Techniques for Hard Disks, System - Level Energy Management.

(6 Hrs.)

UNIT 4:

Green Networks and Communications: Introduction, Objectives of Green Network Protocols, Green Network Protocols and Standards. **Enterprise Green IT Strategy:** Introduction, Approaching Green IT Strategies, Business Drivers and Green IT Strategy, Business Dimensions

for Green IT Transformation, Organizational Considerations in a Green IT Strategy, Steps in Developing a Green IT Strategy, Metrics and Measurements in Green Strategies.

(7 Hrs.)

UNIT 5:

Sustainable IT Services: Creating a Framework for Service Innovation, Introduction Factors Driving the Development of Sustainable IT, Sustainable IT Services (SITS) SITS Strategic Framework, Sustainable IT Roadmap, SITS Leadership and Best Practices.
Managing Green IT: Introduction, Strategizing Green Initiatives, Implementation of Green IT, Information Assurance, Communication and Social Media.

(6 Hrs.)

Text Books:

Sl. No	Content
1.	Harnessing Green IT: Principles & Practices. San Murugesan, G R Gangadharan, Wiley

Reference Books:

Sl. No	Content
1.	“Green IT Strategies and Applications-Using Environmental Intelligence” Bhuvan Unhelkar, CRC Press, June 2011.
2.	“Tools and Techniques for Saving Energy, Money, and Resources”, Bud E. Smith, CRC Press

Course Outcomes:

At the end of the course, student will have the ability to:

CO1	Describe the concepts of Green IT
CO2	Apply the concept of Green IT to various scenarios
CO3	To prepare a report related to a Green IT Use case in a team



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER –IV

COURSE TITLE	Advance Web Programming	Credits	4
COURSE CODE	18MCA4PEAW	L-T-P	3-0-1
CIE	50	SEE	50

Prerequisites: None

Unit 1

Introduction to React

Welcome to React: Obstacles and Roadblocks, React's future, keeping up with the changes, working with the files.

Emerging JavaScript: Declaring variables, Arrow functions, Transpiling ES6, ES6 Objects and Arrays, Promises, Classes, ES6 Modules and CommonJS

Functional Programming with JavaScript

What it means to be functional, Imperative versus Declarative, Functional Concepts

(7 Hrs)

Unit 2

Pure React and React with JSX

Pure React: Page Setup, The Virtual DOM, React Elements, React DOM, Children, Constructing elements with data, React Components, DOM Rendering, Factories.

React with JSX: React Elements as JSX, Babel, Recipes as JSX, and Introduction to Webpack.

(7 Hrs)

Unit 3

Introduction to Node.js

Node.js Up and Running:Setting up a Node Development Environment, Installing Node on Linux(Ubuntu), Setting up WebMatrix on Window 7, Updating Node.

Nod: Jumping In, Asynchronous functions and the Node event loop, Benefits of Node.

Interactive Node with REPL and Node Core: REPL- The first look and undefined expressions, benefits of REPL, Multiline and More Complex JavaScript. Globals, global, process and buffer.The Timers, Servers, streams and sockets, child process.

(7 Hrs)

Unit 4

Programming in Node.js

Control flow, asynchronous pattern and exception handling: The promise, no promise, callback instead. Sequential functionality, nested callbacks and exception handling, asynchronous patterns and control flow.

Routing Traffic, Serving Files and Middleware: Building a Simple Static File Server from Scratch, Middleware, Routers and Proxies.

(7 Hrs)

Unit 5

Introduction to unstructured databases: NoSQL and MongoDB

Getting started with NoSQL: What it is and why you need it? Definition, Sorted Ordered Column-Oriented Stores, Key/Value stores, Document Databases, Graph Databases. First Impressions-Examining Two Simple examples, working with language bindings.

Introduction to MongoDB: Ease of Use, Easy of Scaling, Tons of features. Documents, Collections, Databases, Data Types, Using MongoDB Shell.

Creating, Updating, Deleting and Querying Documents: Inserting, removing, and updating the documents. Querying the document: Query criteria, Type-specific queries, Cursors, database commands.

(8 Hrs)

Text Books:	
1.	Alex Banks & Eve Porcello, "Learning React: Functional Web Development with React and Redux, O'Reilly, July 2018.
2.	Shelly Powers, "Learning Node", O'Reilly, 2012.
3.	Kristina Chodorow, "MongoDB: The Definitive Guide", O'Reilly, July 2015.
4.	ShashankTiwari, "Professional NoSQL", Wiley, India Pvt. Ltd., July 2015.

e-links	
1.	https://reactjs.org/tutorial/tutorial.html
2.	https://www.tutorialspoint.com/reactjs/
3.	https://www.w3schools.com/nodejs/nodejs_intro.asp
4.	https://www.tutorialspoint.com/nodejs/nodejs_introduction.htm
5.	https://code.tutsplus.com/tutorials/nodejs-for-beginners--net-26314
6.	https://github.com/maxogden/art-of-node/#the-art-of-node
7.	https://www.tutorialspoint.com/mongodb/

List of Lab Programs

1. Installation of React
2. Installation of Node
3. Setting up server connection
4. Installing MongoDB
5. Program on fundamental concepts in React

6. Program on ES6
 - a. Object
 - b. Arrays
 - c. Promises
 - d. Class
7. Program on handling control flow, asynchronous function and exception handling in Node.js
8. Program handling CRUD operations in MongoDB with Node.js

Course Outcomes:

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

CO1	Describe the concepts of interactive User Interfaces, server side frameworks and unstructured database
CO2	Apply the knowledge of designing Interactive User Interfaces using React.js
CO3	Illustrate how Node.js handles server side scripting
CO4	Conduct experiments to demonstrate the concepts related to user interface design, server side scripting and unstructured database.
CO5	Work in team to design an application using the React.js, Node.js and MongoDB for a real world problem



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER –IV

COURSE TITLE	Mobile Applications Development	Credits	4
COURSE CODE	18MCA4PEMA	L-T-P	3-0-1
CIE	50	SEE	50

Prerequisites: 18MCA3PCJP

UNIT 1:

Get started: Introduction to Android , Your first Android app, Layouts and resources for the UI, Text and scrolling views, Resources to help you learn, Activities and intents, Activity lifecycle and state, Implicit intents. Testing, debugging, and using support libraries, The Android Studio debugger, App testing, The Android Support Library.

(8 Hrs.)

UNIT 2:

User experience : User interaction: Buttons and clickable images, Input controls, Menus and pickers, User navigation,

RecyclerView, Delightful user experience: Drawables, styles, and themes, Material Design, Resources for adaptive layouts Testing your UI.

(7 Hrs.)

UNIT 3:

Working in the background : Background tasks, AsyncTask and AsyncTaskLoader, Internet connection, Broadcast receivers, Services, Alarms and schedulers, Notifications, Alarms, Efficient data transfer.

(7 Hrs.)

UNIT 4:

Saving user data: Preferences and settings, Data storage, Shared preferences, App settings, Storing data with Room database, Storing data using SQLite database, Room, LiveData, and View Model.

(7 Hrs.)

UNIT 5:

Publish your App: Permission, Performance, Security, Firebase, AdMob, Publishing your App.
(7Hrs.)

Books:

Sl No	Content
1.	Professional Android 4 Application Development by Reto Meier, Wiley Publishing, 2012. ISBN: 978-1-118-10227-5

Reference Books:

Sl.No	Content
1.	Mobile Applications Development with Android: Technologies and Algorithms, Meikang Qiu, Wenyun Dai, Keke Gai, published by CRC, 2016.
2.	The Android Developer's Cookbook: Building Applications with the Android SDK by James Steele, Nelson To, Addison-Wesley Professional; 2010.

E-Book:

Sl. No.	Content
1.	Professional Android Application Development by Reto Meier, Wiley Publishing, 2009

MOOCS:

Sl. No.	Content
1.	https://developer.android.com/courses/fundamentals-training/overview-v2
2.	https://in.udacity.com/course/new-android-fundamentals--ud851
3.	Youtube: The new Boston videos android development

Course Outcomes:

At the end of the course, student will have the ability to:

CO1	Describe the components of mobile application development.
CO2	Apply the computing knowledge in developing mobile applications
CO3	Design the mobile application for a given problem
CO4	Develop an mobile application in a team and submit a report



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER –IV

Elective V

COURSE TITLE	Internet of Things	Credits	4
COURSE CODE	18MCA4PEIT	L-T-P	3-0-1
CIE	50	SEE	50

Prerequisites: 18MCA3PCNW

UNIT 1:

Introduction: Definition and Characteristics of IoT, Physical Design of IoT – Things in IoT, IoT Protocols. Logical Design of IoT – IoT Functional Blocks, IoT Communication models, IoT Communication APIs. IoT enabled Technologies: Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, and Embedded Systems, IoT Levels and Deployment Templates. **(8 Hrs.)**

UNIT 2:

IoT Definitions, Frameworks and Key Technologies: IoT Definitions- General Observations, ITU-T Views, Working Definitions, IoT Frameworks. Identification of IoT Objects and Services, Structural Aspects of the IoT- Environment Characteristics, Traffic Characteristics, Scalability, Interoperability, Security and Privacy. Key IoT Technologies- Device Intelligence, Communication Capabilities, Mobility Support and Device Power, Sensor Technology, RFID technology. **(7 Hrs.)**

UNIT 3:

IoT Standards and Architecture: Overview and Approaches, IETF IPv6 Routing Protocol for RPL Roll, Constrained Application Protocol (CoAP),- Background, Messaging Model, Request / Response Model, Intermediaries and Caching. ETSI M2M, Third-Generation Partnership Project Service Requirements for Machine- Type Communications – Approach, Architectural Reference Model for MTC, 6LoWPAN, IP in Smart Objects (IPSO). **(7 Hrs.)**

UNIT 4:

Connectivity: Wireless Technologies for IoT and Service Discovery : WPAN Technologies for IoT / M2M – Zigbee, Radio Frequency for Consumer Electronics, Bluetooth and its Low-Energy Profile, Near Field Communication (NFC), Dedicated Short Range Communications (DSRC) and related

protocols. Service Discovery in IP Networks and Service Discovery Protocols.

(7 Hrs.)

UNIT 5:

Applications of IoT and Security for Smart Objects: Overview of Applications – Smart Metering, e-Health/ Body Area Networks, City Automation, Automotive Applications, Home Automation, Smart Cards, Tracking. Control Applications and Myriad Other Applications. Security for Smart Objects – The three properties of security, Encryption, Security mechanisms for smart objects, Security mechanisms in the IP architecture.

(7 Hrs.)

Text Books:

Sl. No.	Content
1.	ArshdeepBahga and Vijay Madiseti, "Internet of Things - A Hands-on Approach", Universities Press, 2015
2.	Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6:The Evolving World of M2M Communications", Wiley, 2013
3.	Jean-Philippe Vasseur, Adam Dunkels, "Interconnecting Smart Objects with IP", Morgan Kaufmann Publishers (Elsevier), 2010 (e-book).

Reference Books:

Sl. No.	Content
1.	Michael Miller," The Internet of Things", 1 st Edition, Pearson, 2015
2.	Claire Rowland,Elizabeth Goodman et.al.," Designing Connected Products", FirstEdition,O'Reilly, 2015.
3.	Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things ", Wiley , 2014.
4.	Marco Schwartz, "Internet of Things with Arduino: Build Internet of Things Projects With the Arduino Platform".

Course Outcomes:

At the end of the course, student will have the ability to:

CO1	Explain the concepts of Internet of Things (IoT).
CO2	Apply the knowledge of IoT architecture, framework for a specific scenario.
CO3	Design IoT solution to meet given specifications.
CO4	Develop an IoT prototype related to the Societal or Health or Environment needs, through a group activity and prepare a poster.



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER –IV

COURSE TITLE	NOSQL	Credits	4
COURSE CODE	18MCA4PENS	L-T-P	3-1-0
CIE	50	SEE	50

Prerequisites: None

UNIT 1:

NOSQL: WHAT IT IS AND WHY YOU NEED IT, Definition and Introduction, Context and a Bit of History, Big Data, Scalability, Definition and Introduction, Sorted Ordered Column-Oriented Stores, Key/Value Stores, Document Databases, Graph Databases;

HELLO NOSQL: GETTING INITIAL HANDS-ON EXPERIENCE, First Impressions — Examining Two Simple Examples, A Simple Set of Persistent Preferences Data, Storing Car Make and Model Data, Working with Language Bindings, MongoDB's Drivers, A First Look at Thrift;

INTERFACING AND INTERACTING WITH NOSQL: If No SQL, Then What? Storing and Accessing Data, Storing Data In and Accessing Data from MongoDB, Querying MongoDB, Storing Data In and Accessing Data from Redis, Querying Redis, Storing Data In and Accessing Data from HBase, Querying HBase, Storing Data In and Accessing Data from Apache Cassandra, Querying Apache Cassandra.

(8 Hrs.)

UNIT 2:

PERFORMING CRUD OPERATIONS: Creating Records, Creating Records in a Document-Centric Database, Using the Create Operation in Column-Oriented Databases, Using the Create Operation in Key/Value Maps, Accessing Data, Accessing Documents from MongoDB, Accessing Data from HBase, Querying Redis, Updating and Deleting Data, Updating and Modifying Data in MongoDB, HBase, and Redis, Limited Atomicity and Transactional Integrity.

QUERYING NOSQL STORES, Similarities Between SQL and MongoDB Query Features, Loading the MovieLens Data, MapReduce in MongoDB, Accessing Data from Column-Oriented Databases Like HBase, The Historical Daily Market Data, Querying Redis Data Stores.

MODIFYING DATA STORES AND MANAGING EVOLUTION, Changing Document Databases, Schema-less Flexibility, Exporting and Importing Data from and into MongoDB, Schema Evolution in Column-Oriented Databases, HBase Data Import and Export, Data Evolution in Key/Value Stores.

(7 Hrs.)

UNIT 3:

INDEXING AND ORDERING DATA SETS, Essential Concepts Behind a Database Index, Indexing and Ordering in MongoDB, Creating and Using Indexes in MongoDB, Compound and Embedded Keys, Creating Unique and Sparse Indexes, Keyword-based Search and MultiKeys, Indexing and Ordering in CouchDB, The B-tree Index in CouchDB, Indexing in Apache Cassandra.

MANAGING TRANSACTIONS AND DATA INTEGRITY: RDBMS and ACID, Isolation Levels and Isolation Strategies, Distributed ACID Systems, Consistency, Availability, Partition Tolerance, Upholding CAP, Compromising on Availability, Compromising on Partition Tolerance, Compromising on Consistency, Consistency Implementations in a Few NoSQL Products, Distributed Consistency in MongoDB, Eventual Consistency in CouchDB, Eventual Consistency in Apache Cassandra, Consistency in Membase.

(7 Hrs.)**UNIT 4:**

SCALABLE PARALLEL PROCESSING WITH MAP REDUCE: Understanding MapReduce, Finding the Highest Stock Price for Each Stock, Uploading Historical NYSE Market Data into CouchDB, MapReduce with HBase: MapReduce Possibilities and Apache Mahout, ANALYZING BIG DATA WITH HIVE, Hive Basics, Back to Movie Ratings, Good Old SQL, JOIN(s) in Hive QL, Explain Plan, Partitioned Table.

(7 Hrs.)**UNIT 5:**

SURVEYING DATABASE INTERNALS: MongoDB Internals, MongoDB Wire Protocol, Inserting a Document, Querying a Collection, MongoDB Database Files, Membase Architecture, Hypertable Under the Hood, Regular Expression Support, Bloom Filter, Apache Cassandra, Peer-to-Peer Model, Based on Gossip and Anti-entropy, Fast Writes, Hinted Handoff, Berkeley DB, Storage Configuration

CHOOSING AMONG NOSQL FLAVORS: Comparing NoSQL Products, Scalability, Transactional Integrity and Consistency, Data Modeling, Querying Support, Access and Interface Availability, Benchmarking Performance, 50/50 Read and Update, 95/5 Read and Update, Scans, Scalability Test, Hypertable Tests, Contextual Comparison.

(7 Hrs.)**Text Books:**

Sl. No.	Content
1.	ShashankTiwari, "Professional NOSQL", John Wiley India Pvt. Ltd., 2011.

Reference Books:

Sl. No.	Content
1.	Pramod J Sadalage, Martin Fowler, "NoSQL Distilled", Pearson. 2014.
2.	Kristina Chodorow "MongoDB: The Definitive Guide", Second Edition, Oreilly

Course Outcomes:

At the end of the course, student will have the ability to:

CO1	To Understand Various No SQL Database features
CO2	Implement CRUD operations on NoSQL Database
CO3	Analyze the given use case to suggest suitable NOSQL database



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER – IV

COURSE TITLE	Mini Project-II	Credits	3
COURSE CODE	18MCA4PWM2	L-T-P	0-0-3
CIE	50	SEE	50

Prerequisites: None

Course Details:

- Students are expected to take up mini project with a team size not exceeding 2*. The objective of this course is to work toward solving problems using latest technologies.
- The title, relevance, novelty, synopsis and technologies used for developing an application/ research will be scrutinized by respective guides.
- The application project / research work may be carried out at phases spread across 3 semesters or independently as part of Mini Project-I (18MCA3PWM1), Mini Project-II (18MCA4PWM2) and Mini Project-III (18MCA5PWM3).

• **Rules and Regulations:**

1. The project must be carried out with a team of TWO students. However during the examination, each student must demonstrate the project individually.
2. The team must submit a brief project report (25-30 pages).
3. The sample contents for both application project or the research project is shown below:

<i>Sample contents for application development may include the following chapters:</i>	<i>Sample contents of the Report may include the following for Research work:</i>
• Introduction • Project Plan • Software Requirements Specifications (SRS) • Analysis and Design • Implementation (screenshots with description to be included) • Testing • Conclusion • Future enhancements • Bibliography	• Title, Abstract, Keywords • Introduction • Literature Survey • Objectives of Investigation • Research findings (e.g. Proposed method or Process, or System) • Validation (Experimental Results or Theoretical Analysis) • Conclusion & References

Note: * May vary with prior approval from Head of the Department.

Course Outcomes:

At the end of the course, student will have the ability to:

CO1	Apply the computing knowledge for the chosen problem domain
CO2	Analyse the problem and identify the requirements / objectives
CO3	Design and develop a model / process / algorithm
CO4	Conduct required experiments and validate the input and draw valid conclusions
CO5	Implement using various software tools / technology
CO6	Adhere to ethics during the project development
CO7	Function effectively to engage in independent learning
CO8	Apply the principles of project management
CO9	Work in team, prepare a report and demonstrate the project / paper presentation

**BMS COLLEGE OF ENGINEERING BENGALURU-19**

(Autonomous College under VTU)

Department of Computer Applications**SEMESTER – IV**

COURSE TITLE	Soft Skills	Credits	Non Credited Course / Mandatory Course
COURSE CODE	18MCA4NCSS	L-T-P	0-0-0
CIE	-	SEE	-

Prerequisites: None

Soft skills are intangible and non-technical abilities acquired by students to make them employable. These are less referable to the qualification and are more personality-driven.

Rules and regulations:

- This is not a team work; a student has to register and complete the course individually.
- Students shall take up any online courses (paid / unpaid) or an offline course on one of the topic chosen by them.
- The course duration must span from 4-6 weeks. Student must produce the hardcopy of the registration detail / send mail to the **faculty coordinator** about the confirmation details of registration for the course taken up at the beginning of the semester.
- This course does not have any CIE or SEE; however, student must produce the completion certificate for the course taken up in this semester / period. The result is declared either pass or fail, based on the completion of the course in the stipulated time.
- The broad area of topics are listed below (but not restricted to / is not an extensive one):

Communication Skills	Leadership Skills	Personal Skills	Professional Skills
Verbal Communication	Team Building	Emotional Management	Time Management
Presentation Skills	Decision Making	Emotional Intelligence	Diversity Awareness
Public Speaking	Strategic Planning	Self-Awareness	Entrepreneurial Thinking
Interviewing		Stress Management	Business Ethics
Visual Communication	Crisis Management	Work-Life Balance	Writing reports and proposal

Course Outcome:**At the end of this course students will be able:**

CO 1	Engage in independent learning in the chosen soft skill
CO2	Communicate effectively about the skills acquired during this period



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER – V

COURSE TITLE	Software Project Management	Credits	3
COURSE CODE	18MCA5HSSM	L-T-P	3-0-0
CIE	50	SEE	50

Prerequisites: 18MCA2PCSE

UNIT 1: Introduction to Software Project Management: Introduction, Why is Software project management important? What is a Project? Software projects versus other types of projects, Contract management and Technical project management, Activities in SPM, Plans, methods, and Methodologies, Categorizing projects, Stakeholders, Setting, Objectives, The business case, Project success and failure, What is management? Management control, Traditional versus Modern Project management.

Project evaluation and Programme management: A business case, Project portfolio management, Evaluation of individual projects, Cost-benefit evaluation techniques, Programme management. **(8 Hrs.)**

UNIT 2: An overview of project planning. Activity planning: Introduction, The objectives of activity planning, When to plan, Project schedules, Projects and activities, Sequencing and scheduling activities, Network planning models, Formulating a network model, Adding the time dimension, The forward pass, The backward pass, Identifying the critical path, Activity float, Shortening the project duration, Identifying critical activities, Activity-on-arrow networks. **(7 Hrs.)**

UNIT 3: Risk management: Introduction, Risk, Categories of risk, A framework for dealing with risk, Risk identification, Risk assessment, Risk planning, Risk management, Evaluating risks to the schedule, Applying the PERT technique, Monte Carlo simulation, Critical chain concepts.

Resource allocation: Introduction, The nature of resources, Identifying resource requirements, Scheduling resources, Creating critical paths, Counting the cost, Being specific, Publishing the resource Schedule, Cost schedules, The scheduling sequence. **(8 hrs.)**

UNIT 4: Monitoring and control: Introduction, Creating the framework, Collecting the data, Visualizing progress, Cost monitoring, Earned value analysis, Prioritizing monitoring, Getting the project back to target, Change control.

Managing contracts: Introduction, Types of contract, Stages in contract placement, Typical terms of a contract, Contract management, Acceptance. **(7 Hrs.)**

UNIT 5: Managing people in software environments: Introduction, Understanding behavior, Organization behaviour:: a background, Selecting the right person for the job, Instruction in the best methods, Motivation, The Oldham–Hackman job characteristics model, Stress, Health and safety, Some ethical and professional concerns.

Working in teams: Introduction, Becoming a team, Decision making, Organizational structures, Coordination, dependencies, Dispersed and virtual teams, Communication genres, Communication plans, Leadership.

Software quality: Introduction, The place of software quality in project planning, The importance of software Quality, Defining software quality, ISO 9126, Product versus process quality management, Quality management systems, Process capability models, Techniques to help enhance software quality, Testing, Quality plans. **(7 Hrs.)**

Text Books:

Sl. No.	Content
1.	Bob Hughes, Mike Cotterell, and Raji Mall, Software project management, 5 th edition, McGraw Hill Education (India) Pvt. Ltd., 2011.

Reference Books:

Sl. No.	Content
1.	Bob Hughes, Mike Cotterell, and Raji Mall, Software project management, 6 th edition, McGraw Hill Education (India) Pvt. Ltd., 2017.
2.	Gene Kim, Kevin Behr, George Spafford, The Phoenix Project: A Novel About IT, DevOps, and Helping Your Business Win, IT Revolution Press; Reprint edition, 2014
3.	A Guide to the Project Management Body of Knowledge (PMBOK® Guide), Project Management Institute; 5 edition, 2013
4.	Mickey W. Mantle, Managing the Unmanageable: Rules, Tools, and Insights for Managing Software People and Teams, Addison Wesley, 2012.

Online Courses and E- Books:

Sl. No.	Content
1.	IT Project management (edX), https://www.edx.org/xseries/it-project-management
2.	IT Project management (Coursera), https://www.coursera.org/learn/it-project-management

Course Outcomes:**At the end of the course, student will be able to:**

CO1	Explain the concepts related to Software project management.
CO2	Apply the principles of Software project management.
CO3	Explain the Stress, Health, Safety, Ethical, and Professional concerns of a Software professional.
CO4	Work in teams to produce artefacts of project management for a Scenario.



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications

SEMESTER – V

COURSE TITLE	Windows Application Development with C#.NET	Credits	4
COURSE CODE	18MCA5PCWP	L-T-P	3-0-1
CIE	50	SEE	50

Prerequisites: – 18MCA2PCOP

UNIT1:

Introduction: Evolution of .NET, Overview of .NET Framework 4.0, Exploring Visual Studio IDE, C# Fundamentals – Identifiers and Keywords, Variables and Constants – Value Types, Reference Types, Pointer Types, Type Conversions, Boxing and Unboxing, Expressions and Operators, Control Flow Statements, Exception Handling, Exploring Namespaces, Exploring Classes and Objects and Exploring Structs **(6 Hrs.)**

UNIT2:

Object-Oriented Programming: Encapsulation, Inheritance- Inheritance under constructors, Sealed Classes and Sealed Methods, Extension Methods, Polymorphism- Overloading, Overriding Abstraction- Abstract Classes, Abstract Methods, Interfaces- Syntax of Interfaces, Implementation of Interfaces, Interfaces and Inheritance. Delegates – Creating and using Delegates, Multicasting with Delegates, Events- Event Sources, Event Handlers, Event and Delegates. **(7 Hrs.)**

UNIT3:

Graphical User Interfaces with Windows Forms: Windows Forms, Control Properties and Layout, Labels, TextBoxes and Buttons, GroupBoxes and Panels, CheckBoxes and Panels, CheckBoxes and RadioButtons, ToolTips, NumericUpDown Control, Mouse-Event Handling, Keyboard-Event Handling, Menus, MonthCalendar Control, DateTimePicker Control, LinkLabel Control, ListBox Control, CheckedListBox Control, ComboBox Control, TreeView Control, ListView Control, TabControl Control, Multiple Document Interface (MDI) Windows. **(8 Hrs.)**

UNIT 4:

Data Access with ADO.NET: Understanding ADO.NET- Describing the Architecture of ADO.NET, ADO.NET Entity Framework, 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 DataAdapter, Paging with Data Adapters, Updating with DataAdapters, Adding Multiple Tables to a DataSet, Creating Data View, Using DataReader work with Databases. Language Integrated Query (LINQ) **(7 Hrs.)**

UNIT5:

ASP.NET Essentials: Describing the ASP.NET Technologies – MVC Framework, ADO.NET Entity Framework, ADO.NET Data Services Framework, The Silverlight Technology, Dynamic Data Framework, ASP.NET Web API, Describing the ASP.NET Life Cycle- Life Cycle of an ASP.NET Application on IIS 7.5, Life Cycle of an ASP.NET web page, creating a sample ASP.NET 4.5 Web Application, Creating a sample ASP.NET 4.5 Web Site. Validation Controls – The Base Validator Class, The Required Field Validator Control, The Range Validator Control, The Regular Expression Validator Control, The Compare Validator Control, Custom Validator Control. The Validation Summary Control. **(8 Hrs)**

Text Books:

Sl.No.	Content
1.	.NET 4.5 Programming (6-in-1), Black Book, Kogent Learning Technologies, dreamtech Pre 2016.
2.	Paul Deitel and Harvey M. Dietel C# 2012 for Programmers, Deitel Developer Series, 2013.

Reference Books:

Sl.No.	Content
1	Joseph Albahari& Ben Albahari: C# 6.0 in a NutShell A Definitive Reference, O'Reilly, 6th Edition, 2016.
2	Herbert Schildt: The Complete Reference C# 4.0, Tata McGraw Hill, 2010.
3	E. Balagurusamy: Programming in C#, Tata McGraw Hill, 3rd Edition, 2011.

List of lab Programs integrated with WindowsApplication Development with C#.NET

Part-A

1. Programs to demonstrate Boxing and Unboxing.
2. Program to demonstrate the sum of all the elements present in a jagged array of 3 inner arrays.
3. Programs to demonstrate Classes and Objects.
4. Programs to illustrate the use of different properties in C#
5. Programs to demonstrate Exploring Structs.
6. Programs to demonstrate Exception Handling.

7. Program to demonstrate inheritance covering the concepts of Sealed Classes, Sealed Methods, Extension Methods
8. Programs to demonstrate Abstract Classes and Interfaces.
9. Programs to demonstrate Polymorphism covering the concepts of Overloading, Overriding, Virtual and Override keywords
10. Programs to demonstrate on Operator Overloading.
11. Programs to demonstrate Delegates and Event Handlers.
12. Programs to demonstrate Language Integrated Query (LINQ).

Part-B

1. Build an application using Windows Programming and Database connectivity with ADO.NET.
2. Build an application using ASP.NET techniques with appropriate validations and Database connectivity with ADO.NET

Course Outcomes:

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

CO1	Describe the important features of .NET framework.
CO2	Apply the object oriented Concepts to develop interactive C# applications.
CO3	Design and develop web based applications using C# and ASP.NET
CO4	Perform in a team to prepare a report for developing an application



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER –V

COURSE TITLE	Modeling with UML	Credits	3
COURSE CODE	18MCA5PCMU	L-T-P	2-0-1
CIE	50	SEE	50

Prerequisites: None

UNIT 1: Introduction

What Is UML? The Purpose of Modeling, Software Development, Methods, and Model, Object-Oriented Software Development, Disciplines of System Development

(4 Hrs.)

UNIT 2:

Use-Case Modeling: Basics of Use Cases, Use-Case Diagram, System, Actors, Use Cases, Organizing, Describing, Assessing, Testing Use Cases, Use Cases and Requirements Management, Realizing Use Cases

(5 Hrs.)

UNIT 3:

Classes, Objects, and Their Relationships: Classes and Objects, Class Diagram, Relationships, Associations: Normal, Recursive, Qualified, Ordered, Roles in association, Association class, Ternary association, Aggregation, Generalization

(5 Hrs.)

UNIT 4:

Classes and their relationships: Dependencies and Abstractions Constraints, Expressions, and Derivations, Packages, Templates

Dynamic Modeling: State Machines: States and Transitions, Event; Sending Messages Between State Machines: Substates, Entry, Exit, and Terminate Indicators, History Indicator

(5 Hrs.)

UNIT 5:

Dynamic Modeling: Activity Diagrams: Actions and Edges, Activity Partitions, Objects, Signals, Business Modeling with Activity Diagrams

Interaction Diagrams: Sequence Diagrams: Generic and Instance Form, Concurrent Objects, Combined Fragments, Interaction Occurrences; Creating and Destroying Objects, Recursion, Interaction Overviews, Communication Diagrams, Message Labels Using Communication Diagrams

(5 Hrs.)

Lab Programs – Integrated with “Modeling with UML” Theory:

Design and Demonstrate UML diagrams for a given scenario using UML tool.

Text Books:

Sl. No.	Content
1.	Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, “UML 2 Toolkit”, Wiley Publishing Inc.

Reference Books:

Sl. No.	Content
1.	Terry Quatrani, “Visual Modeling with Rational Rose 2000 and UML”, Addison Wesley
2.	Grady Booch et al, “The Unified Modeling Language User Guide”, 2 nd Edition, Pearson Education.
3.	Jason T Roff, “UML A beginner’s guide”, Tata Mcgraw-Hill Edition 2003
4.	Michael Blaha, James Rumbaugh, “Object-Oriented Modeling and Design with UML”, 2 nd Edition, Pearson Education, Prentice Hall of India, 2005.

E- Books and Online Course Materials:

Sl. No.	Content
1.	Grady Booch Rational Santa Clara, “Object Oriented Analysis and Design with applications”, 2 nd Edition, https://dbgyan.files.wordpress.com/2013/02/grady-booch-object-oriented-analysis-and-design-with-applications-2nd-edition.pdf
2.	

Online Courses and Video Lectures:

Sl. No.	Content
1.	Prof. ParthaPratim Das, Object-Oriented Analysis and Design http://www.nptel.ac.in/courses/106105153/ Course Available from: 07-SEPTEMBER-2016 Course Co-ordinated by: IIT KHARAGPUR

Course Outcomes:

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

CO1	Describe UML design and Object Oriented Modeling concepts.
CO2	Apply the concepts of UML for a given scenario
CO3	Design UML diagrams for a scenario using modern tool



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER – V

COURSE TITLE	Deep Learning	Credits	4
COURSE CODE	18MCA5PEDL	L-T-P	3-1-0
CIE	50	SEE	50

Prerequisite: 18MCA3PCML

UNIT 1: Review of Machine learning and Foundations of Neural Networks and Deep Learning:

The math behind Machine learning-Linear algebra and Statistics, evaluating models, Neural Networks, Training Neural Networks, Activation Functions, Loss Functions, Hyperparameters.

(7 Hrs.)

UNIT 2: Fundamentals of Deep Networks: Defining Deep Learning, Common architectural principles of Deep Networks-Parameters, Layers, Activation functions, Loss functions, Hyperparameters, Building blocks of Deep Networks-RBMs, and Autoencoders.

(6 Hrs.)

UNIT 3: Major architectures of Deep Networks: Convolutional Neural Networks-Biological inspiration, Intuition, CNN architecture overview, Input Layers, Convolutional layers, Pooling layers, Fully Connected layers, Recurrent Neural Networks-Modelling the time dimension, 3D Volumetric input, General RNN architecture, LSTM networks, Domain specific Applications, When do I need deep learning?

(8 hrs.)

UNIT 4: Tuning Deep Networks: Basic concepts, Matching Input data and Network architectures, Relating Model Goal and Output layer, Working with layer count, Parameter count, and memory, Weight initialization strategies, Using activation functions, Understanding learning rates, Controlling epochs and Mini-batch size, How to use regularization, using network statistics from the tuning.

(8Hrs.)

UNIT 5: Tuning Specific Deep Network Architectures: CNN-Common Convolutional Architectural patterns, Configuring Convolutional layers, Configuring Pooling layers, Transfer learning, Recurrent Neural Networks (RNN)-Network Input data and input layers, Output Layers, Training the network, Debugging common issues with LSTMs, Padding and Masking, Evaluation and Scoring with masking.

(7 Hrs.)

Text Books:

Sl. No.	Content
1.	Josh Patterson and Adam Gibson, Deep Learning, A practitioner's approach, First edition, Shroff Publishers and Distributors Pvt. Ltd., 2017

Reference Books:

Sl. No.	Content
1.	DouweOsinga, Deep learning Cookbook, Shroff Publishers and Distributors Pvt. Ltd., 2018
2.	Ian Goodfellow and YoshuaBengio and Aaron Courville, Deep Learning, MIT Press, Jan 2017

Online Courses and E- Books:

Sl. No.	Content
1.	Deep learning for business, https://www.coursera.org/learn/deep-learning-business
2.	Deep learning Tutorial (Stanford university), http://deeplearning.stanford.edu/tutorial/
3.	Deep learning for beginners, https://www.kaggle.com/kanncaa1/deep-learning-tutorial-for-beginners

Course Outcomes:

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

CO1	Explain the concepts related to Deep Learning.
CO2	Apply the concepts of Deep learning to various problems.
CO3	Work in teams to use modern deep learning tool for building models.



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER – V

COURSE TITLE	Advanced Computer Networks	Credits	4
COURSE CODE	18MCA5PEAN	L-T-P	3-1-0
CIE	50	SEE	50

Prerequisites: 18MCA3PCNW

UNIT 1:

Advanced Internetworking: The Global Internet, Routing Areas, Inter domain Routing (BGP) Multicast Addresses, Multicast Routing (DVMRP, PIM, MSDP). Multiprotocol Label Switching (MPLS), Destination-Based Forwarding, Explicit Routing, Virtual Private Networks and Tunnels, Routing among Mobile Devices: Challenges for mobile networking, routing to mobile hosts.

(7 Hrs.)

UNIT 2:

Wireless and Mobile Networks: Introduction, Wireless Links and Network Characteristics, CDMA, Wi-Fi: 802.11 Wireless LANs, Architecture, MAC Protocol, Frame, Mobility in the same IP subnet, Advanced Feature in 802.11, PAN: Bluetooth & Zigbee.

(7 Hrs.)

Unit-3:

Cellular Internet Access: An overview of Cellular Network Architecture, 3G Cellular data networks, on to 4G-LTE, Mobility Management Principles: Addressing, Routing to a Mobile node, Mobile IP, Managing Mobility in Cellular Networks: Routing calls to a mobile User, Hands off in GSM

(7 Hrs.)

UNIT 4:

Network Security: Cryptographic Building Blocks, Principles of Ciphers, Symmetric-Key and Public-Key Ciphers, Authentications, Pre-distribution of Public Keys, Symmetric Keys, Authentication Protocols: Originality and timeliness Techniques, Public-Key, Symmetric-Key Authentication Protocols, Diffie_Hellman Key Agreement,

(7 Hrs.)

UNIT 5:

Software Defined Network: Introduction, Basic Packet Switching Terminology, Historical Background, The Modern Data Center, Traditional Switch Architecture, Autonomous and Dynamic Forwarding Tables, Can We Increase the Packet Forwarding IQ?, Open Source and Technological Shifts. Why SDN? Evolution of Switches and Control Planes, Cost, SDN Implications for Research and Innovation, Data Center Innovation, Data Center Needs.

(8 Hrs.)

Text Books:

Sl.No	Content
1.	James Kurose and Keith Ross, "Computer Networking, A Top-Down Approach". 6 th Edition, Pearson, 2012.
2.	Larry Peterson and Bruce Davie, "Computer Networks, A Systems Approach". Fifth Edition, Morgan Kaufmann, 2013.
3.	Paul Goransson, Chuck Black and Timothy Culver, "A Comprehensive Approach on Software Defined Networks", 2nd Edition, Imprint: Morgan Kaufmann, 2016.

Reference Books:

Sl.No	Content
1.	Andrew S. Tanenbaum "Computer Networks" 5th edition, pearson publications, 2016.
2.	W. Richard Stevens, "Unix Network Programming" (mainly Chapter 6 on Socket Programming), PHI publications, 2004.
3.	Bertsekas and Gallager, "Data Networks" (mainly Chapter 3.3 on basic queuing theory), 2 nd edition, prentice hall publications, 1992.
4.	R. Srikant and Lei Ying "Communication Networks: An Optimization, Control and Stochastic Networks Perspective", cambridge university Press, 2014.

E-Book:

Sl.No	Content
1.	http://sigcomm.org/education/ebook/SIGCOMMeBook2013v1.pdf

MOOCS:

Sl.No	Content
1.	https://in.udacity.com/course/computer-networking--ud436
2.	https://lagunita.stanford.edu/courses/Engineering/Networking-SP/SelfPaced/about
3.	https://www.edx.org/course/computer-networks-internet-kironx-fhlcnx
4.	https://www.my-mooc.com/en/mooc/computer-networking--ud436/

Course Outcomes:**At the end of the course, student will have the ability to:**

CO1	Describe concepts related to Computer Networks.
CO2	Apply the networking concepts for a given problem.
CO3	Analyse the network parameters for a given scenario.
CO4	Conduct experiments in a team to demonstrate Networking concepts using Modern Tools.



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER – V

COURSE TITLE	Software Testing	Credits	4
COURSE CODE	18MCA5PEST	L-T-P	3-1-0
CIE	50	SEE	50

Prerequisites: 16MCA2DCSE

UNIT 1: (7 Hrs.)

Introduction : Human Errors and Testing, Software Quality, Requirements, behavior and correctness, Testing and Debugging, Test Metrics, Types of Testing, Testing and verification, Principles of Testing, Test generation strategies.

Test Generation: Domain partitioning: Introduction, Test selection problem, Equivalence Partitioning, equivalence classes, Equivalence Test cases for Triangle problem.

UNIT 2: (8 Hrs.)

Boundary Value Testing: Robust Boundary value testing, Worst-case Boundary value testing, special value testing.

Decision table based testing: Decision tables, Decision table techniques, and Test cases for Triangle problem, Cause and effect graphing .

UNIT 3: (7 Hrs.)

Static and Dynamic Testing:

Static Testing: Management review, Technical Review, Peer reviews, Static Analysis, Proof of Correctness.

Dynamic Testing: Introduction, White box Testing, Black box Testing, Strategy for testing

UNIT 4: (7 Hrs.)

Path Testing:

DD-Paths, Test Coverage Metrics, Basis Path Testing.

Unit Testing:

Concept of unit testing, Static unit testing, Defect prevention, Dynamic unit testing, Mutation testing, Debugging, Unit testing in eXtreme programming, JUnit: Framework for unit testing, Tools for Unit testing.

Unit 5: (7 Hrs.)

Integration Testing:

Concept of Integration testing, Different types of interfaces and interface errors, Granularity of System Integration testing, System Integration techniques, Software and Hardware Integration, Test plans for system integration.

Text Books:

Sl. No.	Content
1.	Aditya P Mathur, "Foundations of Software Testing 2E", Pearson Publications
2.	Paul C. Jorgensen, "Software Testing: A Craftsman's Approach", 4 th Edition, CRC Press
3.	Software Testing by HemaKhurana, Pearson Publications
4.	Software testing and Quality Assurance by KshirasagarNaik and PriyadarshiTripathy, Wiley Student Edition.

Reference Books:

Sl. No.	Content
1.	Mauro Pezze, Michael Young, "Software testing and Analysis – Process, Principles and Techniques", Wiley India, 2012.

Course Outcomes:

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

CO1	Explain the concepts of Software testing
CO2	Apply software testing techniques for a given problem.
CO3	Design test plan & test cases for a given problem.
CO4	Prepare a test report for a given use case.



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER – V

COURSE TITLE	Web Services	Credits	4
COURSE CODE	18MCA5PEWS	L-T-P	3-1-0
CIE	50	SEE	50

Prerequisites: None

UNIT I

(7 Hrs)

Introduction: Services, Web Services, Web Services Application Opportunities

Emergence of Web Services: Server Side Architecture Progression, Client Side Architecture Progression, Service Oriented Architecture and Web Services

UNIT II

(7 Hrs)

Web Services Application Scenario: Web services hype and the Industry, Web Services and the Industry Acceptance

Extensible Markup Language: History of Markup Languages, What is XML, Validation of XML Data, Advanced XML, Document Constraining

UNIT III

(8 Hrs)

Simple Object Access Protocol: What is SOAP, SOAP Interaction, SOAP Modeling, SOAP Encoding, SOAP Binding

Web Service Description Language: What is WSDL, Web Service Invocation and WSDL, Web Services Description details, Service Description through WSDL-An Example

UNIT IV:

(7 Hrs)

Registries - Universal Description, Discovery and Integration: What is UDDI, UDDI Nomenclature, Core UDDI, Service Publication, Service Discovery

Remote Procedure Call and Messaging: Synchronous Web Services, Asynchronous Web Services, Remote Procedure Call or Messaging

UNIT V

(7 Hrs)

Orchestration and Choreography: Business Process/Workflow, Importance of Business Process, Orchestration and Choreography, Choreography

Advanced Web Services for the Enterprises: First Generation Web Services, WS* - Overview of the Advanced Web Services, WS* - A Detailed Treatment, Importance of Web Services in SOA, WS-I Basic Profile

Text Books:

1. B.V. Kumar, S.V. Subramanya, Web Services An Introduction, Second Edition, Tata McGraw Hill Education Private Limited

Reference Books:

1. Web Services Essentials Distributed Applications with XML-RPC, SOAP, UDDI & WSDL, E. Ethan Cerami: Design Patterns O'Reilly, 2002
2. Gustavo Alonso, Fabio Casati, Harumi Kuno, Vijay Machiraju: Web Services (Concepts Architectures and Applications), Springer International Edition 2009.

Course Outcome:

At the end of the course Student will be able to:

CO1	Describe the concepts of Web Services
CO2	Apply Web services concepts for a given scenario
CO3	Work in a team to present a case study on Web services



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER – V

COURSE TITLE	Soft Computing	Credits	4
COURSE CODE	18MCA5PESC	L-T-P	3-1-0
CIE	50	SEE	50

Prerequisites: 18MCA1BSDM, 18MCA3PCML, 18MCA4PCAD

UNIT 1:

Introduction: Neural Networks, Fuzzy Logic, Genetic Algorithm, Hybrid System, Soft Computing.

Artificial Neural Network: Fundamental Concept, Basic Models of Artificial Neural Network, Important Terminologies of ANNs, McCulloch-Pitts Neuron, Linear Separability, Hebb Network.

(7 Hrs.)

UNIT 2:

Supervised Learning Network : Introduction, Perceptron Networks, Adaptive Linear Neuron, Multiple Adaptive Linear Neurons, Back-Propagation Network, Radial basis Function Network.

(7 Hrs.)

UNIT 3:

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets : Introduction, Classical Sets, Fuzzy Sets, Properties of Fuzzy Sets,

Classical Relations and Fuzzy Relations: Introduction, Cartesian Product of Relation, Classical Relation, Fuzzy Relations, Tolerance and Equivalence Relations.

(8 Hrs.)

UNIT 4:

Membership Functions: Introduction, Features of the Membership Functions, Fuzzification, Methods of Membership Value Assignments.

Defuzzification: Introduction, Max membership, Centroid method, Weighted average, Mean-max membership, Center of Sums.

Fuzzy arithmetic and Fuzzy Measures: Introduction, Interval analysis of Uncertain values, Fuzzy numbers.

(7 Hrs.)

UNIT 5:

Genetic Algorithm : Introduction, Biological background, Search space, Genetic Algorithm Vs. Traditional Algorithms, Simple GA, General genetic algorithm, Operations in GA: Encoding- Binary, Octal, encoding, Selection-Random, Rank, Tournament, Crossover: Single-point crossover, Multi-point crossover, Mutation, Stopping condition for Genetic Algorithm Flow, Constraints in Genetic Algorithm.

(7 Hrs.)

Text Books:

Sl. No.	Content
1.	S N Sivanandam, S N Deepa, "Principles of Soft Computing" Second Edition, Wiley Publications, 2017.

Reference Books:

Sl. No.	Content
1.	S Rajasekaran, G A VijayalakshmiPai, "Neural Networks, Fuzzy Systems and Evolutionary Algorithms Synthesis and Applications", Second Edition, PHI Publications, 2017.
2.	Bart Kosko, "Neural Networks and Fuzzy Systems", PHI, 1996.
3.	Timothy J Ross, "Fuzzy Logic with Engineering Applications", Second Edition, Wiley Publications, 2010

Online Courses and E- Books:

Sl. No.	Content
1.	DebasisSamanta, IIT Kharagpur, https://onlinecourses.nptel.ac.in/noc18_cs13/preview

Course Outcomes:

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

CO1	Explain the concepts of soft computing.
CO2	Apply soft computing techniques to solve a problem
CO3	Analyze and Develop soft computing models for a given problem.
CO4	Implement Soft Computing techniques to solve a problem using modern tools in a team



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER – V

COURSE TITLE	Cyber Security	Credits	4
COURSE CODE	18MCA5PECS	L-T-P	3-1-0
CIE	50	SEE	50

Prerequisite: None

Unit 1

Introduction to Cybercrime

Introduction, Cybercrime: Definition and Origins of the word, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cybercrimes. Categories of Cybercrime. How Criminals Plan Attacks? Social Engineering, Cyber stalking, Cybercafe and Cybercrimes, Botnets, Attack Vector, The Indian ITA 2000.

(7 Hrs)

Unit 2

Tools and Methods used in Cybercrime

Introduction, Proxy Server and Anonymizers, Phishing, Password Cracking, Keyloggers and Spyware, Virus and Worms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL Injection, Buffer Overflow, Attacks on Wireless Networks.

(7 Hrs)

Unit 3

Cybercrime: Mobile and Wireless Devices

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing, Security Challenges posed by Mobile Devices, Device Related Security issues, Attacks on Mobile/Cell Phones.

(7 Hrs)

Unit 4

Understanding Computer Forensics and Forensics of Handheld Devices

Introduction, historical background of Cyberforensics, Need for Computer Forensics, Cyberforensics and Digital Evidence, Digital Forensics Life Cycle. Forensics and Social Networking Sites: The Security / Privacy Threats, Special Toolkit and Techniques.

Understanding Cell Phone Working Characteristics, Hand-held devices and digital forensics. Toolkits of Hand-Held Device Forensics. An illustration on Real life Use of Forensics

(8 Hrs)

Unit 5

Cybercrime and Cyberterrorism: Social, Political Ethical and Psychological Dimensions

Introduction, Intellectual Property in the Cyberspace, The ethical dimension of Cybercrimes, The Psychology, Mindset and shoes of Hackers and Cybercriminals, Sociology of Cybercriminals and Information Warefare.

(7 Hrs)

Text Books:	
1.	Nina Godbole and SunitBelpure Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by, Publication Wiley.

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

Course Outcomes:

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

CO1	Understand the concepts of Cyber Security
CO2	Apply appropriate techniques to prevent Cyber Security threats in the digital system
CO3	Analyze the given scenario and suggest the tools or methods to overcome the Cyber Crimes.
CO4	Work in a team and make an oral presentation on topics related to Cyber Attacks in handheld and wearable devices.



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER –V

COURSE TITLE	Software Architecture and Patterns	Credits	4
COURSE CODE	18MCA5PESA	L-T-P	3-1-0
CIE	50	SEE	50

Prerequisites: None

UNIT 1:

Introduction and Importance: What software architecture is and what it isn't? Architectural structures and views, architectural patterns, What makes a good architecture? Why is software architecture important?

(7 Hrs.)

UNIT 2:

Contexts of SA and Understanding Quality Attributes: Technical Context, Project life-cycle context, Business context, Professional context, Stake holders, How is Architecture influenced? What Do Architecture influence? Architecture and Requirements, Functionality, Quality attribute considerations, Specifying and achieving Quality attribute requirements, Guiding quality design decisions.

(7 Hrs.)

UNIT 3:

Quality Attributes: Availability, Interoperability, Modifiability, Performance, Security, Testability, Usability, Scalability

(7 Hrs.)

UNIT 4:

Architecture in the Life Cycle: Gathering ASRs from requirements documents, ASRs by interviewing stake holders, ASRs by understanding the business, Capturing ASRs in a utility tree, Typing the methods together, Design strategy, The attribute driven design methods, The steps of ADD.

(8 Hrs.)

UNIT 5:

Architectural Patterns: Introduction to patterns; From Mud to structure- Layers, Pipes and filters, Blackboard, Distributed systems- Broker, Interactive Systems- Model-View-Controller, Adaptable Systems- Microkernel.

(7 Hrs.)**Text Books:**

Sl. No.	Content
1.	Len Bass, Paul Clements, Rick Kazma, "Software Architecture in Practice", 3rd Edition, Pearson Education, 2013
2.	Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal, "Pattern- Oriented Software Architecture, A System of Patterns", Volume 1, John Wiley and Sons, 2012

Reference Books:

Sl. No.	Content
1.	Richard N. Taylor, Nenad Medvidovic and Eric M. Dashofy, "Software Architecture: Foundations, Theory, and Practice", Wiley- India 2012
2.	Mary Shaw and David Garlan, "Software Architecture- Perspectives on an Emerging Discipline", Prentice Hall of India, 2007

E- Books and Online Course Materials:

Sl. No.	Content
1.	Len Bass, Paul Clements, Rick Kazman: Software Architecture in Practice, Third Edition http://ptgmedia.pearsoncmg.com/images/9780321815736/samplepages/0321815734.pdf
2.	Buschmann, Henney, Schmidt: Pattern- Oriented Software Architecture http://www.ingenieria.unal.edu.co/ACSCI/sistemasyscomputacion/docs/SWEBOOK/Pattern-Oriented%20Software%20Architecture_%20-%20Frank%20Buschmann.pdf

Online Courses and Video Lectures:

Sl. No.	Content
1.	Prof T V Prabhakar, Software Architecture and design http://www.nptel.ac.in/syllabus/106104027/
2.	Prof. Rushikesh K Joshi, Architectural Design http://nptel.ac.in/courses/106101061/17

Course Outcomes:

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

CO1	Explain the concepts of software architecture
CO2	Apply architecture principles for a scenario.
CO3	Identify different design decisions and quality attributes for the system.
CO4	Design a model architecture using architectural patterns



BMS COLLEGE OF ENGINEERING BENGALURU-19

(Autonomous College under VTU)

Department of Computer Applications

SEMESTER –V

COURSE TITLE	Block Chain Technology	Credits	4
COURSE CODE	18MCA5PEBC	L-T-P	3-1-0
CIE	50	SEE	50

UNIT1:

Introduction to Blockchain: Blockchain: An Information Technology, Satoshi Nakamoto's Blockchain, Types of Blockchain Public, Consortium, Private, Comparing Blockchains, Blockchain Implementations – Bitcoin, Ethereum, Blockchain Collaborative Implementations – Hyperledger, Corda, Blockchain in Practical Use Today -- Financial Technology space, Sharing Economy, Real Estate, Blockchain and Identity, Practice of Law, Decentralized File Storage, Autonomous Organizations, Cloud Computing.

(6 Hrs.)

UNIT2:

Business Use Cases: Currency and Tokens, Financial Services Use Cases – KYC use case, Asset Management Settlement Use Case, Insurance Claims Processing Use Case, Trade Finance (Supply Chain) Use Case, Global Payments Use Case, Smart Property, Smart Contracts on the Blockchain – The Trust Problem, Blockchain Details, BlockchainIoT Protocol Projects.

Technology Use Cases: Web Versions 1 and 2, Web 3.0, Distributed Storage Systems, Distributed Computation, Golem, Decentralized Communications.

(7 Hrs.)

UNIT3:

Legal and Governance Use Cases: Blockchain changes the Legal Landscape, The Beginning of Autonomous Law: Smart Contract – Smart Contract Evolution, Smart Contract Components, Benefits, Challenges, Risks, Legal Challenges, Blockchain as Evidence and Digital Signature, Smart Contract Design Examples.

Technology on Ethereum: Ethereum Accounts – Either the crypto currency, Obtaining Ether, Mining in Ethereum, Ethereum Work – Transactions, Network Fuel (Gas), Messages, The Ethereum Block, State Transition Function (STF), Code Execution, Turning Complete, Scalability, Infrastructure Storage and Communication, Decentralized Applications.

(8 Hrs.)

UNIT4:

Fast- Track Application Tutorial – Introducing Solidity – Solidity Basics, Solidity Functions and parameters, Layout of Storage, Run Ethereum Dapps in your Browser – Installing MetaMask, Developing a Contract using MetaMask, Remix/Browser Solidity, Develop a Simple Smart Contract – Deploy the Smart Contract, Validate the Smart Contract.

Ethereum Applications Best Practices – Ethereum Block chain Development – Setting up the Development Environment for Truffle, Set Up a Truffle Project, Truffle Directory Structure, Ethereum Blockchain Development: Best Practices, Block chain Technologies, Solidity Basics Continued Calling Contracts from Contracts, Handling Events. **(7 Hrs.)**

UNIT5:

Private Blockchain Platforms and Use Cases – Categories of Block chain, Private Blockchain Use Cases, Private Blockchain Technology- AlphaPoint Distributed Ledger Platform, Chain Core, Corda, Domus Tower, Hyperledger etc.

Challenges – Blockchain Governance Challenges – Bitcoin Blocksize Debate, The Ethereum DAO Fork, Ethereum's Move to PoS and Scalling Challenges, Blockchain Technical Challenges – Bugs in the Core Code, Denial-of-Service Attacks, Security in smart contracts, scaling, Sharding. **(8 Hrs.)**

Text Books:

Sl.No.	Content
1.	Joseph J. Bambara, Paul R. Allen, Blockchain – A practical Guide to Developing Business, Law, and Technology Solutions, McGraw Hill Education, 2018.

Reference Books:

Sl.No.	Content
1.	Arshdeep Bahga, Vijay Madiseti, Blockchain Applications: A Hands-On Approach – January 31, 2017
2.	Imran Bashir, Mastering Block chain: Distributed ledger technology, decentralization and Smart contracts, 2nd Edition, Packt Publishing, 2018.
3.	Narayan Prusty, Building Block chain Projects, Packt Publishing, 2017.

Course Outcomes:

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

CO1	Describe the technologies underlying crypto currencies and block chains
CO2	Apply the knowledge of Block chain Technology for a given use case.
CO3	Analyse the given business, legal and governance use cases of the real world applications.
CO4	Perform in a team to prepare a report on the impact of Crypto currency on society and governance.

**BMS COLLEGE OF ENGINEERING BENGALURU-19**

(Autonomous College under VTU)

Department of Computer Applications**SEMESTER –V**

COURSE TITLE	Mini Project-III	Credits	2
COURSE CODE	18MCA5PWM3	L-T-P	0-0-2
CIE	50	SEE	50

Prerequisites: None**Course Details:**

- Students are expected to take up mini project with a team size not exceeding 2*. The objective of this course is to work toward solving problems using latest technologies.
- The title, relevance, novelty, synopsis and technologies used for developing an application/ research will be scrutinized by respective guides.
- The application project / research work may be carried out at phases spread across 3 semesters or independently as part of Mini Project-I (18MCA3PWM1), Mini Project-II (18MCA4PWM2) and Mini Project-III (18MCA5PWM3).

- **Rules and Regulations:**

1. The project must be carried out with a team of TWO students. However during the examination, each student must demonstrate the project individually.
2. The team must submit a brief project report (25-30 pages).
3. The sample contents for both application project or the research project is shown below:

<i>Sample contents for application development may include the following chapters:</i>	<i>Sample contents of the Report may include the following for Research work:</i>
• Introduction • Project Plan • Software Requirements Specifications (SRS) • Analysis and Design • Implementation (screenshots with description to be included) • Testing • Conclusion • Future enhancements • Bibliography	• Title, Abstract, Keywords • Introduction • Literature Survey • Objectives of Investigation • Research findings (e.g. Proposed method or Process, or System) • Validation (Experimental Results or Theoretical Analysis) • Conclusion & References

Note: * May vary with prior approval from Head of the Department.

Course Outcomes:**At the end of the course, student will be able to:**

C01	Apply the computing knowledge for the chosen problem domain
C02	Analyse the problem and identify the requirements / objectives
C03	Design and develop a model / process / algorithm
C04	Conduct required experiments and validate the input and draw valid conclusions
C05	Implement using various software tools / technology
C06	Adhere to ethics during the project development
C07	Function effectively to engage in independent learning
C08	Apply the principles of project management
C09	Work in team, prepare a report and demonstrate the project / paper presentation



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER –V

COURSE TITLE	Seminar 2	Credits	2
COURSE CODE	18MCA5SRS2	L-T-P	0-0-2
CIE	25	SEE	25

Prerequisites: None

Seminar-II Guidelines:

1. **Select broad area of your interest** (E.g. Computer Networks, Machine Learning/Data mining, Databases, etc.)
2. **Select a specific area in the broad area chosen.** (E.g. In Data mining, one can choose cluster analysis or Classification or Association rule mining). Subsequently you can choose a more narrowed topic like Density based clustering or Grid based clustering, etc.
3. **Further search at least 15 recent papers (e.g. last 2-5 years) related to your specific topic in** IEEE explore or Science direct or ACM digital library, etc.. From these papers, select best 6 papers, preferably Journal papers or Reputed conferences. (E.g. Machine Learning Journals: IEEE PAMI, Knowledge and Data engg., Elsevier – Pattern recognition, PRL, Data and Knowledge engineering, Springer- PAA, Data mining and Knowledge discovery, Reputed conferences- ICPR, CVPR, KDD, ICAPR, etc.)
4. **Read these 6 papers thoroughly.** Write down a summary of each paper based on their contributions (ideas), Improvements claimed, Parameters used for comparison, Experiments carried out, Tools used, etc.
5. **Write a report based on summary highlighting** Contributions, differences, your ideas to improve those methods, your analysis and interpretation, etc.

Course Outcomes:

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

CO1	To Identify the best method among a set of research findings
CO2	To apply professional ethics during preparation of report
CO3	To demonstrate life-long learning skills
CO4	To demonstrate oral and written communication skills



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER –VI

COURSE TITLE	Internship 1	Credits	2
COURSE CODE	18MCA6NTI1	L-T-P	0-0-4
CIE	50	SEE	50

Prerequisites: None

Guidelines:

1. The student shall take up the internship work with an NGO / Professional body / NSS / NCC
2. It shall be carried out for 3 weeks. However, students can take up activities related to cultural / technical fest conducted by the college / placement activity of the department / any other activity with the approval of guide and HoD. These activities would account only for 1 week
3. Students will be mentored by an internal guide
4. The student shall carry out internship at any time after the completion of first semester and before commencement of sixth semester.
5. At the end of the Internship period, students are required to submit a Completion Certificate and present their work to the guide
6. One CIE will be for conducted for 50 marks and a SEE will be conducted for 50 marks

Course Outcomes:

At the end of this course, students will have the ability to:

CO 1	Engage in independent learning in the chosen area/ field of internship
CO2	Understand the legal, environmental, societal and health issues for the work carried during the internship
CO3	Communicate effectively both technical and non-technical components of their learning during the internship using ICT tools
CO4	Function effectively as an individual or work in team for the task undertaken during internship



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER –VI

COURSE TITLE	Internship-2	Credits	2
COURSE CODE	18MCA6NTI2	L-T-P	0-0-2
CIE	50	SEE	50

Prerequisites: None

Guidelines:

1.	Students are required to undergo Internship in an Industry or a R&D Institution, or any academic institution of repute.
2.	The students are required to submit Internship approval Letter from the organization.
3.	Students are required to choose an internal guide.
4.	The students will be working under the mentorship of both internal and external guide.
5.	The duration of Internship is for 6 weeks.
6.	The student shall carry out internship any time after the completion of first semester SEE and before the commencement of sixth semester project.
7.	At the end of the internship period, students are required to submit an attendance certificate, Completion Certificate and Internship report. CIE: 50 Marks, SEE: 50 Marks
8.	For CIE & SEE, the student should present the work carried out during internship.

Course Outcomes:

At the end of this course, students will have the ability to:

CO1	Analyse the problem and learn the tools and technologies required to solve the problem.
CO2	Adhere to Professional behaviour while interacting with people in the organization
CO3	Function effectively to engage in independent learning
CO4	Write a report and communicate effectively
CO5	Demonstrate the importance of Legal, Societal, Environmental and Health issues related to Technologies
CO6	Work effectively as a member in a team
CO7	Identify the Intrapreneur/ Entrepreneur characteristics adopted in the industry.



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER –VI

COURSE TITLE	Project Work	Credits	16
COURSE CODE	18MCA6PWMP	L-T-P	0-0-16
CIE	100	SEE	100

The objective of this course is to work independently to carry out an application oriented or research oriented projects.

Guidelines:

01.	The project shall be carried out individually in Industry / R & D lab / Institution.
02.	The project shall be carried out for a semester.
03.	The student shall identify the domain / area / topic and place of work where the project will be carried well in advance.
04.	The student shall submit the synopsis within one week from the commencement of 6 th semester.
05.	An internal guide will be allotted for each student.
06.	Student should interact with the internal guide every week to update the progress of the project.
07.	At the end of the semester, project / dissertation report (40-60 pages) is to be submitted.
08.	Project report has to undergo a plagiarism check and the plagiarism index has to be $\leq 25\%$.
09.	The CIE of the project work will be evaluated by the Guide and Project Evaluation Committee (PEC) member.
10.	The student is required to take two CIE of the project work as per the schedule for 50 marks each.
11.	The dissertation report will be evaluated by the internal guide and external examiner appointed by the COE for SEE.
12.	SEE will be conducted for 100 marks jointly by the internal guide and the external examiner.
13.	A seminar presentation, submission of project report and Viva-Voce shall form the SEE of the project work.

The format of the report shall include the following:

- i) A bonafide certificate duly signed by the Guide, Head of the Department and Head of the Institution.
 - ii) An undertaking by the student that the work is independently carried out by him/her.
 - iii) A project completion certificate from Industry / R & D lab / Institution.
 - iv) Acknowledgement.
- Sample contents for application development include the following chapters:
 - Abstract
 - Introduction
 - Software Requirements Specifications (SRS)
 - Project Plan*
 - Analysis and Design
 - Implementation (screenshots with description to be included)
 - Testing
 - Business Model
 - Impact on societal / environmental / health / others.
 - Conclusion
 - Future enhancements
 - Bibliography

*E.g.: Work breakdown structure, Gantt chart, PERT chart/ CPM, team details.

b. Sample contents for Research work include the following:

- Title, Abstract, Keywords
- Introduction
- Literature Survey
- Objectives of Investigation
- Research findings (e.g. Proposed method or Process, or System)
- Validation (Experimental Results or Theoretical Analysis)
- Conclusion & References.

Course Outcomes

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

CO1	Apply the computing knowledge for the chosen problem domain
CO2	Analyze the problem and identify the requirements / objectives
CO3	Design and develop a model / process / algorithm
CO4	Conduct required experiments and validate the input and draw valid conclusions
CO5	Implement using appropriate software tools / technology
CO6	Adhere to ethics during the project development
CO7	Function effectively to engage in independent learning
CO8	Apply the principles of project management
CO9	Prepare a report and poster, and demonstrate the project
CO10	Identify Legal/ Ethical/ Societal/ Health or Environmental issues related to project work.
CO11	Perform in a team while carrying out a project work.
CO12	Generate ideas and identify the business model to convert the project work into a product.



BMS COLLEGE OF ENGINEERING BENGALURU-19
(Autonomous College under VTU)
Department of Computer Applications
SEMESTER –VI

COURSE TITLE	Cyber Regulations and IPR	Credits	2
COURSE CODE	18MCA6HSPR	L-T-P	2-0-0
CIE	50	SEE	50

Prerequisites: None

UNIT 1:

Need and Role of Law in the Cyber World

Cyber Law: Definition, Cyber law in India, Rules of Law in Cyber, Rules of Cyber World, Significance and Challenges faced by Cyber World.

Freedom of Speech and Access Rights

Free Speech and Expression on the Internet, Privacy Issues and Access Rights.

(5 Hrs.)

UNIT 2:

Intellectual Property Rights in Cyberspace

What is Concept of Property in Cyberspace? What are its salient features and challenges?

Implications of Intellectual Property Rights: International & National Legal Preparedness: Kinds of Intellectual Property Rights, major international implications, kinds of international treaties, existing national legal regimes pertaining to protect IPR in India.

Nature of Intellectual Property Rights and Copyrights issues:

How can Copyright be protected in cyberspace? Steps to take to protect the Intellectual Property in Cyberspace, existing international convention impacting the Copyright Issues in Cyberspace.

(5 Hrs.)

UNIT 3:

Issues of Copyrights, Convention and Agreement and IT Act 2000

How can Copyright be protected in Cyberspace? Steps taken to protect Intellectual Property, existing International Conventions Impacting Copyright issues in CyberSpace. Berner Convention, WIPO Copyrights Convention and TRIPS Agreement.

Information Technology Act 2000, Historical background, Objectives, legal recognition of electronic records and procedures.

(5 Hrs.)

UNIT 4:

Electronic Commerce, Online Contracts, Spamming:

Introduction to Electronic Commerce: Salient features, Significance of Law, Existing international legal scenario pertaining to e-commerce.

Online Contracts: Salient features, Legality, Existing legal jurisprudence, Challenges in India and across the World, Challenges in the enforcement and promoting growth of the Online Contracts.

Spamming: Kinds of spams, Spamming offence, Anti-spam laws, Legal positions and Impact of spamming on e-commerce.

(5 Hrs.)

UNIT 5:

Disclaimer and E-banking:

Disclaimer: Significance of Disclaimer, Liability of a legal entity, Practical challenges in implementation and execution of the disclaimer.

E-banking: Big challenges in implementing e-banking, Position pertaining to e-banking in India, Electronic Fund Transfer (ETF) and its position in India. The UNCITRAL Model Law and WIPO Concerning the Electronic Commerce.

(4 Hrs.)

Text Books:

Sl. No.	Content
1.	Pavan Duggal, "Textbook on Cyber law" Second Edition, Universal Law Publishing.

Reference Books:

Sl. No.	Content
1.	Pavan Duggal, "Cyber law-The Indian perspective", 2009 Edition
2.	Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", 3 rd Edition, Tata McGraw-Hill.

Course Outcomes:

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

CO1	Explain the concepts of Cyber regulations and IPR in the CyberSpace
CO2	Apply the knowledge of Cyber regulations and IPR for a given scenario
CO3	Make an effective oral presentation on issues of IPR in the Software Industry.