



NEW HORIZON
COLLEGE OF ENGINEERING
New Horizon Knowledge Park, Ring Road, Marathalli
Autonomous College Permanently Affiliated to VTU, Approved by AICTE & UGC
Accredited by NAAC with 'A' Grade. Accredited by NBA

(An Autonomous Institution Affiliated to VTU)

Accredited by NAAC with 'A' Grade

Department of Master of Computer Applications

Fifth and Sixth Semester MCA

Scheme and Syllabus

ACADEMIC YEAR 2021-22

CONTENTS		
1.	Vision, Mission of the College and the Department	3
2.	Program Educational Objectives (PEO) , Program Specific Objectives & PEO to Mission Statement Mapping	4
3.	Program Outcomes (PO) with Graduate Attributes	5
4.	Mapping of POs with PEOs	5
5.	Course Credit Structure	6
SCHEME		
6.	Scheme of Fifth Semester MCA	7
7.	Scheme of Sixth Semester MCA	9
8.	Syllabus of Fifth Semester MCA:	
	a) PROGRAMMING USING C#.NET	11
	b) SOFTWARE QUALITY & TESTING	14
	c) ELECTIVES – 6	16-28
	d) ELECTIVES – 7	28-40
	e) ELECTIVES – 8	40-50
	f) PROGRAMMING USING C#.NET LAB	51
	g) SOFTWARE QUALITY AND TESTING LAB	53
	h) MINI PROJECT USING .NET, C# AND SOFTWARE TESTING	54
9.	Syllabus of Sixth Semester MCA:	
	a) INTERNSHIP PROJECT	56
	b) SEMINAR-2	73

NEW HORIZON COLLEGE OF ENGINEERING

VISION

To emerge as an institute of eminence in the fields of engineering, technology and management in serving the industry and the nation by empowering students with a high degree of technical, managerial and practical competence.

MISSION

To strengthen the theoretical, practical and ethical dimensions of the learning process by fostering a culture of research and innovation among faculty members and students.

To encourage long-term interaction between the academia and industry through their involvement in the design of curriculum and its hands-on implementation.

To strengthen and mould students in professional, ethical, social and environmental dimensions by encouraging participation in co-curricular and extracurricular activities.

QUALITY POLICY

To provide educational services of the highest quality both curricular and co-curricular to enable students integrate skills and serve the industry and society equally well at global level.

VALUES

- Academic Freedom
- Integrity
- Inclusiveness
- Innovation
- Professionalism
- Social Responsibility

DEPARTMENT OF MCA

VISION

To emerge as a department of eminence in the field of Computer Applications in serving the Information Technology Industry and the nation by empowering students with a high degree of technical, managerial and practical competence.

MISSION

To strengthen the theoretical, practical and ethical aspects of the learning while inculcating a culture of research, innovation and practical applications amongst faculty and students.

To encourage long-term interactions between the department and the IT Industry through rich involvement of the Industry in the design of the curriculum and its hands-on implementation.

To strengthen and mould students in professional, ethical, social and environmental dimensions by encouraging participation in co-curricular and extracurricular activities.

QUALITY POLICY

To provide services of the highest quality both curricular and co-curricular, so that our students can integrate their skills and serve the industry and society equally well at the global level.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1 Pursue and excel in the field of Computer Applications and contribute to academia, industry and research.

PEO2 Deliver software solutions that are socially relevant and adopt quickly to emerging technologies.

PEO3 Demonstrate professional behavior by understanding ethical and communication skills to engage in lifelong learning.

PROGRAM SPECIFIC OUTCOME (PSOs)

PSO1

Ability to design, develop, implement computer programs and apply the knowledge in various domains to identify research gaps and to provide solutions to new ideas and innovations.

PSO2

Work and communicate effectively with professionals in various fields and pursue lifelong professional development in computing.

PEO to Mission Statement Mapping

Correlation: 3-High, 2-Medium, 1-Low

Mission Statements	PEO1	PEO2	PEO3
To strengthen the theoretical, practical and ethical aspects of the learning while inculcating a culture of research, innovation and practical applications amongst faculty and students.	3	3	3
To encourage long-term interactions between the department and the IT Industry through rich involvement of the Industry in the design of the curriculum and its hands-on implementation.	3	2	3
To strengthen and mould students in professional, ethical, social and environmental dimensions by encouraging participation in co-curricular and extra-curricular activities.	3	3	3

Correlation: 3- High, 2-Medium, 1-Low

Program Outcomes (PO) with Graduate Attributes
PROGRAMME OUTCOMES (POs)

- PO1 Computational Knowledge:** Apply computing knowledge, mathematical knowledge and domain knowledge to create and develop new models for real world applications.
- PO2 Problem Analysis:** Identify, formulate, review research literature and analyze complex problems using principles of mathematics, computing sciences and relevant domains.
- PO3 Design / Development of Solutions:** Design, implement, test and maintain solutions for systems, components or processes that meet specific needs with consideration for public health safety, societal and environmental issues.
- PO4 Conduct investigations of complex Computing problems:** Use Research–based knowledge to analyze and interpret data to obtain viable conclusions.
- PO5 Modern Tool Usage:** Use modern tools, techniques and skills to solve complex and critical computing problems with an understanding of their limitations.
- PO6 Professional Ethics:** Understand and apply ethical principles, cyber regulations and commit to professional computing practice and responsibilities.
- PO7 Life-long Learning:** Recognize the importance of self-learning for continual development as a computing professional.
- PO8 Project management and finance:** Demonstrate the management principles for managing projects as an individual, as a member and as a leader in a team under multidisciplinary environments.
- PO9 Communication Efficacy:** Recognize the importance of communication within the computing community and the society at large.
- PO10 Societal and Environmental Concern:** Understand and assess the local and global influence of software solutions and responsibilities related to professional computing practice.
- PO11 Individual and Team Work:** Deliver effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.
- PO12 Innovation and Entrepreneurship:** Adopt standardized computer application practices with innovative ideas to succeed as an employee or an entrepreneur.

Mapping of POs to PEOs

PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO1	3	3	3	3	3	2	1	3	2	2	3	3
PEO2	3	3	3	2	3	2	1	3	2	3	3	3
PEO3	2	2	3	2	2	3	3	2	2	3	2	2

Correlation: 3- High, 2-Medium, 1-Low



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The Trust is a Recipient of Prestigious Rajyotsava State Award 2012 Conferred by the Government of Karnataka.
Awarded Outstanding Technical Education Institute in Karnataka.

DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS

MCA DEGREE CURRICULUM – CREDIT DISTRIBUTION TABLE

SEMESTER I TO VI

SEMESTER	CORE	ELECTIVES	MINI/ PROJECT WORKS	SEMINAR	TOTAL CREDITS
I	22	0	0	0	22
II	20	0	2	0	22
III	12	6	2	2	22
IV	9	9	2	2	22
V	10	12	3	0	25
VI	0	0	17	2	19
TOTAL	73	27	26	6	132
PERCENTAGE OF DISTRIBUTION	55	20	20	5	
MIN REQ	40-55	20-35	20-35	02-10	

DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS

SCHEME OF FIFTH SEMESTER MCA PROGRAM

S NO	COURSE CODE	COURSE	BOS	CREDIT DISTRIBUTION				OVERALL CREDITS	CONTACT HOURS WEEKLY (THEORY)	MARKS					
				L	T	P	S			CIE	SEE	TOTAL			
1	20MCA51	PROGRAMMING USING C#.NET	MCA	4	0	0	0	4	4	50	50	100			
2	20MCA52	SOFTWARE QUALITY & TESTING	MCA	3	0	0	0	3	3	50	50	100			
3	20MCA53X	ELECTIVES – 6	MCA	4	0	0	0	4	4	50	50	100			
4	20MCA54X	ELECTIVES – 7	MCA	4	0	0	0	4	4	50	50	100			
5	20MCA55X	ELECTIVES – 8	MCA	4	0	0	0	4	4	50	50	100			
6	20MCAL56	PROGRAMMING USING C#.NET LAB	MCA	0	0	1.5	0	1.5	3	25	25	50			
7	20MCAL57	SOFTWARE QUALITY AND TESTING LAB	MCA	0	0	1.5	0	1.5	3	25	25	50			
8	20MCA58	MINI PROJECT USING .NET, C# AND SOFTWARE TESTING	MCA	0	0	3	0	3	-	50	50	100			
		TOTAL		19	0	6	0	25	25	350	350	700			
				L -Lecture (1 hour),				T-Tutorial (2 hours),				P-Practical (2 hours)			

ELECTIVES-6							
SNO	COURSE CODE	COURSE	CREDIT DISTRIBUTION				TOTAL
			L	T	P	S	
1	20MCA531	DATA SCIENCE	4	0	0	0	4
2	20MCA532	OBJECT ORIENTED MODELLING AND DESIGN	4	0	0	0	4
3	20MCA533	PATTERN RECOGNITION	4	0	0	0	4
4	20MCA534	PARALLEL PROGRAMMING	4	0	0	0	4
5	20MCA535	SEARCH ENGINE OPTIMIZATION	4	0	0	0	4
ELECTIVES-7							
SNO	COURSE CODE	COURSE	CREDIT DISTRIBUTION				TOTAL
			L	T	P	S	
1	20MCA541	WEB DESIGN AND HTML5	4	0	0	0	4
2	20MCA542	BIG DATA ANALYTICS USING HP VERTICA	4	0	0	0	4
3	20MCA543	INFORMATION RETRIEVAL AND SECURITY	4	0	0	0	4
4	20MCA544	PERVASIVE COMPUTING	4	0	0	0	4
5	20MCA545	ECONOMICS FOR SOFTWARE ENGINEERS	4	0	0	0	4
ELECTIVES-8							
SNO	COURSE CODE	COURSE	CREDIT DISTRIBUTION				TOTAL
			L	T	P	S	
1	20MCA551	MACHINE LEARNING TECHNIQUES	4	0	0	0	4
2	20MCA552	CRYPTOGRAPHY AND NETWORK SECURITY	4	0	0	0	4
3	20MCA553	MIDDLEWARE TECHNOLOGIES	4	0	0	0	4
4	20MCA554	PRINCIPLES OF DISTRIBUTED SYSTEMS	4	0	0	0	4
5	20MCA555	SYSTEM SIMULATION AND MODELING	4	0	0	0	4

DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS

SCHEME OF SIXTH SEMESTER MCA PROGRAM

S NO	COURSE CODE	COURSE	BOS	CREDIT DISTRIBUTION				OVERALL CREDITS	CONTACT HOURS WEEKLY (THEORY)	MARKS		
				L	T	P	S			CIE	SEE	TOTAL
1	20MCA61	INTERNSHIP PROJECT	MCA	0	0	17	0	17	-	150	150	300
2	20MCA62	SEMINAR - 2	MCA	0	0	0	2	02	-	50	50	100
		TOTAL		0	0	17	2	19	-	200	200	400
L-Lecture (1 hour), T-Tutorial (2 hours), P-Practical (2 hours) *Non credit Mandatory course												

FIFTH SEMESTER
MCA SYLLABUS

PROGRAMMING USING C#.NET

Course Code :20MCA51
 L:T:P:S :4:0:0:0
 Exam Hours :3

Credits :04
 CIE Marks :50
 SEE Marks :50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	To develop background knowledge of .Net and in C#
CO2	To understand the knowledge of object oriented programming and applications in C#
CO3	Create Windows Form applications
CO4	Use ADO.NET to access SQL Server
CO5	To understand the delegates, events and web form creation and provide knowledge for creating websites
CO6	Build C# .NET applications using Visual Studio

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	1	-	-	-	-	-	-	3	3
CO2	2	-	-	-	-	-	-	-	-	-	-	-	3	3
CO3	1	-	-	-	1	-	-	-	-	-	-	-	3	3
CO4	2	3	2	-	-	-	-	-	-	-	-	-	3	3
CO5	2	3	2	1	-	1	-	-	-	-	-	-	3	3
CO6	2	-	1	1	-	1	-	-	-	-	-	-	3	3

SYLLABUS			
Module	Contents of the Module	Hours	Cos
1	<p>Introduction to .NET: Core features of .NET, The building block of .NET Platform (CLR, CTS, CLS), Understanding Common Type System, Common Languages Specification, Common Language Runtime, The role of .NET base class libraries, C# features, An Overview of .NET Binaries (Assemblies), The Role of common Intermediate language, Assembly Manifest, Command Line Compiler (csc.exe), Options of C# compiler, Command Line Debugger (cordbg.exe), Building the Multi-file Assembly.</p> <p>Introduction to C#: Need of C#, C# Pre-processor Directives, Creating a Simple C# Console Application, Identifiers and Keywords. Data Types, Variables and Constants: Value Types, Reference Types, Type Conversions, Boxing and Unboxing, Variables and Constants, Expression and Operators: Operator Precedence, Using the?? (Null Coalescing) Operator, Using the :: (Scope Resolution) Operator and Using the is and as Operators. Control Flow statements: Selection Statements, Iteration Statements and Jump Statements.</p>	9	CO1

2	<p>Namespaces, Classes, Objects and Structures: Namespaces, The System namespace, Classes and Objects: Creating a Class, Creating an Object, Using this Keyword, Creating an Array of Objects, Using the Nested Classes, Defining Partial Classes and Method, Returning a Value from a Method and Describing Access Modifiers. Static Classes and Static Class Members, Properties: Read-only Property, Static Property, Accessibility of accessors and Anonymous types. Indexers, Structs: Syntax of a struct and Access Modifiers for structs.</p> <p>Object-Oriented Programming: Encapsulation: Encapsulation using accessors and mutators, Encapsulation using Properties. Inheritance: Inheritance and Constructors, Sealed Classes and Sealed Methods, Extension methods. Polymorphism: Compile time Polymorphism / Overloading, Runtime Polymorphism/Overriding. Abstraction: Abstract classes, Abstract methods. Interfaces: Syntax of Interfaces, Implementation of Interfaces and Inheritance</p>	9	CO2
3	<p>Graphical User Interface with Windows Forms: Introduction, Windows Forms, Event Handling: A Simple Event- Driven GUI, Visual Studio Generated GUI Code, Delegates and Event-Handling Mechanism, Another Way to Create Event Handlers, Locating Event Information. Control Properties and Layout, Labels, TextBoxes and Buttons, GroupBoxes and Panels, CheckBoxes and RadioButtons, ToolTips, Mouse-Event Handling, Keyboard-Event Handling, Menus, MonthCalendar Control, Date TimePicker Control, LinkLabel Control, ListBox Control, CheckedListBox Control, ComboBox Control, TreeView Control, ListView Control, TabControl Control and Multiple Document Interface (MDI) Windows</p>	9	CO3
4	<p>Data Access with ADO.NET: Understanding ADO.NET: Describing the Architecture of ADO.NET, ADO.NET, ADO.NET Entity Framework. Creating Connection Strings: Syntax for Connection Strings. Creating a Connection to a Database: SQL Server Database, OLEDB Database, and ODBC Data Source. Creating a Command Object. Working with DataAdapters: Creating DataSet from DataAdapter, Paging with DataAdapters, Updating with DataAdapters.</p>	9	CO4
5	<p>Delegates, Events and Exception Handling: Delegates: Creating and using Delegates, Multicasting with Delegates. Events: Event Sources, Event Handlers, Events and Delegates, Multiple Event Handlers. Exception Handling: The try/catch/finally statement, Checked and Unchecked Statements.</p> <p>Web App Development with ASP.NET: Introduction, Web Basics, Multitier Application Architecture, Your First Web Application: Building WebTime Application, Standard Web Controls: Designing a Form, Validation Controls, Session Tracking: Cookies, Session Tracking with http Session State.</p>	9	CO5, CO6

Text Books:

1. .NET 4.0 Programming (6-in-1), Black Book, Kogent Learning Solutions Inc., Wiley-Dream Tech Press. (Chapters: 1, 10, 11, 12, 13, 14 and 19).
2. Paul Deitel and Harvey Deitel: C# 2010 for Programmers, 4th Edition, Pearson Education. (Chapters: 14, 15, and 19)
3. Andrew Trolsen: Pro C# 5.0 and the .NET 4.5 Framework, 6th Edition, Wiley-Appress. (Chapters: 1 & 2)

Reference Books:

1. Bart De Smet: C# 4.0 Unleashed, Pearson Education- SAMS Series.
2. Hebert Schildt: Programming in C# 4.0, Tata McGraw Hill.

Assessment Pattern

CIE- Continuous Internal Evaluation: Theory (50 Marks)			
Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	25	15	10
Remember	7	5	3
Understand	8	5	3
Apply	5	3	2
Analyze	5	2	2
Evaluate	-		
Create	-	-	

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	50
Remember	10
Understand	20
Apply	05
Analyze	05
Evaluate	-
Create	10

SOFTWARE QUALITY AND TESTING

Course Code :20MCA52
 L:T:P:S :3:0:0:0
 Exam Hours :3

Credits :03
 CIE Marks :50
 SEE Marks :50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the basic components of a testing process in improving the quality of software
CO2	Generate appropriate test cases from the requirements of the software application
CO3	Factual understanding of functional testing with examples
CO4	Comprehend structural testing with examples
CO5	Understand the software automation process, components of selenium and installation procedure of Selenium web driver
CO6	Discussion oriented lectures by the instructor, laboratory exercises using selenium, invited workshops by experts from the industry will be the primary mechanisms for learning and knowledge.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	-	3	-	2	-	-	2	-	-	3	3
CO2	2	2	1	-	3	-	1	-	-	2	-	-	3	3
CO3	2	1	3	-	3	-	1	-	-	2	-	-	3	3
CO4	1	1	-	-	2	-	2	-	-	2	-	-	3	3
CO5	2	2	3	-	1	-	1	-	-	2	-	-	3	3
CO6	2	1	3	-	2	-	1	-	-	2	-	-	3	3

SYLLABUS			
Module	Contents of the Module	Hours	Cos
1	Software Testing – Basics: Humans, Errors and Testing –Software Quality – Requirements, Behaviour and Correctness – Correctness Vs Reliability –Testing and Debugging – Test Metrics - Software and Hardware Testing –Testing and Verification –Defect Management – Execution History – Test Generation Strategies – Static Testing.	9	CO1, CO6
2	Test Generation from Requirements: Introduction – The Test-Selection Problem – Equivalence Partitioning – Boundary-Value Analysis – Category-Partition method – Cause-Effect Graphing – Test Generation from Predicates.	9	CO2, CO6
3	Functional Testing – Boundary Value Testing, Equivalence Class Testing and Decision Table-Based Testing: Boundary value analysis – Robustness testing – Worst-case testing, Special-Value testing – Examples – Random testing – Guidelines for Boundary Value testing – Equivalence classes –Equivalence class test cases for the triangle problem, Next Date function, and Commission problem – Guidelines and Observations – Decision tables – Test cases for the triangle problem, Next Date function, and Commission problem – Guidelines and Observations.	9	CO3, CO6

4	<p>Structural Testing – Path Testing and Dataflow Testing: DDPaths – Test Coverage Metrics – Basis path testing – Guidelines and Observations – Define/Use Testing – Slice-Based testing – Guidelines and observations.</p> <p>Test Execution: Overview – From Test Case Specifications to Test Cases – Scaffolding – Generic versus Specific Scaffolding – Test Oracles – Self-Checks as Oracles – Capture and Replay.</p>	9	CO4, CO6
5	<p>Introduction to Selenium: Selenium IDE installation – Recording and running test cases using Selenium IDE – Selenium Commands.</p> <p>Software Test Automation: Fundamentals of Test Automation – Design and Architecture for Automation – Challenges in Automation.</p> <p>Selenium Web Driver: Introduction to Web Driver – Architecture – Installation of Selenium Web Driver</p>	9	CO5, CO6

Text Books:

1. Foundations of Software Testing: Fundamental Algorithms and Techniques, Adithya P. Mathur, Pearson Publication (Chapters: 1,2)
2. Software Testing, A Craftsman’s Approach, Second Edition, Paul C. Jorgensen (Chapters: 5,6,7,9,10)
3. Software Testing and Analysis: Process, Principles and Techniques, Mauro Pezze and Michael Young, John Wiley and Sons (Chapter 17)
4. Software Testing : Principles and Practices, Srinivasan Desikan, Gopalswamy Ramesh,

Reference Books:

1. Software Testing and Quality Assurance, Kshirasagara Naik, Priyadarshi Tripathy, Wiley India, 2012.
2. Software Testing-Principles, Techniques and Tools, M.G. Limaye, McGraw Hill, 2009.
3. The Craft of Software Testing, Brain Marick, Pearson Education India,2008
4. Software Testing, Ron Patton, 2ndEdition,Pearson Education,India,2013
5. Selenium with Python: A Beginners Guide, Pallavi R Sharma, BPB Publications.
6. David Burns: Selenium 2 Testing Tools: Beginners guide, PACKT Publishing, 2012.

Assessment Pattern

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom’s Taxonomy	Tests	Assignments	Quizzes
Marks	25	15	10
Remember	5	3	3
Understand	5	2	3
Apply	5	3	2
Analyze	5	2	2
Evaluate	3	3	-
Create	2	2	-

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	50
Remember	10
Understand	20
Apply	05
Analyze	05
Evaluate	05
Create	05

ELECTIVES -6

DATA SCIENCE

Course Code :20MCA531

Credits :04

L:T:P:S :4:0:0:0

CIE Marks :50

Exam Hours :3

SEE Marks :50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	To understand the data science basics and programming packages.
CO2	To characterize optimal selection and wrapping the pipeline processes in data science.
CO3	To learn the basic mathematics for data science.
CO4	To study the fundamental and advanced statistics for data science.
CO5	To understand data manipulation concepts in high performance packages.
CO6	To demonstrate the visualization of categorical and numerical data using software packages.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	3
CO2	1	2	2	2	-	-	-	-	-	-	-	-	3	3
CO3	3	-	-	-	-	-	-	-	-	-	-	-	3	3
CO4	3	-	-	-	-	-	-	-	-	-	-	-	3	3
CO5	3	-	-	-	-	-	-	-	-	-	-	-	3	3
CO6	2	-	-	-	3	-	-	1	2	-	-	2	3	3

SYLLABUS			
Module	Contents of the Module	Hours	COs
1	Data Science Introduction: Basic terminology, Why data science? Data Science Venn diagram. Programming – Prebuilt Python modules: pandas, sci-kit learn, seaborn, numpy/scipy, requests (to mine data from the web), BeautifulSoup (for the web-html parsing). Types of Data – Structured versus Unstructured and Quantitative versus Qualitative data. Data preprocessing – word/phrase counts, presence of certain special characters and relative length of text. Four levels of data and mathematical operations and other measures on all levels of data. Five Steps of Data Science and Basics of data exploration. Data science –	9	CO1, CO2
2	Basic Mathematics for data science: Vectors and Matrices, Arithmetic symbols, Graphs, Logarithms/exponents and Set theory. Linear Algebra – Matrix multiplication. Introduction to Probability: Basic definitions, Bayesian versus Frequentist, Compound events, Rules of probability. Advanced Probability – Bayes theorem, Applications, Random variables.	9	CO3
3	Basic Statistics: Statistics, Obtaining sample data, Sampling data, Statistical measures – center, variation and relateness. Advanced Statistics: Sampling distributions, Confidence levels, Hypothesis tests – Conducting a test, One sample t-tests, Type-I and Type-II errors. Hypothesis test for categorical variables – Chi-Square goodness of fit test, Chi-Square test for association/independence.	9	CO4
4	High Performance Packages: Introduction to Numpy – Data types in python, Basics of Numpy arrays, Computation on Numpy arrays – Universal functions, Aggregations, Broadcasting, Comparisons, Masks and Boolean logic, Fancy Indexing, Sorting arrays, Numpy’s structured arrays. Data manipulation: Pandas objects, Data Indexing and selection, Operating on data in pandas, Handling missing data, Hierarchical Indexing, concat and append, merge and join, aggregation and grouping, pivot tables, vectorized string operations, working with time series, high-performance pandas – eval() and query().	9	CO5
5	Visualization Packages: Introduction to Matplotlib – Importing, Setting styles, Displaying plots – Simple line plots, scatter plots. Visualizing errors, Density and Contour plots, Histograms, Binnings and Density, Customizing plot legends, Customizing colorbars, Multiple subplots, Text and Annotation, Customizing ticks, 3D plotting in Matplotlib, Geographic data with basemap. Visualization with Seaborn – Seaborn versus Matplotlib, Exploring Seaborn plots.	9	CO6

Text Books:

1. Principles of Data Science, SinanOzdemir, Packt Publishers, ISBN: 978-1-78588-791-8, Dec-2016.
2. Python Data Science Handbook, Jake VanderPlas, O REILLY Pblishers, ISBN: 978-93-5213-491-5, Jan-2017.

Reference Books:

1. Python Data Science – Essentials, Alberto Boschetti and Luca Massaron, Packt Publishers, ISBN: 978-1-78953-786-4.

2. Data Science from Scratch: First Principles with Python By Joel Grus, O REILLY, Second Edition, ISBN – 978-1-492-04113-9, May-2019.

Assessment Pattern

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	25	15	10
Remember	5	3	3
Understand	5	2	3
Apply	5	3	2
Analyze	5	2	2
Evaluate	5	3	-
Create	-	2	-

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	50
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

OBJECT ORIENTED MODELLING AND DESIGN

Course Code :20MCA532

Credits :04

L:T:P:S :4:0:0:0

CIE Marks :50

Exam Hours :3

SEE Marks :50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	To understand the Object Oriented Design process.
CO2	To Learn the class modelling.
CO3	To understand the purpose of state modelling concepts.
CO4	To know about software quality and usability.
CO5	To know the Object Oriented Design process.
CO6	Learn the UML design diagrams.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	3
CO2	1	2	2	3	-	-	-	-	-	-	-	-	3	3
CO3	3	-	-	-	-	-	-	-	-	-	-	-	3	3
CO4	3	-	-	-	-	-	-	-	-	-	-	-	3	3
CO5	3	-	-	1	-	-	-	-	-	-	-	-	3	3
CO6	2	-	2	2	3	-	-	1	2	-	-	2	3	3

SYLLABUS

Module	Contents of the Module	Hours	COs
1	Introduction, Modelling Concepts, class Modelling: What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modelling history Modelling as Design Technique: Modelling; abstraction; The three models. Class Modelling: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models; Practical tips.	9	CO1, CO2
2	Advanced Class Modelling, State Modelling and advanced State Modelling: Advanced object and class concepts; Association ends; n-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages; Practical tips. State Modelling: Events, States, Transitions and Conditions; State diagrams; State diagram behaviour; Practical tips.	9	CO2, CO3

3	Interaction Modelling, Domain and Application analysis: Interaction Modeling: Use case models; Sequence models; Activity models. Use case relationships; Procedural sequence models; Special constructs for activity models. Domain Analysis: Overview of analysis; Domain class model; Domain state model; Application Analysis: Application interaction model; Application class model; Application state model; Adding operations.	9	CO4, CO5
4	Class design, Implementation Modeling and Legacy Systems: Class Design: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example. Implementation Modeling: Overview of implementation; Fine-tuning classes; Fine-tuning generalizations; Realizing associations; Testing. Legacy Systems: Reverse engineering; Building the class models; Building the interaction model; Building the state model; Reverse engineering tips; Wrapping; Maintenance.	9	CO5, CO6
5	Patterns, Design Patterns: Patterns: What is a pattern and what makes a pattern? Pattern categories; Relationships between patterns; Pattern description. Design Patterns: Introduction, structural decomposition, Organization of work, Model View Controller; Communication Patterns: Forwarder-Receiver; Client-Dispatcher-Server; Publisher-Subscriber; Management Patterns: Command processor; Whole Part, Master Slave, View Handler;	9	CO5, CO6

Text Books:

1. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education / PHI, 2005. (Chapters 1 to 15).
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, 2006. (Chapters 1, 3)

Reference Books:

1. Grady Booch et al: Object-Oriented Analysis and Design with Applications, 3rd Edition, Pearson, 2007.
2. Mark Priestley: Practical Object-Oriented Design with UML, 2nd Edition, Tata McGraw- Hill, 2003.
3. K. Barclay, J. Savage: Object-Oriented Design with UML and JAVA, Elsevier, 2008.
4. Booch, G., Rumbaugh, J., and Jacobson, I.: The Unified Modeling Language User Guide, 2nd Edition, Pearson, 2005.

Assessment Pattern

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quiz
Marks	25	15	10
Remember	5	3	3
Understand	5	2	3
Apply	5	3	2
Analyze	5	2	2
Evaluate	5	3	-
Create	-	2	-

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	50
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

PATTERN RECOGNITION

Course Code :20MCA533

Credits :04

L:T:P:S :4:0:0:0

CIE Marks :50

Exam Hours :3

SEE Marks :50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Identify areas where Pattern Recognition and Machine Learning can offer a solution
CO2	Design systems and algorithms for pattern recognition
CO3	Analyse classification problems probabilistically and estimate classifier performance,
CO4	Understand and analyse methods for automatic training of classification systems
CO5	Apply Maximum - likelihood parameter estimation in relatively complex probabilistic
CO6	Understand the principles of Bayesian parameter estimation

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	3
CO2	1	2	2	2	-	-	-	-	-	-	-	-	3	3
CO3	3	-	-	-	-	-	-	-	-	-	-	-	3	3
CO4	3	-	-	-	-	-	-	-	-	-	-	-	3	3
CO5	3	-	-	1	-	-	-	-	-	-	-	-	3	3
CO6	2	-	2	2	3	-	-	1	2	-	-	2	3	3

SYLLABUS			
Module	Contents of the Module	Hours	COs
1	INTRODUCTION: Machine perception, pattern recognition systems, design cycle, learning and adaptation, Applications of pattern recognition.	9	CO1, CO2
2	PROBABILITY: Introduction, probability of events, random variables, Joint distributions and densities, moments of random variables, estimation of parameters from samples, minimum risk estimators.	9	CO1, CO2
3	STATISTICAL DECISION MAKING: Introduction, Baye's Theorem, multiple features, conditionally independent features, decision boundaries, unequal costs of error, estimation of error rates, the leaving one- out technique. Characteristic curves, estimating the composition of populations.	9	CO2, CO3, CO4
4	NONPARAMETRIC DECISION MAKING: Introduction, histograms, Kernel and window estimators, nearest neighbor classification techniques, adaptive decision boundaries, adaptive discriminate Functions, minimum squared error discriminate functions, choosing a decision making technique.	9	CO2, CO3, CO4
5	UNSUPERVISED LEARNING AND CLUSTERINGS: Unsupervised Bayesian learning, data decryption and clustering, criterion functions and clustering, Hierarchical clustering, Online clustering, component analysis. ARTIFICIAL NEURAL NETWORKS: Introduction, nets without hidden layers. nets with hidden layers, the back Propagation algorithms, Hopfield nets, an application.	9	CO5, CO6

Text Books:

1. Pattern Classification Duda R. O., and Hart P E., and Stork D G., Wiley Publishers.
2. Pattern Recognition and Image Analysis, Earl Gose, Richard J and Steve J, PHI.
3. Pattern recognition (Statistical, structural and Neural Approaches), Robert Schalkoff.

Reference Books:

1. "Pattern Recognition, Sergios Theodoridis & Konstantinos Koutrumbas, Elsevier Academic Press, 4th Edition.

Assessment Pattern

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quiz
Marks	25	15	10
Remember	5	3	3
Understand	5	2	3
Apply	5	3	2
Analyze	5	2	2
Evaluate	5	3	-
Create	-	2	-

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	50
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

PARALLEL PROGRAMMING

Course Code :20MCA534

Credits :04

L:T:P:S :4:0:0:0

CIE Marks :50

Exam Hours :3

SEE Marks :50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	To explain models and issues in parallel computing
CO2	To introduce message passing paradigm using MPI
CO3	To study shared memory paradigm with Pthreads
CO4	To study shared memory paradigm with OpenMP
CO5	To learn the GPU based parallel programming using OpenCL and CUDA
CO6	To create awareness to students in the field Parallel Programming Paradigms

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	3	3
CO2	2	2	2	2	-	-	-	-	-	-	-	-	3	3
CO3	2	-	-	-	-	-	-	-	-	-	-	-	3	3
CO4	2	-	-	-	-	-	-	-	-	-	-	-	3	3
CO5	2	-	-	2	-	-	-	-	-	-	-	-	3	3
CO6	2	-	1	1	2	-	-	2	3	-	-	2	3	3

SYLLABUS			
Module	Contents of the Module	Hours	COs
1	FUNDAMENTALS OF PARALLEL COMPUTING: Need for Parallel Computing – Parallel Computer Models – ILP, TLP and Data Parallelism – Parallel Programming Overview – Processes, Tasks and Threads – Parallel Programming Models – Shared Memory Programming – Message Passing Paradigm – Interaction and Communication – Interconnection Networks	9	CO1, CO2
2	CHALLENGES OF PARALLEL PROGRAMMING: Identifying Potential Parallelism – Techniques for Parallelizing Programs – Issues – Cache Coherence issues – Memory Consistency Models – Maintaining Memory Consistency – Synchronization Issues	9	CO1, CO2
3	SHARED MEMORY MODELS AND OPENMP PROGRAMMING: OpenMP Execution Model – Memory Model and Consistency – Open MP Directives – Run Time Library Routines – Handling Data and Functional Parallelism – Performance Considerations.	9	CO2, CO3, CO4
4	MPI PROGRAMMING: The MPI Programming Model – MPI Basics – Circuit Satisfiability – Global Operations – Asynchronous Communication – Collective Communication – Other MPI Features – Performance Issues – Combining OpenMP and MPI.	9	CO2, CO3, CO4
5	PROGRAMMING HETEROGENEOUS PROCESSORS: GPU Architecture – Basics of CUDA – CUDA Threads – CUDA Memories – Synchronization Handling – Performance Issues – Application Development. Introduction to OpenCL.	9	CO5, CO6

Text Books:

1. John L. Hennessey and David A. Patterson, "Computer Architecture – A quantitative approach", Morgan Kaufmann / Elsevier Publishers, 5th . Edition, 2012.
2. Peter S. Pacheco, "An Introduction to Parallel Programming", Morgan Kaufmann, 2011.
3. Michael J Quinn, "Parallel programming in C with MPI and OpenMP", Tata McGraw Hill, 2003.
4. David B. Kirk and Wen-mei W. Hwu, "Programming Massively Parallel Processors", Morgan Kaufmann, 2010

Reference Books:

1. Ananth Grama, George Karypis, Vipin Kumar and Anshul Gupta, "Introduction to Parallel Computing", Second Edition, Pearson Education Limited, 2003.
2. Shameem Akhter and Jason Roberts, "Multi-core Programming", Intel Press, 2006.
3. Ian Foster, "Designing and Building Parallel Programs: Concepts and Tools for Parallel Software Engineering", Addison Wesley Longman Publishing Co., USA, 1995.
4. David E. Culler, Jaswinder Pal Singh, "Parallel Computing Architecture: A hardware/ Software approach", Morgan Kaufmann / Elsevier Publishers, 1999.
5. OpenMP Programmer's Manual.
6. MPI Programmer's Manual.

Assessment Pattern**CIE- Continuous Internal Evaluation: Theory (50 Marks)**

Bloom's Taxonomy	Tests	Assignments	Quiz
Marks	25	15	10
Remember	5	3	3
Understand	5	2	3
Apply	5	3	2
Analyze	5	2	2
Evaluate	5	3	-
Create	-	2	-

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	50
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

SEARCH ENGINE OPTIMIZATION

Course Code :20MCA535

Credits :04

L:T:P:S :4:0:0:0

CIE Marks :50

Exam Hours :3

SEE Marks :50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Impart the knowledge fundamentals of search engine optimization
CO2	understand how to plan for a powerful search engine and how to make your site useful
CO3	understand the role of keywords creating pages
CO4	understand the role of filtering pages
CO5	Getting Your Pages into the Search Engines, Submitting to the Directories
CO6	Develop applications using search engine

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	-	-	-	-	3	3	-
CO2	1	2	2	2	-	-	-	-	-	-	-	3	3	-
CO3	1	-	-	-	-	-	-	-	-	-	-	3	3	-
CO4	1	-	-	-	-	-	-	-	-	-	-	3	3	-
CO5	1	-	-	-	1	-	-	-	-	-	-	3	3	-
CO6	1	-	-	2	2	2	-	3	2	-	-	3	3	2

SYLLABUS			
Module	Contents of the Module	Hours	COs
1	Introduction to SEO: Surveying the Search Engine Landscape Investigating Search Engines and Directories, Where Do People Search?, Search Engine Magic, Gathering Your Tools. Search Results, Deconstructed: The Big Two: Organic and PPC, looking at local results, Checking out Shopping results, Staying Current with News Results, Viewing Video and Image Results, Getting friendly with Social Results, Collecting Bits and Pieces.	9	CO1
2	Planning a powerful Search Engine Strategy: Don't Trust Your Web Designer, Understanding the Limitations, Eyeing the Competition, Going Beyond Getting to #1, Controlling Search Engine Variables, Determining Your Plan of Attack, Look Away a Few Minutes. Making Your Site Useful and Visible. Learning from Amazon, Revealing the Secret But Essential Rule of Web Success, Making Your Site Work Well, Panda-Google Endorses Good Design.	9	CO2

3	Picking Powerful Keywords: Understanding the importance of keywords, Thinking Like Your Prey, Starting Your Keyword Analysis, Using a Keyword Tool, Choosing Your Keywords. Creating Pages that Search Engine Love: Preparing Your Site, Seeing through a Search Engine’s Eyes, Understanding Keyword Concepts, Creating Your Web Pages	9	CO3
4	Avoiding Pages that the Search Engine Hate Dealing with Frames, The HTML Nitty-Gritty of Frames, handling iframes, Fixing Invisible Navigation Systems, Flush the Flash Animation, Waiting for Silverlight (to Disappear), Avoiding Embedded Text in Images, Reducing Clutter in Your Web Pages, Managing Dynamic Web Pages, Using Session Ids and URLs, Fixing Bits and Pieces. Finding Traffic through Local-Search Marketing - Understanding Local-Search Marketing’s Importance, Looking through Local-Search, How Does Local-Search Work?, Two Ways to Reach People Locally, Localizing Your Web Pages, Finding More Local Systems, Don’t Forget Local-Local Directories, The Other Side of Local: Review Sites, Working the Yellow Pages.	9	CO4
5	Getting Your Pages into the Search Engines, Submitting to the Directories: Linking Your Site for Inclusion, Simple Link Submissions to the Major Systems, Submitting an XML Sitemap, Submitting to Secondary Systems, Using Registration Services and Software Programs, Pitting Search Directories Against Search Engines, Why are the Directories So Significant?, Submitting to the Search Directories, Finding Specialized Directories, Using Local Directories. Product search: Remember the Shopping Directories and Retailers: Understanding Where People Search for Products, Working with the Product Indexes, Exploring More Shopping Services, The Classified Ad Sites, Working with E-Commerce or Merchant Sites, Managing Your Data.	9	CO5, CO6

Text Books:

1. SEO for Dummies a Wiley Brand by Peter Kent, 6th Edition.

Reference Books:

1. The Art of SEO Mastering Search Engine Optimization by Eric Enge, Stephan Spencer, and Jessie C. Stricchiola, 3rd Edition, O’Really.
2. Search Engine Optimization Secrets by Danny Dover.
3. Search Engine Optimization Secrets by Cristopher B. Jones.

Assessment Pattern

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom’s Taxonomy	Tests	Assignments	Quiz
Marks	25	15	10
Remember	5	3	3
Understand	5	2	3
Apply	5	3	2
Analyze	5	2	2
Evaluate	5	3	-
Create	-	2	-

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	50
Remember	10
Understand	15
Apply	10
Analyze	10
Evaluate	3
Create	2

ELECTIVES -7**WEB DESIGN AND HTML5****Course Code :20MCA541****Credits :04****L:T:P:S :4:0:0:0****CIE Marks :50****Exam Hours :3****SEE Marks :50****Course Outcomes: At the end of the Course, the Student will be able to:**

CO1	Develop client side intensive web applications using HTML5 family technologies.
CO2	Understand new features incorporated in HTML5
CO3	Use latest HTML5 techniques to create web pages.
CO4	Compare and contrast advancements in Web 2.0 and related Technologies.
CO5	Develop Server side scripts using PHP.
CO6	Build Web applications with PHP.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	-	3	1	1	-	-	3	2	-	3	3
CO2	2	1	2	-	3	1	1	-	-	3	2	-	3	3
CO3	2	1	2	-	3	1	1	-	-	3	2	-	3	3
CO4	2	1	2	-	3	1	1	-	-	3	2	-	3	3
CO5	2	1	2	-	3	1	1	-	-	3	2	-	3	3
CO6	2	1	2	1	3	1	1	1	-	3	2	-	3	3

SYLLABUS			
Module	Contents of the Module	Hours	COs
1	Introduction to HTML5: Overview, Browser Support, New features, Backward compatibility, Syntax, The DOCTYPE, Character Encoding, The <script> tag, The <link> tag, HTML5 Elements, HTML5 Document, HTML5 Attributes: Standard Attributes, Custom Attributes, HTML5 EVENTS, Iframes, WEB FORMS 2.0, SVG, MathML, Web Storage, Server Sent Events, WebSockets.	9	CO1, CO2
2	Advanced Concepts in HTML5: Canvas- Drawing Rectangles, Paths, Lines, Bezier Curves, Quadratic Curves, Using Images, Create Gradients, Styles and Colors, Text and Fonts, Pattern and Shadow, etc. Audio and Video, Geo Location, Drag and Drop, Web Workers.	9	CO3
3	Introduction to web 2.0 & Web Services: Introduction to web 2.0: What is Web 2.0?, Folksonomies and Web 2.0, Software As a Service (SaaS), Data and Web 2.0, Convergence, Iterative development, Rich User experience, Multiple Delivery Channels, Social Networking. Web Services: SOAP, RPC Style SOAP, Document style SOAP, WSDL, REST services, JSON format, What is JSON?, Array literals, Object literals, Mixing literals, JSON syntax, JSON Encoding and Decoding, JSON versus XML.	9	CO4
4	Introduction to PHP: Origins and uses of PHP, Overview of PHP, General syntactic characteristics, Primitives, operations and expressions, Output, Control statements, Arrays, Functions, Pattern matching, Form handling.	9	CO5
5	Building Web applications with PHP: File handling, Tracking users, cookies, sessions, Using Databases, Handling XML.	9	CO6

Text Books:

1. HTML5 for Masterminds, J.D. Gauchat, Revised 3rd Edition, MinkBooks, 2015, ISBN: 154292331X.
2. Francis Shanahan: Mashups, Wiley India 2012
3. Chris Bates: Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2006.

Reference Books:

1. Robert W. Sebesta: Programming the World Wide Web, 4th Edition, Pearson Education, 2012.

Assessment Pattern

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	25	15	10
Remember	5	5	3
Understand	5	5	3
Apply	5	3	2
Analyze	5	2	2
Evaluate	5		
Create	5		

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	50
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

BIG DATA ANALYTICS USING HP VERTICA

Course Code :20MCA542

Credits :04

L:T:P:S :4:0:0:0

CIE Marks :50

Exam Hours :3

SEE Marks :50

Course Outcomes: At the end of the Course, the Student will be able :

CO1	To Explore the fundamental concepts of big data and analytics
CO2	To apply various techniques for mining data stream
CO3	To analyze the big data using intelligent techniques
CO4	To apply search methods and Visualization
CO5	To design applications using Map Reduce Concepts.
CO6	To know Real-time Middleware

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	3
CO2	2	-	-	2	3	-	-	-	-	-	-	-	3	3
CO3	2	3	-	-	-	-	-	-	-	-	-	-	3	3
CO4	3	-	-	2	-	-	-	-	-	-	-	-	3	3
CO5	2	-	3	-	-	-	-	-	-	-	-	-	3	3
CO6	1	-	-	-	-	-	-	1	-	-	-	-	3	3

SYLLABUS			
Module	Contents of the Module	Hours	COs
1	<p>Introduction to SQL and HP Vertica: Types of SQL, Data Types, Constrains, JOINS, Types of JOINS, Clause, Group by, Having, Order by, Where Clause with examples, SQL Alias, Views, Union, Union all, aggregate functions, Operators</p> <p>Introduction to HP-Vertica Database, Vertica Analytics Platform, Columnar Orientation, Advanced Compression, High Availability, Automatic Database design, Massively Parallel Processing, Application Integration.</p> <p>Exercises</p> <p>a) Creation of tables with constrains and insertion of values into tables</p> <p>b) Hands-on DML commands to apply different aggregate function, Group by-Having-Order by clause, Operators.</p> <p>c) Creation of views and working with joins.</p>	9	CO1

<p>2</p>	<p>HP Vertica- 1: Projections, Query Execution ,Vertica Transactions, Hybrid data store – WOS & ROS, Projection Design: Projection fundamentals, Projection types,Projection properties, Replication and Segmentation. Database Designer, Comprehensive mode, Incremental mode, Sample data, Sample queries, DBD Advantages</p> <p>Exercises</p> <ul style="list-style-type: none"> a) Creation of schema, tables and execution of SQL statements on Vertica Database, b) Running Database designer c) Hands-on projections 	<p>9</p>	<p>CO2</p>
<p>3</p>	<p>HP Vertica -2: Loading data via INSERT-COPY-MERGE, Deleting data in Vertica-delete vector, design for delete, process of deleting. Truncate, Purge, Update, Partitioning, Tuple Mover- MoveOut Parameter, MergeOut Parameter, Working with Vertica Management Console.</p> <p>Exercises</p> <ul style="list-style-type: none"> a) Loading data files from different sources to Vertica database. b) Verifying the log files after loading the data into Vertica database. c) Hands-on partitions. 	<p>9</p>	<p>CO3</p>
<p>4</p>	<p>Big Data Analytics with Hadoop: Big data overview, Introduction to Hadoop, Overview of Hadoop Distribution File Systems[HDFS] and Map reduce Operations. Clustering types in Hadoop- Standalone mode, Pseudo distributed mode, Fully distributed mode.</p> <p>Exercises : a) Verifying Hadoop installation (Pseudo distributed mode), Java path,Hadoop location, Hadoop configuration files, Name Node setup, Job Tracker, Metadata files, Accessing Hadoop on browser</p> <ul style="list-style-type: none"> b) Moving data from local file system to Hadoop file system c) Performing MAP Reduction operation in Hadoop d) Verification of operation results through terminal and browser 	<p>9</p>	<p>CO4</p>

5	<p>Hadoop Ecosystem</p> <p>Introduction to SQOOP, Overview of PIG -Standalone mode, cluster mode, when to use PIG latin, Introduction to HIVE, Introduction to HBASE-comparison of Hadoophdfs and HBASE .</p> <p>Exercises :</p> <p>a) Sqoop commands :</p> <p> i) Import of tables from Mysql database to hdfs</p> <p> ii) Export files from hdfs to mysql database</p> <p>b) Pig commands</p> <p> i) Loading and storing - from/to local file system, from/to hdfs</p> <p> ii) Diagnostic operator – Dump</p> <p> iii) Filter operator</p> <p>c) Hive Commands:</p> <p> i) Data Definition Language (DDL) CREATE database/ table/ external table , DROP, ALTER, SHOW, DESCRIBE Statements.</p> <p> ii) Data Manipulation Language (DML) LOAD, INSERT Statements- INSERT INTO, INSERT OVERWRITE</p> <p>d) HBase shell Command: Create table with /without version –</p> <p> i) put command</p> <p> ii) get command with / without version</p> <p> iii) delete column – column family</p> <p> iv) drop table</p>	9	CO5, CO6
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Text Books:

1. Boris lublinsky, Kevin t. Smith, AlexeyYakubovich, “Professional Hadoop Solutions”, Wiley, ISBN: 9788126551071, 2016.
2. Chris Eaton,Dirk derooset al. , “Understanding Big data ”, McGraw Hill, 2016.
3. Tom White, “HADOOP: The definitive Guide”, O Reilly 2015.

Reference Books:

1. Vignesh Prajapati, “Big Data Analytics with R and Haoop”, Packet Publishing 2013.
2. James Taylor, “Decision Management Systems-A Practical guide to using Business rules and Predictive Analytics”, IBM Press, 2015. Systems”, 9th edition, Prentice Hall, 2014.
3. Alberto Cordoba, “Understanding the Predictive Analytics Lifecycle”, Wiley, 2014.
4. Eric Siegel, Thomas H. Davenport, “Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die”, Wiley, 2013.

Assessment Pattern

CIE- Continuous Internal Evaluation: Theory (50 Marks)			
Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	25	15	10
Remember	5	5	3
Understand	5	5	3
Apply	5	3	2
Analyze	5	2	2
Evaluate	5		
Create	5		

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	50
Remember	10
Understand	10
Apply	10
Analyze	5
Evaluate	5
Create	10

INFORMATION RETRIEVAL AND SECURITY

Course Code :20MCA543

Credits :04

L:T:P:S :4:0:0:0

CIE Marks :50

Exam Hours :3

SEE Marks :50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	To learn the information retrieval models.
CO2	To familiar with Web Search Engine functionalities.
CO3	To expose the link analysis.
CO4	To understand Hadoop and Map Reduce.
CO5	To learn document text mining techniques.
CO6	To understand document text mining.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	-	-	-	1	-	3	3
CO2	1	-	-	-	-	-	-	-	-	-	1	-	3	3
CO3	1	1	-	-	-	-	-	-	-	-	1	-	3	3
CO4	1	-	-	-	3	-	-	-	-	-	1	-	3	3
CO5	1	-	-	-	-	-	-	-	-	-	1	-	3	3
CO6	1	-	2	2	-	-	-	-	-	-	1	-	3	3

SYLLABUS			
Module	Contents of the Module	Hours	COs
1	INTRODUCTION: Introduction -History of IR- Components of IR – Issues –Open source Search engine Frameworks – The impact of the web on IR – The role of artificial intelligence (AI) in IR – IR Versus Web Search – Components of a Search engine- Characterizing the web.	9	CO1, CO2
2	INFORMATION RETRIEVAL: Boolean and vector-space retrieval models- Term weighting – TF-IDF weighting- cosine similarity – Pre-processing – Inverted indices – efficient processing with sparse vectors – Language Model based IR – Probabilistic IR –Latent Semantic Indexing – Relevance feedback and query expansion.	9	CO1, CO2

3	WEB SEARCH ENGINE – INTRODUCTION AND CRAWLING: Web search overview, web structure, the user, paid placement, search engine optimization/ spam. Web size measurement – search engine optimization/spam – Web Search Architectures – crawling – meta-crawlers-Focused Crawling – web indexes – Near-duplicate detection – Index Compression – XML retrieval.	9	CO2, CO3, CO4
4	WEB SEARCH – LINK ANALYSIS AND SPECIALIZED SEARCH: Link Analysis –hubs and authorities – Page Rank and HITS algorithms - Searching and Ranking – Relevance Scoring and ranking for Web – Similarity – Hadoop & Map Reduce – Evaluation – Personalized search – Collaborative filtering and content-based recommendation of documents and products – handling “invisible” Web – Snippet generation, Summarization, Question Answering, Cross- Lingual Retrieval.	9	CO2, CO3, CO4
5	DOCUMENT TEXT MINING: Information filtering; organization and relevance feedback – Text Mining - Text classification and clustering – Categorization algorithms: Naive Bayes; decision trees; and nearest neighbor – Clustering algorithms: agglomerative clustering; k-means; expectation maximization (EM)	9	CO5, CO6

Text Books:

1. C. Manning, P. Raghavan, and H. Schütze, Introduction to Information Retrieval , Cambridge University Press, 2008.
2. Ricardo Baeza -Yates and Berthier Ribeiro – Neto, Modern Information Retrieval: The Concepts and Technology behind Search 2nd Edition, ACM Press Books 2011.
3. Bruce Croft, Donald Metzler and Trevor Strohman, Search Engines: Information Retrieval in Practice, 1st Edition Addison Wesley, 2009.
4. Mark Levene, An Introduction to Search Engines and Web Navigation, 2nd Edition Wiley, 2010.

Reference Books:

1. Stefan Buettcher, Charles L. A. Clarke, Gordon V. Cormack, Information Retrieval: Implementing and Evaluating Search Engines, The MIT Press, 2010.
2. Ophir Frieder “Information Retrieval: Algorithms and Heuristics: The Information Retrieval Series“, 2nd Edition, Springer, 2004.
3. Manu Konchady, “Building Search Applications: Lucene, Ling Pipe”, and First Edition, Gate Mustru Publishing, 2008.

Assessment Pattern

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom’s Taxonomy	Tests	Assignments	Quizzes
Marks	25	15	10
Remember	5	3	2
Understand	5	3	2
Apply	5	3	2
Analyze	5	3	2
Evaluate	3	3	2
Create	2		

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	50
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

PERVASIVE COMPUTING

Course Code :20MCA544

Credits :04

L:T:P:S :4:0:0:0

CIE Marks :50

Exam Hours :3

SEE Marks :50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	To understand the characteristics and principles of Pervasive computing and the
CO2	To realize the role of wireless protocols in shaping the future Internet
CO3	To design and implement pervasive applications
CO4	To give an introduction to the enabling technologies of pervasive computing
CO5	To familiarize students with various application scenarios of Pervasive Computing,
CO6	To enable students to explore and obtain awareness on the state-of-the-art of research in pervasive

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	1	-	-	-	-	-	-	-	3	3
CO2	1	1	-	-	1	-	-	-	-	-	-	-	3	3
CO3	1	-	3	-	1	-	-	-	-	-	-	-	3	3
CO4	1	-	-	-	1	-	-	-	-	-	-	-	3	3
CO5	1	-	-	-	1	-	-	-	-	-	-	-	3	3
CO6	1	-	-	3	1	-	-	-	-	-	-	-	3	3

SYLLABUS			
Module	Contents of the Module	Hours	COs
1	INTRODUCTION Pervasive Computing - Principles, Characteristics - interaction transparency, context aware, automated experience capture. Architecture for pervasive computing - Pervasive devices - embedded controls. - Smart sensors and actuators - Context communication and access services.	9	CO1, CO2
2	PROTOCOLS: Open protocols - Service discovery technologies - SDP, Jini, SLP, UpnP protocols – data synchronization – Sync ML framework - Context aware mobile services - Context aware sensor networks, addressing and communications - Context aware security.	9	CO1, CO2
3	TECHNOLOGIES: Past, Present and Future - Device Technology - Device Connectivity - Web application Concepts –WAP and Beyond - Voice Technologies - Personal Digital Assistants.	9	CO2, CO3, CO4
4	ARCHITECTURE Server side programming in Java – Pervasive Web Application Architecture - Example Application - Access via PCs - Access via WAP -Access via PDA and Voice.	9	CO2, CO3, CO4
5	EXAMPLES: Smart Tokens , Heating Ventilation and Air Conditioning , Set Top Boxes, Appliances and Home Networking, Residential Gateway, Automotive Computing, On Board Computing Systems, In Vehicle networks, Entertainment Systems.	9	CO5, CO6

Text Books:

1. Seng Loke, Context - Aware Computing Pervasive Systems, Auerbach Pub., NewYork, 2007.
1. Uwe Hansmann etl , Pervasive Computing, Springer, New York,2001.

Reference Books:

1. Jochen Burkhardt, Stefan Hepper Klaus Rindtorff Thomas Schaeck "Pervasive Computing - Technology and Architecture of Mobile Internet Application", Pearson Education,sixth Edition 2009.

Assessment Pattern

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	25	15	10
Remember	5	3	2
Understand	5	3	2
Apply	5	3	2
Analyze	5	3	2
Evaluate	3	3	2
Create	2		

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	50
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

ECONOMICS FOR SOFTWARE ENGINEERS

Course Code :20MCA545

Credits :04

L:T:P:S :4:0:0:0

CIE Marks :50

Exam Hours :3

SEE Marks :50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Introduce students to the use of economics to pursuit economic growth
CO2	Provides with the knowledge to understand forces of the market in any economy
CO3	Introduce student to the use of economics models and tools to solve societal problems
CO4	Understand the relationship between demand and supply;
CO5	Understand purpose and concept of market structure;
CO6	Understand the important difference between economic growth and development

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	1	-	-	-	-	-	-	-	3	3
CO2	1	1	-	-	1	-	-	-	-	-	-	-	3	3
CO3	1	-	3	-	1	-	-	-	-	-	-	-	3	3
CO4	1	-	-	-	1	-	-	-	-	-	-	-	3	3
CO5	1	-	-	-	1	-	-	-	-	-	-	-	3	3
CO6	1	-	-	3	1	-	-	-	-	-	-	-	3	3

SYLLABUS

Module	Contents of the Module	Hours	COs
1	Demand and Supply: Concept of demand, determinants of individual and market demand functions, elasticity of demand – price, income and cross elasticities, concept of supply, determinants of individual and market supply functions, elasticity of supply, Equilibrium price.	9	CO1, CO2
2	Production: Production function in short run – law of variable proportion, production function in the long run – isoquants, isocosts, ridge lines , returns to scale; producer’s equilibrium - optimum combination of inputs to (i) maximize output - given cost and (ii) minimize cost - given output (least - cost combination of inputs).	9	CO1, CO2
3	Market Structure: Price and output determination under perfect competition and monopoly. Comparison between perfect competition and monopoly with respect to Efficiency.	9	CO2, CO3, CO4

4	Factor Pricing - Demand and supply of factors of production, pricing of a single variable factor under perfect competition and monopoly; modern theory of rent, quasi-rent.	9	CO2, CO3, CO4
5	Macroeconomics: Meaning of macroeconomics, Keynesian theory of determination of income and employment in the three sector economy, multiplier analysis, IS-LM model of equilibrium income and interest rate. Meaning and objectives of fiscal and monetary policies.	9	CO5, CO6

Text Books:

1. Case, Karl. E. and Fair, Principles of Economics (6th ed.), Pearson Education, 2002.
2. Lipsey and Chrystal, Economics (10th ed.), Oxford University Press, Delhi, 2004.

Reference Books:

3. Pindyck, Rubinfeld and Mehta, Microeconomics (1st Indian reprint), Pearson Education, 2005.
4. R.Dornbush, S.Fisher and R. Startz, Macroeconomics , (9th edition), McGraw-Hill, 2003.
5. A.Koutsoyiannis – Modern Microeconomics , (2nd Edition) Aditya Books, 1979.

Assessment Pattern

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	25	15	10
Remember	5	3	2
Understand	5	3	2
Apply	5	3	2
Analyze	5	3	2
Evaluate	3	3	2
Create	2		

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	50
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

ELECTIVES - 8

MACHINE LEARNING TECHNIQUES

Course Code :20MCA551

Credits :04

L:T:P:S :4:0:0:0

CIE Marks :50

Exam Hours :3

SEE Marks :50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the origin and practical applications of machine learning and types of various machine learning algorithms
CO2	Apply suitable machine learning algorithms on input data with appropriate justification
CO3	Analyze the usage of supervised and unsupervised Machine Learning algorithms
CO4	Understand the practical usage and concepts of R tool with its purpose
CO5	Evaluate the performance of classification and clustering algorithms with datasets for different types of applications
CO6	Apply and implement machine learning algorithms using R tool

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	3	3
CO2	2	1	-	-	-	-	-	-	-	-	-	-	3	3
CO3	2	3	1	3	-	-	-	-	-	-	-	-	3	3
CO4	2	-	1	-	3	-	-	-	-	-	-	-	3	3
CO5	2	-	1	-	-	-	-	-	-	-	-	-	3	3
CO6	2	-	1	-	3	-	-	-	-	-	-	-	3	3

SYLLABUS

Module	Contents of the Module	Hours	COs
1	Introduction to Machine Learning: What is Learning? When do we need machine learning? Types of learning, The origins of machine learning, Uses and abuses of machine learning, Ethical considerations, How do machines learn? Abstraction and knowledge representation, Generalization, Assessing the success of learning, Steps to apply machine learning to data, Choosing a machine learning algorithm, the input data, types of machine learning algorithms, Matching data to an appropriate algorithm, Machine Learning Models, Applications of Machine Learning.	9	CO1
2	Machine Learning Algorithms I: Neural Networks - Representation – Perceptron – Multilayer Networks and Back Propagation Algorithms, Decision Tree, Bayesian Method - Naïve Bayes Classification, Instance Based Learning– K Nearest Neighbor.	9	CO2

3	Machine Learning Algorithms II: Regression - Linear Regression, Logistic Regression, Support Vector Machine, Clustering, Genetic Algorithms and Genetic Programming.	9	CO3
4	Introduction to R: Getting R, The R Environment, R Packages, Basics of R, Managing and Understanding Data in R, Reading Data into R, Statistical Graphics, Writing R Functions, Control Statements, R – Loops. Hands on: R Data Interfaces, R Charts and Graphs.	9	CO4
5	Machine Learning Techniques Implementation Using R: Neural Network, Decision Tree, Naïve Bayes, KNN, Regression, K Means Clustering, Time Series Analysis. Hands on : Implementation techniques in R with Datasets.	9	CO5, CO6

Text Books:

1. Machine Learning, Tom M Mitchel, McGraw Hill Education, 2013, ISBN: 978-1-25-909695.
2. Machine Learning with R, Brett, Lantz, Packt Publishing, 2013, ISBN: 978-1-78216-214-8.
3. R for Everyone, Advanced Analytics and Graphics, Jared P Lander, Pearson Publication, 2015, ISBN:978-93-325-3924-2.
4. Data Mining – Practical Machine Learning Tools and Techniques, 2nd Edition, Ian H Witten, Eibe Frank, Morgan Kaufmann Publishers, 2005, ISBN: 0-12-088407-0.

Reference Books:

1. Machine Learning in Action, Peter Harrington, Manning Publications, 2012, ISBN: 978-1617290183.
2. Machine Learning, An Algorithmic Perspective, Stephen Marsland, CRC Press, 2009 ISBN: 978-1-4200-6718-7.
3. Understanding Machine Learning: From Theory to Algorithms, Shai Shalev-Shwartz, Shai Ben- David, 2014, ISBN: 978-1-107-05713-5.

Assessment Pattern

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	25	15	10
Remember	5	3	2
Understand	4	3	2
Apply	4	3	2
Analyze	4	2	-
Evaluate	4	2	2
Create	4	2	2

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	50
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

CRYPTOGRAPHY AND NETWORK SECURITY

Course Code :20MCA552

Credits :04

L:T:P:S :4:0:0:0

CIE Marks :50

Exam Hours :3

SEE Marks :50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	To brief about different cryptographic algorithms.
CO2	To study various wireless security methods.
CO3	To learn hardware perspectives and optimization of wireless security
CO4	To Show how the public keys are distributed using Diffie Hellman method.
CO5	To Discuss about interception and vulnerability of wireless systems
CO6	To Formulate common techniques for implementing security modules

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	3	3
CO2	2	1	-	-	-	-	-	-	-	-	-	-	3	3
CO3	2	3	1	3	-	-	-	-	-	-	-	-	3	3
CO4	2	-	1	-	3	-	-	-	-	-	-	-	3	3
CO5	2	-	1	-	-	-	-	-	-	-	-	-	3	3
CO6	2	-	1	-	3	-	-	-	-	-	-	-	3	3

SYLLABUS			
Module	Contents of the Module	Hours	COs
1	CLASSICAL CRYPTOSYSTEM: Security trends – Security Attacks and services – Symmetric cipher model- Classical Encryption Techniques — LFSR sequences – Basic Number theory – Congruences – Chinese Remainder theorem – Modular exponentiation – Fermat and Euler’s theorem – Legendre and Jacobi symbols – Finite Field – Galois Field.	9	CO1
2	BLOCK CIPHER: Simple DES – DES – Modes of operation – Triple DES – AES – RC4 – RSA – Attacks – Primality test – factoring.	9	CO2, CO3, CO6
3	MESSAGE AUTHENTICATION: Discrete Logarithms – Computing discrete logs – Diffie-Hellman key exchange – ElGamal Public key cryptosystems – Hash functions – Secure Hash – Birthday attacks - MD5 – Digital signatures – RSA – ElGamal – DSA	9	CO2, CO3, CO6

4	NETWORK SECURITY: Kerberos, X.509, PKI – Electronic Mail security – PGP – IP security – Web Security – SSL, TLS, SET.	9	CO4
5	WIRELESS NETWORK SECURITY: Wireless Network Security- IEEE 802.11 Wireless LANs - Protocol Overview and Security - Wireless Application Protocol (WAP) - Protocol Overview - Wireless Transport Layer Security (WTLS).	9	CO5, CO6

Text Books:

1. William Stallings, “Cryptography and Network security Principles and Practices”, Pearson/PHI, 5th ed, 2006. [Unit I, Unit II, Unit IV, Unit V]
2. Wade Trappe, Lawrence C Washington, “Introduction to Cryptography with coding theory”, 2nd ed, Pearson, 2007. [Unit III]

Reference Books:

1. W. Mao, “Modern Cryptography – Theory and Practice”, Pearson Education, Second Edition, 2007.
2. Charles P. Pfleeger, Shari Lawrence Pfleeger, “Security in computing”, Third Edition – Prentice Hall of India, 2006.
3. Douglas R. Stinson. “Cryptography, theory and practice” , Second edition, CRS Press.

Assessment Pattern

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom’s Taxonomy	Tests	Assignments	Quizzes
Marks	25	15	10
Remember	5	3	2
Understand	5	3	2
Apply	5	3	2
Analyze	5	3	2
Evaluate	3	3	2
Create	2		

SEE- Semester End Examination: Theory (50 Marks)

Bloom’s Category	Tests
Marks	50
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

MIDDLEWARE TECHNOLOGIES

Course Code :20MCA553

Credits :04

L:T:P:S :4:0:0:0

CIE Marks :50

Exam Hours :3

SEE Marks :50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	To provide sound knowledge in various middleware technologies
CO2	To familiarize between various web service architectures and their standards
CO3	To implement programs in EJB
CO4	To outline the functionalities of various types of middleware technologies
CO5	To design web services
CO6	To familiarize the real-time middleware

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	3	3
CO2	2	1	-	-	-	-	-	-	-	-	-	-	3	3
CO3	2	3	1	3	-	-	-	-	-	-	-	-	3	3
CO4	2	-	1	-	3	-	-	-	-	-	-	-	3	3
CO5	2	-	1	-	-	-	-	-	-	-	-	-	3	3
CO6	2	-	1	-	3	-	-	-	-	-	-	-	3	3

SYLLABUS

Module	Contents of the Module	Hours	COs
1	INTRODUCTION: Emergence of Middleware – Objects, Web Services – Middleware Elements – Vendor Architecture – Interoperability – Middleware in Distributed Applications – Types of Middleware – Transaction- Oriented Middleware – MOM – RPC.	9	CO1, CO2
2	OBJECT ORIENTED MIDDLEWARE OOM – Developing with OOM – Heterogeneity – Dynamic Object Request – Java RMI – COM+.	9	CO2, CO3, CO6
3	COMPONENT OBJECT RESOURCE BROKER ARCHITECTURE: (CORBA) Naming – Trading – Life Cycle – Persistence – Security – CORBA.	9	CO2, CO3, CO6
4	WEB SERVICES Introduction – XML Web Services standards – Creating Web Services – Extending Web Services – Messaging Protocol – Describing – Discovering – Securing.	9	CO4

5	OTHER TYPES OF MIDDLEWARE: Real-time Middleware – RT CORBA – Multimedia Middleware – Reflective Middleware – Agent-Based Middleware – RFID Middleware.	9	CO5, CO6
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Text Books:

1. Chris Britton and Peter Eye, "IT Architecture and Middleware", Pearson Education, 2nd Edition, 2004.
2. Wolfgang Emmerich, "Engineering Distributed Objects", John Wiley , 2000.
3. Keith Ballinger, ".NET Web Services – Architecture and Implementation", Pearson Education, 2003.

Reference Books:

1. Qusay H. Mahmoud, " Middleware for Communications", John Wiley and Sons , 2004.
2. Gerald Brose, Andreas Vogel, Keith Duddy, "JavaTM Programming with CORBATM: Advanced Techniques for Building Distributed Applications", Wiley, 3rd edition, January, 2004.
3. Michah Lerner, " Middleware Networks: Concept, Design and Deployment of Internet Infrastructure", Kluwer Academic Publishers, 2000.

Assessment Pattern

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	25	15	10
Remember	5	3	2
Understand	5	3	2
Apply	5	3	2
Analyze	5	3	2
Evaluate	3	3	2
Create	2		

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	50
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

PRINCIPLES OF DISTRIBUTED SYSTEMS

Course Code :20MCA554

Credits :04

L:T:P:S :4:0:0:0

CIE Marks :50

Exam Hours :3

SEE Marks :50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	To understand foundations of Distributed Systems
CO2	To introduce the idea of peer to peer services and Distributed Systems
CO3	To understand in detail the system level and support required File system
CO4	To understand the issues involved in studying for distributed system process and resource
CO5	To know about Real-time Middleware
CO6	To know Byzantine Fault Tolerance

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	3	3
CO2	2	1	1	3	3	-	-	-	-	-	-	-	3	3
CO3	2	3	1	-	-	-	-	-	-	-	-	-	3	3
CO4	2	-	1	-	3	-	-	-	-	-	-	-	3	3
CO5	2	-	1	-	-	-	-	-	-	-	-	-	3	3
CO6	2	-	1	-	3	-	-	-	-	-	-	-	3	3

SYLLABUS

Module	Contents of the Module	Hours	COs
1	INTRODUCTION: Introduction to Distributed systems - challenges - architectural models - fundamental models - P2P systems - Introduction to interprocess communications - external data representation and marshalling- client server communication - group communication- multicast/pubsub - Energy Efficient Computing - Cloud computing.	9	CO1, CO2
2	DISTRIBUTED OBJECTS AND FILE SYSTEM: Introduction - Communication between distributed objects - Remote procedure call - Events and notifications - Java RMI case Study - Introduction to DFS - File service architecture – Google file system - Introduction to Name Services- Name services and DNS - Directory and directory services-Cluster Computing-mapreduce/bigtable.	9	CO2, CO3, CO6
3	DISTRIBUTED OPERATING SYSTEM SUPPORT: The operating system layer – Protection - Process and threads - Communication and invocation - Operating system architecture - Introduction to time and global states - Clocks, Events and Process states - Synchronizing physical clocks - Logical time and logical clocks.	9	CO2, CO3, CO6

4	TRANSACTION AND CONCURRENCY: CONTROL-DISTRIBUTED TRANSACTIONS- Transactions – Nested transaction – Locks - Optimistic concurrency control - Timestamp ordering - Comparison of methods for concurrency control - Introduction to distributed transactions - Flat and nested distributed transactions - Atomic commit protocols - Concurrency control in distributed transactions - Distributed deadlocks - Transaction recovery - Data- Intensive Computing and Map Reduce.	9	CO4
5	FAULT TOLERANCE, SECURITY AND REPLICATION: Overview of security techniques - Cryptographic algorithms – Digital signatures - Cryptography pragmatics – Distributed Replication - CDNs and replication – Fault tolerant services - Byzantine Fault Tolerance - Detecting and Correcting Local Faults - Logging and Crash Recovery – Highly available services – Transactions with replicated data. Case study: Multiplayer online games, Social networking services, Large object CDN's (video/ audio streaming systems)	9	CO5, CO6

Text Books:

1. Tanenbaum, A. and van Steen, M., Distributed Systems: Principles and Paradigms, 2nd ed, Prentice Hall, 2007. ISBN: 0132392275.
2. Coulouris, G, Dollimore, J., and Kindberg, Distributed Systems: Concepts and Design, 4rd ed T., Addison-Wesley, 2006. ISBN: 0321263545
3. Mukesh Singhal, Ohio State University, Columbus ,“Advanced Concepts In Operating Systems”, McGraw-Hill Series in Computer Science, 1994.

Reference Books:

1. Kenneth P. Birman, “Reliable Distributed Systems: Technologies, Web Services, and Applications”, Springer.

Assessment Pattern

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	25	15	10
Remember	5	3	2
Understand	5	3	2
Apply	5	3	2
Analyze	5	3	2
Evaluate	3	3	2
Create	2		

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	50
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

SYSTEM SIMULATION AND MODELING

Course Code :20MCA555

Credits :04

L:T:P:S :4:0:0:0

CIE Marks :50

Exam Hours :3

SEE Marks :50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Identify the paradigms and approaches used to design the simulation.
CO2	Have a helping hand for identifying the type of simulation along its features.
CO3	Get an insight for the generation of data.
CO4	Implement the input modeling using different design strategies.
CO5	Implement the verification/ validation of the input models and analyzing the
CO6	Understand the various types of simulation, techniques and methods.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1	-	-	-	-	-	-	-	-	-	3	3
CO2	1	2	1	-	-	-	-	-	-	-	-	-	3	3
CO3	1	2	1	-	-	-	-	-	-	-	-	-	3	3
CO4	1	2	1	2	-	-	-	-	-	-	-	-	3	3
CO5	1	2	1	-	-	-	-	-	-	-	-	-	3	3
CO6	-	2	1	2	3	-	-	-	-	-	-	-	3	3

SYLLABUS			
Module	Contents of the Module	Hours	COs
1	<p>Introduction: When simulation is the appropriate tool and when it is not appropriate; Advantages and disadvantages of Simulation; Areas of application; Systems and system environment; Components of a system; Discrete and continuous systems; Model of a system; Types of Models; Discrete-Event System Simulation; Steps in a Simulation Study.</p> <p>Simulation examples: Simulation of queuing systems, Single-server Problems.</p>	9	CO1, CO6
2	<p>General Principles, Simulation Software: Concepts in Discrete-Event Simulation: The Event-Scheduling / Time-Advance Algorithm, World Views, Manual simulation Using Event Scheduling. Queuing Models: Characteristics of queuing systems; Queuing notation; Networks of queues.</p>	9	CO2, CO6

3	Random-Number Generation, Random-Variate Generation: Properties of random numbers; Generation of pseudo-random numbers; Techniques for generating random numbers; Tests for Random Numbers(K-S, Chi-square, Autocorrelation). Random-Variate Generation: Inverse transform technique; Acceptance-Rejection technique.	9	CO3, CO6
4	Statistical Models in Simulation: Review of terminology and concepts; Useful statistical models; Discrete distributions; Continuous distributions; Poisson process. Input Modeling: Data Collection; Identifying the distribution with data; Parameter estimation; Goodness of Fit Tests; Fitting a non-stationary Poisson process; Selecting input models without data.	9	CO4, CO1
5	Output Analysis for a Single Model: Types of simulations with respect to output analysis; Stochastic nature of output data; Measures of performance and their estimation. Verification and Validation of Simulation Models: Model building, verification and validation; Verification of simulation models; Calibration and validation of modes.	9	CO5

Text Books:

1. Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: Discrete-Event System Simulation, 4th Edition, Pearson, 2010.

Reference Books:

1. Lawrence M. Leemis, Stephen K. Park: Discrete – Event Simulation: A First Course, Pearson / Prentice-Hall, 2006.
2. Averill M. Law: Simulation Modeling and Analysis, 4th Edition, Tata McGraw-Hill, 2007.
3. Simulation 5ed Ross Elsevier
4. Theory of modeling and simulation, Zeiglar, Elsevier

Assessment Pattern

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	25	15	10
Remember	5	3	2
Understand	5	3	2
Apply	5	3	2
Analyze	5	3	2
Evaluate	3	3	2
Create	2		

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	50
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

PROGRAMMING USING C#.NET LAB

Course Code : 20MCAL56
L:T:P:S : 0:0:1.5:0
Exam Hours : 3

Credits :1.5
CIE Marks :25
SEE Marks :25

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	To develop background knowledge of .Net and in C#
CO2	To understand the knowledge of object oriented programming and applications in C#
CO3	Create Windows Form applications
CO4	Use ADO.NET to access SQL Server
CO5	To understand the delegates, events and web form creation and provide knowledge for creating websites
CO6	Build C# .NET applications using Visual Studio

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	1	-	-	-	-	-	-	3	3
CO2	2	-	-	-	-	-	-	-	-	-	-	-	3	3
CO3	1	-	-	-	1	-	-	-	-	-	-	-	3	3
CO4	2	3	2	-	-	-	-	-	-	-	-	-	3	3
CO5	2	3	2	1	-	1	-	-	-	-	-	-	3	3
CO6	2	-	1	1	-	1	-	-	-	-	-	-	3	3

PART - A

1. Write a Program in C# to demonstrate Command line arguments processing.
2. Write a Program in C# to demonstrate boxing and Unboxing.
3. Find the sum of all the elements present in a jagged array of 3 inner arrays.
4. Write a program to demonstrate abstract class and abstract methods in C#.
5. Demonstrate the use of Virtual and override key words in C# with a simple program.
6. Write a program to illustrate the use of different properties in C#.
7. Write a program to demonstrate Operator overloading.
8. Write a program to demonstrate delegates
9. Using Try, Catch and Finally blocks write a program in C# to demonstrate error handling.
10. Demonstrate arrays of interface types (for runtime polymorphism) with a C# program.

PART - B

1. Consider the Database STUDENT consisting of following tables: tbl_Course (CourseID: int, CourseName: string) tbl_Student (USN: string, StudName: string, Address: string, CourseID: int, YrOfAdmsn: int)

Develop suitable windows application using C#.NET having following options:

- a. Entering new course details.

- b. Entering new student details.
 - c. Display the details of students (in a Grid) who belong to a particular course.
 - d. Display the details of the students who have taken admission in a particular year
2. Consider the Database BLOODBANK consisting of following tables: tbl_BloodGroup (BloodID: int, BloodGroup: string) tbl_Donor (DonorID: int, DonorName: string, Address: string, ContactNo: int, DOB: date, Gender: string, Weight: int, BloodID: int)

Develop suitable windows application using C#.NET having following options:

- a. Entering Blood group details.
 - b. Entering new donor details.
 - c. Display the details of donors (in a Grid) having particular blood group.
 - d. Display the details of donors (in a Grid) based on gender.
3. Web Application for an Educational Institution – The page should consist of Institution name, logo, and address. Hyperlink to Dept, facilities and feedback. Feed back page should have fields to enter name, email and message with submit and Cancel button.

CIE- Continuous Internal Evaluation (25Marks) PRACTICAL

Bloom's Taxonomy	Tests
Marks	25
Remember	5
Understand	5
Apply	5
Analyze	2
Evaluate	3
Create	5

SEE- Semester End Examination (25 Marks) PRACTICAL

Bloom's Taxonomy	Tests
Marks	25
Remember	5
Understand	5
Apply	5
Analyze	2
Evaluate	3
Create	5

SOFTWARE QUALITY AND TESTING LAB

Course Code :20MCAL57
 L:T:P:S :0:0:1.5:0
 Exam Hours :3

Credits :1.5
 CIE Marks :25
 SEE Marks :25

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the basic components of a testing process in improving the quality of software
CO2	Generate appropriate test cases from the requirements of the software application
CO3	Factual understanding of functional testing with examples
CO4	Comprehend structural testing with examples
CO5	Understand the software automation process, components of selenium and installation procedure of Selenium web driver
CO6	Discussion oriented lectures by the instructor, laboratory exercises using selenium, invited workshops by experts from the industry will be the primary mechanisms for learning and knowledge.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	-	3	-	2	-	-	2	-	-	3	3
CO2	2	2	1	-	3	-	1	-	-	2	-	-	3	3
CO3	2	1	3	-	3	-	1	-	-	2	-	-	3	3
CO4	1	1	-	-	2	-	2	-	-	2	-	-	3	3
CO5	2	2	3	-	1	-	1	-	-	2	-	-	3	3
CO6	2	1	3	-	2	-	1	-	-	2	-	-	3	3

1. Designing Test Cases using Selenium IDE
2. Designing Test Suites using Selenium IDE
3. Write an automated selenium script to login into a web page
4. Write a program to test whether a test case has passed or failed
5. Write a java program to update the records of 10 students in a student table
6. Write a test program to list the total number of objects present on a web page
7. Write a test program to list the number of items in a list or a combo box
8. Write a test program to automate drop-down choosing in any website
9. Write a test program to automate the registration page of any website
10. Write a program to automate the login page using hard-coded values

CIE-Continuous Internal Evaluation (25Marks) PRACTICAL

Bloom's Taxonomy	Tests
Marks	25
Remember	5
Understand	5
Apply	5
Analyze	2
Evaluate	3
Create	5

SEE-Semester End Examination (25Marks)PRACTICAL

Bloom's Taxonomy	Tests
Marks	25
Remember	5
Understand	5
Apply	5
Analyze	2
Evaluate	3
Create	5

MINI PROJECT USING .NET, C# AND SOFTWARE TESTING

Course Code :20MCA58

Credits :03

L:T:P:S : 0:0:3:0

CIE Marks :50

Exam Hours :3

SEE Marks :50

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

CO1	Recall the concepts learnt in .NET, C# AND SOFTWARE TESTING.
CO2	Illustrate a suitable case study for the domain of applications to be developed.
CO3	Apply the required tools and techniques for software development.
CO4	Examine the requirements and transform them to a software module.
CO5	Assess the valid arguments in case study against the software module developed.
CO6	Formulate the test cases and strategies for the software module developed.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	1	1	3	3
CO2	3	3	3-	-	-	-	-	-	-	-	1	1	3	3
CO3	3	3	3	2	1	-	3	1	-	-	1	1	3	3
CO4	3	3	3	2	1	-	3	1	-	-	1	1	3	3
CO5	3	3	3	2	1	-	3	1	-	-	1	1	3	3
CO6	3	3	3	2	1	-	3	1	-	-	1	1	3	3

List of sample project titles:

1. Campus Recruitment System
2. Network Monitor
3. Push-Pull Email Utility on Mobiles
4. Wi-Fi Connectivity Meta-data Omnibus Messaging and GPRS Integrated Monitoring tool
5. Client-System Monitoring via Mobile Based Message Integration
6. Online Exam with Graphical Presentation Project
7. Online Tax Information System A ASP.Net Project.
8. Online Recruitment portal Project Report.
9. Automobile EMI Management System A ASP.NET Project.

CIE-Continuous Internal Evaluation (50 Marks) PRACTICAL

Bloom's Taxonomy	Tests
Marks	50
Remember	5
Understand	5
Apply	10
Analyze	10
Evaluate	10
Create	10

SEE-Semester End Examination (50 Marks)PRACTICAL

Bloom's Taxonomy	Tests
Marks	50
Remember	5
Understand	5
Apply	10
Analyze	10
Evaluate	10
Create	10

SIXTH SEMESTER
MCA SYLLABUS

INTERNSHIP PROJECT

Course Code :20MCA61
L:T:P:S :0:0:17:0
Exam Hours :3

Credits :17
CIE Marks :150
SEE Marks :150

Course Outcomes: At the end of the Internship/Project, the student will be able to:

CO1	Identify skills to work and gain knowledge in the software industry.
CO2	Map theoretical knowledge with practical knowledge.
CO3	Analyze real-time experience and develop code for projects.
CO4	Demonstrate the strengths in tune with the current industry demands.
CO5	Enhance teamwork skills.
CO6	Demonstrate communication skills required to deliver effective technical presentations.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	1	1	2	2	1	-	-	1	1	-	3	3
CO2	3	-	3	1	2	2	1	-	-	1	1	-	3	3
CO3	3	3	3	1	2	2	1	2	-	1	1	1	3	3
CO4	3	3	3	1	2	2	1	2	-	1	1	1	3	3
CO5	3	3	3	1	2	2	1	-	-	1	3	-	3	3
CO6	3	3	3	1	2	2	1	-	3	1	1	-	3	3

General Guidelines:

1. Students are required to take up individual project in companies/Respective Colleges other than the mini project standards already taken up during previous semester
2. Project should be real time work, for total of 6 months duration
3. Project work may be application oriented or research oriented as per student and guide's interest. Therefore the project reports will vary depending on whether it is application oriented project or research based project.
4. Regular project work weekly dairy should be maintained by the students, signed by the external guide and internal guide in order to verify the regularity of the student. (Enclosing the Format)
5. Seminars / presentation should be given at Synopsis, SRS, Design and Project Completion levels.
6. Project verification at the place of project work must be mandatory by the internal guide, for completion of the work.
7. If project report is not as per the format and not a real time project, external exams will have every right to reject the project
8. Students are encouraged and appreciated to show their project code demo along with their power point slide show during their viva-voce exams as an added advantage.

GUIDELINES FOR THE PREPARATION OF MCA 6TH SEMESTER PROJECT REPORTS

- 1. Printing Area:** The margins should be: **Left:** 1.25", **Right:** 1.00", **Top and Bottom-** 1.00". The text should be justified to occupy the full line width, so that the right margin is not ragged, with words hyphenated as appropriate. Please fill pages so that the length of the text runs to the right margin.
- 2.** The report must be printed on one side only. Please use a high-resolution printer, preferably a laser printer with at least 300 dpi. Project reports must be printed neatly on one side of the paper on a A4 size bond paper. The reports submitted to the department/guide(s) must be hard bounded with dry tone Xerox.
- 3. Abstract:** The abstract should summarize the contents of the report and should contain at least 150 and at most 350 words. It should be set in 12-point font size. There should be two blank (10-point) lines before and after the title **ABSTRACT**.
- 4. Layout, Typeface, Font Sizes, and Numbering:** For the main text, please use 12-point type and 1.5 line spacing. We recommend using **Times New Roman** fonts. Italic type may be used to emphasize words in running text. Bold type and underlining should be avoided.
- 5. Headings.** The chapter headings should be in capitals and must be separated from the other text by 24 point line space. Headings should be in the form where each word is capitalized (i.e., nouns, verbs, and all other words except articles, prepositions, and conjunctions should be set with an initial capital) and should, with the exception of the title, be aligned to the left. The font sizes are given in Table 1. Here are some examples of headings: "Criteria to Disprove Context-Freeness of Collage Languages", "On Correcting the Intrusion of Tracing Non-deterministic Programs by Software", "A User-Friendly and Extendable Data Distribution System", "Multi-flip Networks: Parallelizing GenSAT", "Self-determinations of Man".
- 6. Figures and Photographs** Check that in line drawings, lines are not interrupted and have constant width. Grids and details within the figures must be clearly readable and may not be written one on top of the other. The lettering in figures should have a height of 2 mm (10-point type). Figures should be scaled up or down accordingly. Figures should be numbered and should have a caption which should always be positioned under the figures, in contrast to the caption belonging to a table, which should always appear above the table. Please center the captions between the margins and set them in 9-point type (Fig. 1 shows an example). The distance between text and figure should be about 12 point spacing, the distance between figure and caption about 6 point spacing.
- 7 Formulas** Displayed equations or formulas are centered and set on a separate line (with an extra line or

halfline space above and below). Displayed expressions should be numbered for reference. The numbers should be consecutive within each section or within the contribution, with numbers enclosed in parentheses and set on the right margin. For example, A correlation matrix is computed using equation (5), Here, and are the feature vectors of query examples and and is the dimension of feature .

8. Program Code Program listings or program commands or algorithms in the text are normally set in typewriter font, e.g., CMTT10 or Courier. Example of an Algorithm is

Output: Database created.

Methodology:

For each input image do

Step1: Pre-process the image as explained in section 4.3.1

Step2: Calculate the number of components in a sign as explained in section 4.3.1.

Step3: calculate a feature vector as mentioned in section 4.3.2.1.

Step4: Store the feature vector computed in step 3 in the corresponding database, based on number of components present in the sign. For End. Algorithm End.

9. Footnotes/ Header Footnotes/Header should appear at the bottom of the normal text area, with a line of about 5 cm in Word set immediately below/above the text. Header sample: (Project title is left aligned and page number is right aligned) <<Project Title>><<Page Number>>

10. Sample Footer: <College Name> Department of MCA 2017-2018

11. The list of Reference is headed "Reference" and is assigned a number with square brackets in the decimal system of headings. The list should be set in small print and placed at the end of the dissertation, in front of the appendix, if any exists. Please do not insert a page break before the list of Reference if the page is not completely filled. An example is given at the end of this information sheet. For citations in the text please use square brackets and consecutive numbers: [1], [2], [3] etc.

12. Page Numbering Reports must be printed with page numbers on the top right corner.

13. The total number of reports to be prepared are three

One copy to the concerned guide

One copy for University

One copy to candidate

Two CD's having soft copy of Project report (for department purpose)

14. Before taking the **final printout**, the approval of the concerned guide is mandatory and suggested corrections, if any, must be incorporated.

15. Every copy of the report must contain (See formats towards the end of this document) · Outer title page (parrot green) with a plastic cover · Inner title page (White)

Certificate in the format enclosed, only certificate will be signed by following:

Principal

HOD

Internal guide and External guide (if project is carried out in company) Guide
and/or Co-guide (if project is carried out in college)

16. The **organization of the report** should be as follows

Inner title page

Certificate

Project Completion certificate from Company / College

Declaration (by student) Acknowledgement Abstract

Table of Contents

List of table and figures

Main body of project

Proper **attention is to be paid to the technical contents as well as to the organization of the report and clarity of the expression.** Care should be taken to avoid spelling and typing errors. The student should note that report (write-up)

forms the important component in the overall evaluation of the project. Sample content (more suitable for Application oriented projects) is attached and number of pages may be 40 -70 which can be modified as per guide's instructions depending on the project under development. The respective guides can decide how the content of the project report must be organized if the project is

research oriented, as a specific format cannot be defined for various domains of research problems. CONTENTS (For Application-oriented Projects)

1. INTRODUCTION

PROJECT DESCRIPTION (2-4 pages)

COMPANY PROFILE (1-2-3 pages)

2. LITERATURE SURVEY

EXISTING AND PROPOSED SYSTEM (2-3 pages)

FEASIBILITY STUDY (2-3 pages)

TOOLS AND TECHNOLOGIES USED (2-4 pages)

HARDWARE AND SOFTWARE REQUIREMENTS (1 page)

3. SOFTWARE REQUIREMENT SPECIFICATION

USERS (2-3 pages)

FUNCTIONAL REQUIREMENTS (2-3 pages)

NON-FUNCTIONAL REQUIREMENTS (2-3 pages)

4. SYSTEM DESIGN (High level or Architectural design)

SYSTEM PERSPECTIVE (1-2 pages)

CONTEXT DIAGRAM (1-2 pages)

5. DETAILED DESIGN (various design diagrams according to project)

USE CASE DIAGRAM (4-6 pages)

SEQUENCE DIAGRAMS (4-6 pages)

COLLABORATION DIAGRAMS (3-5 pages)

ACTIVITY DIAGRAM (4-6 pages)

DATABASE DESIGN (ER and/or Conceptual schema)(3-4 pages)

6. IMPLEMENTATION (no full code, code snippet may be included)

SCREEN SHOTS (15-20 pages)

7. SOFTWARE TESTING (Test cases etc.)(6- 8 pages)

8. CONCLUSION (1 page)

9. FUTURE ENHANCEMENTS (1 page) Appendix A

BIBLIOGRAPHY (1 page) Appendix B USER

MANUAL (2-10 pages)

(COVER PAGE)

PROJECT TITLE

A Dissertation submitted in partial fulfillment of the requirements for the award of degree of

NEW HORIZON COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to VTU)

By

**STUDENT NAME
(USN Number)**

Under the Guidance of

GUIDE NAME



Department of Master of Computer Applications

NEW HORIZON COLLEGE OF ENGINEERING

Outer Ring Road, Near Marathalli,

Bangalore – 560 103, KARNATAKA

MAY 2018

(Inner Title Page)

PROJECT TITLE

A Dissertation submitted in partial fulfillment of the requirements for the award of degree of

MASTER OF COMPUTER APPLICATIONS

of

NEW HORIZON COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to VTU)

By

STUDENT NAME

(USN Number)

Under the Guidance of

Internal Guide:

Guide Name, Affiliation

Address & Email

External Guide:

Guide Name Affiliation

Address & Email



Department of Master of Computer Applications

NEW HORIZON COLLEGE OF ENGINEERING

Outer Ring Road, Near Marathalli,

Bangalore – 560 103, KARNATAKA

MAY 2018

(Certificate)

NEW HORIZON COLLEGE OF ENGINEERING



Department of Master of Computer Applications

NEW HORIZON COLLEGE OF ENGINEERING

Outer Ring Road, Near Marathalli,

Bangalore – 560 103, KARNATAKA

CERTIFICATE

This is to Certify that **Student Name** has completed his/her final semester project work entitled “*****” as a partial fulfillment for the award of Master of Computer Applications degree, during the academic year 2018 under my (our joint) supervision.

Signature of Internal Guide

Signature of External Guide

Name Affiliation Address

Head of the Dept./Director

Principal

INTERNAL EXAMINER

EXTERNAL EXAMINER

Declaration

I, **<Name of student>**, student of 6th MCA, **<College Name>**, bearing USN **<USN of student>** hereby declare that the project entitled **<Project Title>** has been carried out by me under the supervision of External Guide /(or Guide) **<Name of the Guide>**, **<Designation of Guide>** and Internal Guide (or Co-guide) **<Name of the Guide>**, **<Designation of Guide>** and submitted in partial fulfillment of the requirements for the award of the Degree of Master of Computer Applications by the **Visvesvaraya Technological University** during the academic year 2018. This report has not been submitted to any other Organization/University for any award of degree or certificate.

Name:

Signature:

Project Work Evaluation: (Industry Internship Project – (20MCA61)

- During project work, the evaluation process will be divided into number of phases to assess the continuous progress (Minimum three phases).
- The project guides and project coordinator follows rubrics, which is set by the Department for evaluation and then submit to the head of department.
- Each internal guide will see the statement of project and literature of work and implementation details. The department will encourage students to make publications in standard conference/journal forums.

Rubrics for Major Project Evaluation CIE: 20MCA61

Review #	Agenda	Assessment	Review Assessment Weightage	Overall Weightage
Review 1	Project Synopsis Evaluation	Rubrics1	50	50 (Avg of R1, R2, R3, R4, R5)
Review 2	Mid-Term Project Evaluation	Rubrics2	50	
Review 3	End-Semester Project Evaluation	Rubrics3	50	
Review 4	Project Report Evaluation	Rubrics4	50	
Review 5	Evaluation by Guide	Rubrics5	50	
Evaluation of Project Report	Project Report &		50	100
	Paper in Journal		50	
External Evaluation- Viva voce			150	150
Total				300

Rubric # R1: Project Synopsis Evaluation: Maximum Marks: 50

Parameters	Allocated Marks	Low	Medium	High
Identification of Problem Domain and Detailed Analysis	15	Minimal explanation of the purpose and need of the project	Average explanation of the purpose and need of the project	Detailed and extensive explanation of the purpose and need of the project
		0 - 6 Marks	7 - 11 Marks	12 - 15 Marks
Study of the existing system and Feasibility of the project proposal	15	Minimal explanation of the specification and limitations of the existing system	Moderate study of the existing systems; collects some basic information	Detailed and extensive explanation of the specifications and the limitations of the existing system
		0 - 6 Marks	7 - 11 Marks	12 - 15 Marks
Objectives and Methodology of the proposed work	20	Objectives of the proposed work are either not identified or not well defined; Incomplete and improper specification	Average justification to the objectives proposed; Steps are mentioned but unclear; without justification to objectives	All objectives of the proposed work are well defined; Steps to be followed to solve the defined problem are clearly specified
		0 - 8 Marks	9 - 14 Marks	15- 20 Marks

Rubric # R2: Mid Term Project Evaluation: Maximum Marks: 50

Parameters	Allocated Marks	Low	Medium	High
Design Methodology	15	Modular approach not adopted, design methodology not defined	Division of problem into modules but inappropriate selection of computing framework, design methodology not defined properly	Division of problem into modules and good selection of computing framework, appropriate design methodology
		0 - 6 Marks	7 - 11 Marks	12 - 15 Marks

Usage of System Design Diagrams (ER, Use Case diagram so on)	15	Minimum usage of ER diagrams, Use Case diagram, Sequence diagram, Class diagram and so on, diagrams not depicting the flow of the project	Considerable usage of ER diagrams, Use Case diagram, Sequence diagram, Class diagram and so on, diagrams depicting the flow of the project to some extent	Maximum usage of ER diagrams, Use Case diagram, Sequence diagram, Class diagram and so on, diagrams depicting the flow of the project
		0 - 6 Marks	7 - 11 Marks	12 - 15 Marks
Incorporation of suggestions	20	Suggestions during mid-term evaluation are not incorporated	Moderate Changes are made as per modifications suggested during midterm evaluation	Changes are made as per modifications suggested during midterm evaluation and new innovations added
		0 - 8 Marks	9 - 14 Marks	15- 20 Marks

Rubric # R3: End-Semester Project Evaluation: Maximum Marks: 50

Parameters	Allocated Marks	Low	Medium	High
Test Cases & Screen Shots of the Design	15	Usage of minimum Test Cases, minimum screen shots designed	Usage of considerable Test Cases & screen shots designed	Usage of all Test Cases, and all screen shots designed
		0 - 6 Marks	7 - 13 Marks	14 - 20 Marks
Conclusion and Discussion	15	Results are not presented properly, project work is not summarized and concluded, Future extensions in the project are not specified	Results presented are satisfactory, project work summary and conclusion not very appropriate, Future extensions in the project are specified	Results are presented in a very appropriate manner, project work is well summarized and concluded, Future extensions in the project are well specified
		0 - 6 Marks	7 - 11 Marks	12 - 15 Marks
Organization & development of Report	20	Inadequate organization and/or development	Some organization evident, but inconsistent	Connects ideas within document and to other sources and ideas; Points are logically developed and flow logically from one idea to the next
		0 - 8 Marks	9 - 14 Marks	15- 20 Marks

Rubric # R4: Project Report Evaluation: Maximum Marks: 50

Parameters	Allocated Marks	Low	Medium	High
Description of concepts and Technical Details	15	Inappropriate explanation of key concepts, poor description of technical requirements of the project	Insufficient description of technical requirements of the project	Complete explanation of key concepts, Strong description of technical requirements of the project
		0 - 6 Marks	7 - 11 Marks	12 - 15 Marks
Project Demonstration	15	Defined objectives not achieved, modules are not in proper working form that further leads to failure of integrated system	Some of the defined objectives are achieved, all modules working well and modules are not properly integrated	All defined objectives are achieved, all modules working well and integrated, project properly demonstrated
		0 - 6 Marks	7 - 11 Marks	12 - 15 Marks
Project Report	20	Project report not prepared according to the specified format, Reference are not appropriate	Project report is according to the specified format, but not well prepared, Reference are missing	Project report is according to the specified format, Reference are appropriate
		0 - 8 Marks	9 - 14 Marks	15- 20 Marks

Rubric # R5: Evaluation by Guide: Maximum Marks: 50

Parameters	Allocated Marks	Low	Medium	High
Self Motivation and Determination	15	Lacks self motivation and determination	Completes the project, but sometimes lacks self motivation	Approaches the project with self motivation and follows till completion
		0 - 6 Marks	7 - 11 Marks	12 - 15 Marks
Technical Knowledge & Awareness related to the project	15	Lacks sufficient knowledge	Fair knowledge related to the project	Extensive knowledge related to the project
		0 - 6 Marks	7 - 11 Marks	12 - 15 Marks

Regularity	20	Irregular in attendance and inconsistent in work	Reports to the guide but lacks consistency	Reports to the guide regularly and consistent in work
		0 - 8 Marks	9 - 14 Marks	15- 20 Marks

Rubric : Evaluation of Project Report ; Maximum Marks : 100

Parameters	Allocated Marks	Low	Medium	High
Project Report	50	Project report not prepared according to the specified format, Reference are not appropriate	Project report is according to the specified format, but not well prepared, Reference are missing	Project report is according to the specified format, Reference are appropriate
		0 - 20 Marks	20 - 35 Marks	36- 50 Marks
Paper in Journal	50	Paper not published in journal	Paper published in conference but not in journal	Paper published in journal
		0	20 Marks	50 Marks

Rubric : External Evaluation – Viva Voce ; Maximum Marks : 150

Parameters	Allocated Marks	Low	Medium	High
Identification of Problem domain, Objectives and Methodology of the proposed work	30	Minimal explanation of the purpose and need of the project, Objectives of the proposed work are either not identified or not well defined; Incomplete and improper specification	Average explanation of the purpose and need of the project. Average justification to the objectives proposed; Steps are mentioned but unclear; without justification to objectives	Detailed and extensive explanation of the purpose and need of the project, All objectives of the proposed work are well defined; Steps to be followed to solve the defined problem are clearly specified
		0 - 12 Marks	13 – 21 Marks	22- 30 Marks

Design Methodology	30	Modular approach not adopted, design methodology not defined	Division of problem into modules but inappropriate selection of computing framework, design methodology not defined properly	Division of problem into modules and good selection of computing framework, appropriate design methodology
		0 - 12 Marks	13 – 21 Marks	22- 30 Marks
Usage of System Design Diagrams (ER, Use Case diagram so on)	30	Minimum usage of ER diagrams, Use Case diagram, Sequence diagram, Class diagram and so on, diagrams not depicting the flow of the project	Considerable usage of ER diagrams, Use Case diagram, Sequence diagram, Class diagram and so on, diagrams depicting the flow of the project to some extent	Maximum usage of ER diagrams, Use Case diagram, Sequence diagram, Class diagram and so on, diagrams depicting the flow of the project
		0 - 12 Marks	13 – 21 Marks	22- 30 Marks
Test Cases, Screen Shots of the Design, Conclusion and Discussion	30	Usage of minimum Test Cases, minimum screen shots designed Results are not presented properly, project work is not summarized and concluded, Future extensions in the project are not specified	Usage of considerable Test Cases & screen shots designed Results presented are satisfactory, project work summary and conclusion not very appropriate, Future extensions in the project are specified	Usage of all Test Cases, and all screen shots designed Results are presented in a very appropriate manner, project work is well summarized and concluded, Future extensions in the project are well specified
		0 - 12 Marks	13 – 21 Marks	22- 30 Marks
Project Communication / Presentation / Interaction	30	Language and/or delivery resulted information being communicated orally with limited effectiveness Contents of presentations are not appropriate and not well delivered. Poor delivery of presentation & Interaction	Language and/or delivery resulted information being communicated orally with considerable effectiveness. Contents of presentations are appropriate but not and well delivered. Eye contact with few people and unclear voice & Interaction	Language and/or delivery resulted information being communicated orally with high degree of effectiveness Contents of presentations are appropriate and well delivered, proper eye contact with audience and clear voice with good language & Interaction
		0 - 12 Marks	13 – 21 Marks	22- 30 Marks

SEMINAR - 2

Course Code :20MCA62
L:T:P:S :0:0:0:2
Exam Hours :3

Credits :02
CIE Marks :50
SEE Marks :50

Seminar Work Evaluation: (20MCA62)

- Seminar coordinators follow rubrics, which is set by the Department for evaluation of seminar work and report prepared by the students in VI semester.
- Seminar coordinators will conduct three seminars per student. Students will be evaluated by the seminar coordinator.
- CIE is for 50 marks, and SEE is for 50 marks.

Rubrics for Seminar Evaluation (CIE):

Table: Rubrics used for CIE - Seminar, Total Marks - 50

Parameters	Allocated Marks	Low	Medium	High
Topic Knowledge	10	Student does not have Subject Knowledge. Student cannot answer questions about subject	Student has considerable knowledge about Subject. Student can answer few questions about subject	Student has good Subject Knowledge. Student can answer most of the questions or all questions about subject
		0 - 3 Mark	4 - 7 Marks	8 - 10 Marks
Adequacy of coverage, Recent Trends and Creativity	10	Seminar exhibited impartiality with limited success. Seminar topic not related to Recent Trends and Creativity.	Seminar exhibited impartiality with considerable success. Seminar topic considerably related to Recent Trends and Creativity.	Seminar exhibited impartiality with a high degree of success. Seminar topic is highly related to Recent Trends and Creativity.
		0 - 3 Mark	4 - 7 Marks	8 - 10 Marks
Communication Skill and Level of Confidence (Oral)	10	Language and/or delivery resulted information being communicated orally with limited effectiveness	Language and/or delivery resulted information being communicated orally with considerable effectiveness	Language and/or delivery resulted information being communicated orally with high degree of effectiveness
		0 - 3 Mark	4 - 7 Marks	8 - 10 Marks
Time Management, Q& A Session	10	Seminar not delivered within the stimulated time. Questions are not answered	Seminar delivered within the stimulated time. Questions are answered but not up to the mark	Seminar delivered within the stimulated time. Questions are answered well
		0 - 3 Mark	4 - 7 Marks	8 - 10 Marks
Seminar Report	10	Seminar report not prepared according to the specified format, Reference are not appropriate	Seminar report is according to the specified format, but not well prepared, Reference are missing	Seminar report is according to the specified format, Reference are appropriate
		0 - 3 Mark	4 - 7 Marks	8 - 10 Marks

Rubrics for Seminar Evaluation (SEE):

Table : Rubrics used for SEE - Seminar, Total Marks - 50

Parameters	Allocated Marks	Low	Medium	High
Topic Knowledge	10	Student does not have Subject Knowledge. Student cannot answer questions about subject	Student has considerable knowledge about Subject. Student can answer few questions about subject	Student has good Subject Knowledge. Student can answer most of the questions or all questions about subject
		0 - 3 Mark	4 - 7 Marks	8 - 10 Marks
Adequacy of coverage, Recent Trends and Creativity	10	Seminar exhibited impartiality with limited success. Seminar topic not related to Recent Trends and Creativity.	Seminar exhibited impartiality with considerable success. Seminar topic considerably related to Recent Trends and Creativity.	Seminar exhibited impartiality with a high degree of success. Seminar topic is highly related to Recent Trends and Creativity.
		0 - 3 Mark	4 - 7 Marks	8 - 10 Marks
Communication Skill and Level of Confidence (Oral)	10	Language and/or delivery resulted information being communicated orally with limited effectiveness	Language and/or delivery resulted information being communicated orally with considerable effectiveness	Language and/or delivery resulted information being communicated orally with high degree of effectiveness
		0 - 3 Mark	4 - 7 Marks	8 - 10 Marks
Time Management, Q& A Session	10	Seminar not delivered within the stimulated time. Questions are not answered	Seminar delivered within the stimulated time. Questions are answered but not up to the mark	Seminar delivered within the stimulated time. Questions are answered well
		0 - 3 Mark	4 - 7 Marks	8 - 10 Marks
Seminar Report	10	Seminar report not prepared according to the specified format, Reference are not appropriate	Seminar report is according to the specified format, but not well prepared, Reference are missing	Seminar report is according to the specified format, Reference are appropriate
		0 - 3 Mark	4 - 7 Marks	8 - 10 Marks
