MASTER OF COMPUTER APPLICATIONS

CURRICULUM AND SYLLABUS

(For students admitted from the Academic year 2022-2023)

UNDER CHOICE BASED CREDIT SYSTEM

[Regulations 2022]

DIRECTORATE OF DISTANCE EDUCATION
SRM INSTITUTE OF SCIENCE AND TECHNOLOGY
SRM NAGAR, KATTANKULATHUR – 603 203

DIRECTORATE OF DISTANCE EDUCATION
MASTER OF COMPUTER APPLICATIONS
(For students admitted from the academic year 2022-2023)

CURRICULUM

SEMESTER – I

Category	Course Code	Course Title	L	T	P	Total LTP	C
Compulsory Core	MCAD2211	Operating System	3	1	0	4	4
	MCAD2212	Database Technology	3	0	4	7	5
Student Must Select any one of the following Core Courses							
Choice Based Core 1	MCAD2213	Programming in Java	3	0	4	7	5
	MCAD2214	Visual Programming Using C# and VB.Net					
Student Must Select any one of the following Elective Courses							
Elective 1	MCAD22E1	Enterprise Resource Planning	3	1	0	4	4
	MCAD22E2	Organizational Behavior					
		Total	**12**	**2**	**8**	**22**	**18**

SEMESER - II

Category	Course Code	Course Title	L	T	P	Total LTP	C
Compulsory Core1	MCAD2221	Python Programming	3	0	4	7	5
	MCAD2222	Software Engineering and Software Testing	3	1	0	4	4
	MCAD2223	Data Mining and Data Warehousing	3	1	0	4	4
Student Must Select any one of the following Core Courses							
Choice Based Core 1	MCAD2224	Advanced Java Programming	3	0	4	7	5
	MCAD2225	Web programming using ASP.NET					
Supportive Course	MCAD2226	Data Analysis Using R	0	1	2	3	2
		Total	**12**	**3**	**10**	**25**	**20**

SEMESTER - III

Category	Course Code	Course Title	L	T	P	Total LTP	C
Compulsory Core 1	MCAD2231	Object Oriented Analysis and Design With UML	3	1	4	8	6
	MCAD2232	Big Data and its Applications	3	1	0	4	4
Student Must Select any one of the following Core Courses							
Choice Based Core	MCAD 2233	Open-Source Technologies	3	1	4	8	6
	MCAD2234	Artificial Intelligence and Machine Learning					
Compulsory Core2	MCAD2235	Mini Project	0	0	4	4	2
Student Must Select any one of the following Elective Courses							
Elective 2	MCAD22E3	Cloud Computing	3	1	0	4	4
	MCAD22E4	Internet of Things (IoT)					
		Total	**12**	**4**	**12**	**28**	**22**

SEMESTER - IV

Category	Course Code	Course Title	L	T	P	Total LTP	C
Student Must Select any one of the following Elective Courses							
Elective 3	MCAD22E5	Computer Networks	4	0	0	4	4
	MCAD22E6	Network Security					
Compulsory Core 1	MCPD2241	Project Work	0	6	20	26	16
		Total	**4**	**6**	**20**	**30**	**20**

Total Credits to be earned for the degree : 80

ELIGIBILITY AND DURATION – Regulations 2022

Programme	Eligibility	Credits	Duration	Maximum Duration
Master of Computer Applications	Any Degree in the UG degree as per **AICTE** norms[Must have studied mathematics in 10+2 or graduation level}	**80**	**2 Years**	**4 Years**

DIRECTORATE OF DISTANCE EDUCATION
MASTER OF COMPUTER APPLICATIONS

Program Educational Objectives (PEOs)

- **PEO1**: To prepare the students to outclass in their profession by providing concrete technical foundations in the field of Computer Applications.
- **PEO2:** To provide the students various computing skills like the analysis, design and development of pioneering software products with modern tools to meet the industry needs.
- **PEO3**: To motivate the students to pursue continuous/lifelong learning and to involve them in research as computing professionals and experts in the broadest context of technological change.
- **PEO4:** To prepare the students who will achieve peer-recognition effectively as individuals or as team members in various projects/internships involving technical, decision-making, economical and social constrictions to contribute to the growth of the nation and society.
- **PEO5:** To encourage the students to communicate and function efficiently in teams in multidisciplinary fields within the global, societal and environmental context, with ethical values.

Student outcomes (SOs/POs-Program Outcomes)

The curriculum and syllabus for Master degrees (2022) conform to outcome based teaching learning process. In general, TWELVE STUDENT OUTCOMES (a-k) have been identified and the curriculum and syllabus have been structured in such a way that each of the courses meets one or more of these outcomes. Student outcomes describe what students are expected to know and be able to do by the time of attainment. These relate to the skills, knowledge, and behaviors that students acquire as they progress through the program. Further each course in the program spells out clear instructional objectives which are mapped to the student outcomes.

a. **Domain Knowledge**: Apply the knowledge/understanding of mathematics, science, to the solution of complex problems applicable to the discipline

b. **Problem Analysis**: Recognize, formulate, and analyze computer applications problems, reaching verified conclusions using the principles of

mathematics, natural sciences, and engineering sciences and arriving at an appropriate solution.

c. **Design/Development of Solutions**: Design, implement, and evaluate a computer-based system, process, component, or program to meet desired solutions that meet the specified needs with suitable concern for the public health and safety, and the cultural, societal, and environmental considerations.

d. **Analyzing Complex problems:** Use domain based knowledge to function effectively on various problems to achieve a common goal to provide effective solutions for complex problem types.

e. **Usage of Modern IT tools:** Create, select, and apply applicable techniques, resources, and modern engineering and IT tools to complex engineering activities with an understanding of the limitations.

f. **The Professional and Society**: Apply reasoning informed by the relative knowledge to assess societal, health, safety, legal and cultural issues and the subsequent accountabilities relevant to the professional engineering practice.

g. **Environment and Sustainability:** Recognize the impact of the professional engineering solutions in societal and environmental backgrounds, and demonstrate the knowledge and need for supportable development.

h. **Ethics and Ethical Implications:** Apply ethical values/principles and pledge to professional ethics and responsibilities and norms of the engineering practice.

i. **Individual and Team work**: Function successfully as an individual, and as a member or leader in assorted teams, and in multidisciplinary settings.

j. **Communication:** Communicate effectively on difficult engineering activities with the engineering community and with society at large, such as, being able to understand and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

k. **Project Supervision:** Prove knowledge and understanding of the engineering and management principles and apply the same to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

l. **Continuous/Life-long Learning:** Be aware of the need for, and have the groundwork and ability to engage in independent and life-long learning in the widest context of technological change.

SEMESTER I

Course Code	Course Title	L	T	P	Total LTP	C
MCAD2211	OPERATING SYSTEM	3	1	0	4	4

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To introduce different types of Operating Systems	a				
2.	To learn about components of Operating Systems.	a				
3.	To implement Input / Output and File Systems.		c			
4.	To enable the learner to aim for careers in Software Development with knowledge on OS.			l	k	

UNIT I - INTRODUCTION TO OPERATING SYSTEM

Basic OS Concepts- Organization- Architecture-Structure of OS- OS Operations- OS Services -System Calls-Types- System Programs- System Design and Implementation

UNIT II - PROCESS MANAGEMENT AND SCHEDULING

Overview of Process Scheduling- Operations on Processes – Cooperating Processes – Inter process Communication-Shared Memory - Message Passing Systems- CPU Scheduling- Scheduling Concepts- Scheduling Criteria- Scheduling Algorithms- Multiprocessor Scheduling.

UNIT III - PROCESS SYNCHRONIZATION AND DEADLOCKS

Critical Section Problem- Peterson's solution -Semaphores- Classic Problems of Synchronization- Monitors – Deadlocks characterization –Methods - Prevention- Avoidance – Detection- Deadlock Recovery.

UNIT IV - MEMORY MANAGEMENT

Swapping- Contiguous Memory Allocation- Paging-Hardware support - Protection-Shared Pages- Structure of page table- Segmentation- Virtual Memory- Demand Paging- Page Replacement Methods- Thrashing.

UNIT V - STORAGE MANAGEMENT

File Concepts- Access Methods- Directory Structures- Protection -File System Structure-Implementation- Directory Implementation- Allocation Methods- Disk Structure- Disk Scheduling algorithms

TEXT BOOK

1. Silberschatz, Galvin & Gagne (2009), Operating system principles, John Wiley & Sons,7thEdition, New York (For 1 to 5 units).

REFERENCES

1. Milan Milenkovic (2003), Operating System Concepts and Design, McGraw Hill, New Delhi.
2. AndrewS. Tennenbaum (1997), Modern Operating System,Prentice Hall India, New Delhi.
3. Deital (1990), An Introduction to Operating System, Pearson Education, New Delhi.

Course Nature: Theory				
Assessment Method(Maximum marks)				
In Semester	**Assessment Tool**	**Assignment I**	**Assignment II**	**Total**
	Marks	**15**	**15**	**30**
End Semester				**70**
Total				**100**

Course Code	Course Title	L	T	P	Total LTP	C
MCAD2212	DATABASE TECHNOLOGY	3	0	4	7	5

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To understand the basic concepts and terminology related to DBMS and Relational Database Design	a				
2.	To the design and implement Relational Algebra		b			
3.	To understand advanced DBMS techniques to construct tables and write effective queries, forms, and reports		a			
4.	To understand advanced Database Application Development			k		
5.	To understand Internet Applications & Database Tuning				d	

UNIT I

Introduction to Database systems

Database Design And ER Diagrams, Entities, Attributes, And Entity Sets, Relationships And Relationship Sets, Key Constraints, Participation Constraints, Weak Entities, Aggregation, The Unified Modeling Language, Case Study: The Internet Shop, Introduction To The Relational Model, Creating And Modifying Relations Using SQL, Example: create the Students relation, Integrity Constraints Over Relations, Key Constraints, Foreign Key Constraints, Specifying Foreign Key Constraints in SQL, Integrity Constraints Over Relations, Foreign Key Constraints.

UNIT II

SQL Operations and Queries

Selection And Projection, Set Operations, Renaming, Joins, Condition Joins, Equijoin, Natural Join, Division, The Form of A Basic SQL Query, Examples of Basic SQL Queries, Nested Queries, The Form of A Basic SQL Query, Examples of Basic SQL Queries, Nested Queries, Triggers And Active Databases, Triggers And Active Databases, Examples of Triggers in SQL, Constraints versus Triggers, Constraints versus Triggers, Other Uses of Triggers.

UNIT III

Database Connectivity

Accessing Databases From Applications, Embedded SQL, Declaring Variables and Exceptions, Embedding SQL Statements, Cursors, Basic Cursor Definition and Usage, Properties of Cursors, Dynamic SQL, An Introduction To JDBC, SQLJ example, Connections.

UNIT IV

XML

XML Documents, Introduction to XML, XML DTDs, Domain-Specific DTDs, The Three-Tier Application Architecture, Single-Tier and Client-Server Architectures, Advantages of the Three-Tier Architecture, Advantages of the Three-Tier Architecture, Normal Forms, Normal Forms, Third Normal Form, Properties of Decompositions, Dependency-Preserving Decomposition, Normalization, Decomposition into BCNF, Decomposition into 3NF.

UNIT-V

ORACLE

Oracle Server Architecture, Connect Users to Servers, Processing queries, changes and commits , Oracle Universal Installer , Setting up OS and Password File, Authentication, Oracle Enterprise Manager Components,

Starting and Shutting an Instance, Opening and Closing a Database, Logical Structure of the Database, Managing Database Use, Creating Database Users - Altering and Monitoring Existing Users, Backup Considerations, Recovery considerations, Components for Backup and Recovery, Types of Failures Performing Offline backups, Performing Online Backups

Learning Resources

1. R. Ramakrishnan, J. Gehrke, Database Management Systems, McGraw Hill, 2004
2. 2. A. Silberschatz, H. Korth, S. Sudarshan, Database system concepts, 5/e, McGraw Hill, 2008.
3. . Kevin Loney (Fifth RePrint-2007), Oracle Database 10G: The Complete Reference, McGraw Hill, New Delhi.

Course Nature: Theory-Cum-Practical						
Assessment Method(Maximum marks)						
In Semester	Assessment Tool	Practical exercises -I		Practical exercises -II		Total
		Theory	Practical	Theory	Practical	
		10	5	10	5	
	Total	**15**		**15**		**30**
End Semester	Marks	Theory			Practical	**70**
		40			**30**	
					Total	**100**

Course Code	Course Title	L	T	P	Total LTP	C
MCAD2213	**PROGRAMMING IN JAVA**	**3**	**0**	**4**	**7**	**5**

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		**Student Outcomes**				
1.	To understand the principles and concepts of object programming	a				

2.	To learn multithreading concepts		a			
3.	To enable the learner to pursue careers in Java solution Architect/Java Programmer		e	l		k

UNIT I - INTRODUCTION TO JAVA

The Creation of Java- The Java Buzzwords- An Overview of Java- Data Types,-Variables-Arrays- Operators- Control Statements.

UNIT II - OBJECT ORIENTED CONCEPTS

Introducing Classes- Overloading Methods- Introducing Access Control- Introducing final- Inheritance Basics- Method Overriding- Using Abstract Classes- The String Constructors- Special String Operations- String Comparison- StringBuffer.

UNIT III - PACKAGES INTERFERENCE EXCEPTION HANDLING AND MULTITHREADING

Packages – Interfaces - Exception Handling - The Java Thread Model - The Main Thread - Creating a Thread - Thread Priorities – Synchronization - Interthread Communication.

UNIT IV - APPLET, AWT AND EVENT HANDLING

Applet Basics - Applet Architecture - An Applet Skeleton - Simple Applet Display Methods - Requesting Repainting - The HTML APPLET Tag - AWT Classes - Window Fundamentals - Working with Graphics - Event Handling - The Delegation Event Model - Event Classes - Event Listener Interfaces.

UNIT V - JAVA CONSOLE INPUT AND OUTPUT AND FILE

Enumerations - I/O Basics - Reading Console Input - Writing Console Output - The PrintWriter Class - Reading and Writing Files - Collections Overview - The Java I/O Classes and Interfaces – File - The Stream Classes - The Byte Streams - The Character Streams.

TEXT BOOK

1. Herbert Schildt (2007), Java:The Complete Reference, The McGraw-Hill, Seventh Edition, New Delhi.

REFERENCES

1. Horstmann S., Gray Cornell (2001), Core Java 2 Volume In, Fundamentals, Addition Wesley, New York.
2. Amold and Gosling, J. (2000), The Java Programming Language, Addition Wesley, 2ndEdition, New Delhi.
3. Art Gittleman (2002), Ultimate Java Programming, Wiley Publications, New York.
4. Herbert Schildt (2007), Java:The Complete Reference, The McGraw-Hill, Eight Edition, New Delhi.

<table>
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<tr><td>Theory</td><td>Practical</td><td>Theory</td><td>Practical</td></tr>
<tr><td>10</td><td>5</td><td>10</td><td>5</td></tr>
<tr><td></td><td>Total</td><td colspan="2">15</td><td colspan="2">15</td><td>30</td></tr>
<tr><td rowspan="2">End Semester</td><td rowspan="2">Marks</td><td colspan="3">Theory</td><td>Practical</td><td rowspan="2">70</td></tr>
<tr><td colspan="3">40</td><td>30</td></tr>
<tr><td colspan="6">Total</td><td>100</td></tr>
</table>

Course Code	Course Title	L	T	P	Total LTP	C
MCAD2214	VISUAL PROGRAMMING USING C# AND VB.NET	3	0	4	7	5

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To gain knowledge in the concepts of the .NET framework as a whole and the technologies that constitute the framework	a				
2.	To gain knowledge about various object oriented concepts in C#.		b			
3.	To gain programming skills in C# both in basic and advanced levels.		c	e		
4.	To enable the learner for aiming careers in software development related fields			l	j	k

UNIT I - .NET FRAMEWORK AND VB.NET

Evolution of the .NET Framework – Overview of the .Net Framework – VB.NET – Simple VB.Net Program. VARIABLES, CONSTANTS AND EXPRESSIONS: Value Types and Reference Types – Variable Declarations and Initializations – Value Data Types – Reference Data Types – Boxing and Unboxing – Arithmetic Operators – Textbox Control – Label Control – Button Control.

UNIT II - CONTROL STATEMENTS AND METHODS

If Statements – Radio Button Control – Check Box Control – Group Box Control – Listbox Control – Checked List Box Control – Combo box Control – Select Case Statement – While Statement – Do Statement – For Statement. METHODS AND ARRAYS: Types of Methods – One Dimensional Array – Multi Dimensional Arrays – Jagged Arrays. CLASSES: Definition and Usage of a Class – Constructor Overloading – Copy Constructor.

UNIT III - ADDITIONAL CONTROLS AND DATABASE CONNECTIVITY

Timer – ProgressBar – LinkLabel – Panel – TreeView – Splitter – Menu – SDI & MDI – Dialog Boxes – Toolbar – StatusBar. DATABASE

CONNECTIVITY: Advantages Of ADO.NET – Managed Data Providers – Developing a Simple ADO.NET Based Application – Creation of Data Table – Retrieving Data From Tables – Table Updating – Disconnected Data Access Through Dataset Objects.

UNIT IV - OBJECT ORIENTED ASPECTS OF C#

Introducing C#-Overview of C#- Literals-Variables-Data types-Expressions-Methods -Classes- Objects- Inheritance-Polymorphism- Interfaces- Operator Overloading- Delegates- Events- Errors and Exceptions.

UNIT V - APPLICATION DEVELOPMENT ON .NET

Building Windows Applications- Building Windows Applications using DLL- Accessing Data with ADO.NET -Web Based Application Development on .NET -Programming Web applications with Web Forms-Programming Web Services.

TEXT BOOK

1. Muthu C. (2008), "Visual Basic.NET", 2nd Ed., Vijay Nicole Imprints Pvt.Ltd.,.(Unit I ,Unit II & Unit III)
2. Programming in C#, E.Balagurusamy (Unit IV & Unit V)

REFERRENCES

1. Jeffrey R.Shaprio (2002), "Visual Basic .NET The Complete Reference", Mac Graw Hill
2. Michael Halvorson (2010), "Visual Basic 2010 Step by Step", Microsoft Press.
3. Harold Davis (2002), "Visual Basic.NET Programming", Sybex.
4. Prgramming in C#, J. Liberty 2nd Edition – O'Reilly (Unit V)

Course Nature: Theory-Cum-Practical						
Assessment Method(Maximum marks)						
In Semester	Assessment Tool	Practical exercises -I		Practical exercises - II		Total
		Theory	Practical	Theory	Practical	
		10	5	10	5	
	Total	**15**		**15**		**30**
End Semester	Marks	Theory			Practical	**70**
		40			**30**	
					Total	**100**

Course Code	**Course Title**	**L**	**T**	**P**	**Total LTP**	**C**
MCAD22E1	**ENTERPRISE RESOURCE PLANNING**	**3**	**1**	**0**	**4**	**4**

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		**Student Outcomes**				
1.	To comprehend the technical aspects of ERP systems	a				
2.	Demonstrate a good understanding of basic issues in Enterprise Systems		b			
3.	To understand concepts of re-engineering and how they relate to ERP system implementations		a			
4.	To be able to identify and describe typical functionality in an ERP system			k		
5.	Effectively describe problems typical of ERP implementation projects and translate this information				d	

UNIT I - INTRODUCTION TO ERP

Overview – Benefits of ERP – ERP and Related Technologies – Business Process Reengineering – Data Warehousing – Data Mining – On–line Analytical Processing – Supply Chain Management.

UNIT II - ERP IMPLEMENTATION

Implementation Life Cycle – Implementation Methodology – Hidden Costs – Organizing Implementation – Vendors, Consultants and Users – Contracts – Project Management and Monitoring.

UNIT III - BUSINESS MODULES

Business Modules in an ERP Package – Finance – Manufacturing – Human Resource – Plant Maintanance – Materials Management – Quality Management – Sales and Distribution.

UNIT IV - ERP MARKET

ERP Market Place – SAP AG – PeopleSoft – Baan Company – JD Edwards World Solutions Company – Oracle Corporation – QAD – System Software Associates.

UNIT V - ERP – PRESENT AND FUTURE

Turbo Charge the ERP System – EIA – ERP and E–Commerce – ERP and Internet – Future Directions in ERP.

TEXT BOOK

1. Alexis Leon, "ERP Demystified", Tata McGraw Hill, 1999. (Units I to V)

REFERENCES

1. Joseph A. Brady, Ellen F. Monk, Bret J. Wangner, "Concepts in Enterprise Resource Planning" , Thomson Learning, 2001.
2. Vinod Kumar Garg and N.K .Venkata Krishnan, "Enterprise Resource Planning - concepts and Planning", Prentice Hall, 1998.
3. Jose Antonio Fernandz, " The SAP R /3 Hand book", Tata McGraw Hill

Course Nature: Theory				
Assessment Method(Maximum marks)				
In Semester	**Assessment Tool**	**Assignment I**	**Assignment II**	**Total**
	Marks	**15**	**15**	**30**
End Semester				**70**
Total				**100**

Course Code	Course Title	L	T	P	Total LTP	C
MCAD22E2	ORGANIZATIONAL BEHAVIOR	3	1	0	4	4

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To identify their personality type and behavioral pattern	a				
2.	To identify the basic skills of leadership				f	
3.	To apply the principles of conflict resolution and learn about group behavior		b			
4.	To adapt to the organization culture, structure and dynamics					H

UNIT-I - INTRODUCTION

What Is Organizational Behavior? – The importance of interpersonal skills- What managers Do- Organizational behavior- Complementing intuitions with systematic study- Disciplines that contribute to the OB field- Challenges and opportunities for OB- Developing an OB model- ETHICAL DILEMMA Jekyll and Hyde

UNIT-II- DIVERSITY IN ORGANIZATIONS

Diversity- Biographical Characteristics-Ability- Implementing Diversity Management Strategies- ETHICAL DILEMMA- Board Quotas- Case incidents

UNIT-III ATTITUDES AND JOB SATISFACTION- EMOTION AND MOODS

Attitudes-Job Satisfaction- ETHICAL DILEMMA Bounty Hunters- CASE INCIDENT 1 Long Hours, Hundreds of E-Mails, and No Sleep- CASE INCIDENT Crafting a Better Job-Emotion and Moods-Emotional labor-Affective events theory- Emotional Intelligence-OB applications of emotions and moods- ETHICAL DILEMMA Happiness Coaches for Employees

UNIT-IV PERSONALITY AND

Personality-Values-International Values- ETHICAL DILEMMA Freedom or Lack of Commitment?- CASE INCIDENT : Is There a Price for Being Too Nice? -CASE INCIDENT 2 Leadership from an Introvert's Perspective

UNIT-V-MOTIVATION CONCEPTS

Defining Motivation- Early Theories of Motivation- Contemporary Theories of Motivation- Integrating Contemporary Theories of Motivation- Motivating by Job Design: The Job Characteristics Model- Employee Involvement- Using Rewards to Motivate Employee.

TEXT BOOK:

1. Stephen P. Robbins, Timothy A. Judge, "Organizational Behavior", 14th Edition, Pearson Education,2012. (Units I to V)

REFERENCES:

1. Robert Kreitner, Angelo Kinicki, "Organizational Behavior", 8th Edition, McGrawHill,2007.
2. Fred Luthans, "Organizational Behavior", McGraw Hill, 1997.
3. Keith Davis, "Human behavior at work: Human relations and Organizational Behavior", Tata McGraw Hill, 1982.
4. Rudrabasavaraj M.N. "Dynamic personnel Administration", 3rdEdition,Himalaya Publishing House, 2011

Course Nature: Theory				
Assessment Method(Maximum marks)				
In Semester	**Assessment Tool**	**Assignment I**	**Assignment II**	**Total**
	Marks	**15**	**15**	**30**
End Semester				**70**
Total				**100**

SEMESTER – II

Course Code	Course Title	L	T	P	Total LTP	C
MCAD2221	PYTHON PROGRAMMING	3	0	4	7	5

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To understand the principles and concepts of Python	a				
2.	To learn System tools, OS and Sys modules		a			
3.	To enable the learner to pursue careers in Socket Programming		e	l		k

UNIT -1: INTRODUCTION TO PYTHON

Python Interpreter and its working, Syntax and Semantics, Data Types, Assignments, Expressions, Control Flow Statements, Sequences, Dictionaries, Functions and lambda expressions

UNIT - 2: ITERATIONS AND COMPREHENSIONS

Handling text files Modules, Classes, OOP Exception Handling, Exception Handling Strings, Regular Expressions, try statement in Python, User-Defined Exception in Python, Use of Inheritance in Python

UNIT - 3: SYSTEM TOOLS

OS and Sys modules, Directory Traversal tools, Parallel System tools, threading and queue, Program Exits, system interfaces by focusing on tools and techniques, binary files, tree walkers, Python's library support for running programs in parallel.

UNIT -4: SOCKET PROGRAMMING

Handling Multiple Clients, Client-side scripting, urlibServer Side Scripting, CGI Scripts with User Interaction, Passing Parameters, XML Parser Architectures and APIs, Parsing XML with SAX APIs, The parse Method

UNIT - 5: INTRODUCTION TO TKINTER

Top Level Windows, Dialogs, Message and Entry, Event handling, Menus, List boxes and Scrollbars, Text, SQL Database interfaces with sqlite3, Basic

operations and table load scripts, SQLite database from your Python program, Design and implement basic applications

TEXT BOOKS

1. Mark Lutz ,"Learning Python", O Reily, 4thEdition, 2009, ISBN: 978-0-596-15806-4.

REFEENCE:

1. Mark Lutz ,"Programming Python ", O Reily, 4thEdition, 2010, ISBN 9780596158118
2. Tim Hall and J-P Stacey ,"Python 3 for Absolute Beginners" , 2009, ISBN:9781430216322
3. Magnus Lie Hetland , "Beginning Python: From Novice to Professional", 2nd Edition, 2009, ISBN:9781590599822.

<table>
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<tr><td rowspan="2">End Semester</td><td rowspan="2">Marks</td><td colspan="3">Theory</td><td>Practical</td><td rowspan="2">70</td></tr>
<tr><td colspan="3">40</td><td>30</td></tr>
<tr><td colspan="6">Total</td><td>100</td></tr>
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Course Code	Course Title	L	T	P	Total LTP	C
MCAD2222	SOFTWARE ENGINEERING AND SOFTWARE TESTING	3	1	0	4	4

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To classify the various Software Process Models	a		l		
2.	To understand the Software Testing Concepts.		e			
3.	To implement the Software Quality and Control Concepts		b			j
4.	To Design the Test cases and to get familiarity over Automated Testing tools	a				j

UNIT I - THE PRODUCT AND THE PROCESS

The Evolving Role of Software– Software Characteristics– Software Applications– Software: A Crisis on the Horizon?- Software Myths- Software Engineering: A Layered Technology– The Software Process– Software Process Models– The Linear Sequential Model– The Prototyping Model- The RAD Model- Evolutionary Software Process Models- Component-Based Development.

UNIT II - SYSTEM ENGINEERING AND ANALYSIS CONCEPTS

Computer-Based Systems– The System Engineering Hierarchy – Business Process Engineering: An Overview– Product Engineering: An Overview– Requirements Engineering– System Modeling– Requirement Analysis- Requirements Elicitation for Software- Software Prototyping- Specification- Specification Review.

UNIT III PRINCIPLES OF TESTING

PRINCIPLES OF TESTING: Introduction - Phases of software – Quality assurance and Quality control - Testing verification and validation - TECHNIQUES: White box - static testing - structural testing - challenges in white box testing - Black box testing.

UNIT IV - TYPES OF TESTING

TYPES OF TESTING: Integration testing - Top-Down Integration – Bottomupintegration-Bi-Directional Integration - System - Integration – SYSTEM ACCEPTANCE TESTING: Functional versus Non Functional Testing - Functional System Testing - Non Functional Testing Acceptance Testing.

UNIT V - PERFORMANCE TESTING

PERFORMANCE TESTING: Introduction - Factors of governing - performance testing - Methodology for performance testing - Tools for performance testing - Process for performance Testing – REGRESSION TESTING : Introduction - Types regression testing - Best pratice in regression testing.

TEXT BOOKS

1. Roger S. Pressman, (2001), "*Software Engineering* ", Fifth edition, McGraw-Hill Higher Education - A Division of The McGraw-Hill Companies.
2. Srinivasan Desikan and Gopalasamy Ramesh, "*Software Testing for Principles and Practices*", Person Education,.

REFERENCES

1. William E. Perry (2006), "*Effective Methods of Software Testing*", 3rd Ed, Wiley India.
2. Renu Rajani, Pradeep Oak (2007), *"Software Testing"*, TMH.

Course Nature: Theory				
Assessment Method(Maximum marks)				
In Semester	Assessment Tool	Assignment I	Assignment II	Total
	Marks	15	15	30
End Semester				70
Total				100

Course Code	Course Title	L	T	P	Total LTP	C
MCAD2223	DATA MINING AND DATA WAREHOUSING	3	1	0	4	4

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To impart knowledge about Data Mining	a				
2.	To know about various techniques used in Data Mining	b				
3.	To design data warehouses for the companies		c			
4.	To enable the learner for aiming careers in Data Warehouse Management			l	g	k

UNIT I - DATA MINING CONCEPTS & ARCHITECTURE

Introduction – Data Mining Definitions, Tools, Applications - Data Mining - Learning: Definition, Anatomy of Data Mining.Types of Knowledge – Knowledge Discovery Process- introduction, Evaluation,Stages, Operations and Architecture of Data Mining.

UNIT II - DATA MINING TECHNIQUES

Visualization Techniques – Likelihood & distance-Neural Networks-Decision Tree technique-Constructing decision trees-ID3 algorithm-Genetic algorithms: Crossover & mutation -Clustering: Distance function-K-means algorithm -Hierarchical Clustering - Association rules: Apriori algorithm – Real Time Applications and Future Scope.

UNIT III - DATA WAREHOUSING CONCEPTS & ARCHITECTURE

Introduction –Goals- Process Architecture- Load Manager-Warehouse Manager-Query Manager - DWH Objects - Fact table & Dimension table – DWH Users - Data Warehouse Schemas: Star schemas-Snowflake Schemas.

UNIT IV - DATA WAREHOUSE PARTITIONING & AGGREGATION

Horizontal Partitioning-Vertical Partitioning-Hardware Partitioning-Software partitioning Methods-Aggregation-Designing Summary tables-Designing Summary tables

UNIT V - DATA MARTS, META DATA, BACKUP & RECOVERY

Data Marts: Introduction-Estimating Design – Cost-Meta Data-Backup: Types of backup-Backup the data warehouse – SureWest Online Backup-Recovery: Strategies-various Testing Strategies-Various Recovery models, Disaster Recovery procedure

TEXT BOOKS

1. PrabhuS, Venkatesan N(2006), Data Mining & Warehousing – New Age International – First Edition, New Delhi (For Units 1 & 2).
2. Sam Anahory, Dennis Murray (2004), Data warehousing in real world – Pearson Education, New Delhi (For Units 3, 4 & 5).

REFERENCES

1. Pieter Adriaans, DolfZantinge (2005), Data Mining – Pearson education, New Delhi.
2. Alex Berson, Stephen J Smith (2004), Data Warehousing, Data mining & OLAP – Tata McGraw Hill Publications, New Delhi.

Course Nature: Theory				
Assessment Method(Maximum marks)				
In Semester	Assessment Tool	Assignment I	Assignment II	Total
	Marks	15	15	30
End Semester				70
Total				100

Course Code	Course Title	L	T	P	Total LTP	C
MCAD2224	ADVANCED JAVA PROGRAMMING	3	0	4	7	5

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To understand the principles and concepts of Advance object programming	a				
2.	To learn Multi-Tier Apllication Development		a			
3.	To enable the learner to pursue careers in enterprise applications and framework		e	l		k

UNIT I JAVA GUI PROGRAMMING (9 Hours)

Basics of Swings - Swing Components - Containers and Frames –Layout ManagerMenus and Toolbars - Event Handling

UNIT II J2EE CONCEPTS (9Hours)

Java EE 5 Platform Overview- Distributed Multi-tiered Applications- Web & Business Components-Java EE Containers – services & types- Java EE Application Assembly & Deployment – Packaging Applications, Java EE modules- Getting Started with Web applications- Model View Controller (MVC)2 Architecture & Packaging – Web application deployment descriptor (web.xml file)- Web Application Archive (*.WAR file) -Ant build tool.

UNIT III APPLICATIONS IN DISTRIBUTED ENVIRONMENT (9 Hours)

Remote method Invocation – activation models – RMI custom sockets – Object Serialization – RMI- IIOP implementation – CORBA – IDL technology – Naming Services – CORBA programming Models - JAR file creation.

UNIT IV MULTI-TIER APPLICATION DEVELOPMENT (9 Hours)

Server-side programming – servlets – Java Server Pages - Applet to Applet communication – applet to Servlet communication - JDBC – Applications on databases -Prepared Statements - Creating Prepared Statement object-Assign values for Prepared Statement parametersMultimedia streaming applications – Java Media Framework-XML Introductions

UNIT V ENTERPRISE APPLICATIONS AND FRAMEWORK (9 Hours)

Server Side Component Architecture –EJB Introduction-EJB Architecture-Session Beans – Entity Beans – Persistent Entity Beans –Java Frameworks-Strut introduction-HIBERNATE

TEXT BOOKS:

1. Eric Armstrong,JenniferBall,StephanieBodoff ―J2EE The Complete Reference‖ 2005. (UNIT II)
2. Ed Roman, ―Mastering Enterprise Java Beans‖, John Wiley & Sons Inc., 1999.
(UNIT III and UNIT V)
3. Hortsmann& Cornell, ―CORE JAVA 2 ADVANCED FEATURES, VOL II‖, Pearson
Education, 2002. (UNIT I and UNIT IV)
4. Mowbray, ―Inside CORBA‖, Pearson Education, 2003.(Unit III)

REFERENCES:

1. Web reference: http://java.sun.com.
2. Patrick Naughton, ―COMPLETE REFERENCE: JAVA2‖, Tata McGraw-Hill, 2003.

Course Nature: Theory-Cum-Practical						
Assessment Method(Maximum marks)						
In Semester	Assessment Tool	Practical exercises - I		Practical exercises - II		Total
		Theory	Practical	Theory	Practical	
		10	5	10	5	
	Total	**15**		**15**		**30**
End Semester	Marks	Theory			Practical	**70**
		40			**30**	
					Total	**100**

Course Code	Course Title	L	T	P	Total LTP	C
MCAD2225	**WEB PROGRAMMING USING ASP.NET**	**3**	**0**	**4**	**7**	**5**

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		**Student Outcomes**				
1.	To develop simple web form using various controls and implement the concept ofmaster page	a				
2.	To Explain the architecture of Dot Net platform	b				
3.	To develop interaction of front end with database using facilities of .NET platform		c			
4.	To deploy .Net Web Applications			l	g	k

UNIT – I INTRODUCTION TO .NET FRAMEWORK AND ASP.NET

State the components of Framework and describe CLR, Microsoft .NET framework, Overview, Net framework Architecture, Net Framework components: (CLR, CLS, CTS, MSIL, NameSpace, JIT, Metadata, FCL,

Assembly, GAC, GC,Memory Management), Explain benefits of ASP.NET over Classic ASP and also the Client-Server architecture. Basics of ASP.NET, Features of ASP.NET, Differences between ASP.NET and Classic ASP, Develop applications using ASP.NET IDE, Creating simple Web Application in ASP.NET, Introduction to Visual Studio 2008, Creating a New Web Project (ASP.NET), Opening an Existing Web Site, Building Web Sites, Set up of work environment, start page, the menu system, toolbars, the new project dialog box, graphical designer, code designer.

UNIT – II ASP.NET WEB FORMS

Develop simple web page using built in Objects, Adding Controls to the Web Page, Types of ASP.NET Files, Page Life Cycle, Web Form Processing Stages(Roundtrip), ASP.Net In-Built Objects, Use controls available with the IDE platform of ASP.NET for given purpose. Web Server Controls (Button, Check Box, Check Box List, Drop Down List, HyperLink, Image, Image Button, Label, Link Button, List Box, List Item, Panel, Place Holder, Radio Button, Radio Button List, TextBox), Working with Control Properties and Events, Validation Controls (Required Field Validator, RangeValidator Control, Compare Validator, RegularExpression Validator, CustomValidator, Validation Summary)

UNIT – III STYLES, THEMES AND MASTER PAGES

Apply Styles, themes and Master pages in ASP.NET Web applications, Styles, Creating Style Sheets, Applying Style Sheet Rules, Themes, How Themes Work, Handling Theme Conflicts, Creating Multiple Skins for the Same Control, Master Page, Basics of Master page, How Master page and Content pages are connected, Nesting Master Pages

UNIT -IV ASP.NET STATE MANAGEMENT

Develop programs using session management and user's preference in ASP.NET, State Management, View State, The Query String, Cross-Page Posting and Validation, Cookies (create, set, add and expire cookie), Session State, Application State, The Global.asax application file, Application Events, ASP.NET Configuration, The Web.config File, Storing Custom Settings in the web.config File

UNIT - V CONNECTING DATABASE USING ADO.NET

Describe Objects of ADO.NET, Describe the use of Data Binding to bind different, ADO.NET Architecture, DataProvider, Connection Object, Command Object, DataReader Object, Differentiate between single value and repeated value types of data binding, DataAdapter Object, DataSet, DataView, Data Binding, Types of data binding (Single Value, Repeated Value), SQL Data Source, Selecting, Updating and Deleting Records

TEXT BOOK:

1. ASP.NET: The Complete Reference Books, Matthew Macdonald, McGraw Hill education

REFERENCE

1. Programming in Visual Basic .NET, Julia Case Bradley, Anita C. Millspaugh, McGraw Hill, latest edition
2. Visual Basic .net Comprehensive Concepts and Techniques, Shelly, cashman, Quasney, Cengage learning, 2012

<table>
<tr><td colspan="7">Course Nature: Theory-Cum-Practical</td></tr>
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Course Code	Course Title	L	T	P	Total LTP	C
MCAD2226	DATA ANALYSIS USING R	0	1	2	3	2

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To understand the principles and concepts of Data Science	a				
2.	To learn Working with R Programming		a			
3.	To enable the learner to pursue careers in Data Visualization in R		e	l		k

UNIT 1: INTRODUCTION TO DATA SCIENCE

What is Data Science, Scenarios on Data Science, Data Science and Organization, Different types of data, Structured data, Unstructured data, Machine generated data, Understanding on Data Science Process, Explain on Research Goal, Data Processing on Data Science, Getting Start With R, Overview of R, Why R for Data Science, Eclipse, Live-R, Project Workspace Setup, Understanding on R Packages, Load Libraries and Installed Packages

UNIT 2: WORKING WITH R PROGRAMMING

Data Types and Syntax, Processing on Variables, Data Items on Structure, Classes and Manipulate Objects, Control statements IF, ELSE, SWITCH, Loop statements, FOR, WHILE, REPEAT, Working with String and Date, Understanding on Vector, List, Data Frames, Working with Arrays, Read and Write data from CSV, Tabular Data and Database.

UNIT 3: CLASSIFICATION IN R

Classification - Introduction, Types of Classification, Application of Classification, Overview of DT, Naïve Bayes, KNN, Random forest, Introduction – DT, DT Algorithm, Example of DT with R, Introduction – Naïve bayes, Naïve Bayes Algorithm, , Example of Naïve Bayes with R, Introduction - KNN, KNN Algorithm, Example of KNN with R, Introduction – Random Forest, Random Forest Algorithm, Example of Random Forest with R

UNIT 4: CLUSTERING IN R

Clustering - introduction, Types of Clustering, Application of Clustering, Overview of K-means, Hierarchical, Medoids, DBSCAN, Packages, Introduction – K-means, K-means Algorithm, Example of K-means with R, Introduction – Hierarchical, Hierarchical Algorithm, Example of Hierarchical with R

UNIT 5: DATA VISUALIZATION IN R

Overview of Data Visualization, Packages, Interactive Graphics, Plotting, Scatter plot , Box plot, Bar plot, Pie chart, Histogram, XKD-Style Plots, Heat Maps, Introduction to predictive models, What is Model and how to build a model.

TEXTBOOK:

1. R for Data Science by Hadley Wickham
2. Introduction to Data Science, R. Irizarry

REFERENCE:

1. R Programming for Data Science, Roger D Peng
2. Data Visualization: A practical introduction, by Kieran Healy

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SEMESTER – III

Course Code	Course Title	L	T	P	Total LTP	C
MCAD 2231	OBJECT ORIENTED ANALYSIS AND DESIGN WITH UML	3	1	4	8	6

	INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:	Student Outcomes				
1.	To ensure quality and reusability while developing software	c				
2.	To analyze and design the problem domain using unified Object approach	b	d			
3.	To identify and categorize business, access and view layer objects of the application		d			
4.	To derive OOA & OOD phases using UML diagrams and CASE tools		e	l		

UNIT I- OO BASICS

An Overview of OO Systems Development – Introduction, Views, Methodologies, Need, Overview of Unified Approach; Object Basics – Introduction, Philosophy, OO Concepts – Object Relationships, Associations, Aggregations and Object Containment, Advanced Topics and Case Study; OOSD – SD Process, Building HQ S/W, Use Case Driven Approach, Reusability.

UNIT II- METHODOLOGIESM, MODELING AND UML

Methodologies – Introduction, Rumbaugh, Booch and Jacobson Methodologies; Patterns and Frameworks; Unified Approach; UML – Introduction UML Diagrams - Class, Use-Case, Behavior and Implementation Diagrams - Model Management - UML Extensibility and Meta Model.

UNIT III- OOA: IDENTIFYING USE CASES AND CLASSIFICATION

Identifying Use Cases -Introduction, Business Object Analysis, Use Case Driven OOA: Unified Approach, Business Process Modeling – Use-Case Model, Developing Effective Documentation – Case Study; OA:

Classification – Introduction, Approaches – Noun Phrase, Common Class Patterns, Use Case Driven, CRC; Naming Classes.

UNIT IV- IDENTIFYING ORAM AND OO DESIGN

Identifying Object Relationships, Attributes and Methods – Introduction, Associations, Super- Sub Class and Part – of Relationships – Case Study. Class and Object Responsibility, Defining Attributes and Methods for ViaNet bank Objects; OOD Process and Axioms - Introduction, Corollaries, Design Patterns; Designing Classes – Introduction, OOD philosophy, OCL, The Process, Class Visibility, Designing Methods for ViaNet Bank Objects, Packages and Managing Classes.

UNIT V - ACCESS LAYER AND VIEW LAYER

Access Layer – Introduction, DBMS, Logical and Physical DB Organization and Access Control, Distributed Databases and Client Server Computing, OODBMS, Object Relational Systems, Multi Database Systems, Designing Access Layer Classes; Case study; View Layer – Introduction, Design view layer classes, Macro and Micro Level Process, Purpose of a View Layer Interface, Prototyping the User Interface, Case Study.

TEXT BOOK

1. Ali Bahrami – Object Oriented System Development – Tata McGraw Hill, 2008.

REFERENCE:

1. Grady Booch, Ivar Jacobson, James Rumbaugh - The Unified Modeling Language User Guide - Pearson Education, 2nd edition, 2005.

<table>
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Course Code	Course Title	L	T	P	Total LTP	C
MCAD 2232	**BIG DATA AND ITS APPLICATIONS**	**3**	**1**	**0**	**4**	**4**

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		**Student Outcomes**				
1.	To understand the nature of data & carry out intelligent data analytics	**a**				
2.	To know various modern data analysis tools & trends in data analysis		**e**			
3.	To gain knowledge in Hadoop Distributed File Systems and Applications of Big Data using Pig and Hive services			**l**		

UNIT I - INTRODUCTION TO BIG DATA

Introduction to BigData Platform – Challenges of Conventional Systems - Intelligent data analysis Nature of Data - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

UNIT II - MINING DATA STREAMS

Introduction To Streams Concepts – Stream Data Model and Architecture – Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

UNIT III – HADOOP

History of Hadoop- The Hadoop Distributed File System – Components of HadoopAnalyzing the Data with Hadoop- Scaling Out- Hadoop Streaming-Design of HDFSJava interfaces to HDFS- Basics-Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features

UNIT IV - HADOOP ENVIRONMENT

Setting up a Hadoop Cluster - Cluster specification - Cluster Setup and Installation - Hadoop Configuration-Security in Hadoop - Administering Hadoop – HDFS - Monitoring-Maintenance-Hadoop benchmarks- Hadoop in the cloud

UNIT V – FRAMEWORKS

Applications on Big Data Using Pig and Hive – Data processing operators in Pig –Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper –SQOOP

TEXT BOOKS

1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007 (Unit 1).
2. Tom White “ Hadoop: The Definitive Guide” Third Edition, O’reilly Media, 2012 (Units 3, 4 & 5).
3. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge Press, 2012. (Unit 2).

Course Nature: Theory				
Assessment Method(Maximum marks)				
In Semester	Assessment Tool	Assignment I	Assignment II	Total
	Marks	15	15	30
End Semester				70
Total				100

Course Code	Course Title	L	T	P	Total LTP	C
MCAD2233	**OPEN-SOURCE TECHNOLOGIES**	**3**	**1**	**4**	**8**	**6**

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		**Student Outcomes**				
1.	To understand the basics and advantages of open source	a				
2.	To learn the open source software Angular JS		b			
3.	To develop the programming skill in Mongo DB		c	e		

UNIT-1 Introduction

Open Source, Need and Principles of OSS, Open-Source Standards, Requirements for Software, OSS success, Free Software, Examples, Licensing, Free Vs. Proprietary Software, Free Software Vs. Open-Source Software, Public Domain. History of free software, Proprietary Vs Open-Source Licensing Model, use of Open- Source Software, FOSS does not mean no cost. History: BSD, The Free Software Foundation and the GNU Project.

Unit-2 Open-Source Eco System

Open-Source Operating Systems: GNU/Linux, Android, Free BSD, Open Solaris. Open-Source Hardware, Virtualization Technologies, Containerization Technologies: Docker, Development tools, IDEs,

Debuggers, Programming languages, LAMP, Open-Source Database technologies
Case Studies: Example Projects: Apache Web server, BSD, GNU/Linux, Android, Mozilla (Firefox), Wikipedia, Drupal, WordPress, Git, GCC, GDB, GitHub, Open Office, LibreOffice

Unit 3- Angular JS
Introduction and Agenda - Prerequisites - What are SPA's - Introduction to AngularJS - Features of AngularJS - MVC Architecture - Versions and Transitions - Environmental Setup - Angular JS IDE's - Introduction to Visual studio code - Angular app fundamentals - Simple AngularJS App - Companies using Angular JS - Advantages of Angular JS

Unit 4-Mongo DB
Introduction to Mongodb- Installing Mongo DB in Windows, Linux and Mac Operating Systems - Installing and Working with MongoDB interfaces: i)Mongo Shell, ii)Mongo Compass - Mongodb Datatypes: i)Integer ii)Boolean iii)Double iv)String v)Arrays vi)Object vii)Null viii)Regular expression ix)Timestamp x)Date xi)Object ID - Introduction to entities of MongoDB: i)Databases i)Collections and iii)Documents - Database: i)createDatabase()method with example, ii)dropDatabase() method with example - Collections: i)createCollection() method with example ii)dropCollection() method with example

Unit 5 – Mongo DB
Indexes: Properties of Index, i)Unique Indexes, ii)Partial Indexes, iii)Sparse Indexes, iv)TTL Indexes - Aggregation in Mongodb: i)aggregate() method - Aggregate expressions: i) $sum ii) $avg iii) $min iv) $max v) $push vi) $addToSet vii) $first viii) $last - Mongodb Backup: Export/Import data backup using shell - i)mongodump, ii)mongorestore - Mongodb Backup: Export/Import data backup using Mongo Compass - Monitoring Deployment using Mongodb: i)mongostat, mongotop, iii)serverStatus, dbStats, collStats

TEXTBOOK:
James Lee and Brent Ware, “Open-Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP”.
Learning AngularJS, Free eBook created from Stack Overflow contributors.
MongoDB: The Definitive Guide, Book by Kristina Chodorow and Michael Dirolf

WEB REFERENCES

www.w3schools.com, www.php.net, www.phpclasses.org www.tizag.com, www.tutorialspoint.com, www.perl.org, www.oracle.com

Course Nature: Theory-Cum-Practical						
Assessment Method(Maximum marks)						
In Semester	Assessment Tool	Practical exercises - I		Practical exercises - II		Total
		Theory	Practical	Theory	Practical	
		10	5	10	5	
	Total	**15**		**15**		**30**
End Semester	Marks	Theory			Practical	**70**
		40			**30**	
					Total	**100**

Course Code	Course Title	L	T	P	Total LTP	C
MCAD2234	**ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**	**3**	**1**	**4**	**8**	**6**

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		**Student Outcomes**				
1.	To understand the basics and advantages about Artificial Intelligence(AI) and Heuristic search technique	a				
2.	Understand and Apply real time problem using Artificial Intelligence Understand and Apply Machine Learning in Gaming development		b			
3.	Practice the Machine Learning Models		c	e		

UNIT 1: DEFINITIONS

History of Artificial Intelligence, AI Problems and AI, Techniques, Demonstration of water Jug problem, Production System Characteristics, Game Planning, Heuristic Search Techniques, Sales man problem, Revolutions of AI, Intelligent Agents, Demonstrations of AI real-time examples.

UNIT 2: KNOWLEDGE REPRESENTATIONS

Representation and Mapping, Approaches in Knowledge representations, Explanations of different types of Knowledge, Predicate logic, First order Predicate Logic (FOPL), Representing Knowledge using Rules, Knowledge Acquisition, Ontology, Syntax and semantic of FOL

UNIT 3: LEARNING

Types of Machine Learning, Supervised Learning, Perspectives and Issues in Machine Learning, Concept Learning task, Concept Learning as a search, Reinforcement Learning, Importance of Reinforcement Learning, Design a Learning System, Candidate Elimination Algorithm, Hypothesis space Version space, Mushroom dataset

UNIT 4: LEARNING WITH TREES

Basic Decision tree algorithm, Hypothesis space search, Decision tree and Inductive Bias ,Decision tree implementation, Unsupervised Learning, Clustering techniques, K- Means algorithm, Implementation of Decision tree and K- Mean algorithm, ID3 algorithm, Entropy calculation, Measure Information gain

UNIT 5: INTRODUCTION ABOUT NEURAL NETWORK

Neural Network representation, Types of Neural Network, Application of Neural Network using ppt, Neural Network model implementation, Perceptronand Multi-layer perceptron, Convergence andlocal minima, Activation functionsandSigmoid functions, Implementation of Multi-layer neural network , Backpropagation algorithm, Feed Forward Neural Network, Genetic algorithm

TEXTBOOK:

1. Rich Elaine & Kevin Knight – Artificial Intelligence – Tata McGraw Hill -1993
2. Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997. (Chapters : 1, 2, 3, 4, 8 and 9)

REFERENCE:

1. Peter Flach, ―Machine Learning: The Art and Science of Algorithms that Make Sense of Data‖, First Edition, Cambridge University Press, 2012.
2. Stephen Marsland, ―Machine Learning –An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

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Course Code	Course Title	L	T	P	Total LTP	C
MCAD2235	**MINI PROJECT**	**0**	**0**	**4**	**4**	**2**

Students can choose problems of their own interest to develop software package using the programming languages/tools available. There will be two reviews conducted during the project period for all the students. At the end of the project, every student shall submit a structured project report.

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		**Student Outcomes**				
1.	Acquire practical knowledge within the chosen area of technology for project development	a				
2.	Identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach		B			
3	Contribute as an individual or in a team in development of technical projects		C			k
4	Develop effective communication skills for presentation of project related activities					j

Course Nature: Practical					
Assessment Method(Maximum marks)					
In Semester	Assessment Tool	Practical exercises -I	Practical exercises -II	Practical exercises -III	Total
		10	10	10	**30**
End Semester		Practicals			**70**
				Total	**100**

Course Code	Course Title	L	T	P	Total LTP	C
MCAD22E3	CLOUD COMPUTING	3	1	0	4	4

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To understand the need of cloud computing in the IT sector	**a**				
2.	To know the cloud service providers and the kind of services offered by them		**g**			
3.	To analyze the benefits of cloud in business continuity by applying cloud services, security and virtualization features		**b**			
4.	To enable the learner for aspiring careers in Cloud / Software Product development areas			**l**	**k**	**J**

UNIT I - CLOUD FUNDAMENTALS

Cloud computing Definition – Cloud Models such as NIST, Cube, Private, Public, Hybrid and Community clouds – Cloud Characteristics – Benefits, Disadvantages, Challenges and obstacles of Cloud Computing – Cloud Cost Measurement, Capital expenditure, Total cost and SLA – Cloud Architecture – Types of Cloud Services (IaaS, PaaS, SaaS, IdaaS).

UNIT II - CLOUD PLATFORMS

Abstraction – Load balancing and virtualization : case study Google cloud – Hypervisors : Case study VMware vSphere - Machine Imaging – Capacity Planning with baseline metrics, measurement, load testing, network capacity and scaling – PaaS services : Case study Force.com – PaaS Frameworks: Case study Drupal, EccenbtexAppBaseSpuarespace ,WaveMaker and Wolf.

UNIT III - CLOUD SERVICE PROVIDERS

Google Web Services : Explore and survey Google Application, Google analytics, Google Translate, Google Toolkit, APIs and Google App Engine - Amazon Web services: Components, Elastic Compute Cloud (EC2), Amazon Storage Systems, Amazon Elastic Block Store, and Amazon Database Services – Microsoft Cloud Services : Windows Azure platform and Windows Live.

UNIT IV - CLOUD INFRASTRUCTURE AND SECURITY

Cloud Management: Responsibilities, Lifecycle, Management Products and Standards -Cloud security: CSA Cloud Reference Model – Implement Cloud security for Infrastructure, Data, Network, Storage and Host - Disaster recovery and management.

UNIT V - SOA, STORAGE AND BACKUP

Network service model infrastructure, Communication and Management of SOA – Moving applications to cloud, Service attributes and Cloud bursting – Cloud storage, provisioning, unmanaged and managed storage – Cloud backup, types and features and storage interoperability – Cloud Mail services.

TEXT BOOKS

1. Barrie Sosinsky (2011), "Cloud Computing Bible", Wiley Publishing Inc., New York
2. Kris Jamsa (2012), "Cloud Computing: SaaS, PaaS,IaaS, Virtualization, Business Models, Security and More", Jones and Bartlett Learning LLC, Boston, USA

REFERENCES

1. George Reese (2009), "Cloud Application Architectures: Building Applications and Infrastructures in the cloud" ,O'Reilly Media Inc. Cambridge,USA
2. Anthony T Velte, Toby J Velte, Robert Elsenpeter (2010), "Cloud Computing: A practical approach" ,McGrawHill, New Delhi.

Course Nature: Theory				
Assessment Method(Maximum marks)				
In Semester	Assessment Tool	Assignment I	Assignment II	Total
	Marks	15	15	30
End Semester				70
Total				100

Course Code	Course Title	L	T	P	Total LTP	C
MCAD22E4	INTERNET OF THINGS (IoT)	3	1	0	4	4

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To understand the need to Explore the system management and domain for various applications of IoT	**a**				
2.	To know the categorize the various protocols that are used for developing IoT applications.		**g**			
3.	To analyze the deploy an IoT application and connect to the cloud		**b**			
4.	To enable the learner for aspiring careers in develop IoT application for real time scenario			**l**	**k**	**j**

UNIT 1: INTRODUCTION

Definition& Characteristics of IoT, Physical design of IoT, Things in IoT, IoT protocols, logical Design of IoT, IoT Functional Blocks ,IoT Communication Model and IoT Communication APIs, IoT Enabling Technologies, Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems, IoT Levels and Deployment Templates, Levels 0, Levels 1, Levels 2, Levels 3, Level 4, Level 5, IOT Applications

UNIT 2: INTRODUCTION

Application of IoT,Home Automation, Cities,Industry, Health & Lifestyle, Discuss Health , Lifestyle problem, M2M, Architecture of M2M, SDN, Architecture of SDN, NFV for IOT, Architecture of NFV, IoT System Management, Advantages of IoT system management, Need for IoT , Systems Management, Disadvantages of IoT system management, Simple Network Management Protocol, Limitations of SNMP, Network Operator, Requirements

]UNIT 3: INTRODUCTION ABOUT IOT PROTOCOLS

Infrastructure , 6LowPAN, Architecture of 6LowPAN, Ipv6, Architecture of Ipv6, Comms / Transport, Wifi, Bluetooth, mDNS , Discovery, Physical Web, DNS-SD, Data Protocols MQTT, Examples of MQTT, Difference between MQTT and HTTP, CoAP, AMQP, Types of CoAP, Request and Response methods, Pros and Cons of CoAP, Semantic, JSON- LD

UNIT 4: IOT PLATFORMS DESIGN METHODOLOGY

Purpose & Requirements, process model specification, domain model specification, Information model specifications, service specifications, Iot level specifications, Functional view specifications, operational view specifications. Device & component Integration, Application development, IoT System for Weather Monitoring, Purpose & Requirements, process model specification, domain model specification, Information model specifications, service Specifications, Iot level specifications, Device & component Integration, Application development, IoT System for Agriculture, Purpose & Requirements, process model specification, domain model specification, Information model specifications, service specifications, Iot level specifications, Functional view specifications, operational view specifications. Device & component Integration, Application development, Introduction to Cloud Storage Models, Arduino, Rasberry pi, Explanation of raspberry pi pin diagram, Introduction to Cloud StorageCommunication APIs, Python Web Application Framework, Django Architecture Design of Weather Monitoring using Django, Starting Development with Django Toolkit

UNIT 5: INTRODUCTION ABOUT RESTFUL API

Designing a RESTful Web API, Amazon Web Services, Amazon Web Services for IoT, Creating a ID in Amazon, EC2, Implementation of EC2, Autoscaling, Implementation of Autoscaling, S3, Implementation of S3, RDS, Implementation of RDS, DynamoDB, Implementation of DynamoDB, Kinesis, Implementation of Kinesis, Case studies – Environment, IoT systems for weather Reporting Bot, Air Pollution Monitoring System, Forest

Fire Detection, Case studies - IoT system for Energy, Smart grid, Renewable Energy Systems

TEXTBOOK:

1. ArshdeepBahga and Vijay Madisetti, “Internet of Things - A Hands-on Approach”, Universities Press, 2015.(Unit I –Unit V)
2. Dieter Uckelmann et.al, “Architecting the Internet of Things”, Springer, 2011.
3. CunoPfister, “Getting Started with the Internet of Things”, O’Reilly, 2011.

REFERENCE:

1. Adrian McEwen, Hakim Cassimally, “Designing the Internet of Things”, Wiley, 2014.
2. HonboZhou , “The Internet of Things in the Cloud: A Middleware Perspective “, CRC Press , 2012.
3. Olivier Hersent, David Boswarthick, Omar Elloumi, “The Internet of Things – Key applications and Protocols”, Wiley, 2012.

Course Nature: Theory				
Assessment Method(Maximum marks)				
In Semester	Assessment Tool	Assignment I	Assignment II	Total
	Marks	15	15	30
End Semester				70
Total				100

SEMESTER – IV

Course Code	Course Title	L	T	P	Total LTP	C
MCAD22E5	COMPUTER NETWORKS	4	0	0	4	4

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes				
1.	To understand data communication and networking with little or no background in data communication..	a		e		
2.	To enable the learner to become developers, IT staff and help desk professional			l	k	

UNIT I –INTRODUCTION

Network hardware, network software, OSI reference model, TCP/IP reference models - Comparison of OSI reference model, TCP/IP reference models Physical Layer: Theoretical basis for data communication, guided transmission media, wireless transmission media, modulation, multiplexing, structure of the telephone system, the mobile telephone system spectrum allocation.

Unit II - DATALINK LAYER

Design issues, Error detection and correction, elementary data link protocols, sliding window protocols. THE MEDIUM ACCESS CONTROL SUB LAYER: Static and dynamic channel allocation – multiple access protocols-classic Ethernet physical layer, classic Ethernet Mac sub layer protocol, Bluetooth architecture, RFID architecture.

UNIT III - THE NETWORK LAYER

DESIGN issues- routing algorithms-congestion control algorithms-tunneling-routing – fragmentation.

UNIT IV -THE TRANSPORT LAYER

Elements of transport layer protocols- UDP-TCP PROTOCOL-delay tolerant networking.

UNIT V -THE APPLICATION LAYER

DOMAIN NAME SYSTEM-architecture and services of Email-world wide web-streaming audio and video-content delivery.

TEXT BOOK

1. Andrew S. Tanenbaum “Computer Networks”, V Edition, Pearson Education.

Course Nature: Theory				
Assessment Method(Maximum marks)				
In Semester	Assessment Tool	Assignment I	Assignment II	Total
	Marks	15	15	30
End Semester				70
Total				100

Course Code	Course Title	L	T	P	Total LTP	C
MCAD22E6	**NETWORK SECURITY**	**4**	**0**	**0**	**4**	**4**

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		**Student Outcomes**				
1.	To understand the concept of Transport Level Security, Wireless Network Security and Electronic Mail Security	a				
2.	To know about the IP Security		d			H
3.	To gather extensive Knowledge about the System Security			l		F

UNIT I - TRANSPORT LEVEL SECURITY

Web Security considerations - Secure Socket Layer SSL Architecture - SSL Record Protocol Change Cipher - Spec Protocol - Handshake Protocol - Cryptographic Computations - Transport Layer Security - Version Number- MAC - Pseudorandom Function - Alert Codes – HTTPS - Connection Initiation & Closure - SSH Transport Layer Protocol – Connection Protocol

UNIT II - WIRELESS NETWORK SECURITY

IEEE 802.11 Wireless LAN overview, IEEE802.11i Wireless LAN Security IEEE802.11i Services - IEEE802.11I Phases of Operation - Discovery Phase - Authentication Phase - Key Management Phase - Protected Data Transfer Phase - IEEE802.11i Pseudorandom Function - Wireless Application Protocol Overview - Operational Overview - Wireless Markup Language - WAP Architecture - Wireless Application Environment WAP protocol Architecture - Wireless Transport Layer Security WTLS Sessions and Connections WTLS Protocol Architecture - Cryptographic algorithms - WAP End-to-End Security

UNIT III - ELECTRONIC MAIL SECURITY

Pretty Good Privacy - Notation - Operation Description - Cryptographic Keys and Key Rings - Public Key Management - S/MIME RFC 5322 MIME - S/MIME Functionality and Messages - S/MIME Certificate Processing - Enhanced Security Services - Domain Identified Mail Internet Mail Architecture E-Mail Threats -DKIM Strategy DKIM Functional Flow

UNIT IV - IP SECURITY

IP Security Overview - IP Security Policy - Security Associations Security Associations Database - IP Traffic Processing - Encapsulating Security Payload ESP Format Encryption and Authentication Algorithms - Padding Anti-Replay Service Transport and Tunnel Modes - Combining Security Associations Authentication Plus Confidentiality - Basic Combinations of Security Associations - Internet Key Exchange Key Determination Protocol - Header and Payload Formats

UNIT V - SYSTEM SECURITY (

Intruders Intruder Behavior Patterns Intrusion Techniques - Intrusion Detection - Audit Records Statistical Anomaly Detection - Rule-Based Intrusion Detection The Base-Rate Fallacy - Distributed Intrusion Detection Honeypots - Intrusion Detection Exchange Format - Password Management - Password Protection - Password Selection Strategies - Malicious Software - Types Of Malicious Software - Viruses - Virus Countermeasures – Worms - Distributed Denial of Service Attacks – FIREWALLS - Needs of Firewalls - Firewall Characteristics - Types of Firewalls - Firewall Basing - Firewall Location and Configurations

TEXT BOOK

1. William Stallings - Cryptography and Network Security - Pearson Education, New Delhi, 5th Edition, 2011. (Chapter 16 – 19 and online chapter 20 – 22)

REFERENCES

1. Behrouz A. Forouzan, Debdeep Mukhopadhyay - Cryptography and Network Security -Tata McGraw-Hill Education Pvt. Ltd., 2nd Edition, 2011
2. Charles Pfleeger - Security in computing - Prentice Hall of India, 4th Edition, 2006.

Course Nature: Theory				
Assessment Method(Maximum marks)				
In Semester	Assessment Tool	Assignment I	Assignment II	Total
	Marks	15	15	30
End Semester				70
Total				100

Course Code	Course Title	L	T	P	Total LTP	C
MCPD2241	**PROJECT WORK**	**0**	**6**	**20**	**26**	**16**

INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		**Student Outcomes**				
1.	To Undertake problem identification, formulation and solution and to Demonstrate a depth of knowledge in their selected topic/area	a	b			
2.	Analyze complex engineering problems and apply		b	e		

	appropriate techniques /methodologies and design project using appropriate languages and other tools					
3.	Develop creative solutions to problems and conceive innovative approaches in developing and designing of the project.			d		
4.	Students will acquire the skills to communicate effectively and to present ideas clearly and coherently to specific audience in both the written and oral forms					j
5.	Demonstrate an ability to present and defend their project work to a panel of experts				k	

Outcome of the project

1. To conceptualize a novel idea / technique into a product
2. To think in terms of multi-disciplinary environment
3. To understand the management techniques of implementing a project
4. To experience on the challenges of teamwork
5. To prepare a presentation in a professional manner
6. To prepare document all aspects of design work

Instructions for the Project

Students can choose problems of their own interest to develop software package using the programming languages/tools available. There will be two reviews conducted during the project period for all the students .At the end of the project, every student shall submit a structured project report and will take a Viva Voce examination.

<table>
<tr><td colspan="6">Course Nature: Project</td></tr>
<tr><td rowspan="2">In Semester</td><td rowspan="4">Assessment Tool</td><td colspan="2">Review 1</td><td colspan="2">Review 2</td><td>Total</td></tr>
<tr><td colspan="2">15</td><td colspan="2">15</td><td>30</td></tr>
<tr><td rowspan="2">End Semester</td><td>Presentation</td><td>Analysis</td><td>Finding & Conclusion</td><td>Viva Voce</td><td rowspan="2">70</td></tr>
<tr><td>10</td><td>20</td><td>20</td><td>20</td></tr>
<tr><td colspan="5">Total</td><td>100</td></tr>
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