

**Programme Launching Process and Approval  
(Complete delivery of the course)  
Masters in Computer Applications (MCA)**

**A. About the Institution's Programme:**

Master of Computer Applications (MCA) is a three-year (six semesters) professional Master's Degree in computer science awarded in India. Due to the high demand for qualified professionals in the field of Information technology, this programme was designed. This programme can be taken after the successful completion of Bachelor's Degree. The MCA programme is inclined towards application development. Hence in this programme emphasis is more on latest programming language and tools to develop better and faster applications.

The core subjects of MCA are aimed at developing knowledge and skills in computers using various technologies, with a view of the software industry requirements. The programme involves participation in collaborative work, group projects and practical exercises on the tools that is taught in the curriculum. The objective of this activity is to improve the hands-on skills of participants and produce competent software engineers.

In the growing world of technology, most of the businesses are very much dependent on technology to meet the competition in the market. Hence there is a demand for highly skilled software engineers, irrespective of the domain application needs to be created and developed by a computer engineer. Therefore, MCA after the graduation is used as a means to gain skills and expertise in hope of making a shift from their previous career and to grow in their respective fields.

**B. Programme Vision and Mission**

**Vision:** To foster human development through excellence in Quality Education, Research and Entrepreneurial Development

**Mission:**

- In order to provide a conducive teaching and learning atmosphere.
- Ensure knowledge based academic environment in the department.
- Enable the student's to solve software engineering problems independently.
- Mentoring the students with effective communications skills.
- Tutoring the students with best of social and ethical skills along with their engineering knowledge.
- Counsel the students to gear up with their urges towards self- development and continuous improvement.
- To ensure that the students are groomed in the society as a true software or IT professional.

**Programme/ Course Objectives:**

After going through this programme, the learners are proficient enough to do the following

- To take up positions as system analysts, systems designers, Programmers and managers in any field related to information technology.
- Imparting comprehensive knowledge with equal emphasis on theory and practical knowledge through working in industry, giving them insight into the actual workings of the IT world.

**Graduate attributes:**

MCA graduates will have built on their prior professional experience and academic background to acquire a broad base of technical knowledge and skills that enables them to:

- Gain comprehensive knowledge, technical expertise and hands-on experience in the specialised area

- Design, implement and troubleshoot the problem in the specialised domain and provide related solutions to the problem at any level

### University Campus:

Teerthanker Mahaveer University is a Jain Minority State Private University established by Act No. 30 of 2008 of the Government of Uttar Pradesh and has been approved by University Grants Commission (UGC) under Section 2(f) of UGC Act, 1956. The university is located on National Highway-24 and is barely 144 Kms from National Capital, New Delhi. The University stand committed to the ideals of Lord Mahaveer i.e. Right Philosophy, Right Knowledge, and Right Conduct in all its operations and aspires to be recognized as an ultimate destination for world-class education.

University is NAAC accredited and are proficient to provide counselling and tutoring to students with experience faculty members and equipped with infrastructure. With the fast pace of life and the need for up gradation of knowledge, the present generation needs are to access learning from sources which are separated by time and distance. To match the above and to keep pace with the growing global trend of extending conventional University instructional mode to online, self-learning and distance education methodology, Teerthanker Mahaveer University has created the Directorate of Distance Education. This facilitates to support effective learning under the distance mode. The students are advised to make use of this high - end learning system. It is the endeavour of the University to facilitate the distant students with instructional guided content and online infrastructure with the use of advanced technology.

- C. Target Group of Learners:** Larger target learners are the working professionals who are unable to leave their job and high aspire for knowledge. Sometimes highly self-motivated students are also a part of our target audience.
- D. Job Prospects:** A candidate who holds an MCA degree will have great job opportunities in top level IT companies and consultancy firms. Some of the job prospects which an MCA graduate can work for any IT company are as follows:
- Software Programmer
  - Software Engineer
  - Software Developer
  - Systems Analyst
  - Software Application Architect
  - Software Consultant

### E. Instructional Design

#### Curriculum structure/Programme Structure

- Duration of the programme: MCA course is of three years which comprises of 6 semesters to complete the course.
- Medium of Delivery: The instruction medium practiced in this ODL is blended mode which is a combination of high quality content and expert facilitator.
- Credit System: Credit system is a systematic way of describing an educational course by attaching credits to its components to give value to learning. Below table 1 depict the credit system description for MCA

**Table 1: Comparative Credits in Conventional and Open and Distance Learning Modes**

Semester	I	II	III	IV	V	VI	Total
Credits Conventional mode	24	24	24	24	24	24	144
Credits in Open and Distance Learning	16	16	16	16	16	16	96

It will be desirable to ensure uniformity in distribution of units between the two systems as far as possible. Thus, taking into account the number of hours indicated in Choice Based Credit System for conventional mode and the percentage of hours required for face-to-face Contact Programmes for learners in Open and Distance Learning mode, the following table 2 is provided for norms for counselling sessions in theory and practical courses with Open and Distance Learning credit value for Open and Distance Learning mode programme delivery.

**Table 2: Contact Theory and Practical Sessions**

<b>Four courses with minimum total credit of 16 per semester</b>			
Number of Assignments	4 Theory Papers of 4 credits If practical papers are included then there will be variation in credit and number of papers per semester		Counselling for theory only Courses: Four courses of 4 credits each
	contact sessions-practical**	Contact sessions theory*	
Four-Six subjects per semester	60 hours of guided experiments which includes self-paced learning and face to face learning.	44 hours	16 hours face to face teaching per course

- **Academic calendar**

Academic Calendar for MCA starts from 1st of February (Odd Session) and 1st of August (even session) every year and ends on 31<sup>st</sup> of July and 31<sup>st</sup> of January of subsequent year respectively. Admissions will start one month prior to starting of the respective session. For more details, please refer to university notification on the website (<http://tmu.ac.in/directorate-of-distance-education/>).  
(Need clarity)

- **Session Schedule**

Session	Starting date	Closing date
Spring Session	1 <sup>st</sup> week of February	Last Week of July
Fall Session	1 <sup>st</sup> week of August	Last week of January

- Programme Matrix: Programme Matrix is applicable for Academic Year-2017-19 for Masters of Computer Applications (MCA).

<b>Semester I</b>								
Subject Code	Subject	Credits			Marks			Total Marks
		T	P	Total	IA	CA	UE	
DMCA101	Data Structures	2	-	2	30	-	70	100
DMCA102	Object Oriented Programming using C++	4	-	4	30	-	70	100
DMCA103	Computer System Organization	4	-	4	30	-	70	100
DMCA104	Discrete Mathematics	2	-	2	30	-	70	100
DMCA105	Data Structure Lab	2	-	2	30	-	70	100
DMCA106	OOPs using C++ lab	2	-	2	30	-	70	100
<b>Semester II</b>								
DMCA201	Programming in Java	4	-	4	30	-	70	100
DMCA202	Database	2	-	2	30	-	70	100

	Management System							
DMCA203	Information Security fundamentals	2	-	2	30	-	70	100
DMCA204	Operating System	4	-	4	30	-	70	100
DMCA205	Java Lab	2	-	2	30	-	70	100
DMCA206	DBMS lab	2	-	2	30	-	70	100
<b>Semester III</b>								
DMCA301	NoSQL Databases	2	-	4	30	-	70	100
DMCA302	Web Programming	2	-	2	30	-	70	100
DMCA303	Software Engineering	4	-	4	30	-	70	100
DMCA304	Enterprise Application Development	2	-	2	30	-	70	100
	Elective – I	2	-	2	30	-	70	100
DMCA306	Web Programming Lab	2	-	2	30	-	70	100
<b>Specialization Groups</b>								
<b>Information Security</b>	<b>Storage and Cloud Technology</b>	<b>Infrastructure Management Services</b>						
DMCAIS305 – Database Security fundamentals with respect to NoSQL databases	DMCASCT303- Storage Area Networks	DMCAIMS303 - Data Mining						
<b>Semester IV</b>								
DMCA401	NET Framework	4	-	4	30	-	70	100
DMCA402	Distributed and Cross Platform Databases	4	-	4	30	-	70	100
DMCA403	Operation Research	4	-	4	30	-	70	100
	Elective – II	2	-	2	30	-	70	100
DMCA405	NET Lab	2	-	2	30	-	70	100
DMCA406	OS lab	2	-	2	30	-	70	100
<b>Specialization Groups</b>								
<b>Information Security</b>	<b>Storage and Cloud Technology</b>	<b>Infrastructure Management Services</b>						
DMCAIS404	DMCASCT404 Cloud Computing	DMCAIMS404- Server Infrastructure Management						
<b>Semester V</b>								
DMCA501	Computer Graphics	4	-	4	30	-	70	100
DMCA502	Object Oriented Modelling design	4	-	4	30	-	70	100
	Elective IV	4	-	4	30	-	70	100
DMCA504	OOMD Lab	2	-	2	30	-	70	100
DMCA505	Mini Project	2	-	2	30	-	70	100

Specialization Groups								
Information Security	Storage and Cloud Technology	Infrastructure Management Services						
DMCAIS503- Cryptography and network security	DMCASCT503- AWS	DMCAIMS503- Service Oriented Architecture						
Semester VI								
DMCA601	Elective –V	4	-	4	30	-	70	100
DMCA602	Elective lab	4	-	4				
	Final Project on the chosen Elective course	6	-	6	30	-	70	100
Specialization Groups								
Information Security	Storage and Cloud Technology	Infrastructure Management Services						
Ethical hacking	Virtualisation and Cloud Security	Installation of exchange server						

- Detailed curriculum

## Data Structures

**Subject Code: DMCA101**

**Credits: 02**

**Total Hours: 30**

### Course Contents:

#### Unit 1: Introduction to Data Structures

**6 Hours**

Information and its Storage representation – Storage of Information – Primitive Data Structures – Operations on data Structures. Linear Data Structures and their Sequential Storage Representation – Concepts and Terminology for Non-primitive Data Structures.

#### Arrays

Definition – Terminology – One dimensional Array – Memory Allocation – Operations – Applications - Array as an ADT - Sparse Matrices - Row and Column major representation - Pointer Arrays.

#### Unit II: Stack and its Applications

**6 Hours**

Stacks – Definition and Concepts – Representation of Stack – Representation of Stack as an ADT - Array and Linked list representation. Operations on Stacks – Applications of Stacks - Recursion – Evaluation of Arithmetic Expressions – Conversion of Infix to Postfix Notation – Towers of Hanoi problem.

#### Queues

Introduction – Definition – Representation of queues - Array representation – Linked list Representation – Operations of queues - Types of Queues – Circular queue – Definition – Operations – Applications - Deque – Definition – Operations – Applications - Priority queue - Definition – Operations – Applications – Application of General queues – Simulation.

#### Unit III: Linked Lists

**6 Hours**

Definitions – Types – Single Linked lists – Representation as an ADT - Operations - Circular Linked list – Operation - Double Linked Lists – Operations - Circular double linked lists - Operations – Applications of Linked lists – Sparse Matrix Manipulation – Polynomial Representation and Manipulation.

#### Unit IV: Non- linear Data Structures – Trees

**6 Hours**

Trees – Definitions and Concepts – Types of Binary trees - Operations on Binary trees – Storage Representation and manipulation of Binary Trees – Linear - Linked and Threaded Storage Representation for Binary trees – Conversion of General trees to Binary trees – Sequential and other Representation of trees – Applications – Manipulation of Arithmetic Expressions. AVL Trees – Single & Double Rotation

#### Unit V: Graphs

**6 Hours**

Graphs and their Representation – Definition, Graph Terminology - Matrix Representation – List Structures – Other Representation - Operations – Traversals - Breadth First Search – Depth first Search – Spanning Trees – Applications – Topological Sorting.

#### Sorting and Searching (Review)

Sorting - Types of Sorting – Insertion – Shell – Heap – Merge – Quick sort – radix Sort. Searching – Linear Search – Binary Search.

#### Text Books:

1. An Introduction to Data Structures with Applications, Jean – Paul Tremblay and Paul.G.Sorenson, Second Edition, Tata McGraw – Hill Edition,1991.(Unit I, II, III, IV, V, VII) (Unit – I: Chp 1-1.3, 1.4-1.4.1)
2. Classic Data Structures, D.Samanta – IIT Kharagpur, Prentice – Hall of India Private Limited, New – Delhi, 2005.(Chapters 1, 2, 3, 4, 5, 7, 8)

**Reference Books:**

1. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, Second Edition, Pearson Education Asia, 2002. (Unit – VI and all Units)
2. Data Structures, Algorithms and Applications in C++, SartajSahni, Second Edition, Universities Press India Private Limited, 2005. (Unit – I - Chp – VII)
3. Data Structures - A Pseudocode Approach with C, Richard.F.Gilberg and Behrouz.A.Forouzan, Second Edition, Thomson Course Technology, 2007.
4. Data Structures using C and C++, YedidyahLangsam, Moshe.J.Augenstein and Aaron.M.Tenanbaum, Second Edition, Pearson Education Asia, 2002.
5. Data structures and program design in C++, Robert.L.Kruse, Alexander.J.Ryba, Second Edition, Prentice – Hall of India Private Limited, 1997.

# Object Oriented Programming using C++

**Subject Code: DMCA102**

**Credits: 04**

**Total Hours: 60**

## **Unit I : Overview of OOP**

**12 Hours**

Object oriented paradigm - Structured vs. Object Oriented Paradigm - Elements of Object Oriented Programming – Objects – Classes - Encapsulation & data abstraction – Inheritance - Polymorphism etc.

## **C++ Overview**

Introduction - different data types – operators – expressions – qualifiers - arrays and strings.

## **Unit: II**

**13 Hours**

### **Modular Programming with Functions**

Function Components - argument passing - inline functions - function overriding - function overloading - function templates - recursive functions.

### **Classes & Objects**

Introduction - Class Specification - Class Objects - access members - defining member functions - data hiding – constructors – destructors - parameterized constructors - static data members –

## **Unit: II**

**I**

**12 Hours**

### **Classes & Objects [Cont..]**

Functions - scope resolution operator - Passing objects as arguments - returning objects - friend functions & classes - arrays of objects - Dynamic objects – Pointers to objects - Class members, Operator overloading using friend functions such as ++, --, [ ] etc.

## **Unit: IV**

**13 Hours**

### **Inheritance Virtual functions & Polymorphism & I/O Stream Library**

Base Class, Inheritance & protected members - protected base class inheritance - inheriting multiple base classes – Constructors - Destructors & Inheritance. Passing parameters to base Class Constructors, Granting access, Virtual base classes. Virtual functions – Calling a Virtual function through a base class reference - Virtual attribute is inherited - Virtual functions are hierarchical - pure virtual functions - abstract classes – using Virtual functions - Early & late binding.

## **Unit: V**

**10 Hours**

IO Stream Library - output operator <<, input >> - additional I/O operators - overloading the output operator <<, overloading the io operator >> - file input & output.

### **Text Books:**

1. The Complete Reference C++, H. Schildt, 4<sup>th</sup> Edition, Tata McGraw Hill, 2007.
2. Mastering C++, K R Venugopal, Rajkumar, T., Ravi Shankar: Tata McGraw Hill, 1997.

### **Reference Books:**

1. C++Primer, Stanley B.Lippmann, and JoseeLajore: 4<sup>th</sup> Edition, Addison Wesley, 2005.



# Computer System Organization

**Subject Code: DMCA103**

**Credits: 04**

**Total Hours: 60**

**Unit-I**

**12 Hours**

## **Introduction to Computer Systems:**

**Types of Computer Systems:** Micro Computers, Mini Computers, Mainframes and Super Computers.

**Computer Work Environments:** Home, Business, Gaming and Networking, Computer Components And Their Function: Arithmetic Logic Unit (ALU), Control Unit, Memory and Input/output Devices), Connection (Bus) Central Processing Unit (CPU), Memory (Random Access Memory (Ram), Read Only Memory (Rom), Registers, Auxiliary Storage and Computer Architecture, Hardware: Motherboard, Power Supply Unit, Cooling Units, Hard Disc Drive, Controllers, Ports, Main Memory, Memory Types, Storage Devices, Battery, Specialized Cards, Accelerated Graphics Port(AGP), Network, Graphics, Modem, Sound and Optical Drives, Software: Operating Systems, Utility Programs, Library Programs, Translator Programs and Applications Software, Peripherals: Printers, Plotters, Cameras, Scanners, Keyboard and Mouse, Monitors, Display Adapters, Multimedia Devices, Storage Media, Networking, Portable Drives, Plug and Play Components

**Unit-II**

**12 Hours**

## **Installation, Configuring and Testing of Computer Systems:**

**Installing A Computer System: Installing Process of:** Motherboard, Processor, Heat-Sink And Fan, Memory, Power Supply Unit, Hard Disc Drive, Optical Drive, Specialized Cards, Software (Operating System, Application Software, Utility Software) (*Includes Software Configuration*), Peripheral Devices (Printer, Scanner, Camera And Communication Devices Like Modem and Router), **Configuring a Computer System: Configuring Process of:** Basic Input Output System (BIOS) (Date/Time and Power Management), BIOS Components and BIOS Configurations (*includes explanation of application of BIOS*), Security (Installing Latest Antivirus/Security Updates) and Desktop (Icon Size, Font Size, Color, Background, Menu), **File Management:** Files and Folders, Setting File/Folder Sharing Permissions, Peripheral Devices, Printer, Scanner, Camera and Communication Devices, **Testing the Computer System:** Fault Detection, Power On Self Test (POST), Diagnostic Faults, Troubleshoot Devices, Technical Support Documentation (Reference Manuals, Online Manufacturer, Support) Testing Hardware (Input/output Devices, Peripheral Devices) Testing Software, Documentation (Test Plan), **Health and Safety:** Health and Safety Practices, Electrostatic Precautions (Antistatic Mats, and Antistatic Wrist Straps), **Assembling a Computer:** Process, **Disassembling a Computer:** Process

**Unit-III**

**12 Hours**

## **Computer System Maintenance Desktops, Laptops and Mobiles:**

**Maintaining the Software:** Software Updation/Upgradation (Virus Definition Files, Patches/Updates) Scheduling Maintenance Tasks (Defragmentation, Clean-Up, Back-Up, System Profilers and Other Third Party Utility Software), **Maintaining the Hardware:** Hardware Upgradation (Installing and Configuring New Peripherals like Printers, Scanners. Installing and Configuring Additional or Replacement Devices like Hard Drive, Memory, Graphics, Sound, Optical Media, Network and Cleaning Equipment), **File Management:** Manage Files/Folders, Back-Up Procedures, **Laptop Maintenance:** Installing and Configuring Laptop Hardware and Components, Features of the Laptops (Description and comparisons) and security, **Mobile Device Maintenance:** Configuring Mobile Software and Hardware (Touch Screens, Network Connectivity, Emails, Wireless Connectivity and Pairing), Securing Mobile Devices (Antivirus), Basic Features of Mobile Operating Systems (Android, iOS), Open Source Vs Proprietary/Vendor Specific Software (Operating System) and Concept of App Stores, Differences between the maintenance of Laptops and Mobile Devices

**Operating Systems: Features and Requirements (Microsoft Windows Operating Systems)**

**Microsoft Windows Operating Systems:** From Windows XP to Windows 7, Features: 32-Bit Vs. 64-Bit, Aero, Gadgets, User Account Control, Bit-Locker, System Restore, Administrative Tools, Firewall, Security Center, File Structure And Paths, Compatibility Tools and Windows Upgrade OS Advisor, **Boot Methods:** (USB, CD-ROM, DVD, PXE), **Type of Installations:** Creating Image: Unattended Installation, Upgrade, Clean Install, Repair Installation, Multiboot, Remote Network Installation and Image Deployment, **Partitioning:** Dynamic, Basic, Primary, Extended and Logical, **File System Types Formatting:** FAT, FAT32, NTFS and CDFS, **Usage Of Command Line Tools:** Networking: Ping, Tracert, Netstat, Ipconfig, Net, Nslookup, Nbtstat, Taskkill, Bootrec, Shutdown, Tasklistetc),

**Unit-V**

12 Hours

**Usage of Appropriate Operating System Features and Tools:** Administrative, Computer Management, General, Disk Management and Command Line Utilities Tools, **Control Panel Utilities:** Common for all Windows OS, Unique to Windows Vista and Unique to Windows 7, **Setting up and Configuring Windows Networking On A Client/Desktop:** Process, **Performing Preventive Maintenance Procedures Using Appropriate Tools:** Best Practices, **Security Settings:** User and Groups, Administrator, Power User, Guest and Standard User, **Basics of Client-Side Virtualization:** Purpose of Virtual Machines, Resource Requirements, Emulator Requirements, Security Requirements and Network Requirements

**Text Books:**

1. William Stallings. Computer Organization and Architecture – Designing for Performance. 7th Edition. Prentice Hall of India Pvt. Ltd., 2007.
2. Carl Hamachar, Zvonko Vranesic and Safwat Zaky. Computer Organization.

**Reference Books:**

1. PC Hardware in a Nutshell by Barbara Fritchman Thompson, Robert Bruce Thompson- O'Reilly, 2<sup>nd</sup> Edition, 2010
2. Fundamentals of Computer Organization and Architecture by Mostafa AB-EL-BARR and Hesham EL-REWNI, John Wiley and Sons, 2006
3. Fundamental Of computer Organization by Albert Zomaya, 2010

## Discrete Mathematics

**Course Code:DMCA104**

**Course Credit: 02**

**Hours: 30**

**Unit: I**

**5Hrs**

**Logic -I**

Proposition, logical connectives, laws of logic, logical equivalence, rules of inference.

**Logic –II**

Predicate and Quantifiers.Negations, logical equivalence with quantifiers.

**Unit: II**

**6Hrs**

**Basics of Counting**

Fundamental principles, Permutation and Combinations, Mathematical Induction, Recursive Definitions.

**Relations & Functions**

Sets, Relations,Functions, Pigeonhole Principle.

**Unit: III**

**7Hrs**

**Properties of Relations**

Representing Relations, Hasse diagrams, Closure of Relations, Transitive closure- Warshall's Algorithm  
Equivalence Relations, Partial Ordering.

**Unit : IV**

**7Hrs**

**Group Theory**

Definition and Properties of Groups, Sub Groups, Cyclic Groups.

**Cosets and Coding Theory**

Cosets And Lagrange's Theorem. Coding Theory, Hamming Matrix, Parity Check And Generator Matrices.

**Unit: V**

**5Hrs**

**Group codes**

Group codes, Decoding with coset leaders, Hamming Matrices.

**Text Book:**

1. Discrete and Combinatorial Mathematics, R.P. Grimaldi, Pearson Education, Fourth Edition Asia, New Delhi, 2002

**Reference Books:**

1. Discrete Mathematics with Applications, Thomas Koshy, Academic Press, 2005
2. Discrete Mathematics and its Applications, Kenneth H. Rosen, Sixth Edition Tata McGraw- Hill Publishing Company Limited, New Delhi, 2004
3. Elements of Discrete Mathematics, Liu, TMH, 2004.
4. Essence of Logic', John Kelley, PHI, 2002.

## Semester II Programming in Java

**Subject Code: DMCA201**

**Credits: 04**

**Total Hours: 60**

**Unit: I**

**12 Hrs**

### **Introduction to Java**

Java and Java applications; Java Development Kit (JDK); Java is interpreted, Byte Code, JVM; Object-oriented programming; Simple Java programs. Data types and other tokens: Boolean variables, int, long, char, operators, arrays, white spaces, literals, assigning values; Creating and destroying objects; Access specifiers. Operators and Expressions: Arithmetic Operators, Bitwise operators, Relational operators, The Assignment Operator, The ? Operator; Operator Precedence; Logical expression; Type casting; Strings. Control Statements: Selection statements, iteration statements, Jump Statements.

**Unit: II**

**12Hrs**

Classes, Inheritance, package and Interface

Classes: Classes in Java; Declaring a class; Class name; Super classes; Constructors; Creating instances of class; Inner classes. The Object Class. Packages and Interfaces :Packages,AccessProtection,Importing Packages.

Interfaces:DefiningInterfaces,ImplementingInterfaces,Applying Interfaces, variables in Interfaces, Interfaces can be extended . Inheritance: Simple, multiple, and multilevel inheritance; Overriding, overloading.

**Unit: III**

**12Hrs**

Multi-Threaded Programming and Exceptions

Multi-Threaded Programming: What are threads? How to make the classes threadable; Extending threads; Implementing runnable; Synchronization; Changing state of the thread; Bounded buffer problems, read-write problem, producer-consumer problems.

Exception Handling:Fundamentals,ExceptionTypes,UncaughtExceptions,using try and catch,multiple catch clauses,nested try statements,throw, throws,finally,java's built in exceptions,creating your own exceptions and chained exceptions.

**Unit: IV**

**12Hrs**

### **Input/Output:Streams**

The Stream classes,The Byte Streams ,TheCharacterStreams,Using Stream I/O ,Serialization

### **Lambda Expressions and Event Handling**

Lambda Expressions- Introducing Lambda Expressions, Lambda Expression Fundamentals, Functional Interfaces, Some Lambda Expression Examples, Block Lambda Expressions, Generic Functional Interfaces, Passing Lambda Expressions as Arguments, Lambda Expressions and Exceptions, Lambda Expressions and Variable Capture, Method References, Method References to static Methods Method References to Instance Methods Method References with Generics, Constructor References, Predefined Functional Interfaces.

The Applet Class: Two types of Applets; Applet basics; Applet Architecture; An Applet skeleton; Simple Applet display methods; Requesting repainting; Using the Status Window; The HTML APPLET tag; Passing parameters to Applets; get Document base () and get Codebase(); Aplet Context and show Document(); The Audio ClipInter face; The Applet Stub Interface; Output to the Console.

Event Handling: Two event handling mechanisms; The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model; Adapter classes; Inner classes.

**Java FX and Networking**

Introducing GUI Programming with Java FX

Java FX Basic Concepts, The Java FX Packages, The Stage and Scene Classes, Nodes and Scene Graphs, Layouts, The Application Class and the Lifecycle Methods, A Java FX Application Skeleton, Compiling and Running a Java FX Program, The Application Thread. A Simple Java FX Control: Label, Using Buttons and Events, Event Basics, Introducing the Button Control, Demonstrating Event Handling and the Button, Drawing Directly on a Canvas.

Exploring Java FX Controls, Using Image and Image View, Adding an Image to a Label, Using an Image with a Button, Toggle Button, Radio Button, Handling Change Events in a Toggle Group  
An Alternative Way to Handle Radio Buttons, Check Box, List View, List View Scrollbars  
Enabling Multiple Selections, Combo Box, Text Field, Scroll Pane, Tree View

Introducing Effects and Transforms, Effects, Transforms, Demonstrating Effects and Transforms  
Adding Tooltips, Disabling a Control, Introducing Java FX Menus, Menu Basics, An Overview of Menu Bar, Menu, and MenuItem, Create a Main Menu, Add Mnemonics and Accelerators to Menu Items, Add Images to Menu Items, Use RadioMenuItem and CheckMenuItem, Create a Context Menu, Create a Toolbar.

**Networking**

Networking Basics: Socket Overview, Client/Server, Reserved Sockets, Proxy Servers, Internet Addressing .Java and the Net, InetAddress: Factory Methods, Instance Methods, TCP/IP Client Sockets: Whois, URL, URL Connection, TCP/IP Server Sockets, A Catching Proxy HTTP Server: Source Code, Datagram, InetAddress and Inet6Address, RMI, Cookies

**Text Books:**

1. Herbert Schildt: Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2007.
2. Jim Keogh: J2EE The Complete Reference, Tata McGraw Hill, 2007.

**Reference Books:**

1. Y. Daniel Liang: Introduction to JAVA Programming, 6th Edition, Pearson Education, 2007.
2. Stephanie Bodoff et al: The J2EE Tutorial, 2nd Edition, Pearson Education, 2006

# Database Management System

**Subject Code: DMCA202**

**Credits: 02**

**Total Hours: 30**

**Unit: I**

**5Hrs**

Overview of Database Systems Managing Structured Data - File Systems vs. DBMS - Basics of DBMS – Overview of Relational Model - Database languages – Queries - Transaction Management - Structure & Design of a DBMS - History of DBMS - Object Relational and semi-structured DB - Users & Administrators.

**Unit: II**

**6Hrs**

Introduction to Database Design

ER Diagrams – Entities, Attributes and Relationships. Design with ER Model - Conceptual Design for Large Enterprises - UML - Case Study.

Relational Model

Relations - Integrity constraints over relations - Logical DB design – Views.

**Unit: III**

**6Hrs**

Schema Refinement and Normal Forms

Features of Good DB Design - First Normal forms and Atomic Domain- Functional Dependencies and Decomposition - Normal Forms - Database Design Process.

Introduction to SQL

Basic form for SQL queries – Nested Queries – Aggregate Queries- Null values- Joins – Triggers - Store-Procedures and User defined Functions.

**Unit: IV**

**7Hrs**

DB Application Development

DB Access from applications – embedded SQL, Cursors, and Dynamic SQL. Introduction to JDBC & SQL/J - Stored Procedures.

Overview of Storage and Indexing

Data on external storage - File Organizations and Indexing - Index Data Structures - Comparison of File Organizations - Indexes and Performance Tuning.

Overview of Query Evaluation

System Catalog - Operator Evaluation - Algorithms for relational operations. Introduction to Query Optimization – Alternative Plans.

**Unit: V**

**6 Hrs**

Overview of Transaction Management

ACID Properties - Transactions and Schedules - Concurrent Execution of Transactions - Lock-based concurrency control - Transaction support in SQL. Introduction to Crash Recovery.

Physical Database Design and Tuning

Introduction to Physical Database design - Index Selection - Clustering. Overview of Database Tuning - Choices in tuning queries and Views.

**Text books:**

1. Database Management Systems, Raghu Ramakrishnan and Johannes Gehrke 3rd Edition, McGraw Hill 2003.
2. Database System Concepts, AbrahamSilberschatz, Henry F. Korth and S. Sudarshan, 5th Edition, McGraw Hill 2006.

**Reference Books:**

1. Fundamentals of Database Systems, Elmasri and Navathe, 5thEdition, Addison- Wesley, 2007.
2. An Introduction to Database Systems, C.J. Date, A. Kannan, S. Swamynatham, 8th Edition, Pearson education, 2006.

## Information Security Fundamentals

**Subject Code: DMCA203**

**Credits: 02**

**Total Hours: 30**

**Unit: I**

**6 Hrs**

Introduction to Information Security

Overview of Information security, Threats, Type of Vulnerabilities and Risk, Business Requirements, Information Security Definitions – Security Policies – Tier 1 (origination Level), Tier 2 (Functional Level), Tier 3 (Application or Device Level), Procedures, Standards, Guidance. Role of Governance in Information Security, Develop a Risk Management Program, Risk Management Process, Best Practices for IT Governance.

**Unit: II**

**6 Hrs**

Information Asset Classification

Classification of Information, Information Assets – Owner, Custodian, User, Information Classification in terms of Secret, Confidential, Private and Public, Declassification. Retention and Disposal of Information Assets. Provide Authorization for Access – Owner, Custodian and User

**Unit: III**

**6Hrs**

Access Control User Identity and Access Management- Account Authorization, Access and Privilege Management, System and Network Access Control. Operating Systems Access Controls, Monitoring Systems Access Controls, Intrusion Detection System, Event logging, Cryptography. Physical Security: Identify Assets to be Protected, Perimeter Security, Firewalls, Prevention and Detection Systems, Safe Disposal of Physical Assets. Email Security: PGP, MIME, IP Security: IP security overview

**Unit: IV**

**6 Hrs**

Introduction to Cryptography

Introduction to Advanced Cryptography and Cryptanalysis, Classical Encryption Techniques – Substitution Techniques, Transposition Techniques, Permutation Method. Advanced Encryption Techniques and Security Issues – RC4, One-time Pad, RSA, DES, Triple DES, AES and Diffie Hellman

**Unit: V**

**6 Hrs**

Conventional Encryption

Confidentiality using conventional encryption – Placement of Encryption, Traffic Confidentiality, Key Distribution and Random Number Generation. Key management – Generating Keys, Nonlinear Keyspaces, Transferring Keys, Verifying Keys, Using Keys, Updating Keys, Storing keys, Backup keys, Compromised Keys, Lifetime of Keys, Destroying Keys and Public-Key Management

**Text Books:**

1. Information security: Principles and Practice - Mark Stamp, 2nd Edition, Pub: John Wiley & Sons, Inc., 2011
2. Information Security Risk Analysis - Thomas R. Peltier, Third Edition, Pub: Auerbach, 2012
3. Cryptography and Network Security Principles and Practices, Fifth Edition by William Stallings, Prentice Hall Publication Inc., 2007

**Reference Books:**

1. Information Security Risk Analysis - Thomas R. Peltier, Third Edition, Pub: Auerbach, 2012
2. Applied Cryptanalysis – Breaking Ciphers in the Real World Stamp, Richard M.Low

# Operating Systems

**Subject Code: 15MCA205**

**Credits: 04**

**Total Hours: 60**

## **Unit: I**

**12Hrs**

Introduction to Operating Systems, System structures

What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and security; Distributed system; Special-purpose systems; Computing environments. Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating System design and implementation; Operating System structure; Virtual machines; Operating System generation; System boot.

## **Unit : II**

**12Hrs**

Process Management

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

## **Unit : III**

**12Hrs**

Process Synchronization

Synchronization: The Critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors.

Deadlocks

Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.

## **Unit : IV**

**12Hrs**

Memory Management

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

File System, Implementation of File System

File System: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection. Implementing File System: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management.

## **Unit: V**

**12Hrs**

Secondary Storage Structures, Protection

Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk

Management; Swap space management. Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights, Capability-Based systems.

### **Case Study: The Linux Operating System**

Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory management; File systems, Input and output; Inter-process communication.

### **Text Books:**

1. Abraham Silberschatz, Peter Baer Galvin , Greg Gagne: Operating System Principles, 7th edition, Wiley-India, 2006. (Chapters: 1, 2, 3.4, 5, 6, 7, 8, 9, 10, 11,12, 17,21)



**Reference Books:**

1. D.M Dhamdhere: Operating systems - A concept based Approach, 2nd Edition, Tata McGraw- Hill, 2002.
2. P.C.P. Bhatt: Operating Systems, 2nd Edition, PHI, 2006.
3. Harvey M Deital: Operating systems, 3rd Edition, Addison Wesley, 1990.

## Java Programming Lab

**Subject Code: DMCA205**

**Credits: 02**

**Total Hours: 30**

1.
  - a. Write a JAVA Program to demonstrate Constructor Overloading and Method overloading.
  - b. Write a JAVA Program to implement Inner class and demonstrate its Access Protections.
2.
  - a. Write a JAVA Program to implement Inheritance.
  - b. Write a JAVA Program to implement Exception Handling (Using Nested try catch and finally).
3. Write a program to implement Package
4. Write a JAVA program which has
  - a. A Class called Account that creates account with 500Rs minimum balance ,a deposit() method to deposit amount, a withdraw() method to withdraw amount and also throws Less Balance Exception if an account holder tries to withdraw money which makes the balance become less than 500Rs.
  - b. A Class called Less Balance Exception which returns the statement that says withdraw amount (\_\_\_Rs) is not valid.
  - c. A Class which creates 2 accounts, both account deposit money and one account tries to with draw more money which generates a Less Balance Exception take appropriate action for the same.
5.
  - a. Write a JAVA Program to create an Interface and implement it in a class.
  - b. Write a JAVA Program to create a class (extending Thread) and use methods Thread class to change name, priority, ---- of the current Thread and display the same.
6.
  - a. Write a JAVA Program to create a Scrolling Text using JAVA Applets.
  - b. Write a JAVA Program to pass parameters to Applets and display the same.
7. Write a JAVA Program to implement Client Server (Client requests a file, Server responds to client with contents of that file which is then display on the screen by Client – Socket Programming).
8. Write a JAVA Program to implement a simple Client Server Application using RMI.
9. Write a JAVA Program which uses File Input Stream / File Output Stream Classes.
10. Write a JAVA program which uses Datagram Socket for Client Server Communication.
11. Write JAVA Applet programs which handles Mouse Event using Java FX
12. Write JAVA Applet programs which handles Keyboard Event using java FX
13. Write a Swing Application which uses Java FX
  - a. JTabbedPane
  - b. Each Tab should use JPanel, which includes any one component given below in each Panel
  - c. Combo Box/List/Tree/Radio button

**Tables to be used in the exercise:**

**Student (Student\_id, Sname, Dep No, email)**

**College/Dept (Dept No, Dname, HOD)**

**Faculty (Faculty\_id, fname, dept, designation, salary)**

**Employee (EmpID, name, job, hiredate, sal, deptno, MgrID, age)**

**Department (deptno, dname, loc)**

1. Create a query to display all the data from the table. Separate each column by a comma. Name the column THE\_OUTPUT.
2. Create a query to display the name and age of students, whose age is more than 30 years.
3. Display the employee number, name, salary, and salary increased by 15%.
4. Create a query that displays the names and indicates the amounts of their annual salaries with asterisks. Sort the data in descending order of salary.
5. Retrieve data from multiple tables by using all types of below specified joins:

**Inner Join:**

- a. Retrieve only the information about departments to which at least one employee is assigned.
- b. Retrieve only the information about those employees who are assigned to a department.

**Outer Joins:-**

Outer joins can be a left, a right, or full outer join.

Left outer join selects all the rows from the left table specified in the LEFT OUTER JOIN clause, not just the ones in which the joined columns match.

- c. Retrieve the information of all the employees along with their Department Name if they are assigned to any department.  
Right outer join selects all the rows from the right table specified in the RIGHT OUTER JOIN clause, not just the ones in which the joined columns match.
- d. Retrieve the information of all the departments along with the detail of EmployeeName belonging to each Department, if any is available.

**Self Join**

- e. Retrieve the ID of the employees and the IDs of their respective managers from the employee table.
6. Using group functions, retrieve suitable results by using HAVING, GROUP BY and ORDER BY clauses
    - a. Find the age of highest paid employee who is at least 30 years old for each department with at least two such employees.
    - b. Find those departments for which the average age of employee is the minimum over all departments.
    - c. Find the sum of salary of all the employees in each department having department number greater than 10.
  7. Write a query that displays the names with the first letter capitalized and all other letters lowercase, and the length of the names, for all names whose name starts with J, A, or M. Give each column an appropriate label. Sort the results by the names.
  8. Perform below specified DDL operations:
    - Create a table of all the students attending this class which contains their student\_id, name, department code and email id. The department code should be a valid one having reference in the

existing dept table in the college schema. Ensure that the email id of all the students should be distinct in the table and there should be one unique\_id for every student. It can't be null.

- Create another table by name NEWDEPT from DEPT table's deptno, dname Columns and another column by name dept\_head. Apply all the given constraints properly.
  - Perform below specified operations with these tables.
  - Rename the table.
  - Add one column (sex) to that table which contains either M or F.
  - Drop column from the table.
  - Drop the table.
9. Create one simple view on students which contains all students records belong to department MCA.
  10. Try to insert one row data through the view and verify it in the base table.
  11. Create a sequence and insert data to students using that sequence for providing new students number.
  12. Create a PL/SQL block that selects the maximum department number in the DEPARTMENTS table and stores it in a variable. Print the results to the screen.
  13. Create a PL/SQL block to insert a new department number into the Departments table. Use maximum dept number fetched from above and adds 10 to it.
  14. Create a PL/SQL block to delete the department created in exercise 16. Print to the screen the number of rows affected.
  15. Write a PL/SQL block which accepts employee name, basic and should displayEmployee name, PF and net salary.
    - HRA=30% of basic salary
    - DA=75% of basic salary
    - Net salary=basic+HRA+DA-PF
    - If the basic is less than 8000 PF is 5% of basic salary.
    - If the basic is between 8000 and 15000 PF is 7% of basic salary.
    - If the basic is between 15000 and above PF is 8% of basic salary.
  16. Write a PL/SQL block to award an employee with the bonus. Bonus is 15% of commission drawn by the employee. If the employee does not earn any commission then display a message that 'employee does not earn any commission'. Otherwise add bonus to the salary of the employee. The block should accept an input for the employee number.
  17. Write a PL/SQL block which accepts employee number and finds the average salary of the employees working in the department where that employee works. If his salary is more than the average salary of his department, then display messaging that 'employee's salary is more than average salary' else display 'employee's salary is less than average salary'.
  18. Using Cursors Write a program that gives all employees in department MCA and 15% pay increase. Display a message displaying how many Employees were awarded the increase.
  19. Using cursors display the names of employees who are working for Department MCA.
  20. Create a procedure that deletes rows from the employee table. It should accept 1 parameter, job; only delete the employee's with that job. Display how many employees were deleted.
  21. Write a PL/SQL block to invoke the procedure. Write a simple before statement-level trigger that displays a message prior to an insert operation on the EMP table.

22. Write an after statement-level trigger. Whenever an insert, update, or delete operation occurs on the EMP table, a row is added to the empauditlog table recording the date, user, and action.
23. Write a row-level trigger that calculates the commission of every new employee belonging to department 30 that is inserted into the EMP table.
24. Design mini database project using procedures and triggers. Front-end can be done using VB, ASP.Net or any other similar application.

**Semester III**  
**NoSQL Databases**

**Subject Code: DMCA301**

**Credits: 02**

**Total Hours: 30**

**Unit I: Introducing NoSQL**

**6 hours**

The value of Relational Databases, Disadvantages of Relational Databases, A Brief History of NoSQL, Features of NoSQL, ACID vs BASE, Managing Different Data Types

**Unit II: Data models**

**6 hours**

Aggregates , key-value and document data models, Column-Family Stores, relationships, graph databases, schema-less databases, materialized views

**Unit III: distribution models**

**6 hours**

Single Server, sharding, master-slave replication, peer-peer replication, sharding and replication

**Unit IV: Consistency**

**6 hours**

Update Consistency, Read Consistency, Relaxing Consistency, Relaxing Durability

**Unit V: NoSQL Databases**

**6 Hours**

Key-Value Databases, Document Databases, Column-Family Stores, Graph Databases, Beyond NoSQL

**Text Books:**

1. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Copyright © 2013 Pearson Education, Inc. 2012.
2. NoSQLFor Dummies®, 2015 by John Wiley & Sons, Inc
3. Professional NoSQL, Shashank Tiwari, Wrox
4. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
5. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
6. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.
7. "MongoDB: The Definitive Guide" by Kristina Chodorow

## Web Programming

**Subject Code: DMCA302**

**Credits: 02**

**Total Hours: 30**

### **Unit: I**

**6 Hours**

Fundamentals of Web, XHTML – 1: Internet, WWW, Web Browsers and Web Servers, URLs, MIME, HTTP, Security, Web Programmers Toolbox.

XHTML: Basic syntax, Standard structure, Basic text markup, Images, Hypertext Links.

XHTML – 2, CSS: XHTML (continued): Lists, Tables, Forms, Frames CSS: Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The box model, Background images, The <span> and <div> tags, Conflict resolution.

### **Unit: II**

**6 Hours**

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

JavaScript and HTML Documents, Dynamic Documents with Javascript:

The JavaScript execution environment, The Document Object Model, Element access in Javascript, Events and event handling, Handling events from the Body elements, Button elements, Text box and Password elements, The DOM 2 event model, The navigator object, DOM tree traversal and modification. Introduction to dynamic documents, Positioning elements, Moving elements, Element visibility, Changing colors and fonts, Dynamic content, Stacking elements, Locating the mouse cursor, Reacting to a mouse click, Slow movement of elements, Dragging and dropping elements.

### **Unit: III**

**6 Hours**

**XML:** Introduction, Syntax, Document structure, Document type definitions, Namespaces, XML schemas, Displaying raw XML documents, Displaying XML documents with CSS, XSLT style sheets, XML processors, Web services.

### **Unit: IV**

**6 Hours**

Perl, CGI Programming: Origins and uses of Perl, Scalars and their operations, Assignment statements and simple input and output, Control statements, Fundamentals of arrays, Hashes, References, Functions, Pattern matching, File input and output; Examples. The Common Gateway Interface; CGI linkage; Query string format; CGI.pm module; A survey example; Cookies. Database access with Perl and MySQL

### **Unit: V**

**6 Hours**

**PHP:** Origins and uses of PHP, Overview of PHP, General syntactic characteristics, Primitives, operations and expressions, Output, Control statements, Arrays, Functions, Pattern matching, Form handling, Files, Cookies, Session tracking, Database access with PHP and MySQL.

### **Text Books:**

1. Robert W. Sebesta: Programming the World Wide Web, 4th Edition, Pearson Education, 2008. (Listed topics only from Chapters 1 to 9, 11 to 15)

### **Reference Books:**

1. M. Deitel, P.J. Deitel, A. B. Goldberg: Internet & World Wide Web How to Program, 4th Edition, Pearson Education, 2004.
2. Chris Bates: Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2007.
3. XueBai et al: The web Warrior Guide to Web Programming, Cengage Learning, 2003.

# Software Engineering

**Subject Code: DMCA303**

**Credits: 04**

**Total Hours: 60**

## **Unit: I**

**12 Hours**

### Overview

Introduction: FAQ's about software engineering, Professional and ethical responsibility. Socio-Technical systems: Emergent system properties; Systems engineering; Organizations, people and computer systems; Legacy systems.

Critical Systems, Software Processes

Critical Systems: A simple safety-critical system; System dependability; Availability and reliability. Software Processes: Models, Process iteration, Process activities; The Rational Unified Process; Computer-Aided Software Engineering.

## **Unit: II**

**12 Hours**

### Requirements

Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; Interface specification; the software requirements document. Requirements Engineering Processes: Feasibility studies; Requirements elicitation and analysis; Requirements validation; Requirements management.

System models, Project Management

System Models: Context models; Behavioural models; Data models; Object models; structured methods. Project Management: Management activities; Project planning; Project scheduling; Risk management.

## **Unit: III**

**12 Hours**

### Software Design

Architectural Design: Architectural design decisions; System organization; Modular decomposition styles; Control styles. Object-Oriented design: Objects and Object Classes; An Object-Oriented design process; Design evolution.

## **Unit: IV**

**12 Hours**

### Development

Rapid Software Development: Agile methods; Extreme programming; Rapid application development. Software Evolution: Program evolution dynamics; Software maintenance; Evolution Processes; Legacy system evolution.

## **Unit: V**

**12 Hours**

### Verification and Validation

Verification and Validation: Planning; Software inspections; automated static analysis; Verification and formal methods. Software testing: System testing; Component testing; Test case design; Test automation.

### Management

Managing People: Selecting staff; Motivating people; Managing people; The People Capability Maturity Model. Software Cost Estimation: Productivity; Estimation techniques; Algorithmic cost modelling, Project duration and staffing.

## **Text Books:**

1. Roger. S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, McGraw-Hill, 2007.

## **Reference Books:**

1. Ian Sommerville: Software Engineering, 8th Edition, Person Education Ltd., 2007. (Chapters:- 1, 2, 3, 4, 5, 6, 7, 8, 11, 14, 17, 21, 22, 23, 25, 26)
2. Pfleeger: Software Engineering Theory and Practice, 2nd Edition, Pearson Education, 2001.
3. Waman S Jawadekar: Software Engineering Principles and Practice, Tata McGraw Hill, 2004.



# Enterprise Application Development

**Subject Code: 15MCA304**

**Credits: 02**

**Total Hours: 30**

## **Unit 1: Introduction to Enterprise Application**

**6 hours**

Enterprise Architecture – life cycle, development framework, architectural model, conceptual layers, enterprise IT architecture domain. Enterprise Server – introduction, different types of enterprise servers, set up clusters. Enterprise Resource Planning (ERP) - Customer Relationship Management (CRM) - SCM – HRM. Enterprise Java – Introduction to web application and its lifecycle; Different containers

## **Unit 2: Web Tier**

**6 hours**

XML and Java API for XML processing – Introduction to JAXP; DOM, SAX and StAX interface; XSLT, Servlets – Introduction; servlet life cycle; sessions; session tracking using hidden fields, user authentication, URL rewriting and Cookies; Inter-servlet communication, Java Server Pages (JSP) – introduction to JSP tags; JSP Life Cycle; Directives; Custom JSP tags, Java Server Faces Technology – Introduction; Page Navigation; Tags; Life Cycle and Architecture.

## **Unit 3: Enterprise Information Systems Tier**

**6 hours**

Java Database Connectivity – Introduction; Different types of drivers; Steps to establish a connection and query it, Java Persistence API – JPA Architecture; Entities; Entity Relationship; Managing Entities, Java Transaction API (JTA) – Transactions in J2EE; Serializability; Concurrent transactions; Distributed transaction and transaction manager, Mobile Database – Need for mobile database; Architecture; different products; Mobile transactions

## **Unit 4: Business Tier**

**6 hours**

Enterprise JavaBeans (EJB) – EJB container; enterprise beans; Session beans; Message-driven beans, JAX-WS Web service endpoints – introduction to creating web services and client, Business Intelligence and Data warehousing – Data model, Data integrity, OLAP, Application in an enterprise, Model-View-Controller (MVC) Architecture – Introduction, Model1 and Model 2 architecture

## **Unit 5: Enterprise Mobility**

**6 hours**

Introduction to Enterprise Mobility: Trends and benefits; Drivers; Risks and analysis, Enterprise Mobility Architecture – High level architecture; Building Units; Capability Model; Meta Model – Mobile Device Security; Enterprise Mobility infrastructure: Secure VOIP, Enterprise Mobility Middleware and Solutions - MEAPs, Native Apps, HTML5., Use Cases.

### **Text Books:**

1. Head First Servlets and JSP by Bryan Basham, Kathy Sierra, and Bert Bates from O'Reilly Media, INC, 2008

### **Reference Books:**

1. Java Server Faces: The Complete Reference by Chris Schalk, Ed Burns and James Holmes, 2006
2. A Practical Guide to Enterprise Architecture by James McGovern, 2003
3. Java EE 6 Development using GlassFish Application Server by David R. Heffelfinger, Packt Publishing, 2009
4. Effective Enterprise Java by Ted Neward, 2004
5. Java Enterprise Best Practices by Robert Eckstein and J. Steven Perry from O'Reilly Authors, 2002

**Elective – 1 – 2 credit paper**

**Semester IV**  
**.Net Technologies**

**Subject Code: DMCA401**

**Credits: 04**

**Total Hours: 60**

**Unit: I**

**12 Hours**

**OVERVIEW OF .NET**

Advantages of .NET over the other languages, overview of .NET binaries, Intermediate Language, metadata, .NET Namespaces, Common Language runtime, common type system, common Language Specification. C# fundamentals – C# class, object, string formatting, Types, scope, constants, C# iteration, control flow, operators, array, string, Enumerations, structures, custom Namespaces.

**Unit: II**

**12 Hours**

**OBJECT ORIENTED PROGRAMMING WITH C#**

Class, encapsulation, inheritance, polymorphic, casting, Exception Handling, Garbage Collector. Interfaces and Collections - Enumerator, Cloneable objects, Comparable objects, Collections, Indexes, overloading operators, delegates, Events, XML Documentation

**Unit: III**

**12 Hours**

**BUILDING WINDOW**

Namespaces, Windows Forms Types, Application Class, Form, Component Class, Control class, Control Events, Scrollable Control, Container Control, Menu, Status Bars, Tool Bar, Windows Forms Application, System Registry, Event Viewer.

Programming with Windows form controls - Windows form control Hierarchy, Adding controls, Textbox, Checkboxes, Radio Buttons, Group Boxes, List Boxes, Combo Boxes, Track Bar, Calendar, Spin Control, Panel, ToolTips, Error Provider, Dialog Boxes.

**Unit: IV**

**12 Hours**

**INPUT - OUTPUT AND ADO .NET**

Introduction to System. IO .namespace, File and folder operations and stream class

Building Data Table, Data View, Data Set, Data Relations, ADO.NET managed Providers, OLEDB managed Provider, SQL.

**Unit: V**

**12 Hours**

**WEB DEVELOPMENT AND ASP.NET**

Web applications and web servers, HTML form Development, GET and POST, ASP.NET application, ASP.NET namespaces, creating sample C# web Applications, architecture, Debugging and Tracing of ASP.NET, Introduction to web Form controls. Building Web Services- web service namespaces, building simple web

**Text Book:**

1. Andy Harris, 'Microsoft C# Programming for the Absolute Beginner', PRENTICE-HALL OF INDIA PVT LTD, 2002.

**Reference Books:**

1. Andrew Troleson C# and the .NET Platform, Dreamtech Press, Second Edition
2. Bradley L Jones, 'Sams Teach Yourself the C# Language in 21 Days', Sams, 1st edition, 2001
3. WEBSITES:
  - (i) <http://C-sharpcorner.com/tutorials.asp>
  - (ii) <http://www.programmingtutorials.com/csharp.aspx>

## Distributed and Cross-platform Databases

**Subject Code: DMCA402**

**Credits: 04**

**Total Hours: 60**

### **Unit 1: Introduction to Distributed Databases**

**12 hours**

Distributed Data processing, Distributed database system (DDBMSS), Distributed DBMS Architecture: DBMS Standardization, Architectural models for Distributed DBMS, Distributed DBMS Architecture, Distributed Database Design, query processing, Features of NoSQL, Need for NoSQL, Distributed systems, Advantages of distributed computing, NoSQL Databases, MongoDB, CouchDB, Cassandra, RavenDB, DynamoDB

### **Unit 2: Introduction to MongoDB**

**12 hours**

Introduction to MongoDB, Features, Advantages, How to install, Data types, Data modeling, Documents, Collections, MongoDB Shell, Create and drop database and collection, Operations on document (insert, query, update, delete)

### **Unit 3: Replication and Sharding in MongoDB**

**12 hours**

Projection methods, Limiting and sorting records, Indexing, Aggregation, Replication - setting a replica set, components of a replica set, connecting and administration; Sharding - configuring sharding, shard key

### **Unit 4: Advanced concepts in MongoDB**

**12 hours**

Relationships, Database References, Covered queries, Analyzing queries, Atomic operations, Advanced indexing, Indexing limitations, ObjectId, Map Reduce, Text search, Regular Expressions, GridFS, Server Administration - starting and stopping MongoDB, Monitoring MongoDB, making back-ups

### **Unit 5: Introduction to Cassandra**

**12 hours**

History and features, Architecture, How to install, The Cassandra Data model, Shell commands, Configuring Cassandra, Keyspace operations, Table operations, CRUD operations, CQL Types, Clients, Monitoring, Maintenance, Performance Tuning,

### **Reference Books:**

1. Distributed Databases principles and systems, StefanoCeri, Giuseppe, Pelagatti, Tata McGraw Hill
2. Professional NoSQL, by Shashank Tiwari, Wrox
3. NoSQLFor Dummies, by Adam Fowler, Wiley
4. MongoDB: The Definitive Guide, By Kristina Chodorow, O'Reilly
5. The Definitive Guide to MongoDB, by David Hows, EelcoPlugge, Peter Membrey, Tim Hawkins
6. MongoDB in Action, by Kyle Banker, Manning Publications Co.
7. Practical Cassandra: A Developer's Approach, by Russell Bradberry, Eric Lubow, Addison-Wesley
8. Cassandra: The Definitive Guide, by Eben Hewitt, O'Reilly

# Operations Research

**Subject Code: DMCA403**

**Credits: 04**

**Total Hours: 60**

## **Unit: I**

**12 Hours**

Introduction and Overview of the OR Modeling Approach

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

Introduction to Linear Programming

Formulation of linear programming problem (LPP) – examples - Graphical solution - the LP Model - Special cases of Graphical method.

## **Unit: II**

**12 Hours**

Solving LPP - the Simplex Method

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

Transportation and Assignment Problems

The transportation problem - formulation and solution of transportation models - variants in TP – Degeneracy - the assignment problem - the Hungarian method for solution of the assignment problem - variations of the Assignment problem.

## **Unit: III**

**12 Hours**

Network Analysis in Project Planning

Basic tools and techniques of Project Management - role of network techniques in Project Management - Network logic - Fulkerson's rule - CPM and PERT.

Introduction and Analysis of Uni-Variate Data

Definition of Statistics – Functions – Limitations - Scope of Statistics in business Concepts - Measures of Central Tendency- Introduction, Types, qualities of a good measure of central tendency – Mean – Median – Mode – Problems.

## **Unit: IV**

**12 Hours**

Measures of Dispersion

Dispersion – concept - absolute and relative measures – Range - Quartile Deviation - Mean Deviation and Standard Deviation Problems.

Tools in Strategic Finance

Time value of money – present value - future value – annuity - growing annuity – perpetuity - deferred annuity – Application: Loan amortization, reverse mortgage etc.

## **Unit: V**

**12 Hours**

### **Decision Making**

Capital budgeting techniques – concept of cash flows - Net Present Value - Modified Internal Rate of return (MIRR) – IRR - Application: Evaluating financial feasibility of Capex plans - business plans etc.

### **Risk Analysis**

Capital projects' risk analysis – Simulation, decision tree approach - sensitivity analysis - use of random numbers - Options pricing, Concept of beta in portfolio management - beta calculation - Application: Risk analysis of projects - Derivatives - Real Options etc.

**Text books:**

1. Operations Research: An Introduction, Hamdy A Taha, 8th Edition, Prentice Hall India, 2007.
2. Fundamentals of Statistics – S.C. Gupta, V.K.Kapoor, 11th Edition, S.Chand and Sons, 2007.
3. Principles of Corporate Finance: Allen & Mohanty, Richard A. Brealey, Myers, 9th Edition, Tata Mc-Graw Hill, 2012.

**Reference books:**

1. Operations Research, Prem.K.Gupta and Dr D.S Hira, 5th Edition, S.Chand publications, 2009.
2. Operations Research, S D Sharma, Kedamath, Ramnath & Co., Meerut, 2009.
3. Introduction to Operations Research, Frederick S. Hillier and Gerald J. Lieberman, 8th Edition, Tata McGraw Hill, 2005.
4. Corporate Finance: Theory and Practice, Aswath Damodaran, Second Edition, Wiley and Sons, 2001.
5. Financial Management-Theory and practice, Brigham & Ehrhardt, 13th Edition, Thomson South Western College, 2010.
6. Decision Support Systems in Finance and Accounting, Hans Heymann, H.G. Heymann, Robert Bloom, ISBN: 0899302696, Quorum books, 1998.
7. Software to be used
  - (i) LINDO-Operation research
  - (ii) Microsoft excel-Statistics and Finance

**Elective – II – 2 Credit-**

## **.NET Programming Lab**

**Subject Code: DMCA405**

**Credits: 02**

**Total Hours: 30**

### **List of Experiments**

1. Create an application to handle mouse and key events .
2. Creation of Menu , Tool bar and Status Bar.
3. Unary/Binary operator overloading
4. Implementing enumerable interface
5. Implementing incomparable interface
6. Implementing deep clone/Shallow clone using icloneable interface
7. Program to access and mutate named properties
8. Implementing two dimensional indexer
9. Implementing single & multilevel inheritance
10. Implementing file input & Output
11. Design an application using Windows Form Controls.
12. Create a student application using ADO .NET.
13. Design a simple web application using ASP .NET

## Semester V Computer Graphics

**Subject Code: DMCA501**

**Credits: 04**

**Total Hours: 60**

**Unit: I**

**14 Hours**

Graphics Output Primitives and Attributes

Introduction to open GL, Coordinate reference frames, Specifying two dimensional world coordinate reference frame in Open GL, Open GL point functions, Open GL line functions, Line drawing algorithms, Circle generation algorithms, Ellipse generation algorithms, Fill area primitives, Polygon fill areas, OpenGL polygon fill area functions, General scan line polygon fill algorithm, Fill methods for areas with irregular boundaries, Open GL fill area attribute functions,

**Unit: II**

**14 Hours**

Two – Dimensional and Three - Dimensional Geometric Transformations

Basic two dimensional geometric transformations, Matrix representations and homogeneous coordinates, Inverse transformations, Two dimensional composite transformations, Other two dimensional transformations, Three dimensional Translation, Rotation, Scaling, Other three dimensional transformations, Affine transformations, Open GL geometric transformation functions

**Unit: III**

**10 Hours**

Two Dimensional Viewing

The two dimensional viewing, Clipping window, Normalization and viewport transformations, Clipping algorithms, Two dimensional point clipping, Two dimensional line clipping algorithms, Polygon fill area clipping, Curve clipping, Text clipping

**Unit: IV**

**12 Hours**

Three Dimensional Viewing The three dimensional viewing concepts, Three dimensional viewing pipeline, Three dimensional viewing coordinate parameters, Transformation from world to viewing coordinates, Projection transformations, Orthogonal projections, Oblique parallel projections, Perspective projections, The viewport transformation and three dimensional screen coordinates

**Unit: V**

**10 Hours**

Curves and Computer Animation

Bezier spline curves, Raster methods for computer animation, Design of animation sequences, Traditional animation techniques, General computer animation functions

**Text book:**

1. Donald Hearn, M.Pauline Baker, Computer Graphics with Open GL, Pearson (Indian Edition), Third Edition Chapters and topics [2.9, 3.1, 3.2, 3.3, 3.4, 3.5, 3.9, 3.10, 3.14, 3.15, 3.16, 4.10, 4.13, 4.14, 5.1, 5.2, 5.3, 5.4, 5.5, 5.10, 5.11, 5.12, 5.14, 5.15, 5.17, 6.1, 6.2, 6.3, 6.5, 6.6, 6.7, 6.8, 6.9, 6.10, 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, 7.8, 7.9, 8.10, 13.1, 13.2, 13.3, 13.4]

**Reference Books:**

1. Edward Angel, 'Interactive Computer Graphics' – A top down approach using Open GL, Pearson, Fifth Edition
2. Peter Shirley, Steve Marschner, 'Computer Graphics, Cengage Learning (Indian edition), 2009

# Object-Oriented Modeling and Design

**Subject Code: DMCA502**

**Credits: 04**

**Total Hours: 60**

## **Unit: I**

**12 Hours**

Introduction, Modeling Concepts, class Modeling

What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history. Modeling as Design Technique: Modeling; abstraction; The three models. Class Modeling: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models; Practical tips.

Advanced Class Modeling, State Modeling

Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages; Practical tips. State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Practical tips.

## **Unit: II**

**12 Hours**

Advanced State Modeling, Interaction Modeling

Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models; Practical tips. Interaction Modeling: Use case models; Sequence models; Activity models. Use case relationships; Procedural sequence models; Special constructs for activity models.

Process Overview, System Conception, Domain Analysis

Process Overview: Development stages; Development life cycle. System Conception: Devising a system concept; elaborating a concept; preparing a problem statement. Domain Analysis: Overview of analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis.

## **Unit: III**

**12 Hours**

Application Analysis, System Design

Application Analysis: Application interaction model; Application class model; Application state model; Adding operations. Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example.

## **Unit: IV**

**12 Hours**

Class Design, Implementation Modeling, 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.

## **Unit: V**

**12 Hours**

Design Patterns, Idioms

What is a pattern and what makes a pattern? Pattern categories; Relationships between patterns; Pattern description; Communication Patterns: Forwarder-Receiver; Client-Dispatcher-Server; Publisher-Subscriber; Management Patterns: Command processor; View Handler; Idioms: Introduction; what can idioms provide? Idioms and style; Where to find idioms; Counted Pointer example.



**Text Books:**

1. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education, 2005. (Chapters 1 to 17, 23)
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, 4)

**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
5. E. Gamma, R. Helm, R. Johnson, J. Vlissides: Design Patterns- Elements of Reusable Object-Oriented Software, Addison-Wesley, 1995.
6. Simon Bennett, Steve McRobb and Ray Farmer: Object-Oriented Systems Analysis and Design Using UML, 2nd Edition, Tata McGraw-Hill, 2002.

**Elective IV- 4 credits**

## OOMD Lab

**Subject Code: DMCA504**

**Credits: 02**

**Total Hours: 30**

The student has to draw the necessary UML diagrams using any suitable UML Drawing Tool and implement in Java OR C++ OR C# a program to demonstrate the Design Pattern specified by the Examiner.

The Design Pattern is allotted based on lots from the following list:

1. Expert
2. Controller
3. Publisher-Subscriber
4. Command
5. Forward-Receive
6. Client-Dispatcher
7. Proxy
8. Façade
9. Polymorphism

## Semester VI Mini Project

**Subject Code:**

**Credits: 02**

**Total Hours: 30**

**Elective VI - 4 credits**

**Elective Lab - 4 credits**

**Final Project Viva Voce - 6 credits**

### Course Materials

- To support and emphasise on student's learning, different artefacts such as Self Learning Material, PPT, Videos and Practice Quizzes are provided on Learning Management System (LMS). Students can also obtain the printed SLM from the University free of cost.
- Resources such as PPT, QB and Video are available on LMS as e-content.
- These resources are arranged on the LMS according to ARCS Model. These are ordered according to hierarchical order of media richness theory.
  - Video: To grab the attention of the student on a concept by giving him ample visual cues. (Attention)
  - PPT: Aim of the PPT is to provide base knowledge or to recall the prior knowledge (Relevance)
  - PDF: SLM has a deeper content. PPT and PDF together contribute to carry forward teacher/learner from known to unknown approach. (relevance and confidence)
  - Practice Quiz: This is an assessment artefact that aims at the student testing his understanding of the concepts by his own. (Confidence and satisfaction)

### Personal contact programme (PCP)

- PCP will be held at the university campus as per the schedule. 12 hours of PCP will be conducted by the faculty for each course

### Learning Management System (LMS)

- Student orientation Programme is done through webinar session
- Practical sessions on LMS: Orientation on LMS is provided through face to face with hands-on experience of activities on navigating through LMS
- Two industry expert session will be delivered through webinar for each course
- Schedule for the lab session is provided on LMS notification
- Practical course is always aligned with the theory paper related to the skill and the paper is of 2 credit.

### Monitoring:

- BBA programme is supported in a systematic way with sufficient academic oversight and operational support to help the learners with all the basic information needed.
- Student Engagement Team ensures sufficient feedback and response to student's reaction to course delivery and content.
- Timely notifications and advertisements of any event conducted at the university will be provided by the student engagement coordinators
- Committed one-on-one communication will be carried out by the Student engagement team members

### Helpdesk: Process of helpdesk is as given below

- Help desk will receive student queries
- Help desk will allocate student queries to respective learning advisors
- Helpdesk will escalate the student queries to faculty member or program incharge if it cannot be solved through learning advisors
- Student query will be resolved within 48 hours of its receipt

## Evaluation Scheme

- Scheme of examination

Credits	Duration of University Exam. in hour(s)	Internal Assessment Marks	University Exam. Marks	Total Marks
4	2	30	70	100
2	1	30	70	100

- Internal Assessment: The student needs to submit two set of assignment for a subject which is subjected to evaluation from the university faculty. Highest of two marks/ mean of two submission is taken as the final IA marks.

Internal Assessment Marks Distribution Table:

Subject Code	Subject Title	Credits	Marks allotted for Assignments	Marks allotted for Seminar / GD / Case Study	Marks allotted for Practical / Project	Total IA Marks
<b>Semester I</b>						
DMCA101	Data Structures	2	30	-	-	30
DMCA102	Object Oriented Programming using C++	4	30	-	-	30
DMCA103	Computer System Organization	4	30	-	-	30
DMCA104	Discrete Mathematics	2	30	-	-	30
DMCA105	Data Structure Lab	2	30	-	-	30
<b>Semester II</b>						
DMCA201	Programming in Java	4	30	-	-	30
DMCA202	Database Management System	2	30	-	-	30
DMCA203	Information Security fundamentals	2	30	-	-	30
DMCA204	Operating System	4	30	-	-	30
DMCA205	Java Lab	2	30	-	-	30
DMCA206	DBMS lab	2	30	-	-	30
<b>Semester III</b>						
DMCA301	NoSQL Databases	2	30	-	-	30
DMCA302	Web Programming	2	30	-	-	30
DMCA303	Software Engineering	4	30	-	-	30
DMCA304	Enterprise Application Development	2	30	-	-	30
	Elective – I	2	30	-	-	30
DMCA306	Web Programming Lab	2	30	-	-	30
<b>Semester IV</b>						
DMCA401	.NET Framework	4	30	-	-	30
DMCA402	Distributed and Cross Platform Databases	4	30	-	-	30
DMCA403	Operation Research	4	30	-	-	30
	Elective – II	2	30	-	-	30
DMCA405	.NET Lab	2	30	-	-	30
DMCA406	OS lab	2	30	-	-	30

Semester V						
DMCA501	Computer Graphics	4	30	-	-	30
DMCA502	Object Oriented Modelling design	4	30	-	-	30
	Elective IV	4	30	-	-	30
DMCA504	OOMD Lab	2	30	-	-	30
DMCA505	Mini Project	2	30	-	-	30
Semester VI						
DMCA601	Elective –V	4	30	-	-	30
DMCA602	Elective lab	4	30	-	-	30
	Final Project and Viva Voce on the chosen Elective course	6	30	-	-	30

- Last date for Submission of Assignment/Project:  
The dates for the submission of the Assignments / Project Reports will be decided by the university so that the department can submit the IA/ Project marks to the Controller of Examinations by the due date as specified on the Website. Assignment is a part of continuous evaluation.
- University examination: University exam will be conducted twice a year in the interval of 6 months.
- Pattern of the university question paper: if it is online evaluation then, pattern should be strictly multiple choice questions. However, this still follows the assessment taxonomy of blooms. 30% of the knowledge and comprehension questions and 70% of the questions are of application and above level. On the basis of this Question distribution is among 2 parts in questions paper, Part A and Part B. The distribution of marks is based on complexity involved in the pattern of the question. The total time to solve 4 credit question paper is 3 hours and 2 credit paper is 1 hour 30 minutes.
- Schedule for the examination is announced by the university
- Suppose there is a clash in the subjects in case of re-sitting, then the student is only allowed to write one of the paper (suggesting the fresh paper as first priority).
- Once the student is declared as pass there is no scope of improvement by resitting for the same paper for better marks.
- You should have minimum passing marks of 40% in IA and 40% in university exam and aggregate of 50% to be declared as pass in a subject.
- Student who fails in any one of the above mentioned assessment then it is considered to be fail.

### Grading System

Student's performance will be evaluated both on the internal assessment and the university exam performance.

The aggregate grading system is as shown below

Grade	Marks (%)
A - Excellent	70 and above
B - Very Good	60 - 69
C - Good	50 - 59
D - Satisfactory	40 - 49
E - Failure	-

### Carry over system

Due to the privilege of carry over system for every semester, self-study should start automatically for the next Semester without waiting for the examination result.

## Assignments

All Assignments questions will be uploaded on the Website. Candidate has to download the assignment questions and duly answer to those question and submit it to university on or before the last date of submission. All the assignment answers are evaluated by university faculty members. The assignments aims at developing continuous study habit and self-motivated assessment for the learner. All assignments should be hand written or word processed with neat presentation. Assignment should include cover page for each course which should have the following details.

- Name of the student:
- Registration Number:
- Course name:
- Programme:
- Assignment No.:
- Date of Submission:

## Project:

- MCA will have one real time project needs to be taken during Sixth semester of the course curriculum. This project may be based on the specialisation course that you take in third semester.
- Project orientation: each student is allotted with one faculty for guiding project in the specialised course.
- Project Guidelines

This information will provide you guidance to develop a project thesis. Project work is always marked for 4 credits since the project work reflects skill part of MCA course curriculum.

- Project Objective: The objectives of the MCA course curriculum Project work are to
  - (i) Apply the skills and knowledge gained during the course by analysing a specific business problem or issue, on a piece of independent work that has to be carried over an extended period.
  - (ii) Demonstrate proficiency in the design of a research project, application of appropriate research methods, collection and analysis of data, and presentation of results.
- Learning outcomes: on the successful completion of the course completion project work
  - (i) Demonstrate clarity of problem definition and scope; critical evaluation of a focused review in relevant literature; a carefully argued case for the research methods employed; proficiency in the analysis and interpretation of qualitative and/or quantitative data, wherever appropriate; and sensitivity of the project towards the organizational context for which recommendations are made, if necessary
  - (ii) Illustrate the results of their research in an academically acceptable format, paying particular attention to integration of the literature review, critical evaluation of data, clear presentation of research results, and clear evaluation by implementing the recommendations.
  - (iii) **Selecting a project topic and organisation domain:** Criteria's for selecting the topic and organization:
    - (a) Elective subject: Project can be undertaken on specialisation course.
    - (b) Originality: Project work must be carried out by yourself and must be original. You can certainly take ideas from elsewhere, but ensure to evolve them in a unique way to suit your project requirements.
    - (c) Company specific: The project work should be undertaken in a company or any of its departments or any business establishments. The outcome of the project work should be useful to the organization or establishment.
    - (d) You must consult your internal guide or external guide in selection of topic and only after their approval the project has to be undertaken.
    - (e) You can do the project in the organization where you are working / have worked / intend to work.
    - (f) It is good Idea to link your project to your future plans. This will be useful for your future job prospects and it will also demonstrate your potential employers about your enthusiasm and knowledge.

- (g) Remember that you have constraints of resources like time, monetary, and infrastructure. Hence, it is necessary to complete your project within the specified constraints.
- Suggested titles for the project work
    - (i) Remote It infrastructure Management
    - (ii) Managing Cloud Computing services
    - (iii) Using Cryptography techniques in digital media
  - Format of project report
    - (i) The full content of the report must be hard bound together so that the pages cannot be removed or replaced.
    - (ii) The cover of the report must contain, title, name of the candidate, the award and the year of submission.
    - (iii) Text pages should be printed on one side of the paper, preferably with 1.5 line spacing, and page numbers at the bottom of the each page. Margins should be 2" on the left and 1" on the right.
    - (iv) Please use separate index sheets for all chapters each chapter should start from a new page.
    - (v) The declaration must be duly signed by the student
    - (vi) The project report must be about 100-150 pages.
    - (vii) Report must contain all the necessary documents such as Certificate from the viva-voce panel, Certificate of the University study centre, Company certificate, acknowledgements etc.
    - (viii) One copy of the project report along with CD, must submit to the university.

## Table of Contents

Page No.

Executive summary

- i) Introduction
- ii) Objective
- iii) Methodology
- iv) Analysis
- v) Conclusions
- vi) Recommendations

### Part I

Company Profile

- i) Brief Introduction of a company
- ii) History (very brief) of the organization.

### Part II

Project overview

- i) Introduction
- ii) Objective
- iii) Methodology
- iv) Analysis
- v) conclusions
- vi) Recommendations

### Part III

- i) Appendix
- ii) Bibliography
- iii) References
- iv) Glossary

**Note:** this is only suggestive but not exhaustive

- Project Evaluation

## PROJECT EXAMINATION MARKS STATEMENT FOR MCA (Revised)

**University:**

**Status:**

**Date of Examination:**

**Course Code:**

Roll No.	Name	Internal Evaluator						External Evaluator						Grand Total Marks
		Synopsis	Methodology	Analysis + Findings	Project report	VIVA	Total internal evaluator's marks	Synopsis	Methodology	Analysis + Findings	Project report	VIVA	Total external evaluator's marks	
		05 marks	10 marks	25 marks	25 marks	35 marks	100 marks	05 marks	10 marks	25 marks	25 marks	35 marks	100 marks	200 Marks
		IE1	IE2	IE3	IE4	IE5	IE=IE1+IE2+IE3+IE4+ IE5	EE1	EE2	EE3	EE4	EE5	EE=EE1+EE2+EE3+EE4+ EE5	

We hereby certify that the project examination has been conducted on the date as indicated above and the information given above has been verified and found correct.

1. Internal Examiner Signature with Date  
Name:

2. External Examiner Signature with Date  
Name:

**University Stamp with signature**

### Examination and Results

- The University will conduct term-end examinations. Term-end examination dates and other details shall be published well in advance by the university on its Learning Management System. Student should check exam details from LMS notifications.
- No student will be allowed to appear for the examination without admit card. Admit Cards will be issued only to those students who fulfil the prerequisites as specified by the University. For example, Admit Cards will be issued to all fresh and Re-Registered students and, resitting candidates who have filled up the Resitting Form before the last date specified by the University.) The Admit Card is valid only when produced along with the Identity Card issued by the University.
- Candidates are not allowed to bring Mobile Phones, calculators, statistical/scientific tables, lap top computers or any object/device/ gadget inside the examination Hall which would be of unfair assistance in answering the University question papers. In case of specific subjects scientific and non-programmable calculators will be allowed after due check.
- Candidate will receive answer sheet fifteen minutes prior to the commencement of the examination. Please ensure that there are no flaws in the answer booklet.
- On the front page of the answer sheet, the candidate is required to write the Name (block capitals), Roll Number (nine digits) and Test Booklet Number (five digits) legibly in the spaces provided for the purpose. On the reverse page of the answer sheet, carefully write the Roll Number and Test Booklet Number in numerals in appropriate boxes using 2B pencil and completely blacken the corresponding circles.
- Candidate exchanging their booklet with other candidates is not permissible.
- Candidates will not be permitted to enter the examination hall after ten minutes of the commencement of examination. Candidates has to sit in the examination hall at least for 1 hour after commencing examination.
- The identity and signature of the candidates will be verified during the examination at any instance of time. Candidates are required to sign the declaration on the answer sheet in the presence of invigilator.



- In the Multiple Choice Questions (MCQs), each question has only one correct answer and must be indicated by completely darkening the appropriate circle. Darkening of more than one circle will be regarded invalid/improper.
- The test booklet can be used for rough work; but, do not leave any stray marks on the answer sheet. Do not fold, bend, cut, tear or otherwise deface/mutilate the answer sheet in any manner.
- Candidates must hand over the answer sheet and the test booklet to the invigilator before leaving the examination hall.
- Candidates caught cheating or attempting to cheat will be disqualified immediately and debarred from appearing for University Examinations in accordance with the prevailing rules of the University.
- The results will be published on the website

#### **F. Admission Procedure**

- Notification of admission will be released by the university on its website
- There will be sale of prospectus, applications forms receipt of applications with documents based on which details will be taken and counselling sessions for admission is conducted
- There will be one round of verification of documents that happen once application is received
- Admissions test and interviews are conducted
- Admissions results will be announced on the university website and the results are communicated personally to successful candidates

#### **Mode of Fee Payment:**

1. Fees can be deposited in the form of DD in favour of **Teerthanker Mahaveer University , Moradabad** and sent to the below address:  
**Teerthanker Mahaveer University, Delhi Road, Moradabad(U.P.)**
2. **Online paytm Payment link:**  
<https://paytm.com/education?op=Teerthankar%20Mahaveer%20University>
3. **Through Net Banking:**  
Name of the Bank: Punjab National Bank, Bagadpur, Moradabad  
Bank Account No.: 601000210000473  
IFSC Code: PUNB0601000
  - Once the fees is received along with the necessary documents, re-verification of the documents will be conducted for successful candidates. Following are the documents needed
    - Age and ID proof
    - 10<sup>th</sup>Std Marks sheet
    - PUC marks sheet
    - 2 copies of passport size photo graphs
  - Rules and regulations explained by the coordinators and obtained the compliance from the candidates
  - Admission letter shall be issued to the candidates once the admission is confirmed.
  - ID card and registration number shall be issued to the candidates after admissions confirmation
  - Induction will be undertaken once admission letter, ID card and registration is received by the candidates.

#### **G. Library resources:**

- Number of Text books available in the University Library: 156137
- Number of physical journals available: 381(National-181& International-200)
- Number of Online Journal Subscribed to:4587
- Number of audio-video reference available to: 1500
- Subscription to online resources (such as EBSCO, IEEE, etc): 4
  1. EBSCO
  2. Clinical Key
  3. DELNET
  4. Manupatra (Law)

## H. Cost estimation of the programme

Particulars	Requirements	Number	Cost per Unit	Calculation	Total
Program Coordinator	1 Program Coordinator	36 months	Rs 60000 per month	$1*36*60000/4$	540000
Faculty member	2 Faculty member	36 months	Rs 50000 per month	$2*36*50000/4$	900000
Print SLM	30 SLM per program	60 students	Rs 350 per SLM	$30*60*350$	630000
SLM delivery	6 set per program	60 students	Rs 200 per set	$6*60*200$	72000
LMS	36 month program	60 students	Rs 50 per month	$36*60*50$	108000
Contact Classes	16 hours per subject	30 subjects	Rs 1500 per hour	$16*30*1500$	720000
Webinar	9 hours per subject	30 subjects	Rs 1500 per hour	$9*30*1500$	405000
Learning Advisor	1 Learning Advisor	36 months	Rs 35000 per month	$1*36*35000/4$	315000
Assignment evaluation	30 subjects	60 students	Rs 50 per assignment	$30*60*50$	90000
Project support & evaluation	1 project	60 students	Rs 500 per project	$1*60*500$	30000
Online Lab	1 Lab	60 students	Rs 500 per student	$1*60*500$	30000
Examination	30 subjects	60 students	Rs 400 per subject	$30*60*400$	720000
Acquisition & Admission		60 students	Rs16000 per student	$60*16000$	960000
<b>Total</b>					<b>5520000</b>