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Item No. 4.176

UNIVERSITY OF MUMBAI



Revised syllabus (Rev- 2016) from Academic Year 2016 -17
Under

FACULTY OF TECHNOLOGY

**Master of Computer Applications:
MCA**

Second Year with Effect from **AY 2017-18**

Third Year with Effect from **AY 2018-19**

As per **Choice Based Credit and Grading System**
with effect from the AY 2016–17

From Co-ordinator's Desk:

To meet the challenge of ensuring excellence in Master Program in Computer Applications (M.C.A.: referred as Master of Computer Applications) education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited. Inline with this Faculty of Technology of University of Mumbai has taken a lead in incorporating philosophy of outcome based education in the process of curriculum development.

Faculty of Technology, University of Mumbai, in one of its meeting unanimously resolved that, Each Board of Studies shall prepare some Program Educational Objectives(PEO's) and give freedom to affiliated Institutes to add few (PEO's) and course objectives and course outcomes to be clearly defined for each course, so that all faculty members in affiliated institutes understand the depth and approach of course to be taught, which will enhance learner's learning process. It was also resolved that, maximum senior faculty from colleges and experts from industry to be involved while revising the curriculum. I am happy to state that, each Board of studies has adhered to the resolutions passed by Faculty of Technology, and developed curriculum accordingly. In addition to outcome based education, semester based credit and grading system is also introduced to ensure quality of Master of Computer Applications (MCA) education.

Semester based Credit and grading system enables a much required shift in focus from teacher centric to learner centric education since the workload estimated is based on the investment of time in learning and not in teaching. It also focuses on continuous evaluation which will enhance the quality of education. University of Mumbai has taken a lead in implementing the system through its affiliated Institutes and Faculty of Technology has devised a transparent credit assignment policy and adopted ten points scale to grade learner's performance. Choice Based Credit and Grading System are implemented for First Year of Master of Computer Applications (M.C.A.) from the academic year 2016-2017. Subsequently this system will be carried forward for Second Year and Third Year of M.C.A. in the academic year's 2017-2018 and 2018-2019 respectively.

Dr. S. K.Ukarande

Co-ordinator,
Faculty of Technology,
Member Academic Council
University of Mumbai, Mumbai

Preamble:

The MCA Choice based syllabus is designed considering various modes of effective teaching-learning and assessment that reflect in its interdisciplinary approach required for advanced application course. This integrated teaching methodology allows understanding of interaction between the different business areas required for IT enabled industries. This methodology also allows students to develop multiple skills such as critical logic analysis, numerical ability, Database programming, Algorithmic optimization with testing, networking, report writing, communication skill, presentation skills, independent research, and working with real-life case studies. These skills further enable the students to take a full, active and responsible role in the IT enabled industries.

The syllabus is directional in wide scope and allows the much desired flexibility to keep speed with the ever growing body of knowledge and explorations in IT enabled industries considering human side of enterprise. The course structures are carefully designed so that students get superiority in dealing with diverse situations when they step into the corporate world.

I would like to extend my thanks to Industries like IBM India Pvt. Ltd., Accenture, RBS India Pvt. Ltd., Myglamm, N.I.C. etc for their valuable inputs to strength the scope and contents of the syllabus. I would also like to extend my thanks to all M.C.A. Faculty members for their contribution in designing an outcome based curriculum.

Dr. Dhananjay R. Kalbande

Chairman- Ad-hoc Board of Studies of Computer Application,
Member- Academic Council,
University of Mumbai, Mumbai.

**Program Structure for
Master of Computer Application (CBCGS)
Mumbai University
(With Effect from 2017-2018)
Semester III**

Subject Code	Subject Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
MCA301	Database Management systems	04	--	--	04	--	--	04
MCA302	Java programming	04	--	--	04	--	--	04
MCA303	Information Security	04	--	--	04	--	--	04
MCA304	Operation Research	04	--	--	04	--	--	04
MCA305	Software Testing and Quality Assurance	04	--	--	04	--	--	04
MCAL301	Database Management systems and Software Testing Lab	--	06	--	--	03	--	03
MCAL302	Java Programming and Unified Modeling Language Lab	--	06	--	--	03	--	03
MCAPR 301	Mini Project	--	--	--	--	--	--	02
Total		20	12	--	20	06	--	28

Subject Code	Subject Name	Examination Scheme								
		Theory Course					Term Work	Pract.	Oral	Total
		Internal Assessment			End Sem. Exam.					
		Test1	Test2	Avg.						
MCA301	Database Management systems	20	20	20	80	--	--	--	100	
MCA302	Java programming	20	20	20	80	--	--	--	100	
MCA303	Information Security	20	20	20	80	--	--	--	100	
MCA304	Operation Research	20	20	20	80	--	--	--	100	
MCA305	Software Testing and Quality Assurance	20	20	20	80	--	--	--	100	
MCAL301	Database Management systems and Software Testing Lab	--	--	--	--	25	50	25	100	
MCAL302	Java Programming and Unified Modeling Language Lab	--	--	--	--	25	50	25	100	
MCAPR 301	Mini Project	--	---	---	---	25	--	25	50	
Total		100	100	100	400	75	100	75	750	

**Program Structure for
Master of Computer Application (CBCGS)
Mumbai University
(With Effect from 2017-2018)
Semester IV**

Subject Code	Subject Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
MCA401	Data Mining and Business Intelligence	04	--	--	04	--	--	04
MCA402	Advanced Web Technology	04	--	--	04	--	--	04
MCA403	Computer Graphics	04	--	--	04	--	--	04
MCA404	Elective 1	04	--	--	04	--	--	04
MCA405	Elective 2	04	--	--	04	--	--	04
MCAL401	Advanced Web Technology and Data Mining and Business Intelligence Lab	--	06	--	--	03	--	03
MCAL402	Computer Graphics and Image Processing Lab	--	06	--	--	03	--	03
MCAL403 Activity Lab	Soft Skill Development	--	02	--	--	02	--	02
Total		20	14	--	20	08	--	28

Subject Code	Subject Name	Examination Scheme							
		Theory Course				Term Work	Pract	Oral	Total
		Internal Assessment			End Sem. Exam.				
Test1	Test 2	Avg.							
MCA401	Data Mining and Business Intelligence	20	20	20	80	--	--	--	100
MCA402	Advanced Web Technology	20	20	20	80	--	--	--	100
MCA403	Computer Graphics	20	20	20	80	--	--	--	100
MCA404	Elective 1	20	20	20	80	--	--	--	100
MCA405	Elective 2	20	20	20	80	--	--	--	100
MCAL401	Advanced Web Technology and Data Mining and Business Intelligence Lab	--	--	--	--	25	50	25	100
MCAL402	Computer Graphics and Image Processing Lab	--	--	--	--	25	50	25	100
MCAL403 Activity Lab	Soft Skill Development	--	--	--	--	50	--	--	50
Total		100	100	100	400	100	100	50	750

**Program Structure for
Master of Computer Application (CBCGS)
Mumbai University
(With Effect from 2017-2018)
Elective for Semester IV**

SEM IV – Elective I	
Course Code	Course Name
MCA4041	Entrepreneurship Management
MCA4042	Business Infrastructure and Management
MCA4043	ERP
MCA4044	Ethics and CSR
SEM IV – Elective II	
Course Code	Course Name
MCA4051	Digital Forensics
MCA4052	Simulation and Modelling
MCA4053	Next Generation Networks
MCA4054	AI and Soft Computing

SEMESTER III

Subject Code	Subject Name		Credits						
MCA301	Database Management Systems		04						
Subject Code	Subject Name	Teaching Scheme			Credits Assigned				
		Theory	Pract.	Tut	Theory	Pract.	Tut	Total	
MCA301	Database Management Systems	04	--	--	04	--	--	04	
Subject Code	Subject Name	Examination Scheme							
MCA301	Database Management Systems	Theory Marks				TW	Pract.	Oral	Total
		Internal Assessment			End Semester Exam				
		Test1 (T1)	Test2 (T2)	Average of T1 & T2		End Semester Exam			
		20	20	20	80	--	--	--	100

Pre-requisites:

Basic Knowledge of data structures

Course Educational Objectives (CEO): At the end of the course, the students will be able to

CEO301.1	Emphasize on basic concepts to organize, maintain and retrieve information from a DBMS.
CEO301.2	Cover the principles of database systems and recognize how they are used in developing data-intensive applications.
CEO301.3	To study an effective and efficient database system with the help of the rising trends of parallel and distributed databases.

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

MCA301.1	Understand various database concepts and apply them in real life applications.
MCA301.2	Determine the manner in which data can be stored, organized and manipulated in a database system.
MCA301.3	Apply various indexing and optimization techniques to process queries.
MCA301.4	Analyze and design database applications using suitable database techniques.

Syllabus

Sr. No.	Module	Detailed Contents	Hrs
1	Overview of DBMS	Overview of Database management System, File systems versus DBMS, Advantages of DBMS, View of data: Data Abstraction, Instances and Schemas, Data Models, Database Languages , Structure of DBMS, Role of DBA	06
2	Database Design using ER Model and Relational Model	Overview of design process: Entity Relationship Model, Constraints, Entity relationship Diagram, Entity Relationship Design Issues, Weak Entity Sets, Extended ER features The Relational Model: Concepts of Relational Models, Integrity Constraints over Relations, Enforcing Integrity Constraints, Querying Relational data, Logical Database Design: ER to Relational with Case Studies	06
3	Normalization	Informal Design Guidelines for Relational Schema, Functional Dependencies Normal forms: First, Second, Third Normal Form and BCNF. Introduction to De-normalization. Inference Rules for Functional Dependencies, Equivalence of Sets of Functional Dependencies, Minimal Set of Functional Dependencies, Properties of Relational Decomposition-Dependency Preservation, Lossless Join.	08
4	Indexing	Overview of indexing: Clustered Indexes, Primary and Secondary Indexes, Index Data Structures Tree structured indexing: Intuition for Tree Indexes, Indexed Sequential Access Methods, B+ Trees, Search, Insert, Delete, Duplicate Hash Based Indexing: Static Hashing, Extensible Hashing, Linear Hashing, Extensible Vs Linear Hashing	10
5	Query Evaluation and Transaction Management	Overview of Query Processing and Query Optimization, Query Evaluation Plans. Transaction Concepts, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability. Concurrency Control: Lock-Based Protocol, Timestamp-Based, Multi-version Schemes, Deadlock Handling Recovery: Failure Classification, Log Based Recovery	10
6	Parallel and distributed Databases	Parallel Databases: Architecture for Parallel Databases, Parallel Query Evaluation Distributed Databases: Types of Distributed Databases, Distributed DBMS Architecture, Storing Data in a Distributed DBMS, Distributed Transaction, Distributed Concurrency Control, Distributed Recovery	08
7	Object database systems	Structured Data Types, Operations on Structured Data, Inheritance, Objects, Oids and Reference Types, Object oriented versus Object relational	04

References:

- Korth, Silberchatz, Sudarshan, "Database system Concepts", McGraw Hill, 2006
- Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", Third Edition, McGraw Hill 2003.
- Elmasari and Navathe, Benjamin Cummins, "Fundamental of Database System", Pearson Education, 2009
- C. J. Date, "An Introduction to Database Systems", 8/e, Pearson Education, 2002
- Rob Coronel, "Database Systems Design, Implementation and Management", Cengage Publication, 2009
- Atul Kahate, "Database Management System" Pearson Education. 2006

Assessment:**Internal:**

Assessment consists of two tests (T1 and T2). The final marks should be the average of the two tests.

End Semester Theory Examination: Guidelines for setting up the question paper.

- Question paper will comprise of total six questions.
- Question Number One should be compulsory.
- All questions carry equal marks.
- Students can attempt any three from the remaining.
- Questions will be mixed in nature (for example, suppose Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).

In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Subject Code		Subject Name					Credits		
MCA302		Java Programming					04		
Subject Code	Subject Name		Teaching Scheme			Credits Assigned			
			Theory	Pract.	Tut	Theory	Pract.	Tut.	Total
MCA302	Java Programming		04	--	--	04	--	--	04
Subject Code	Subject Name	Examination Scheme							
		Theory Marks				TW	Pract	Oral	Total
		Internal Assessment			End Semester Exam				
		Test1 (T1)	Test2(T2)	Average of T1 & T2					
MCA302	Java Programming	20	20	20	80	--	--	--	100

Pre-requisites:

Basic understanding of any Object Oriented Programming Language.

Course Educational Objectives (CEO): At the end of the course, the students will be able to

CEO302.1	Understand fundamentals of object-oriented programming in Java.
CEO302.2	Study various Java programming constructs.
CEO302.3	Learn application development using Java Components.

Course Outcomes (CO): At the end of the course, the students will be able to

MCA302.1	Solve computational problems using basic constructs.
MCA302.2	Find a solution for real world problems using Java
MCA302.3	Develop Web Applications using Server Side Programming.

Syllabus

Sr. No.	Module	Detailed Contents	Hrs
1.	Fundamentals of Java Programming	Features of Object-oriented Programming, History of Java, Features of Java, JVM Architecture, Differences between C++ and Java, Data types, variable, expressions, operators, control structures, arrays	03
2.	Object and Classes	Classes, Instance variables, Methods, Constructors, Access Specifiers, Abstract Classes and Wrapper Classes, Autoboxing and Unboxing, Inheritance, Polymorphism, Method Overriding, Use of Static, final, super and this keyword, Garbage collection and finalize method, string and mutable string, Inner Classes	04
3.	Packages and Interfaces	Package concept, Creating user defined package, Access control protection, Defining interface, Implementing interface.	02
4.	Generics and Collections	Generics - Generic Class, Creating Generic Classes, Generic Methods, Bounded Type, Collections- Collections and Generics, Collection Classes-Lists, Vector, Linked Lists, Maps, HashMap, WildCards, LambdaExpressions - Lambda Type Inference, Lambda Parameters, Lambda Function Body, Returning a Value From a Lambda Expression, Lambdas as Objects	05
5.	Exception Handling	Exception handling fundamentals, Exception types, Exception as objects, Exception hierarchy, Exception Keywords - Try, catch, finally, throw, throws, Creating User defined Exceptions, Assertion, Annotations	04
6.	Multi-threading	Java thread model, Life Cycle of Thread, Working with Thread class and the Runnable interface, Thread priorities, ThreadGroup class, Inter thread communication, Synchronization.	04
7.	File handling	Input streams and Output streams, FileInputStream and FileOutputStream, Binary and Character streams, Buffered Reader/ Writer, Object serialization and Deserialization.	04
8.	Event handling and GUI programming	Comparison of AWT and SWING, Applet class, Applet API hierarchy, Life cycle of Applet, Delegation Event Model, Event handling mechanisms, Swing components, Swing Component Hierarchy- Basic and Advanced Components, JApplet, Layout managers, Adapter class, Inner class.	05
9.	Database Programming	JDBC architecture, Types of drivers, Java.sql package, Establishing connectivity and working with connection interface, Working with statement interface, Working with PreparedStatement interface, Working with ResultSet interface, Working with ResultSetMetaData interface.	05
10.	Web development using Servlets	Introduction to servlets, Servlet vs CGI, Servlet API overview, Servlet Life cycle, Generic servlet, HttpServlet, ServletConfig, ServletContext, Handling HTTP Request and response –GET / POST method, request dispatching, Using cookies, Session tracking..	06
11.	Web development using JSP	Introduction to JSP, JSP Architecture, JSP Directives, JSP scripting elements, Default objects in JSP, JSP Actions, JSP with beans and JSP with Database, Error handling in JSP, Session	06

		tracking techniques in JSP, Introduction to custom tags, JSTL tags in detail	
12.	Introduction to Spring Frameworks	Introduction to Spring Framework, Spring Architecture, Spring Aspect of Object Oriented Concepts – Join Point and Point Cuts.	04

References:

- The complete reference JAVA2, Herbert schildt. Tata McGraw Hill
- Programming with Java A Primer, E. Balaguruswamy Tata McGraw Hill
- Core Java for beginners, Sharanam Shah and Vaishali Shah, SPD
- Java 6 Programming Black Book, Wiley –Dreamtech
- Web Enabled Commercial Application Development using java 2.0, Ivan Byaross
- Java Server Programming java EE6, Black book, Dreamtech press.
- Core Servlets and Java Server Pages :Vol I: Core Technologies 2/e , Marty Hall and Larry Brown, Pearson
- Java 6 Programming, Black Book, Dreamtech Press.
- Java Enterprise in a Nutshell, 3rd Edition A Practical Guide, Jim Farley, William Crawford, O'Reilly
- Java EE 6 Server Programming For Professionals, Sharanam Shah and Vaishali Shah, SPD
- Spring in Action, Craig Walls, 3rd Edition, Manning

Web References:

- <https://docs.oracle.com>

Assessment:

Internal:

Assessment consists of two tests (T1 and T2) .The final marks should be the average of the two tests.

End Semester Theory Examination: Guidelines for setting up the question paper.

- Question paper will comprise of total six questions.
- Question Number One should be compulsory.
- All question carry equal marks.
- Students can attempt any three from the remaining.
- Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

Subject Code		Subject Name						Credits	
MCA303		Information Security						04	
Subject Code	Subject Name	Teaching Scheme			Credits Assigned				
		Theory	Pract.	Tut	Theory	Pract.	Tut	Total	
MCA303	Information Security	04	--	--	04	--	--	04	
Subject Code	Subject Name	Examination Scheme							
MCA303	Information Security	Theory Marks				TW	Pract.	Oral	Total
		Internal Assessment			End Semester Exam				
		Test1 (T1)	Test2(T2)	Average of T1 & T2					
		20	20	20	80	--	--	--	100

Pre-requisites:

Computer Networks, Databases

Course Educational Objectives (CEO): At the end of the course, the students will be able to

CEO303.1	Understand information assurance as practiced in computer operating systems, distributed systems, networks and representative applications.
CEO303.2	Study cryptography and key encryption techniques used today.
CEO303.3	Comprehend relevant security parameters in the internet, web, database systems and applications

Course Outcomes (CO): At the end of the course, the students will be able to

MCA303.1	Understand the requirement of information security and a clear understanding of its importance
MCA303.2	Be familiar with information security threats and countermeasures, and familiar with information security designs using available secure solutions
MCA303.3	Use the database security mechanisms, intrusion detection systems, formal models of security, cryptography, network ,web security

Syllabus

Sr. No.	Module	Detailed Contents	Hrs
1	Introduction	Principles of Security, Attacks, Services and Mechanisms, Integrity check, digital Signature, authentication.	03
2	Cryptography	Private Key Cryptography: Block Encryption, DES Algorithm, Problems with DES, Variations of DES, IDEA Algorithm, Uses of Secret key Cryptography; ECB, CBC, OFB, CFB Public Key Encryption : RSA Symmetric and Asymmetric Key Cryptography together	08
3	Authentication	Types of Authentication- Password-based authentication, address-based authentication, cryptographic authentication, smart cards, biometrics, mutual authentications, reflection attacks, Message Digest : MD5 ,SHA,MAC ,HMAC, Digital Certificate process, KDC-working, multi domain KDC, Kerberos	10
4	Internet Security	Transport Layer Security: SSL, SET Email Security : PGP, S/MIME, Comparison, IP security : IPsec, Web Services Security : XML, SOAP, WSDL and UDDI, SSI, WS-Security, SAML, Ws-Trust, WS-Security Policy	08
5	Intrusion Prevention and Detection:	Introduction, Intrusion Detection Systems , Prevention versus Detection, Types of Intrusion Detection systems, DOS attacks, Flooding Attacks, DDoS Attack Prevention/Detection, Defenses Against Denial-of-Service Attacks, Malware Detection	06
6	Database Security	The Need for Database Security, Database Access Control, Inference, Statistical Databases , Database Encryption,	05
7	Firewalls	Characteristics, Packet filters, Application Level Gateways, Circuit Level Gateways, Firewall Architectures, Trusted System,	06
8	IEEE 802.11 Wireless LAN Security	Background, Authentication: Pre- WEP Authentication, Authentication in WEP, Authentication and key agreement in 802.11i, Confidentiality and Integrity: Data protection in WEP, Data protection in TKIP and CCMP	06

References:

- AtulKahate, “Cryptography and Network Security”, McGraw Hill
- Network Security and Cryptography: Bernard Menezes, CENGAGE Learning
- Cryptography and Information Security, V. K. Pachghare PHI Learning Pvt. Ltd.
- M. Stamp, “Information Security: Principles and Practice,” 2nd Edition, Wiley, ISBN: 0470626399, 2011.
- W. Stallings, “Computer Security: Principles and Practice,” 2nd Edition, Prentice Hall, ISBN: 0132775069, 2011.
- Kaufman C., Perlman R., and Speciner, “Network Security”, Private Communication in a public world, 2nd ed., Prentice Hall PTR.,2002
- Computer Security, 3rd Edition, Dieter Gollmann, December 2010, Wiley Publications

Assessment:**Internal:**

Assessment consists of two tests (T1 and T2) .The final marks should be the average of the two tests.

End Semester Theory Examination: Guidelines for setting up the question paper.

- Question paper will comprise of total six questions.
- Question Number One should be compulsory.
- All question carry equal marks.
- Students can attempt any three from the remaining.
- Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

Subject Code	Subject Name						Credits		
MCA304	Operation Research						04		
Subject Code	Subject Name	Teaching Scheme			Credits Assigned				
		Theory	Pract.	Tut	Theory	Pract.	Tut	Total	
MCA304	Operation Research	04	--	--	04	--	--	04	
Subject Code	Subject Name	Examination Scheme							
MCA304	Operation Research	Theory Marks				TW	Pract.	Oral	Total
		Internal Assessment			End Semester Exam				
		Test1 (T1)	Test2 (T2)	Average of T1 & T2					
		20	20	20	80	--	--	--	100

Pre-requisites:

Basic knowledge of Mathematics and Statistics.

Course Educational Objectives (CEO): At the end of the course, the students will be able to

CEO304.1	Study formulation, analysis and solving science, engineering and business problems.
CEO304.2	Study mathematics and mathematical modelling using computers to forecast the implications of various choices.
CEO304.3	Study the selection of the best alternatives from the available choices.

Course Outcomes (CO): At the end of the course, the students will be able to

MCA304.1	Apply Operations research methodology to a broad range of problems in business and industry.
MCA304.2	Use mathematics and mathematical modelling using computers to forecast the implications of various choices.
MCA304.3	Solve optimization problems.
MCA304.4	Think of new methods for solving optimization problems.

Syllabus

Sr No	Module	Detailed Contents	Hrs
1	Nature of Operation Research	History ,Nature of Operation Research ,Impact of Operation Research, Application Areas	01
2	Overview of Modeling Approach	Formulating the problem, Constructing a mathematical model, Deriving a solution, Testing a model and the solution, Establishing control over the solution, Implementation issues	02
3	Linear Programming	Introduction ,Graphical solution, Graphical sensitivity analysis, The standard form of linear programming problems, Basic feasible solutions, Simplex algorithm, Artificial variables, Big M and two phase method, Solution to Problems based on Degeneracy, Alternative optima, Unbounded solution, Infeasible solutions.	12
4	Dual Problem	Relation between primal and dual problems, Dual simplex method, Sensitivity analysis.	05
5	Transportation Problem	Starting solutions. North-west corner Rule – least cost methods – Vogel’s approximation method, MODI Method, Minimization and Maximization problem	05
6	Assignment Problem & Travelling Salesman Problem	Assignment Problem: Hungarian method (Minimization and Maximization) Traveling Salesman Problem: Branch & Bound technique, Hungarian method	05
7	Sequencing Problem	Two machines n jobs , three machines n jobs, n machines m jobs	03
8	PERT and CPM	Arrow network ,Time estimates, earliest expected time, latest allowable occurrence time, latest allowable occurrence time and slack time, Critical path, Probability of meeting scheduled date of completion of project, Calculation of CPM network ,Various floats for activities, Project crashing.	06
9	Replacement Theory	Replacement of items that deteriorate, Replacement of items that fail group replacement and individual replacement.	04
10	Integer Programming	Branch and Bound Algorithm, Cutting plane Algorithm	06
11	Game Theory	Two person Zero sum games, Solving simple games.	03

References:

- Operation Research-An Introduction: Taha H. A., McMillan Publishing Company, NY
- Introduction to Operation Research: Hillier F., and Lieberman G.J, Holden Day
- Operations Research : P. K. Gupta & Hira, S. Chand
- Operations Research Applications and Algorithms: Waynel L. Winston Thomson
- Mathematical Programming Techniques: Kambo, N.S., McGraw Hill
- Operations Research- Principles and Practice: Ravindran, Wiley Production
- Operations Research: L E Prasad, Cengage Learning

- Optimization Methods: K.V. Mital & Mohan New Age
- Operations Research: Kanti Swaroop, Gupta P.K. Man Mohan, Sultan Chand and Sons
- Operation Research: S.D. Sharma
- Principles of Operation Research (with applications to managerial decisions) – H.M. Wagher, PHI, New Delhi

Assessment:

Internal:

Assessment consists of two tests (T1 and T2). The final marks should be the average of the two tests.

End Semester Theory Examination: Guidelines for setting up the question paper.

- Question paper will comprise of total six questions.
- Question Number One should be compulsory.
- All questions carry equal marks.
- Students can attempt any three from the remaining.
- Questions will be mixed in nature (for example, supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).

In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Subject Code	Subject Name		Credits						
MCA305	Software Testing and Quality Assurance		04						
Subject Code	Subject Name	Teaching Scheme			Credits Assigned				
		Theory	Pract.	Tut	Theory	Pract.	Tut	Total	
MCA305	Software Testing and Quality Assurance	04	--	--	04	--	--	04	
Subject Code	Subject Name	Examination Scheme							
MCA305	Software Testing and Quality Assurance	Theory Marks				TW	Pract.	Oral	Total
		Internal Assessment			End Semester Exam				
		Test1 (T1)	Test2 (T2)	Average of T1 & T2		End Semester Exam			
		20	20	20	80	--	--	--	100

Pre-requisites:

Students should have knowledge of Software Engineering theory.

Course Educational Objectives (CEO): At the end of the course, the students will be able to:

CEO305.1	Study importance of Software Testing in Software Development
CEO305.2	Explore appropriate Software Testing Techniques for finding bugs in Software.
CEO305.3	Study various Software Testing Tools and Quality Assurance Methods.

Course Outcomes (CO): At the end of the course, the students will be able to:

MCA305.1	Solve the problems using Software Testing techniques and Approaches.
MCA305.2	Apply various Software testing Techniques to find bugs in software.
MCA305.3	Use open source software Testing Tools.
MCA305.4	Apply various Software Quality Assurance Techniques to ensure the quality in software.

Syllabus

Sr. No.	Module	Detailed Contents	Hrs
1	Basics of Software Testing	Humans, Errors & Testing, Correctness Vs Reliability, Testing & Debugging, Principles of Testing, Test Metrics	04
2	Testing in the Software Life Cycle & Test Levels	The General V-Model, W-Model, Component Test, Integration Test, System Test, Acceptance Test, Generic types of Testing-Functional, Non Functional, Testing software structure, Regression Testing	08
3	Static Testing	Structured Group Examinations - Reviews, Static Analysis - Control Flow Analysis & Data Flow Analysis, Tools for Static Testing	04
4	Dynamic Analysis	Black Box Testing- Equivalence Class Partitioning, Boundary Value Analysis, State Transition Test, Cause Effect Graphing and Decision Table Technique, User Documentation Testing, Domain Testing, White Box-Statement Coverage, Branch Coverage, Test of Conditions, Path Coverage	08
5	Test Management	Test Planning, Test Management, Test Process, Test Reporting, Incident Management – Test Log, Incident Reporting, Classification, Status	08
6	Test Automation	Design and Architecture for Automation, Test Automation-Design and Architecture for Automation, Generic Requirements for test Tool/Framework, Criteria for selecting test tools, Testing of Object Oriented Systems	08
7	Software Quality	Five Views of software quality, ISO 9126 Quality Characteristics, ISO 9000:2000 & Latest Software Quality Standards, SQA Planning: SQA plan, Organizational Level Initiatives.	05
8	Software Measurement & Metrics	Measurement during Software Life Cycle Context, Defect Metrics, Metrics for software Maintenance & Requirements, Measurement Principles, Case study for Identifying Appropriate Measures & Metrics for Projects	07

References:

- Software Testing Foundations, Andreas Spillner, Tilo Linz, Hans Schaefer, Shoff Publishers and Distributors
- “Foundations of Software Testing”, by Aditya P. Mathur – Pearson Education custom edition 2000.
- “The ART of Software Testing”, by GlenfordJ. Myers, Wiley India, Second Edition
- “Software Testing: Principles and Practices”, by Srinivasan D and Gopalswamy R, PearsonEd, 2006.
- “Software Testing & Quality Assurance Theory & Practice” By KshirasagarNaik&PriyadarshiTripathi, Wiley Student Edition.
- “Software Quality Assurance Principles & Practice”, by Nina S. Godbole, Narosa.

- Stephan H.Kan, “Metric and Model in Software Quality Engineering”, Addison Wesley, 1995.
- Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, Fifth Edition ,McGraw Hill, 2001
- “Advanced Software Testing”, Vol. 2, Rex Black, SPD.

Assessment:

Internal:

Assessment consists of two tests (T1 and T2) .The final marks should be the average of the two tests.

End Semester Theory Examination: Guidelines for setting up the question paper.

- Question paper will comprise of total six questions.
- Question Number One should be compulsory.
- All question carry equal marks.
- Students can attempt any three from the remaining.
- Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

Subject Code	Subject Name						Credits		
MCAL301	Database Management systems and Software Testing Lab						03		
Subject Code	Subject Name	Teaching Scheme			Credits Assigned				
		Theory	Pract.	Tut	Theory	Pract.	Tut	Total	
MCAL301	Database Management systems and Software Testing Lab	--	06	--	--	03	--	03	
Subject Code	Subject Name	Examination Scheme							
MCA L301	Database Management systems and Software Testing Lab	Theory Marks				TW	Pract.	Oral	Total
		Internal Assessment			End Semester Exam				
		Test1 (T1)	Test2 (T2)	Average of T1 & T2					
		--	--	--	--	25	50	25	100

Pre-requisites:

Basic Knowledge of SQL and Software Engineering concepts

Course Educational Objectives (CEO): At the end of the course, the students will be able to

CEOL301.1	Make the students understand basic and relatively advanced issues in modern database management, information storage and retrieval.
CEOL301.2	Study various database techniques in developing data-intensive applications.
CEOL301.3	Explore the need of software testing in current industry scenario, understanding and knowledge of foundations, techniques and tools in area of software.
CEOL301.4	Understand the essential characteristics requirements and usage of Automation tools.

Course Outcomes (CO): At the end of the course, the students will be able to

MCAL301.1	Design database systems using available tools.
MCAL301.2	Develop applications using basic and modern database techniques as per organization requirements.
MCAL301.3	Demonstrate software testing tools
MCAL301.4	Create test design documents and test reports

Syllabus

Sr. No.	Module	Detailed Contents	Hrs
1	DDL and DML	Data Definition Language: Create, Alter, Drop, Rename, Truncate Data Manipulation Language: Insert, Update, Delete, Select	06
	Constraints	Not Null, Unique Key, Primary Key, Foreign Key, Check, adding and Dropping a Constraint	02
2	Data Control Language and Transaction Control	Grant, Revoke, Roles Commit, Rollback	02
3	SQL SELECT Statements	Column Alias, Concatenation Operator, Arithmetic Operators, Comparison Conditions, Logical Conditions, ORDER BY Clause	04
4	Functions And Subquery	Single Row Functions, Character Functions, Number Functions, Date Functions, Conversion Functions, Aggregate functions Subquery: Types of Subquery, Group by and Having Clause	06
5	Joins and other concepts	Equijoins, Non-Equijoins, Self Joins, Left Outer Joins, Right Outer Joins, Full Outer Joins, Natural Joins Other Concepts: View, Index	06
6	PL/SQL Practical	Programming: Variables, Identifiers, Comment, PL/SQL Block Structure IF Statements: Simple IF Statements, Compound IF Statements IF-THEN-ELSE Statements Loop: Basic Loop, WHILE Loop, FOR Loop	06
7	Cursor and Trigger	Cursor: Types of Cursor, Explicit Cursor Attributes Trigger: Trigger, Statement Trigger, Row Trigger, Using Conditional Operations.	06
8	Functions, Procedures and packages	Create Function, Function with Arguments, Executing Function, Dropping Function Procedures: Block Structure of Subprogram, Types of Subprograms, Procedure with Parameters, Executing Procedures, Dropping Procedures Packages: Package Specification, Package Body, Creating Package, Execution, Dropping Package	06
9	Parallel and distributed database	Implementation of different types of Partitions: Range, Hash, List. Distributed Database: Horizontal, Vertical fragmentation	04
10	Object Oriented database	Implementation of Abstract Data Type, Inheritance, Reference	04
11	Manual Testing	<ul style="list-style-type: none"> Study of Reviews (Writing Test cases, Testing Framework, Test Document) Construction of CFG & Deriving Test Cases Implementation of Test Cases using Unit Testing, Integration & System Testing 	04

12		<ul style="list-style-type: none"> • Implementation of Test Cases using Equivalence Class Partitioning, Boundary Value Analysis. • State Transition Test, Cause Effect Graphing and Decision Table Technique. 	04
13	Automation Testing	<ul style="list-style-type: none"> • Study of Automation Tools. • Building Test Cases. • Using Base URL to Run Test Cases in Different Domains 	06
14		<ul style="list-style-type: none"> • Selenium commands-selenese • Matching Text Patterns • Performance Testing Concepts :Load Testing, Stress Testing 	06
15		<ul style="list-style-type: none"> • Web Driver Implicit & Explicit Wait • Cross Browser Testing • API Testing 	06

Note: Automation software testing practical's can be performed using open source tool like selenium.

Reference Books:

- Joel Murach, "Murach's oracle PL /SQL" Joel Murach's publication Murachs and Assocites
- Sharnam shah, Vaishali Shah, "Oracle for Professionals"Publication SPD-Shroff Publishers and Distributors 2011
- RiniChakrabarti, ShilbhadraDasgupta, KLSI, "Advanced Data Base Management System Publication DreamTech
- Chakravarti , "Advance Data Base Management System", Wiley -Dreamtech
- RajshekharSundaram, "Oracle 10g Programming: A Premier", Publication Pearson Education 2009
- Peter Rob and Coronel, "Database Principals fundamentals of Design, Implementation and Management", Publication Cengage Learning 2011.

Subject Code	Subject Name		Credits						
MCAL302	Java Programming and Unified Modeling Language Lab		03						
Subject Code	Subject Name	Teaching Scheme			Credits Assigned				
		Theory	Pract.	Tut	Theory	Pract.	Tut	Total	
MCAL302	Java Programming and Unified Modeling Language Lab	--	06	--	--	03	--	03	
Subject Code	Subject Name	Examination Scheme							
MCA L302	Java Programming and Unified Modeling Language Lab	Theory Marks				TW	Pract.	Oral	Total
		Internal Assessment			End Semester Exam				
		Test1 (T1)	Test2 (T2)	Average of T1 & T2					
		--	--	--		--	25	50	25

Pre-requisites:

Basic understanding of programming fundamentals and software engineering.

Course Educational Objectives (CEO): At the end of the course, the students will be able to

CEOL302.1	Understand, developing, testing and debugging Java programs.
CEOL302.2	Study UML tools
CEOL302.3	Explore object-oriented design using UML

Course Outcomes (CO): At the end of the course, the students will be able to:

MCAL302.1	Develop a simple software application using the object oriented approach.
MCAL302.2	Design and develop a Java Web Applications.
MCAL302.3	Apply UML tools for object oriented software modeling.

Syllabus

Sr. No.	Module	Detailed Contents	Hrs.
1	Fundamentals of Java Programming	Program on creation of classes and using different types of function. Program using constructor/method overloading Program on passing Object as parameter to a function Program using static and final variable and methods	02
2	Objects and Classes	Program to perform different operations on Array and String Program using Interface and Inheritances. Program using Wrapper class to cover auto boxing and un boxing	04
3	Packages and Interfaces	Programs based on creating and using packages along with access control specification. Programs based on defining, creating and implementing interfaces.	04
4	Generics, Collections and Lambda Expression	Programs based on Generics, Collections and Lambda Expression	04
5	Exception Handling	Programs based on exception handling mechanism covering all keywords. Programs based on creating own exceptions.	04
6	Multi-threading	Programs based on Multithreading approach, thread priorities, Inter thread communication, and Synchronization.	04
7	File Handling	Programs based on Input streams and Output streams, FileInputStream and FileOutputStream, Binary and Character streams, Buffered Reader/Writer, Object serialization and Deserialization.	04
8	Event handling and GUI programming	Programs based on designing GUI Interface. Programs based on creating an applets, use of containers, components, event handling, layout managers, Adapter classes, Inner class etc.	04
9	Database Programming	Programs based on database connectivity using MS-Access/ Oracle/ MySQL as a backend covering all the database operations.	04
10	Web development using Servlets	Programs based on handling request and response –GET / POST method, Programs based on cookies	04

		and Session tracking.	
11	Web development using JSP	Programs demonstrating JSP Syntax and semantics. Programs based on directives and error objects. Programs based on session tracking.	04
12	Introduction to Spring Frameworks	Basic programs based on Spring framework	03
13	Introduction to UML	UML Overview, The Nature and purpose of Models	01
14	Modeling Requirements: Use Cases	Capturing a System Requirement, Use Case Relationships, Use Case Overview Diagrams	02
15	Modeling System Workflows: Activity Diagrams	Activity Diagram Essentials, Activities and Actions, Decisions and Merges, Doing Multiple Tasks at the Same Time, Time Events, Objects, Sending and Receiving Signals, Starting an Activity, Ending Activities and Flows, Partitions (or Swimlanes), Managing Complex Activity Diagrams	02
16	Modeling a System's Logical Structure: Introducing Classes and Class Diagrams Modeling a System's Logical Structure: Advanced Class Diagrams	What is a Class?, Getting Started with Classes in UML, Visibility, Class State: Attributes, Class Behavior: Operations, Static Parts of Your Classes Class Relationships, Constraints, Abstract Classes, Interfaces, Templates	02
17	Bringing Your Classes to Life: Object Diagrams	Object Instances, Links, Binding Class Templates	01
18	Modeling Ordered Interactions: Sequence Diagrams	Participants in a Sequence Diagram, Time, Events, Signals, and Messages, Activation Bars, Nested Messages, Message Arrows, Bringing a Use Case to Life with a Sequence Diagram, Managing Complex Interactions with Sequence Fragments,	02
19	Focusing on Interaction Links: Communication Diagrams Focusing on Interaction Timing: Timing Diagrams	Participants, Links, and Messages, Fleshing out an Interaction with a Communication Diagrams, Communication Diagrams Versus Sequence Diagrams What Do Timing Diagrams Look Like?, Building a Timing Diagram from a Sequence Diagram, Applying Participants to a Timing Diagram, States, Time, A Participant's State-Line, Events and Messages, Timing Constraints	02

20	Completing the Interaction Picture: Interaction Overview Diagrams	The Parts of an Interaction Overview Diagram, Modeling a Use Case Using an Interaction Overview	01
21	Managing and Reusing Your System's Parts: Component Diagrams	What is a Component?, A Basic Component in UML, Provided and Required Interfaces of a Component, Showing Components Working Together, Classes That Realize a Component, Ports and Internal Structure, Black-Box and White-Box Component Views	02
22	Modeling an Object's State: State Machine Diagrams	Essentials, States, Transitions, States in Software, Advanced State Behavior, Composite States, Advanced Pseudostates, Signals, Protocol State Machines	02
23	Modeling Your Deployed System: Deployment Diagrams	Deploying a Simple System, Deployed Software: Artifacts, What Is a Node?, Hardware and Execution Environment Nodes, Communication Between Nodes, Deployment Specifications, When to Use a Deployment Diagram	02
24	UML tools and techniques for web-based/object oriented Applications	UML Tools, Different UML Notations for Web application	02
25	Creation of documentation such as SRS, SDS from UML diagrams. Generation of code from UML model.	Basic Concept, Generating by Templates, Using Batches, Installing and Uninstalling Templates	02
26	Mini Project	A Mini – Project based on Java Programming and UML using an integrated approach. (Maximum Two students in a Group).	10

Reference Books:

- The complete reference JAVA2, Herbert schildt. Tata McGraw Hill
- Programming with Java A Primer, E.Balaguruswamy Tata McGraw Hill
- Core Java for beginners, Sharanam Shah and vaishali shah, SPD
- Java 6 Programming Black Book, Wiley –Dreamtech
- Web Enabled Commercial Application Development using java 2.0, Ivan Byaross
- JDBC, Servlet, and JSP Black Book, Santosh Kumar, Dreamtech
- Java Server Programming java EE6, Black book, Dreamtech press.
- Core Servlets and Java Server Pages :Vol I: Core Technologies 2/e , Marty Hall and Larry Brown, Pearson
- Java 6 Programming, Black Book, Dreamtech Press.
- Spring in Action, Craig Walls, 3rd Edition, Manning
- The Unified Modelling Language Reference manual, Second Edition, James Rambaugh, Iver Jacobson, Grady Booch, Addition- Wesley

- Learning UML 2.0, Kim Hamilton, Russell Miles, O'Reilly
- The Unified Modeling Language User Guide Second edition, Grady Booch, James Rumbaugh, Ivar Jacobson , Addison Wesley (2005)
- Object-Oriented Modeling and Design with UML, Michael Blaha, James Rumbaugh, PHI (2005)
- Designing Flexible Object-Oriented Systems with UML, Charles Richter, Sams

Web References:

1. <https://docs.oracle.com>
2. [http://staruml.sourceforge.net/docs/user-guide\(en\)/ch08.html](http://staruml.sourceforge.net/docs/user-guide(en)/ch08.html)
3. https://www.ibm.com/support/knowledgecenter/SS6RBX_11.4.3/com.ibm.sa.oomethod.doc/topics/c_Web_app_Extensions_WAE.html

Subject Code		Subject Name				Credits			
MCAPR301		Mini Project				02			
Subject Code	Subject Name	Teaching Scheme			Credits Assigned				
		Theory	Pract	Tut	Theory	Pract	Tut	Total	
MCAPR301	Mini Project**	--	--	--	--	--	--	02	
Subject Code	Subject Name	Examination Scheme							
MCA PR301	Mini Project	Theory Marks				TW	Pract.	Oral	Total
		Internal Assessment			End Semester Exam				
		Test1 (T1)	Test2 (T2)	Average of T1 & T2		End Semester Exam			
		--	--	--	--	25	-	25	50

Pre-requisites:

Course Educational Objectives (CEO): At the end of the course, the students will be able to

CEOPR301.1	Conceptualize knowledge with emphasis on team work, effective communication, critical thinking and problem solving skills.
CEOPR301.2	Adapt to a rapidly changing environment by having learned and applied new skills and new technologies.
CEOPR301.3	Study designing small projects in a multidisciplinary environment.

Course Outcomes (CO): At the end of the course, the students will be able to

MCAPR301.1	Design, implement and evaluate a mini-project.
MCAPR301.2	Gain project management skills.
MCAPR301.3	Work effectively in small groups on medium scale computing projects.
MCAPR301.4	Demonstrate the ability to produce a technical document

Sample Guidelines for Preparing and Documenting the Project Report

Sr. No.	Module	Detailed Contents
1	Introduction	<ul style="list-style-type: none">• Introduction of the project(SRS)• Problem definition• Objective of Project• scope of Project
2	System Study	<ul style="list-style-type: none">• Existing System• Disadvantages of Existing system• Proposed System• Use Cases
3	Analysis & Design	<ul style="list-style-type: none">• Software/hardware Requirement Specification<ul style="list-style-type: none">○ Software requirement○ Hardware requirement• GANTT Chart• Flowchart/ DFD/ER/UML diagram(any other project diagram)• Module design and organization
4	Testing & Validation	<ul style="list-style-type: none">• Test cases and Report (based on manual & automation testing)
5	User Manual	<ul style="list-style-type: none">• Explanation of Key functions• Method of Implementation<ul style="list-style-type: none">○ Forms○ Output Screens
6	Conclusion	<ul style="list-style-type: none">• Project Conclusion & Future enhancement

- **Rubrics should be followed for evaluation.**

- **References for report documentation**

1. Author Name, Title of Paper/ Book, Publisher's Name, Year of publication
2. Full URL Address

** Mini Project will be performed by students during summer vacation of Even Semester of first year (SEM II) Mini project will be evaluated in SEM III. Evaluation of the mini project will be internal 25 marks as TW and 25 marks as oral examination conducted by External Examiner (Institute Level)

**Program Structure for
Master of Computer Application (CBCGS)
Mumbai University
(With Effect from 2017-2018)
Semester IV**

Subject Code	Subject Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
MCA401	Data Mining and Business Intelligence	04	--	--	04	--	--	04
MCA402	Advanced Web Technology	04	--	--	04	--	--	04
MCA403	Computer Graphics	04	--	--	04	--	--	04
MCA404	Elective 1	04	--	--	04	--	--	04
MCA405	Elective 2	04	--	--	04	--	--	04
MCAL401	Advanced Web Technology and Data Mining and Business Intelligence	--	06	--	--	03	--	03
MCAL402	Computer Graphics and Image Processing	--	06	--	--	03	--	03
MCAL403 Activity Lab	Soft Skill Development	--	02	--	--	02	--	02
Total		20	14	--	20	08	--	28

Subject Code	Subject Name	Examination Scheme								
		Theory Course				End Sem. Exam.	Term Work	Pract	Oral	Total
		Internal Assessment			Avg.					
		Test1	Test 2							
MCA401	Data Mining and Business Intelligence	20	20	20	80	--	--	--	100	
MCA402	Advanced Web Technology	20	20	20	80	--	--	--	100	
MCA403	Computer Graphics	20	20	20	80	--	--	--	100	
MCA404	Elective 1	20	20	20	80	--	--	--	100	
MCA405	Elective 2	20	20	20	80	--	--	--	100	
MCAL401	Advanced Web Technology and Data Mining and Business Intelligence	--	--	--	--	25	50	25	100	
MCAL402	Computer Graphics and Image Processing	--	--	--	--	25	50	25	100	
MCAL403 Activity Lab	Soft Skill Development	--	--	--	--	50	--	--	50	
Total		100	100	100	400	100	100	50	750	

**Program Structure for
Master of Computer Application (CBCGS)
Mumbai University
(With Effect from 2017-2018)
Elective for Semester IV**

SEM IV – Elective I	
Course Code	Course Name
MCA4041	Entrepreneurship Management
MCA4042	Business Infrastructure and Management
MCA4043	ERP
MCA4044	Ethics and CSR
SEM IV – Elective II	
Course Code	Course Name
MCA4051	Digital Forensics
MCA4052	Simulation and Modelling
MCA4053	Next Generation Networks
MCA4054	AI and Soft Computing

SEMESTER IV

Subject Code	Subject Name						Credits		
MCA401	Data Mining and Business Intelligence						04		
Subject Code	Subject Name	Teaching Scheme			Credits Assigned				
		Theory	Pract.	Tut	Theory	Pract.	Tut	Total	
MCA 401	Data Mining and Business Intelligence	04	--	--	04	--	--	04	
Subject Code	Subject Name	Examination Scheme							
MCA 401	Data Mining and Business Intelligence	Theory Marks				TW	Pract.	Oral	Total
		Internal Assessment			End Semester Exam				
		Test1 (T1)	Test2 (T2)	Average of T1 & T2					
		20	20	20	80	--	--	--	100

Pre-requisites:

Basic knowledge of data base concepts

Course Educational Objectives (CEO): At the end of the course, the students will be able to

CEO401.1	Acquire the knowledge of various concepts and tools behind data warehousing and mining data for business intelligence
CEO401.2	Study data mining algorithms, methods and tools
CEO401.3	Identify business applications of data mining

Course Outcomes (CO): At the end of the course, the students will be able to:

MCA401.1	Use conceptualization of BI techniques
MCA401.2	Apply data warehouse concepts for data analysis and report generation
MCA401.3	Develop industry level data mining skills using software tools
MCA401.4	Make use of relevant theories, concepts and techniques to solve real-world BI problems

Syllabus

Sr. No.	Module	Detailed Contents	Hrs
1	Business Intelligence-	Introduction and overview of BI-Effective and timely decisions, Data Information and knowledge, BI Architecture, Ethics and BI. BI Applications- Balanced score card, Fraud detection, Telecommunication Industry, Banking and finance, Market segmentation.	06
2	Prediction methods and models for BI	Data preparation, Prediction methods-Mathematical method, Distance methods, Logic method, heuristic method-local optimization technique, stochastic hill climber, evaluation of models	06
3	BI using Data Warehousing	Introduction to DW, DW architecture, ETL Process, Top-down and bottom-up approaches, characteristics and benefits of data mart, Difference between OLAP and OLTP. Dimensional analysis- Define cubes. Drill- down and roll- up – slice and dice or rotation, OLAP models- ROLAP and MOLAP. Define Schemas- Star, snowflake and fact constellations.	08
4	Data Mining and Preprocessing	Data mining- definition and functionalities, KDD Process, Data Cleaning: - Missing values, Noisy data, data integration and transformations. Data Reduction: - Data cube aggregation, dimensionality reduction-data compression, Numerosity reduction- discretization and concept hierarchy.	06
5	Associations and Correlation	Association rule mining:-support and confidence and frequent item sets, market basket analysis, Apriori algorithm, Incremental ARM, Associative classification- Rule Mining.	06
6	Classification and Prediction	Introduction, Classification methods:-Decision Tree- ID3, CART, Bayesian classification- Baye'stheorem(Naïve Bayesian classification),Linear and nonlinear regression.	08
7	Clustering	Introduction, categorization of Major, Clustering Methods:-partitioning methods- K-Means. Hierarchical- Agglomerative and divisive methods, Model- based- Expectation and Maximization.	08
8	Web mining and Text mining	Text data analysis and Information retrieval, text retrieval methods, dimensionality reduction for text. Web Mining: - web content, web structure, web usage.	04

References:

- Business Intelligence data mining and optimization for decision making- by Carlo Verzellis ,wiley publication.
- Adaptive business Intelligence by ZbigniewMichlewicz, martin Schmidt, matthewmichalewicz, constantinChiriac
- Data Mining concepts and techniques second edition by Jiawei Han and MichelineKamber.
- Data Mining:” Introductory and Advanced topics” , Pearson Education, by M.Dunham
- Data warehousing Fundamentals by PaulrajPonnian, John Willey
- Data mining for Business intelligence: concepts, techniques and applications in Microsoft Excel by G. Shumeli, N R Patel, P.C Bruce, Wiley

Assessment:**Internal:**

Assessment consists of two tests (T1 and T2) .The final marks should be the average of the two tests.

End Semester Theory Examination: Guidelines for setting up the question paper.

- Question paper will comprise of total six questions.
- Question Number One should be compulsory.
- All question carry equal marks.
- Students can attempt any three from the remaining.
- Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

Subject Code	Subject Name	Credits							
MCA402	Advanced Web Technologies	04							
Subject Code	Subject Name	Teaching Scheme			Credits Assigned				
		Theory	Pract.	Tut	Theory	Pract.	Tut	Total	
MCA402	Advanced Web Technologies	04	--	--	04	--	--	04	
Subject Code	Subject Name	Examination Scheme							
MCA402	Advanced Web Technologies	Theory Marks				TW	Pract.	Oral	Total
		Internal Assessment			End Semester Exam				
		Test1 (T1)	Test2 (T2)	Average of T1 & T2	End Semester Exam				
		20	20	20	80	--	--	--	100

Pre-requisites:

- Basic Understanding of Object Oriented Programming
- Basic Understanding of Web Technologies

Course Educational Objectives (CEO): At the end of the course, the students will be able to

CEO402.1	Study the architecture of Dot Net framework
CEO402.2	Understand the basic principles of C# development
CEO402.3	Learn advanced windows and web development techniques using dotNET

Course Outcomes (CO): At the end of the course, the students will be able to

MCA402.1	Create UI applications using C#
MCA402.2	Design and develop secure web applications using asp.net according to industry standards
MCA402.3	Define and create custom web services

Syllabus

Sr. No.	Module	Detailed Contents	Hrs
1	Introduction to Dot Net and C#	<p>Introduction to Dot Net Framework Architecture of Dot NET Framework, CLR-Working and Features,CTS,CLS,Assemblies-Types,Structure and Metadata,GAC</p> <p>C# Basics Data Types(Value Types and Reference Types),Control Structures,Operators and Expressions, Arrays</p>	08
2	OOP C#	<p>Classes and Objects Instance Variables, Methods, Constructors, Properties, Access Specifiers,Static members and methods</p> <p>Inheritance Levels of Inheritance,Constructor and Inheritance,Polymorphism,Interfaces,Abstract classes,Delegates,Indexers,Sealed Classes,Exception handling</p> <p>Collections and Generics Bounded and Unbounded Collections,Generic Programming-Generic classes, Functions, Constraints on Generic Programming</p>	10
3	Databases and C#	<p>File Handling Text Files, Binary Files, String Processing, Serialization and Deserialization</p> <p>ADO.Net Connected and Disconnected,Architecture of ADO.Net,Commands,Datasets,Data Readers, Data Adapters,Working with Stored Procedures</p> <p>LINQ and the ADO.NET EntityFramework LINQ Introduction, Mapping Your Data Model to an Object Model, Introducing Query Syntax</p>	08
4	Asp.Net Web Applications	Life cycle of Asp.Net web pages, Role of client side scripting, postback posting and cross page posting, asp.net compilation model, asp.net HTML Controls,Server Controls(basic controls,Calendar,AdRotator,FileUpload,ValidationControls	08
5	Data and State Management in ASP.NET	ASP.NET Websites with Themes and MasterPages, Data Source Controls, Data Bound Controls, ASP.NET State Management-Client Side and Server Side. ASP.NET and AJAX	10
6	Web Services	XML,Web Services Architecture, UDDI,SOAP and its Format,WSDL,Create and Consuming XML Web Service-Simple and Databases, WCF- Architecture,End Points, Types of Contracts, Web Applications and Security	08

References:

- Beginning Visual C# 2012 Programming, Karli Watson, Jacob Vibe Hammer, Jon D. Reid, Morgan Skinner, Daniel Kemper, Christian Nagel, ISBN: 978-1-118-31441-8, Wrox Publication
- Professional C# 2008, Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner, ISBN: 978-1-118-64321-1, Wrox Publication
- Beginning ASP.NET 4.5: in C# and VB, Imar Spaanjaars, ISBN: 978-1-118-31180-6, Wrox Publication
- Professional ASP.NET 4.5 in C# and VB, Jason N. Gaylord, Christian Wenz, Pranav Rastogi, Todd Miranda, Scott Hanselman, Scott Hunter (Foreword by), ISBN: 978-1-118-31182-0, Wrox Publication
- Murach's ASP.NET 4 Web Programming with C# 2010, Anne Boehm, Joel Murrach, SPD, Murrach Books
- Murach's C# 2015, Anne Boehm and Joel Murach, ISBN 978-1-890774-94-3, Murrach Books
- Murach's ADO. Net 4 Database Programming with C# 2010 4th Edition
- Pro C# 5.0 and the .NET 4.5 Framework – Andrew Trolsen, APress
- Advance .NET Technology second edition by Chirag Patel- DreamTech Press

Web References:

- MSDN: Learn to Develop with Microsoft Developer Network:
<https://msdn.microsoft.com/>

Assessment:**Internal:**

Assessment consists of two tests (T1 and T2). The final marks should be the average of the two tests.

End Semester Theory Examination: Guidelines for setting up the question paper.

- Question paper will comprise of total six questions.
- Question Number One should be compulsory.
- All question carry equal marks.
- Students can attempt any three from the remaining.
- Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

Subject Code	Subject Name						Credits			
MCA403	Computer Graphics						04			
Subject Code	Subject Name	Teaching Scheme			Credits Assigned					
		Theory	Pract.	Tut	Theory	Pract.	Tut	Total		
MCA403	Computer Graphics	04	--	--	04	--	--	04		
Subject Code	Subject Name	Examination Scheme								
MCA 403	Computer Graphics	Theory Marks				TW	Pract.	Oral	Total	
		Internal Assessment			End Semester Exam					
		Test1 (T1)	Test2 (T2)	Average of T1 & T2						
		20	20	20	80	--	--	--	100	

Pre-requisites:

Basic Mathematics

Course Educational Objectives (CEO): At the end of the course, the students will be able to

CEO403.1	Understand the concepts of output primitives of Computer Graphics.
CEO403.2	Learn 2 D and 3 D graphics Techniques.
CEO403.3	Study various Image Processing techniques

Course Outcomes (CO):At the end of the course, the students will be able to:

MCA403.1	Demonstrate the algorithms to implement output primitives of Computer Graphics.
MCA403.2	Apply 2 D transformation techniques.
MCA403.3	Analyze 3 D transformation techniques.
MCA403.4	Apply image processing techniques.

Syllabus

Sr. No.	Module	Detailed Contents	Hrs
1	Introduction to Computer Graphics	Introduction to Computer Graphics, Elements of Computer Graphics ,Graphics display systems.	02
2	Output primitives & its Algorithms	Points and Lines, Line Drawing algorithms :DDA line drawing algorithm, Bresenham's drawing algorithm ,Circle and Ellipse generating algorithms : Mid-point Circle algorithm ,Mid-point Ellipse algorithm ,Parametric Cubic Curves :Bezier curves .Fill area algorithms: Scan line polygon fill algorithm ,Inside-Outside Tests, Boundary fill algorithms, Flood fill algorithms	15
3	2D Geometric Transformations & Clipping	Basic transformations, Matrix representation and Homogeneous Coordinates, Composite transformation, shear & reflection. Transformation between coordinated systems. Window to Viewport coordinate transformation, Clipping operations – Point clipping Line clipping : Cohen – Sutherland line clipping, Midpoint subdivision, Polygon Clipping: Sutherland – Hodgeman polygon clipping ,Weiler – Atherton polygon clipping	12
4	Basic 3D Concepts & Fractals	3D object representation methods: B-REP, sweep representations, CSG, Basic transformations, Reflection, shear. Projections – Parallel and Perspective Halftone and Dithering technique. Fractals and self-similarity: Koch Curves/snowflake, Sierpinski Triangle	06
5	Introduction to Image Processing	Fundamental Steps in Digital Image Processing ,Components of an Image Processing System ,Basic Concepts in Sampling and Quantization, Representing Digital Images, Spatial and Gray-Level Resolution	05
6	Image Enhancement Techniques	Image Enhancement in the Spatial Domain: Some Basic Intensity Transformation Functions: Image Negatives, Log Transformations, and Power Law Transformations. Piecewise-Linear Transformation Functions: Contrast stretching, Gray-level slicing, Bit plane slicing. Introduction to Histogram, Image Histogram and Histogram Equalization, Image Subtraction, and Image Averaging	12

References:

- Donald Hearn and M Pauline Baker, Computer Graphics C Version -- Computer Graphics, C Version, 2/E, Pearson Education.
- David F. Rogers, James Alan Adams, Mathematical elements for computer graphics , McGraw-Hill, 1990
- Rafael C. Gonzalez and Richard E. Woods, Digital Image Processing (3rd Edition), Pearson Education.
- S. Sridhar-Digital image Processing, Second Edition, Oxford University Press
- Anil K. Jain -Fundamentals of digital image processing. Prentice Hall, 1989

Assessment:**Internal:**

Assessment consists of two tests (T1 and T2) .The final marks should be the average of the two tests.

End Semester Theory Examination: Guidelines for setting up the question paper.

- Question paper will comprise of total six questions.
- Question Number One should be compulsory.
- All question carry equal marks.
- Students can attempt any three from the remaining.
- Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

Elective Subjects

Elective-I
MCA404

Subject Code	Subject Name				Credits				
MCA4041	Entrepreneurship Management				04				
<hr/>									
Subject Code	Subject Name	Teaching Scheme			Credits Assigned				
		Theory	Pract.	Tut	Theory	Pract.	Tut	Total	
MCA4041	Entrepreneurship Management	04	--	--	04	--	--	04	
<hr/>									
Subject Code	Subject Name	Examination Scheme							
MCA 4041	Entrepreneurship Management	Theory Marks				TW	Pract.	Oral	Total
		Internal Assessment			End Semester Exam				
		Test1 (T1)	Test2 (T2)	Average of T1 & T2					
		20	20	20		80	--	--	--

Pre-requisites:

- Basic knowledge of Project Management & IT in Management.
- Knowledge of Financial Accounting & Management.

Course Educational Objectives (CEO): At the end of the course, the students will be able to

CEO4041.1	Be familiar with Entrepreneurship basics, Skills and Qualities of Entrepreneurs.
CEO4041.2	Understand how to design effective and efficient Business Plan for intended users.
CEO4041.3	Understand and Learn various approaches for Woman Entrepreneurship, Business Management and Development.

Course Outcomes (CO): At the end of the course, the students will be able to

MCA4041.1	Understand the concepts and fundamentals of Entrepreneurship.
MCA4041.2	Analyse the process of Business Idea generation and converting the idea into a Business Model.
MCA4041.3	Identify the Role of Small Scale Industries (SSI) & Institutions Supporting Small Scale Enterprise.
MCA4041.4	Understand the exit strategies and Social Responsibilities.

Syllabus

Sr. No.	Module	Detailed Contents	Hrs
1	Foundation of Entrepreneurship	Concept, Meaning and Definition of Entrepreneur and Entrepreneurship, Importance and Significance of Growth of Entrepreneurial Activity, Concept of Entrepreneur, Traits, Characteristics, Skills and Qualities of Entrepreneurs, Classification and Types of Entrepreneurs, Entrepreneur vs Professional Manager.	08
2	Creating and Starting the Venture	Business Idea: New Business Idea, Pre-selection Process, Sources of Business Idea, Preliminary Research, Business Idea Evaluation, Other Analysis. Business Plan: Use of Business Plan, Creating a Business Plan, Types of Business Plan, Description of Business, Management Team, Marketing Plan, Finance, Risk and Contingencies.	10
3	Small Business Enterprise	Role of Small Scale Industries (SSI), Concept and Definition of Small Scale Industries, Government policy and Development of SSI in India, Growth and Performance of SSI in India, Problems for SSI. Institutions Supporting Small Scale Enterprise: Central Level, State Level and Other Agencies, Industry Association. Setting up a Small Business Enterprise: Identifying the Business Opportunity, Business Opportunity in Other Sectors, Formulating of setting SSI.	14
4	Women Entrepreneurship	Women Entrepreneurship Defined, Environment, Challenges in the path of Women Entrepreneurship, Strategies for the Development of Women Entrepreneurship, Empowerment of Woman by Entrepreneurship, Grassroots Entrepreneurship through Self Help Groups (SHGs), Institutions supporting Women Entrepreneurship in India, Women Entrepreneurship in India, Case Studies of Successful Women Entrepreneurs.	08
5	Growing and Managing the Venture	Growth Strategies, Economic Implication of growth, Implications of Growth for the firm, Overcoming Pressures on existing Financial & Human Resources, Overcoming Pressures on Management of Employees & Entrepreneurs' Time, Implication of Firm Growth to the Entrepreneur.	06
6	Exit Strategies and Social Responsibility	Reasons for Existing, Long-Term Preparation, Short-Term Preparation, Introduction of Social Responsibility, Corporate Social Responsibility(CSR), Dimensions of CSR.	06

References

- Vasant Desai, The Dynamics of Entrepreneurial Development and Management, 2015, Himalaya Publishing House.
- Rajeev Roy, Entrepreneurship, Oxford University Press Edition Fourth.

- Robert D Hisrich, Michael P Peters, Dean A Shepherd, Entrepreneurship, Sixth Edition, The Mc Graw Hill Company.
- PoornimaCharantimath, Entrepreneurship Development- Small Business Enterprise, Pearson.
- Vasant Desai, Entrepreneurship and Small Business Management, 2009, Himalaya Publishing House.
- Dr TN Chhabra, Entrepreneurship Development, Sun India Publications, New Delhi
- Dr CN Prasad, Small and Medium Enterprises in Global Perspective, New century Publications, New Delhi
- Entrepreneurial Development: S.S. Kanka, S. Chand & Company.

Web References:

- www.msme.gov.in
- www.womenentrepreneursindia.com
- www.msmetraining.gov.in

Assessment:

Internal:

Assessment consists of two tests (T1 and T2) .The final marks should be the average of the two tests.

End Semester Theory Examination: Guidelines for setting up the question paper.

- Question paper will comprise of total six questions.
- Question Number One should be compulsory.
- All question carry equal marks.
- Students can attempt any three from the remaining.
- Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

Subject Code	Subject Name		Credits						
MCA4042	Business Infrastructure and Management		04						
Subject Code	Subject Name	Teaching Scheme			Credits Assigned				
		Theory	Pract.	Tut	Theory	Pract.	Tut	Total	
MCA4042	Business Infrastructure and Management	04	--	--	04	--	--	04	
Subject Code	Subject Name	Examination Scheme							
MCA4042	Business Infrastructure and Management	Theory Marks				TW	Pract.	Oral	Total
		Internal Assessment			End Semester Exam				
		Test1 (T1)	Test2 (T2)	Average of T1 & T2					
		20	20	20		80	--	--	--

Pre-requisites:

Knowledge of Internet, Web and Network Systems

Course Educational Objectives (CEO): At the end of the course, the students will be able to

CEO4042.1	Study fundamentals of conducting business over the Internet
CEO4042.2	Familiarize with the Infrastructure, Ethics of electronic-business
CEO4042.3	Explore different kinds of business values and managing the change in digital market

Course Outcomes (CO): At the end of the course, the students will be able to

MCA4042.1	Adopt to transform traditional business into an e-business.
MCA4042.2	Identify the Infrastructure and Security issues related to e-business
MCA4042.3	Understand the current scenarios of digital world and applications of it

Syllabus

Sr. No.	Module	Detailed Contents	Hrs
1	The world of E – Business	What Is E-Business?, Characteristics Of E-Business, Categories Of E-Business (B2B, C2B, B2C, C2C), Elements Of E-Business, E-Business Roles And Challenges, E-Business Requirements, Impact Of E-Business, Inhibitors Of E-Business.	04
2	E-business Strategies	What Is E-Business Strategies, Strategic Positioning, Levels Of E-Business Strategies, The Changing Competitive Agenda: Business And Technology Drivers, The Strategic Planning Process, Strategic Alignment, The Consequences Of E – Business: Theoretical Foundations, Success Factors For Implementation Of E – Business Strategies.	06
3	E-Business Models	Pressure Forcing Business Changes, Business Models – Definition, Classification Of Business Models, Networked Business Models.	06
4	The digital firm – Electronic business / Electronic commerce	Electronic Business, Electronic Commerce And The Emerging Digital Firm: Internet Technology And The Digital Firm, New Business Models & Value Propositions Electronic Commerce: Categories Of Electronic Commerce, Customer – Centered Retailing, Windows On Management: Customer Communities Become Product Development Tools, B2B Electronic Commerce, New – Efficiencies And Relationships, Window On Organization: Covisint: The Vision And The Reality, E – Commerce Payment Systems. Electronic Business & The Digital Firm: How Intranets Support Electronic Business, Intranets & Group Collaboration, Intranet Applications For E – Business, Supply Chain Management & Collaborative Commerce. Management Challenges And Opportunities: Unproven Business Models, Business Process Change Requirements, Legal Issues, Trust, Security & Privacy, MIS In Action: Manager’s Toolkit: Digitally Enabling The Enterprise: Top Questions To Ask, Make IT Your Business.	10
5	Digital / Electronic Markets & Solutions	Electronic Markets Defined, Functions Of Electronic Markets, How Do Electronic Markets Differ From Traditional Market?, Effects Of Electronic Markets, Electronic Market Success Factors, E – Market Technology Solutions.	06
6	E-Business technological Infrastructure and Management	Technical e-Business Challenges, Basic Infrastructure, Web Technologies and Application, Collaborative Technology, The role of enterprise Information Systems in e-Business. The new IT Infrastructure for the Digital Firm: Enterprise Networking and Internetworking, Standards and connectivity for the Digital Integration, Technology and Business Standards. Support Technology for Electronic Business: Web Server and Electronic Commerce servers, How to Integrate the wireless Web into Business strategy, Customer Tracking and Personalization Tools, Web content Management Tools, Web site Performance	12

		Monitoring Tools, Web Hosting Services, The Challenge of Managing the IT Infrastructure and Solutions.	
7	Ethical & Social Issues in the digital firm	<p>Understanding ethical and social issues related to systems: Model For Thinking About Ethical, Social And Political Issue, Moral Dimensions Of The Information Age, Key Technology Trends That Raise Ethical Issue.</p> <p>Ethics in an information society: Basic Concepts:Responsibility, Accountability And Liability, MIS In Actions: Manager’s Toolkit: How To Conduct An Ethical Analysis, Candidate Ethical Principles, Professional Codes Of Conduct, Some Real World Ethical Dilemmas.</p> <p>The moral dimensions of information Systems: Information Rights: Privacy & Freedom In The Internet Age, Window On Organizations: Privacy For Sale, Property Rights: Intellectual Property, Accountability, Liability And Control, System Quality: Data Quality And System Errors, Quality Of Life: Equity, Access And Boundaries, Window On Management: Alberta Narrows Its Digital Divide, Management Actions: Corporate Code Of Ethics, Make IT Your Business.</p>	08

References:

- Michael P. Papazoglou , Pieter M.A. Ribbers “E-Business Organizational and Technical Foundations,Wiley India Edition.
- Waman S Jawadekar, Management Information Systems- A Digital-Firm perspective ,4th edition,TMH
- H Albert Napier,Ollie rivers,Stuart Wagner, JB Napier 2ed, “Creating a Winning E Business”Cengage Learning India Edition.
- Kenneth C Laudon, Jane P.Laudon “Managing The Digital Firm , Eighth Edition, Pearson Education.
- Kenneth C Laudon, Carol GuercioTraver “e-commerce Business, technology, Society”,4ed,Pearson
- Dave Chaffey” E-Business and E-commerce Mnagement”3ed,Pearson.

Assessment:

Internal:

Assessment consists of two tests (T1 and T2) .The final marks should be the average of the two tests. Besides this, students in a group of 3 or 4 have to present a case study compulsorily related to electronic / digital Business likee-chaupal/e-governance /e-tourism/e-Learning/e-real estate/e-Media/ Impact of e-Business on society etc.

End Semester Theory Examination: Guidelines for setting up the question paper.

- Question paper will comprise of total six questions.
- Question Number One should be compulsory.
- All question carry equal marks.
- Students can attempt any three from the remaining.
- Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

Subject Code		Subject Name				Credits			
MCA4043		Enterprise Resource Planning				04			
Subject Code	Subject Name	Teaching Scheme			Credits Assigned				
		Theory	Pract.	Tut	Theory	Pract.	Tut	Total	
MCA4043	Enterprise Resource Planning	04	--	--	04	--	--	04	
Subject Code	Subject Name	Examination Scheme							
MCA 4043	Enterprise Resource Planning	Theory Marks				TW	Pract.	Oral	Total
		Internal Assessment			End Semester Exam				
		Test1 (T1)	Test2 (T2)	Average of T1 & T2					
		20	20	20		80	--	--	--

Pre-requisites:

Knowledge of Information Technology, Business System Management, Software and Networking

Course Educational Objectives (CEO): At the end of the course, the students will be able to

MCA4043.1	Study technical aspects of Enterprise Resource Planning (ERP) with its lifecycle.
MCA4043.2	Identify the functionality in an ERP system
MCA4043.3	Understand tools and methodology used for designing ERP for an Enterprise

Course Outcomes (CO): At the end of the course, the students will be able to

MCA4043.1	Conceptualize the basic structure of ERP
MCA4043.2	Identify implementation strategy used for ERP
MCA4043.3	Apply design principles for various business module in ERP
MCA4043.4	Apply different emerging technologies for implementation of ERP

Syllabus

Sr. No.	Module	Detailed Contents	Hrs
1	Introduction to Enterprise Resource Planning (ERP)	Information System and Its Components, Value Chain Framework, Organizational Functional Units, Evolution of ERP Systems, Role of ERP in Organization, Three-Tier Architecture of ERP system	08
2	ERP Implementation Lifecycle	Project Preparation, Initial Costing, Requirement Engineering, ERP Solution Selection, Technical Planning, Change Management and Training Plan, Implementation and Deployment Planning, Configuration, Custom Coding, Final Preparation, Go-live	08
3	ERP and Related Technologies	Business Process Reengineering(BPR), Data Warehousing, Data Mining, On-line Analytical Processing(OLAP), Supply Chain Management (SCM), Customer Relationship Management(CRM), Electronic Data Interchange (EDI)	08
4	ERP Manufacturing Perspective	MRP - Material Requirement Planning, BOM - Bill Of Material, MRP - Manufacturing Resource Planning, DRP - Distributed Requirement Planning, PDM - Product Data Management	06
5	ERP Modules	Finance, Plant Maintenance, Quality Management, Materials Management,	08
6	Benefits of ERP	Reduction of Lead-Time, On-time Shipment, Reduction in Cycle Time, Improved Resource Utilization, Better Customer Satisfaction, Improved Supplier Performance, Increased Flexibility, Reduced Quality, Costs, Improved Information Accuracy and Design-making Capability	06
7	Introduction to ERP tools	OpenERP JD Edwards-Enterprise One Microsoft Dynamics-CRM Module SAP	08

References:

- Enterprise Resource Planning - Alexis Leon, Tata McGraw Hill.
- Enterprise Resource Planning – Diversified by Alexis Leon, TMH.
- Enterprise Resource Planning - Ravi Shankar & S. Jaiswal ,Galgotia.
- Enterprise Resource Planning : Concepts and Practices by Vinod Kumar Garg, N. K. Venkitakrishnan
- ERP a Managerial Perspective by S Sadagopan
- Guide to Planning ERP Application, AnnettaClewto and Dane Franklin, McGRaw-Hill, 1997
- The SAP R/3 Handbook, Jose Antonio, McGraw – Hill
- E-Business Network Resource planning using SAP R/3 Baan and Peoplesoft : A Practical Roadmap For Success By Dr. Ravi Kalakota
- Enterprise Resource Planning, A Managerial Perspective by Veena Bansal, PEARSON

Assessment:**Internal:**

Assessment consists of two tests (T1 and T2) .The final marks should be the average of the two tests.

End Semester Theory Examination: Guidelines for setting up the question paper.

- Question paper will comprise of total six questions.
- Question Number One should be compulsory.
- All question carry equal marks.
- Students can attempt any four from the remaining.
- Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

Subject Code	Subject Name		Credits						
MCA4044	Ethics & CSR		04						
Subject Code	Subject Name	Teaching Scheme			Credits Assigned				
		Theory	Pract.	Tut	Theory	Pract.	Tut	Total	
MCA4044	Ethics & CSR	04	--	--	04	--	--	04	
Subject Code	Subject Name	Examination Scheme							
MCA4044	Ethics & CSR	Theory Marks				TW	Pract	Oral	Total
		Internal Assessment			End Semester Exam				
		Test1 (T1)	Test2 (T2)	Average of T1 & T2					
		20	20	20		80	--	--	--

Pre-requisites:

Basic knowledge of Organizational behavior& Corporate Governance

Course Educational Objectives (CEO): At the end of the course, the students will be able to

CEO4044.1	Acquire knowledge of Ethics in the modern era
CEO4044.2	Understanding of Ethical decision making approaches.
CEO4044.3	Understand the scope and complexity of Corporate Social responsibility in the global and Indian context.

Course Outcomes (CO): At the end of the course, the students will be able to

MCA4044.1	Understand ethical theories and ethics in profession.
MCA4044.2	Analyze global issues in ethics
MCA4044.3	Apply Ethical Code, Audit and living in real world.
MCA4044.4	Analyze Corporate Social Responsibility and its framework.

Syllabus

Sr. No.	Module	Detailed Contents	Hrs
1	Basic Concepts in Ethics & Ethical Theories	Introduction, Terminology, Personal Ethics, Professional Ethics, Life skills, Basic Ethical Principles, Moral Development, Theories-Piaget's Theory, Kohlberg's Theory, Elliot Turiel's Theory, Gilligan's Theory, Comparison of Moral Development Theories. Classification of Ethical Theories, Some basic Theories	10
2	Global Issues in Ethics	Introduction, Current Scenarios, Business Ethics, Environmental Ethics, Computer Ethics, Media Ethics, Bioethics, Research Ethics, Intellectual Property Rights, Professionals & Ethics.	08
3	Ethical Codes	Need for Ethical Codes, Sample codes, Codes from Other Professions, Corporate Codes, Implementation of codes, Limitations of codes.	08
4	Ethics Audit & Ethical Living	Need for Ethics audit, Ethics Profiles of Organizations, Considerations for Ethics Audit, Ethics standards and Benchmarking, Procedure for Ethics audit, Ethics audit Report. Ethical Living, Ethical living for Professionals.	08
5	Understanding Corporate Social Responsibility (CSR), Evolutions of Company & CSR Role of various institutions in CSR	Introduction, Understanding CSR, History of CSR in India. Theories of corporate Governance, Importance of CSR in Corporate Governance, The Social Impact. Introduction, Role of Government, Role of NGO'S & Not-for-profit Organizations, Role of Educational Institutions, Role of the Media.	10
6	Framework for rating CSR & Global CSR.	Understanding CSR ratings, available Accepted Rating Frameworks, Structure of BITC CR Index, Rating Criteria and basic structure of the rating process. Study of Sample Rating Framework for Corporate. Multinational companies, challenges of multinationals, country specific CSR Initiatives.	08

References:

- Professional Ethics, R. Subramanian, Oxford Higher Education.
- Corporate Social Responsibility, Madhumita Chatterji, Oxford Higher Education
- Business Ethics and Corporate Governance, A.C. Fernando, Pearson 2nd Edition
- Corporate Ethics, Governance, and Social Responsibility: Precepts and Practices, Fernando, Pearson

Assessment:**Internal:**

Assessment consists of two tests (T1 and T2) .The final marks should be the average of the two tests.

End Semester Theory Examination: Guidelines for setting up the question paper.

- Question paper will comprise of total six questions.
- Question Number One should be compulsory.
- All question carry equal marks.
- Students can attempt any three from the remaining.
- Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

Elective-II

MCA405

Subject Code	Subject Name		Credits						
MCA4051	Digital Forensics		04						
Subject Code	Subject Name	Teaching Scheme			Credits Assigned				
		Theory	Pract.	Tut	Theory	Pract.	Tut	Total	
MCA4051	Digital Forensics	04	--	--	04	--	--	04	
Subject Code	Subject Name	Examination Scheme							
MCA 4051	Digital Forensics	Theory Marks				TW	Pract	Oral	Total
		Internal Assessment			End Semester Exam				
		Test1 (T1)	Test2 (T2)	Average of T1 & T2	End Semester Exam				
		20	20	20	80	--	--	--	100

Pre-requisites:

Information Security

Course Educational Objectives (CEO): At the end of the course, the students will be able to

CEO4051.1	Understand the fundamental of forensics
CEO4051.2	Have in depth knowledge of relationship between IT and Forensics
CEO4051.3	Study different aspects of digital evidences

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

MCA4051.1	Develop computer forensic awareness
MCA4051.2	Utilizing the knowledge for investigations in order to solve computer crime
MCA4051.3	Perform best practices for incidence response
MCA4051.4	Apply computer forensic tools for investigation

Syllabus

Sr. No.	Module	Detailed Contents	Hrs
1	Introduction	Introduction of Cyber Crime, Computer roles in Crime, Introduction to Digital Forensics and its uses. Forensics Evidence, Collection, Processing and the phases of forensics investigation, Types of Computer Forensics	06
2	Data Recovery	Encryption and Decryption, Recovery deleted files, Identifying false images and Steganography methods for media data including text, image and audio data	08
3	Digital Evidence Controls	Uncovering attacks that evade detection by event viewer and task manager. Memory image acquisition techniques and their limitations	08
4	Network Forensics	Different attacks in network, collecting and analyzing network based evidence in windows and Unix environment, Email forensics for standard protocols	06
5	Mobile Phone and Android Forensics	Crime and mobile phones, evidences, forensic procedures, files present in SIM Card, Device data, External memory dump and evidences in memory card, Android forensic fundamental, Data extraction techniques, screen lock bypassing techniques	08
6	Cloud Forensics	Fundamentals of cloud forensics, Cloud crimes, Uses of cloud forensics and its challenges, Interaction of Email system with local and cloud storage	08
7	Real forensic Case and Its Tools	Processing a complete forensic case and preparing a forensic report and Introduction of some forensic tools- Helix, FTK, Autopsy and FIRE	08

Reference:

- Digital Forensics with open source tools. Cory Altheide and Harlan Carvey, ISBN: 978-1-59749-586-8, Elsevier Publications, April 2011
- Digital Evidence and Computer crime 3rd Edition: Forensics Science, Computers and the Internet by Eoghan Casey, 2011
- Computer Forensic and Cyber Crime: An Introduction 3rd Edition by Marjie T. Britz, 2013
- Network Forensics: Tracking Hackers through Cyber Space, Sherri Davidoff, Jonathan Ham Prentice Hall 2012
- Android Forensics: Investigation and Security by Andrew Hogg, Publisher – Synergy
- Practical Mobile Forensics: Satish Bommisetty, Rohit Tamma and Heather Mahalik, Pack Publishing LTD 2014, ISBN-978-1-78328-831-1

Web References:

1. Computer Forensics World <http://www.computerforensicsworld.com/>
2. Computer Forensic Services <http://www.computer-forensic.com>
3. Digital Forensic Magazine <http://www.digitalforensicsmagazine.com>
4. Journal of Digital Forensic Practice <http://www.tandf.co.uk/15567281>

5. <http://cloudtimes.org/2012/11/05/the-basics-of-cloud-forensics/>

Assessment:

Internal:

Assessment consists of two tests (T1 and T2) .The final marks should be the average of the two tests.

End Semester Theory Examination: Guidelines for setting up the question paper.

- Question paper will comprise of total six questions.
- Question Number One should be compulsory.
- All question carry equal marks.
- Students can attempt any three from the remaining.
- Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

Subject Code	Subject Name						Credits		
MCA4052	Simulation & Modelling						04		
Subject Code	Subject Name	Teaching Scheme			Credits Assigned				
		Theory	Pract.	Tut	Theory	Pract.	Tut	Total	
MCA4052	Simulation and Modelling	04	--	--	04	--	--	04	
Subject Code	Subject Name	Examination Scheme							
MCA4052	Simulation and Modelling	Theory Marks				TW	Pract	Oral	Total
		Internal Assessment			End Semester Exam				
		Test1 (T1)	Test2 (T2)	Average of (T1 & T2)					
		20	20	20	80	--	--	--	100

Pre-requisites:

Overview of Probability, Statistics and Discrete Mathematics and basics of Computers.

Course Educational Objectives (CEO):At the end of the course, the students will be able to

CEO4052.1	Understand the basic system concepts and definitions of the types of system.
CEO4052.2	Provides techniques to model and simulate each system.
CEO4052.3	Ability to analyze the system and make use of information to improve its performance.

Course Outcomes (CO): At the end of the course, the students will be able to:

MCA4052.1	Apply functional modeling to model the activities of a static system.
MCA4052.2	Understand the behavior of a dynamic system and create a model for a dynamic system.
MCA4052.3	Simulate the real systems

Syllabus

Sr. No.	Module	Detailed Contents	Hrs
1	Introduction to Simulation	What is modeling and Simulation: History, Application areas, Advantages and Disadvantages, Role of modeling and simulation for Problem solving, Types of simulation models and examples: static (Monte Carlo simulation and its application to industries), dynamic (Bank), deterministic (arrivals at scheduled appointment time), stochastic (random arrivals and service time), Discrete event simulation (queuing system), continuous (communication and traffic system). Steps in simulation study. Uses of simulation with examples(Experimentation, experience, ethics, human interaction).	04
2	Description and solutions of simulation examples	Simulation of Queuing system (G/G/1, D/D/1 ,..., M/G/1, M/M/1) characteristics, notation, Measures of performance of Queuing system, example of single channel of Queue, the Able Baker call center problem.Simulation of inventory system (News Paper seller problem), Other examples: Reliability problem, Use of random normal numbers for simulation, project simulation, Lead Time Demand, Job Shop Model.	12
3	Simulation Models using Random Numbers and Variates	Simulation Examples based on statistical distributions. Discrete distributions, Continuous distributions, Poisson process.Random- Number Generation: Properties of Random Numbers, Generation of Pseudo- Random Numbers, Techniques for Generating Random Numbers, Tests for Random Numbers. Random Variate Generation:Inverse Transformation Technique –Uniform Distribution, Exponential Distribution, Weibull Distribution. Convolution Method for Erlang Distribution, Acceptance-Rejection Technique – Poisson Distribution.	12
4	Input and Output Analysis	Input Models with Data: Data Collection, Identifying the Distribution with Data - Parameter Estimation, Goodness of Fit Tests: Chi-Square Test, Kolmogorov-Smirnov Test. Selecting Input Models without Data , Time-Series Input Models Output Analysis: Stochastic Nature of Output Data - Types of Simulation with respect to Output Analysis- Measures of Performance and their Estimation (Point Estimation, confidence Interval Estimation). Output Analysis for Terminating Simulations (Confidence Interval Estimation)Output Analysis for Steady-State Simulation.(Error estimation)	12
5	Verification and Validation	Model Building, Verification and Validation; Verification of Simulation Models - Calibration and Validation of Models:- Face Validity, Validation of Model Assumptions, Validating Input-Output Transformations - Input-Output Validation using Historical Input Data, Input-Output . Validation using a Turing	06

		Test. Optimization via simulation examples.	
6	Modelling and Simulation of Real World Problems	Simulation of manufacturing systems, Simulation of computer systems, Simulation of supermarket. Simulation of Transportation model, business model, Medical models, Social Science models.	06

Reference:

- J. Banks, J. S. Carson II and B. L. Nelson,, “Discrete-Event System Simulation”, 2nd Edition, Prentice Hall of India, New Delhi, 1995.
- Simulation & Modelling- Jain, Wiley -Dreamtech
- J. A. Sokolowski, C.M. Banks, “Principles of Modeling and Simulation: A multidisciplinary Approach”, John Wiley & Sons Publications, edited 2011.
- Averill M. Law and W. David Kelton, “Simulation Modeling & Analysis”, 2nd Edn., Tata McGraw Hill, 1991.
- Geoffrey Gardon, “System Simulation”, 2nd Edn., Printice Hall of India, 1992.
- Narsingh Deo, ” System Simulation with Digital Computers”, Prentice Hall of India, 1979.

Assessment:

Internal:

Assessment consists of two tests (T1 and T2) .The final marks should be the average of the two tests.

End Semester Theory Examination: Guidelines for setting up the question paper.

- Question paper will comprise of total six questions.
- Question Number One should be compulsory.
- All question carry equal marks.
- Students can attempt any three from the remaining.
- Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

Subject Code	Subject Name		Credits						
MCA4053	Next Generation Networks		04						
Subject Code	Subject Name	Teaching Scheme			Credits Assigned				
		Theory	Pract.	Tut	Theory	Pract.	Tut	Total	
MCA4053	Next Generation Networks	04	--	--	04	--	--	04	
Subject Code	Subject Name	Examination Scheme							
MCA 4053	Next Generation Networks	Theory Marks				TW	Pract	Oral	Total
		Internal Assessment			End Semester Exam				
		Test1 (T1)	Test2 (T2)	Average of T1 & T2					
		20	20	20		80	--	--	--

Pre-requisites:

Computer Networks

Course Educational Objectives (CEO): At the end of the course, the students will be able to

CEO4053.1	Relate the paradigm shift from circuit switched network to packet switched network.
CEO4053.2	Understand the core technologies, and architectures of the Next Generation Networks
CEO4053.3	Summarize technology options for Multi-Service Networks

Course Outcomes (CO): At the end of the course, the students will be able to:

MCA4053.1	Evaluate the importance of packet switching for NGN
MCA4053.2	Analyze and differentiate various architectures of a next generation network (NGN)
MCA4053.3	Comprehend the multiple services offered by NGN

Syllabus

Sr. No	Module	Detailed Contents	Hrs
1	Introduction	Changes, Opportunities and Challenges, Technologies, Networks, and Services, Requirements for NGN, Next Generation Network Concept, Next Generation Society	08
2	Next Generation Technology	Technologies influencing change, IP Networks (Migration from circuit Switching to Packet Switching), building blocks for NGN, Wireline NG Technologies: Fiber to Premises, Long-Haul Managed Ethernet, Wireless NG Technologies: Broadband Bluetooth & ZigBee, Long Term Evolution, VOIP, Multi service Flexible Networks architecture. VPNs, ITU - NGN Architecture, Numbering, naming and addressing in NGN	10
3	IMS and Convergence Management	IMS Architecture, IMS Services : Push to Talk over cellular Service , IMS Based FMC Services	08
4	IPTV &HbbTV	Introduction, Architecture of NGN Based IPTV, NGN Based IPTV Services, Protocols Used for IPTV, HbbTV (Hybrid Broadcast Broadband TV) Services, HBB-NEXT, Multiple-User Environment	08
5	Next Generation Multiservice Technology	MPLS , MPLS services and components , MPLS &QoS, overview of VPN, layer2 VPN, layer 3 VPN	08
6	NGN Services	Software- Based Business Services, High- Definition Voices, Three Dimensional Television, Mobile and Manages Peer-to Peer Service, Converged/ Personalized / Interactive Multimedia Services, Grand-Separation for Pay-per-Use Service, Consumer and Business-Oriented Apps Storefront	10

Reference:

- Thomas Playvk, “Next generation Telecommunication Networks, Services and Management”, Wiley & IEEE Press Publications, 2012
- Next Generation Networks – NGN, Module 1: ITU NGN standards and architectures
- NGN Architecture: Generic Principles, Functional Architecture, and Implementation Keith Knightson, Consultant, Naotaka Morita, NTT Corporation, Thomas Towle. Lucent Technologies — Bell Laboratories, IEEE Communications Magazine • October 2005
- Azhar Sayed , Monique Morrow MPLS and Next Generation Networks:Foundations for NGN andEnterprise Virtualization", Cisco Press

Assessment:

Internal:

Assessment consists of two tests (T1 and T2) .The final marks should be the average of the two tests.

End Semester Theory Examination: Guidelines for setting up the question paper.

- Question paper will comprise of total six questions.
- Question Number One should be compulsory.
- All question carry equal marks.
- Students can attempt any three from the remaining.
- Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

Subject Code	Subject Name				Credits				
MCA 4054	Artificial Intelligence and Soft Computing				04				
Subject Code	Subject Name	Teaching Scheme			Credits Assigned				
		Theory	Pract	Tut	Theory	TW	Tut.	Total	
MCA 4054	Artificial Intelligence and Soft Computing	04	--	--	04	--	--	04	
Subject Code	Subject Name	Examination Scheme							
MCA 4054	Artificial Intelligence and Soft Computing	Theory Marks				TW	Pract	Oral	Total
		Internal Assessment			End Semester Exam				
		Test1 (T1)	Test2 (T2)	Average of T1 & T2	End Semester Exam				
		20	20	20	80	--	--	--	100

Pre-requisites:

Students should have knowledge of SET theory, SET relations and Probability.

Course Educational Objectives (CEO): At the end of the course, the students will be able to

CEO4054.1	Identify and describe problems that are amenable to solution by AI methods.
CEO4054.2	Study appropriate soft computing techniques for problem solving
CEO4054.3	Study optimization techniques based on soft computing approach

Course Outcomes (CO): At the end of the course, the students will be able to

MCA4054.1	Understand various AI concepts
MCA4054.2	Solve the problems using neural networks techniques.
MCA4054.3	Apply fuzzy logic techniques to find solution of uncertain problems.
MCA4054.4	Analyze the genetic algorithms and their applications

Syllabus

Sr. No.	Module	Detailed Contents	Hrs
1	Introduction to AI	Artificial Intelligence : Role of AI in engineering, AI in daily life, Intelligence and Artificial Intelligence, Different task domains of AI, Programming methods, Limitations of AI Intelligent Agent: Agent, Performance Evaluation, task environment of agent, Agent classification, Agent architecture	05
2	Problem Solving	Problems, problem spaces and search: Define the problem as a state space search, Production systems, Problem characteristics, Production system characteristic, Issues in design of search program Search Techniques: DFS, BFS, Hill Climbing	06
3	Knowledge Representation	Knowledge Representation: Need to represent knowledge, Knowledge representation with mapping scheme, Properties of good knowledge-based system, Knowledge representation issues, AND-OR graph, Types of knowledge	09
4	Concepts of Soft Computing	Soft Computing: Hard computing Vs Soft Computing, Soft computing constituents – ANN, Fuzzy Logic, GA Applications of Soft Computing	02
5	Neural Network	Artificial Neural Network: Introduction, Fundamental Concept, Artificial Neural Network, Brain vs. Computer - Comparison Between Biological Neuron and Artificial Neuron, Basic Models of Artificial Neural Network Supervised Learning Network- Linear Separability, Perceptron Networks, Adaptive Linear Neuron (Adaline), Multiple Adaptive Linear Neurons, Back-Propagation Network. Unsupervised Learning Networks- MaxNet	12
6	Fuzzy Logic	Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets: Introduction to Fuzzy Logic, Classical Sets (Crisp Sets), Fuzzy Sets Classical Relations and Fuzzy Relations: Introduction, Cartesian Product of Relation, Classical Relation, Fuzzy Relations Membership Functions: Introduction, Features of the Membership Functions, Fuzzification, Methods of Membership Value Assignments Defuzzification: Introduction, Lambda-Cuts for Fuzzy Sets (Alpha-Cuts), Lambda-Cuts for Fuzzy Relations, Defuzzification Methods	10
7	Fuzzy Inference System	Fuzzy Inference System: Truth Values and Tables in Fuzzy Logic, Fuzzy Propositions, Formation of Rules, Decomposition of Rules (Compound Rules), Aggregation of Fuzzy Rules, Fuzzy Inference Systems (FIS)- Construction and Working Principle of FIS, Methods of FIS, Overview of Fuzzy Expert System	04
8	Genetic Algorithm	Genetic Algorithm: Basic concepts, Difference between genetic algorithm and traditional methods, Simple genetic algorithm, Working principle, Procedures of GA, Genetic operators- reproduction, Mutation, crossover.	04

References:

- Artificial Intelligence, 3rd Edition, Elaine Rich, Kevin Knight, S.B. Nair, Tata McGraw Hill.
- Artificial Intelligence and Soft Computing for Beginners- Anandita Das, ShroffPublication.
- Dr. S. N. Sivanandam and Dr. S. N. Deepa, "Principles of Soft Computing " John Wiley
- S. Rajsekaran & G.A. VijayalakshmiPai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications" Prentice Hall of India.
- Kumar Satish, "Neural Networks" Tata McGraw Hill
- Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India.
- Search, Optimization & Machine Learning by *David E. Goldberg*.

Assessment:**Internal:**

Assessment consists of two tests (T1 and T2). The final marks should be the average of the two tests.

End Semester Theory Examination: Guidelines for setting up the question paper.

- Question paper will comprise of total six questions.
- Question Number One should be compulsory.
- All question carry equal marks.
- Students can attempt any three from the remaining.
- Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3).

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

Subject Code	Subject Name							Credits	
MCAL401	Advanced Web Technology and Data Mining and Business Intelligence Lab (AWT and DMBI Lab)							03	
Subject Code	Subject Name	Teaching Scheme			Credits Assigned				
		Theory	Pract.	Tut	Theory	Pract.	Tut	Total	
MCAL401	Advanced Web Technology and Data Mining and Business Intelligence Lab	--	06	--	--	03	--	03	
Subject Code	Subject Name	Examination Scheme							
MCA L401	Advanced Web Technology and Data Mining and Business Intelligence Lab	Theory Marks				TW	Pract.	Oral	Total
		Internal Assessment			End Semester Exam				
		Test1 (T1)	Test2(T2)	Average of T1 & T2					
		--	--	--	--	25	50	25	100

Pre-requisites:

- Basic Knowledge of Object Oriented Programming concepts
- Basic Understanding of Database Systems

Course Educational Objectives (CEO): At the end of the course, the students will be able to

CEOL401.1	Learn advanced windows and web development techniques using dotNET
CEOL401.2	Understand Business Intelligence and Data Mining techniques
CEOL401.3	Prepare Business Intelligence applications using Web Technologies.

Course Outcomes (CO): At the end of the course, the students will be able to:

MCAL401.1	Develop Windows forms applications and Web Applications using Dot NET Technologies
MCAL401.2	Apply Data warehousing and mining techniques.
MCAL401.3	Design and implement web enabled BI application for industry.

Syllabus

Sr. No.	Module	Detailed Contents	Hrs
1	Introduction to Dot Net and C#	<ul style="list-style-type: none"> • Basic Windows Forms Applications • Windows Forms Applications using Control Structures and Operators • Advanced Windows Forms Controls 	04
2	OOP C#	<ul style="list-style-type: none"> • Programs using Classes and Objects • Programs based on Inheritance • Programs using Static and Constant • Programs using Interfaces • Programs using Abstract Classes • Programs on Collections • Designing Generic Classes and Methods 	10
3	Databases and C#	<ul style="list-style-type: none"> • Text File Handling • Text Editing Application • Binary File Handling • Database Connectivity in Connected Manner • Database Connectivity in Disconnected Manner • LINQ with Object Data Source • LINQ with DataSet 	08
4	Asp.Net Web Applications	<ul style="list-style-type: none"> • Web Applications using Web Server Controls • Web Applications using advanced Web Server Controls • ASP .NET Applications using Web Forms • ASP.NET Applications using MVC 	08
5	Data and State Management in ASP.NET	<ul style="list-style-type: none"> • ASP.Net Web Applications managing States • Web Applications using SQL Data Source • Web Applications using Connected and Disconnected database Connectivity • Web Applications using ADO.NET Entity Framework • Web Applications using jquery and database Connectivity • Web Applications using ASP.NET Ajax • Websites using Master Pages and Themes 	10
6	Web Services	<ul style="list-style-type: none"> • Creating and Consuming a XML Web Service-Simple and Database • Creating and Consuming a WCF service – Simple and Database • Designing Secure Web Application • Deploying web Site 	06
7	Data Warehousing	<p>Data Warehousing using Oracle</p> <ul style="list-style-type: none"> • Setting Up and Starting Warehouse Builder • Introducing OWB Architecture and Configuration • Defining Source Metadata • Ensuring Data Quality Using Data Profiling • Defining Staging Metadata and Mapping Tables • Deriving Data Rules and Running Correction Mappings 	06

		<ul style="list-style-type: none"> Defining a Relational Dimensional Model Handling Slowly Changing Dimensions OLAP with Oracle <ul style="list-style-type: none"> Analytical Queries Grouping Functions Windowing Functions RollUp and Cube 	
8	Data Mining	Data Mining Using Weka/R Miner <ul style="list-style-type: none"> Introducing Weka/R Miner The Data Mining Process Using Classification Models Using Regression Models Using Clustering Models Performing Market Basket Analysis Performing Anomaly Detection Deploying Data Mining Results 	08
9	BI Tools	Open Source BI Tools <ul style="list-style-type: none"> Preparing Reports Preparing Dashboards Preparing Balanced ScoreCards Analysis of Reports 	08
10	Mini Project	Mini Project A Mini Projects based on Data Mining and Business Intelligence Techniques using advanced Web Technologies.	10

References:

- Beginning Visual C# 2012 Programming, Karli Watson, Jacob Vibe Hammer, Jon D. Reid, Morgan Skinner, Daniel Kemper, Christian Nagel, ISBN: 978-1-118-31441-8, Wrox Publication
- Professional C# 2008, Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner, ISBN: 978-1-118-64321-1, Wrox Publication
- Beginning ASP.NET 4.5: in C# and VB, Imar Spaanjaars, ISBN: 978-1-118-31180-6, Wrox Publication
- Professional ASP.NET 4.5 in C# and VB, Jason N. Gaylord, Christian Wenz, Pranav Rastogi, Todd Miranda, Scott Hanselman, Scott Hunter (Foreword by), ISBN: 978-1-118-31182-0, Wrox Publication
- Murach's ASP.NET 4 Web Programming with C# 2010, Anne Boehm, Joel Murrach, SPD, Murrach Books
- Murach's C# 2015, Anne Boehm and Joel Murrach, ISBN 978-1-890774-94-3, Murrach
- Murach's ADO. Net 4 Database Programming with C# 2010 4th Edition
- Pro C# 5.0 and the .NET 4.5 Framework – Andrew Trolsen, APress
- Advance .NET Technology second edition by Chirag Patel- DreamTech Press

Web References:

- MSDN: Learn to Develop with Microsoft Developer Network:
<https://msdn.microsoft.com/>
- www.weka.org, www.oracle.com, www.pentahobi.com

Subject Code	Subject Name		Credits					
MCA L402	Computer Graphics and Image Processing Lab		03					
Subject Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Pract.	Tut	Theory	Pract.	Tut.	Total
MCA L402	Computer Graphics and Image Processing Lab	--	06	--	--	03	--	03
Subject Code	Subject Name	Examination Scheme						
MCA L402	Computer Graphics and Image Processing Lab	Theory Marks			TW	Pract.	Oral	Total
		Internal Assessment		End Semester Exam				
		Test1 (T1)	Test2 (T2)	Average of T1 & T2				
		--	--	--	25	50	25	100

Pre-requisites:

- Understanding of Object Oriented Programming Language
- Knowledge of Algorithms

Course Educational Objectives (CEO): At the end of the course, the students will be able to:

CEOL402.1	Understand the concepts of output primitives of Computer Graphics.
CEOL402.2	Learn 2 D and 3 D graphics Techniques.
CEOL402.3	Study various Image Processing techniques

Course Outcomes (CO): At the end of the course, the students will be able to:

MCAL402.1	Implement the algorithms to draw output primitives of Computer Graphics.
MCAL402.2	Implement 2D transformations
MCAL402.3	Implement 3D transformations
MCAL402.4	Implement various image processing techniques.

Syllabus:

Sr. no	Module	Detailed Contents	Hours
01	Introduction	Introduction to graphics coordinates system and demonstration of simple inbuilt graphic functions	2
02	Output primitives & its Algorithms	Implementation of line generation A. A. DDA line B. Bresenham's line C. application of Line drawing algos.	6
03	Output primitives & its Algorithms	Implementation of circle drawing A. Midpoint circle B. application of Circle drawing algos.	4
04	Output primitives & its Algorithms	Implementation of ellipse drawing A. Midpoint Ellipse	4
05	Output primitives & its Algorithms	Implementation of curve drawing A. Bezier Curve	2
06	Output primitives & its Algorithms	Implementation of filling algorithms A. Boundary fill B. Flood fill C. Scan line D. application of Circle drawing algos.	8
07	2D Geometric Transformations & Clipping	Implementation of two dimensional transformations A. Translation, Rotation & Scaling B. Shear & Reflection	6
08	2D Geometric Transformations & Clipping	Implementation of clipping algorithms A. Cohen Sutherland Line clipping B. Midpoint Subdivision C. Sutherland Hodgeman Polygon Clipping	10
09	Basic 3D Concepts & Fractals	Implementation of 3D Transformations (only coordinates calculation)	2
10	Basic 3D Concepts & Fractals	Implementation of fractal generation A. Koch curve/Snowflake B. Sierpinski Triangle	6
11	Introduction of Animation	Implementation of animation programs (using basic inbuilt Graphical functions)	4
12	Image Enhancement Techniques	Implementation of Basic Intensity Transformations A. Image negative B. Log transformation C. Power law Transformation	6
13	Image Enhancement Techniques	Implementation of Piecewise-Linear Transformation Functions A. Contrast Stretching B. Grey level Slicing C. Bit plane slicing	8
14	Image Enhancement Techniques	Implementation of histogram equalization A. Image histogram & histogram	10

		Equalization B. Image Subtraction C. Image averaging	
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Reference:

- Donald Hearn and M Pauline Baker, Computer Graphics C Version -- Computer Graphics, C Version, 2/E, Pearson Education.
- David F. Rogers, James Alan Adams, Mathematical elements for computer graphics , McGraw-Hill, 1990
- Rafael C. Gonzalez and Richard E. Woods, Digital Image Processing (3rd Edition), Pearson Education.
- S. Sridhar-Digital image Processing, Second Edition, Oxford University Press
- Anil K. Jain -Fundamentals of digital image processing. Prentice Hall, 1989

Subject Code		Subject Name			Credits				
MCAL403 Activity Lab		Soft Skills Development			02				
Subject Code	Subject Name	Teaching Scheme			Credits Assigned				
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total	
MCAL403 Activity Lab	Soft Skills Development	--	02	--	--	02	--	02	
Subject Code	Subject Name	Examination Scheme							
MCA L403 Activity Lab	Soft Skills Development	Theory Marks				TW	Pract	Oral	Total
		Internal Assessment			End Semester Exam				
		Test1 (T1)	Test2 (T2)	Average of T1 & T2					
		--	--	--	--	50	--	--	50

Pre-requisites: ----

Course Educational Objectives (CEO): At the end of the course, the students will be able to

CEOL403.1	To provide essential professional skills needed to make a positive impact on work and social lives
CEOL403.2	Understand the corporate culture and adapt to various situations
CEOL403.3	Improve their etiquettes, interpersonal skills and professional image

Course Outcomes (CO): At the end of the course, the students will be able to

MCAL403.1	Develop skills in communication, business correspondence, presentations, group discussions and interviews
MCAL403.2	Apply valuable strategies and interpersonal skills thereby making themselves more productive and better capable to lead others
MCAL403.3	Understand the importance of teamwork and learn to perform to the best of their ability, both individually and as team players

Syllabus

Sr. No	Module	Detailed Contents	Hrs
1	Soft Skills Introduction	Soft-Skills Introduction What are Soft Skills? Significance of Soft-Skills – Soft-Skills Vs. Hard Skills - Selling Soft- Skills – Components of Soft Skills – Identifying and Exhibiting Soft-Skills	01
2	Communication	Concept and meaning of communication, methods of communication, verbal and non-verbal communication, barriers to communication, techniques to improve communication. Communication in a business organization: Internal (Upward, Downward, Horizontal, Grapevine). External Communication, 7 C's of communication. Active Listening, Differences between Listening and Hearing, Critical Listening, Barriers to Active Listening, Improving Listening Practical (Role plays, case studies)	02
3	Written Business Communication	Written Communication: Principles of Correspondence, language and style in official letter (full block format, modified block format), Business letters (enquiry to complaints and redressal), Application letter, CV writing, , E-mail etiquette, Documentation of Meetings, Notice, Agenda, Minutes of Meetings. Practical (Practice on CV, Business Letters, Applications, Notice, Agenda, Minutes of Meetings)	04
4	Presentation Skills	Presentation techniques, Planning the presentation, Structure of presentation, Preparation, Evidence and Research, Delivering the presentation, handling questions, Time management. Visual aids. Practical - Presentation by students in groups of maximum 3 on Organizational Behavior topics allocated by faculty. Topics have to cover – 1. Personality: Meaning, Personality Determinants, Traits, Personality types and its, impact on career growth, 2. Personality and Values, Perception and Individual Decision Making. 3. Diversity in Organizations 4. Attitude: Meaning, Components of Attitude, changing attitude and its impact on career growth 5. Motivation 6. Goal setting: SMART (Specific, Measurable, Attainable, Realistic, Timely) Goals, personal and professional goals 7. Time Management. 8. Learning in a group, Understanding Work Teams, Dynamics of Group Behavior, Techniques for effective participation 9. Leadership 10. Emotional intelligence	10
5	Effective Public Speaking	Public Speaking, Selecting the topic for public speaking, Understanding the audience, Organizing the main ideas, Language and Style choice in the speech, Delivering the speech Practical (Extempore)	03
6	Group Discussions	Group Discussion Skills, Evaluation components, Do's and Don'ts. Practical (Group Discussions)	03
7	Interview	Interview Techniques, Pre-Interview Preparation, Conduct during	03

	Techniques	interview, Verbal and non-verbal communication, common mistakes. Practical (Role plays, mock interviews)	
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Reference:

- Business Communication (Revised Edition), Rai & Rai, Himalaya Publishing House.
- Soft skills: an integrated approach to maximise Personality, Chauhan & Sharma, Wiley India publications.
- Business Communication: A practice oriented approach, Kalia and Shailja Agarwal.
- Business Communication – Meenakshi Raman, Prakash Singh, Oxford Publication
- Stephen Robbins & Judge Timothy: Organization Behavior, Pearson Education
- K. Aswathappa – Organizational Behavior: Text, cases & games, Himalaya Publishing House.
- Pareek, Udai, Understanding Organizational Behaviour, Oxford University Press, New Delhi.

Assessment:

Internal:

Internal term work would consist of

1. A written examination of 20 marks
2. Continuous evaluation of 30 marks would be done by internal faculty on the basis of student participation in all practical activities during entire semester.