

# St Joseph's University

## Master of Computer Applications

### SYLLABUS

#### MCA –I Year : Choice Based Credit System (CBCS)

I Semester		II Semester			
MCA 601.1	E1	Database Management Systems	MCA601.2	E1	Cloud Computing with Amazon Web Services
	E2	Database Design and Implementation		E2	Grid and Cluster Computing
	E3	NoSQL with MongoDB		E3	High Performance Computing
MCA602.1	E1	Data Structures & Analysis of Algorithms	MCA602.2	E1	Software Engineering and UML
	E2	Data Structures & Graph Theory		E2	Object Oriented Software Engineering
	E3	Advanced Data Structures and Algorithms		E3	Agile Software Development
MCA 603.1	E1	Object Oriented Programming with Java	MCA603.2	E1	Mobile Application Development using Android
	E2	Enterprise Computing with Advanced Java		E2	Cross Mobile App Development with React Native
	E3	Enterprise Computing : Java EE Frameworks		E3	Mobile App Development for iOS with Swift
MCAS604.1	E1	Web Design with HTML5, CSS, Java Script	MCAS 604.2	E1	Natural Language Processing
	E2	Web Programming with PHP & MySQL		E2	Image Processing & Pattern Recognition
	E3	Web Application Development using Python		E3	Bioinformatics Algorithms, Databases and Tools
MCAS 605.1	E1	Probability and Stochastic Processes	MCAS 605.2	E1	Data Warehousing & Data Mining
	E2	Operations Research		E2	Business Intelligence and Advanced Data Mining
	E3	Statistical techniques for Computing		E3	Data Science and Analytics
MCAHL 606.1 P	DBMS and Data Structures Lab		MCAHL 606.2	Cloud Computing and Mobile App Development Lab	
MCAHL 607.1	Java & Web Development Lab		MCASL 607.2	Machine Learning and Data Mining Lab	
MCASC 608.1	Business Communication and Entrepreneurship		MCAS 608.2	Advanced Entrepreneurship & Mini Project	
-----	Technical Seminar		MCAA 609.2	Technical Writing and Presentation – I	

MCA – II Year : Choice Based Credit System (CBCS)				
III Semester			IV Semester	
MCAH 601.3	E1	Functional Programming Paradigm	MCA 601.4	Industry Internship
	E2	Internet of Things and Applications Development		Project Work
	E3	Augmented and Virtual Reality		Research Project / Dissertation
MCAH 602.3	E1	Web Development with Angular.js, Node.js	Add On / Certificate Courses/ Value added programmes offered	
	E2	Content Management with WordPress	C1	IIC by MHRD to promote Innovation Activities
	E3	Blockchain Technology with Ethereum	C2	Infosys Campus Connect – InfyTQ
MCAH 603.3	E1	Computing with C# and .NET Framework	C3	Mule Soft Developer Certification by Sales Force
	E2	Web Technologies & .NET Framework	C4	TCS Analytics Center for Big Data Analytics
	E3	Cross-Platform Development using .NET Core	C5	Dell - EMC- Programmes on Cloud and Big Data
MCAS 604.3	E1	Cognitive Computing and Artificial Intelligence	C6	IBM Industry Aligned Programmes / Certifications
	E2	Computational Intelligence and Machine Learning	C7	Vmware IT Academy Certification Programmes
	E3	Deep Learning and Neural Networks	C8	UniCourt Academia Initiative for Functional Programming
MCAS 605.3	E1	Big Data Analytics : MapReduce and Hadoop	C9	Amazon Web Services (AWS) Certification
	E2	Big Data Analytics with Scala and Spark	C10	STEP –The Hindu English Proficiency Test
	E3	Big Data Visualization using Tableau	C11	ICT Academy Workshops / seminars / Certifications
MCAH 606.3	Web Application Development & .NET Lab		C12	Seminars from NASSCOM, FICCI, CII, ASOCHEM
MCAS 607.3	Machine Learning & Big Data Lab		C13	IEEE & IEE CS / CSI / ISTE Student member
MCAPR 608.3	Business Consultancy Project			
MCAAO 609.3	Technical Writing and Presentation – II		C14	Rural Immersion Programme

# I Semester

## MCA 601.1 [E1] : DATABASE MANAGEMENT SYSTEMS

Total No. of Lectures : 48

Total Marks : 100

[ L – T – P – S ]

No. of Lectures / Week : 4

Credits : 4

[ 3 – 1 – 0 – 2 ]

**Learning Objectives:** This is a course about data and its management. The design of files and databases and the use of database management systems are integral and critical parts of developing and using information systems. Today, virtually every information system will include the database design and implementation or the use of an existing database.

- Introduction to database management systems
- Foundation on Relational model, Relational Algebra.
- Concepts on Basic SQL as a universal Database language.
- Knowledge on File Structure, Indexing and Query processing.
- Knowledge on Transaction and Database architecture.

**Learning Outcomes:** After you have finished this course, you should have

- Very good understanding about data and database systems.
- Describe the fundamental elements of relational database management systems
- Understand the design of relational databases through the use of Entity-Relationship Diagrams and Normalization procedures
- develop basic skills in the use of SQL in defining and creating a database, inserting and modifying entries in a table,
- Effective way of manipulating the database to produce useful decision making information for management & analytics.
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### SYLLABUS:

Overview of Database Systems, Database Architecture, Data Modeling, Database design and ER Model, Overview of ER Model, Relational database model, Normalization, Structured query language, Nested Queries, Views, Indexes, Transaction management and Concurrency control, Failure in Database/Transaction, Distributed database.

### TEXT BOOKS:

1. Raghurama Krishnan, Johannes Gehrke ,Data base Management Systems, 3rd Edition, 2014, Mc Graw Hill Education,
2. A.Silberschatz, H.F. Korth, S.Sudarshan, Data base System Concepts, VI edition, 2006, McGraw Hill,

### REFERENCES:

1. Peter Rob, Carlos Coronel, Database System Concepts, 5<sup>th</sup> Edition, 2015, Cengage Learning
2. Ashima Bhatnagar Bhatia, Vaibhav Bansal, Database Management System, First Edition 2015, Narosa Publishing House Pvt. Ltd
3. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, 7<sup>th</sup> Edition, 2018, Pearson India Education Services Pvt. Ltd,
4. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, 3rd Edition, 2014, McGrawHill Education,
5. Arun Majumdar & Pritimoy Bhattacharya, DATABASE MANAGEMNET SYSTEMS , 2007, TMH.

## **MCA 602.1 [E2] : DATABASE DESIGN AND IMPLEMENTATION**

**Total No. of Lectures : 48**

**No. of Lectures / Week : 4**

**Total Marks : 100**

**Credits : 4**

**[ L-T-P-S ]**

**[ 3-1-0-2 ]**

### **Course objectives**

This course is designed to enable students to achieve a comprehensive understanding of data, information and knowledge. How an efficient management system, helps to create database. Design tables, manipulate data values, maintaining integrity constraints and so on and also this course stresses on writing queries to generate different reports, how to optimize queries, creating views and cursors. Prepare the students to understand the power Query languages and also writing stored procedure and triggers at the back end.

Upon successful completion of this course, students should be able to:

- Understand the limitations of traditional file management systems
- Understand the need for an efficient management system to administer the data repository of any organization
- Importance of data consistency and also how data integrity ignorance affects any business organization
- Providing data security through different means (such as Views)
- Identifying the power of Query language - generating flexible and customized reports
- Providing complex integrity constraints through the use of Triggers
- Know the Power of procedural SQL, writing Stored procedures, functions and packages
- Gain knowledge about the emerging trends in database technology
- Implementation of active database rules and also object relational features

**Learning Outcomes:** After you have finished this course, you should have

- Very good understanding about data and database systems and its design issues
- Describe the fundamental elements of relational database management systems
- Understand the design of relational databases through the use of Entity-Relationship Diagrams and Normalization procedures
- develop basic skills in the use of SQL in defining and creating a database, inserting and modifying entries in a table,
- Effective way of manipulating the database to produce useful decision making information for management & analytics.
- Handling the distributed database and understanding the issues related to data distribution
- Introduces to the concept of Big data domain and Schema-less storage

### **SYLLABUS:**

Introduction-Database System Applications, Introduction to Data base design, Relational Model, Relational algebra, Relational Algebraic Operations, SQL, Normalization, Views, Functions, File Organization, Transactions, PL/SQL, Transaction Control statements, PL/SQL Cursors and Exceptions, Distributed Database Systems, Big data.

### **Text Books**

1. R. Elmasri and S.B. Navathe: "Fundamentals of Database System", Pearson, 7<sup>th</sup> Edition, 2018
2. Raghurama Krishnan, Johannes Gehrke, Data base Management Systems, 3rd Edition, 2014, McGrawHill Education,

#### References:

1. Alexis Leon, Mathew Leon, "Database Management System", Vikas Publishers
2. Peter Rob, Carlos Cornel, "Database Systems: Design & Management", Cengage
3. J A Hoffer, Mary B Prescott, H Topi, "Modern Database Management Systems", Pearson
4. Saeed K Rahimi, Frank S Haug, "Distributed Database Management System: A Practical Approach", Wiley India Publishers
5. Bipin C. Desai, "Introduction to Database Systems", Galgotia Publications.
6. Date, C. J. , "An introduction to database systems", 3<sup>rd</sup> Edition, Narosa publishing house.
7. Hansen & Hansen, "Database Management and Design", Prentice Hall of India Ltd.
8. Ullman, J. D., "Principals of Database systems", Galgotia publications
9. Narang, "Database Management System", Prentice Hall of India Ltd
10. Nilesh Shah, "Database Systems using ORACLE: A simplified guide to SQL, and PL/SQL", 2<sup>nd</sup> Edition, Prentice Hall of India Ltd.
11. Ivan Bayross "SQL, PL/SQL : The programming language of Oracle", BPB Publications

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### **MCA 601.1 [E3] : NoSQL with MongoDB**

Total No. of Lectures : 48

Total Marks : 100

[ L-T-P-S ]

No. of Lectures / Week : 4

Credits : 4

[ 3-1-0-2 ]

#### Learning Objectives

Most of the students are thinking data and its storage in terms of relational model. With the inception of big data and unstructured data storage, retrieval and querying has become very cumbersome. This course will help students to understand handling data, when data is not in the form of table and data which has no strict schema. The introduction of NoSQL opens a new world in the big data domain. Storage of unstructured and semi structured data and its manipulations puts no restriction/constraints on the user. This course is designed to provide knowledge and skills to become a successful MongoDB expert. The course covers a range of NoSQL and MongoDB topics such as CRUD Operations, Schema Design and Data Modeling, Scalability etc.

#### Learning Outcomes

After successful completion of the course students should be able to

- Understand that data need not be structured for storage and retrieval
- Define, compare and use the four types of NoSQL Databases (Document-oriented, Key Value Pairs, Column-oriented and Graph).
- Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases.
- Explain the detailed architecture, define objects, load data, query data and performance tune Document-oriented NoSQL databases.
- Using NoSQL tools efficiently in the academic projects
- Helps students to change the query writing style and optimization of the query.

#### SYLLABUS:

Relational Data modeling, Replication and sharding, Types of replication, MongoDB , Basic commands, MongoDB Data types, MongoDB Projection, Indexing and Query Optimization, Indexing types.

### Text Books

1. Rick Copeland.. MongoDB Applied Design Patterns, , First Edition, 2013, OREILLY
2. Kyle Banker, Peter Bakkum, Shaun Verch, Douglas Garrett, Tim Hawkins, MongoDB in Action, Second Edition, , 2016 dreamtech press

### References

1. Samse Pub1 , NoSQL with MongoDB in 24 Hours, 1st Edition, Kindle Edition
  2. Amol Nayak, MongoDB Cookbook Paperback – 2014, Publisher: Packt Publishing
  3. Doug Bierer,, MongoDB 4 Quick Start Guide, First Edition, 2018, Packt Publishing,
  4. Shannon Bradshaw, Eoin Brazil & Christina Chodorow, MongoDB The Definitive Guide,3<sup>RD</sup> Edn, 2019, , O'REILLY
  5. Subhashini Chellappan, MongoDB Recipes, 1<sup>st</sup> Edition, 2015
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## **MCA 602.1 [E1] DATA STRUCTURES AND ANALYSIS OF ALGORITHMS**

**Total No. of Lectures: 48**

**Total Marks: 100**

**[L – T – P – S]**

**No. of Lectures/Week: 4**

**Credits: 4**

**[3 – 1 – 0 – 2]**

### Course Objectives:

- To understand the basic concepts such as Abstract Data Types, Linear and Non Linear Data structures.
- To understand the notations used to analyze the Performance of algorithms.
- To understand the behavior of data structures such as stacks, queues, trees, hash tables, search trees
- To choose an appropriate data structure for a specified application.
- To understand and analyze various searching and sorting algorithms.

### Course Outcomes:

- Ability to choose appropriate data structures to represent data items in real world problems.
- Ability to analyze the time and space complexities of algorithms.
- Ability to design programs using a variety of data structures such as stacks, queues, hash tables, binary trees, search trees, heaps, graphs, and B-trees.
- Ability to analyze and implement various kinds of searching and sorting techniques.

### **SYLLABUS:**

**Introduction, Analysis of algorithms. Space and Time Complexity,** Introduction to Data structure types, Stack Data structure, Implementation of Stack, Queue( linked list implementation), Circular queue, Priority queue, Singly Linked Lists, Doubly liked list, Polynomial addition, implementation of stack and queue using linked list, Trees, traversals of BST, threaded binary tree, Searching and sorting.

**TEXT BOOKS:**

1. Data structures, using C and C++, 2nd Edition, Yedidyah Langsam, Aaron M. Tenenbaum. Pearson
2. Design and Analysis of Algorithms, By A.A.Puntambekar Technical Publications, 2010

**REFERENCE BOOKS:**

1. Data structures with C++, J. Hubbard, Schaum's outlines, TMH.
  2. Data structures and Algorithms in C++, M.T. Goodrich, R. Tamassia and D. Mount, Wiley India.
  3. Data structures and Algorithm Analysis in C++, 3rd edition, M. A. Weiss, Pearson.
  4. Classic Data Structures, D. Samanta, 2nd edition, PHI.
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**MCA 602.1 (E2) DATA STRUCTURES AND GRAPH THEORY****Total No. of Lectures: 48****Total Marks: 100****[L – T – P – S]****No. of Lectures/Week: 4****Credits: 4****[3 – 1 – 0 – 2]****Course Objectives:**

- To understand the basic concepts such as Abstract Data Types, Linear and Non Linear Data structures.
- To understand the notations used to analyze the Performance of algorithms.
- To understand the behavior of data structures such as stacks, queues, trees, hash tables, search trees, Graphs and their representations.
- To choose an appropriate data structure for a specified application.
- To understand and analyze various searching and sorting algorithms.

**Course Outcomes:**

- Ability to choose appropriate data structures to represent data items in real world problems.
- Ability to analyze the time and space complexities of algorithms.
- Ability to design programs using a variety of data structures such as stacks, queues, hash tables, binary trees, search trees, heaps, graphs, and B-trees.
- Able to analyze and implement various kinds of searching and sorting techniques.

**SYLLABUS:**

Introduction, Stack, IMPLEMENTAION OF Stack using C++, Queue, circular queue, Double ended queue, priority queue, implementation using linked list. Lists, Circular linked list, Polynomial equation using linked list, ordered linked list, Trees, Binary Search tree, implementation using linked list, traversals, Threaded binary tree, AVL trees. Search and sorting, Graphs, warshall's algorithm, shortest path algorithm, Graph traversal methods – Depth First Search and Breadth First Search, Graph spanning tree – prims algorithm and kruskal's algorithm.

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**TEXT BOOKS:**

1. Data structures, using C and C++, 2nd Edition, Yedidyah Langsam, Aaron M. Tenenbaum. Pearson
2. **Design and Analysis of Algorithms** By A.A.Puntambekar Technical Publications, 2010

#### **REFERENCE BOOKS:**

1. DATA STRUCTURES THROUGH C IN DEPTH by S. K. Srivastava and Deepali Srivastav BPB Publications.
  2. Data Structures – R Venkateshan, S. Lovelyn rose – Second Edition – Wiley
  3. DATA STRUCTURES AND ALGORITHMS MADE EASY by Narasimha Karumanchi - Careermonk Publications; 5th ed. edition (2016)
  4. Data structures and Algorithms in C++, M.T. Goodrich, R. Tamassia and D. Mount, Wiley India.
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### **MCA 602.1 (E3) ADVANCED DATA STRUCTURES AND ALGORITHMS**

**Total No. of Lectures: 48**  
**No. of Lectures/Week: 4**

**Total Marks: 100**  
**Credits: 4**

**[L – T – P – S]**  
**[3 – 1 – 0 – 2]**

#### **Course Objectives:**

- To understand the basic applications of data structures, Linear and Non Linear Data structures.
- To understand the behavior of data structures such as stacks, queues, trees, hash tables, search trees, Graphs and their representations.
- To choose an appropriate data structure for a specified application.
- To understand and analyze various searching and sorting algorithms.
- To understand and analyze graphs theory and its applications.

#### **Course Outcomes:**

- Ability to choose appropriate data structures to represent data items in real world problems.
- Ability to use different advanced algorithms in different time efficient cases.
- Ability to design programs using a variety of data structures such as stacks, queues, hash tables, binary trees, search trees, heaps, graphs, and B-trees.
- Able to analyze and implement various kinds of searching and sorting techniques.
- Able to use graph in different applications such as maps, finding shortest path and finding spanning trees.

#### **SYLLABUS:**

Introduction, Stack: stack as an ADT, Representing Stack using C++ – infix to postfix, postfix evaluation, Decimal to binary conversion, Recursion, Queue, Circular queue, Types of queues, Lists, Types of linked lists, Operations on linked list, ordered linked list, representation of Exponential euqaltung and operations. Trees, Binary Search Tree, implementation, traversals, Threaded binary search tree. Self-balancing trees -AVL trees, B trees, splay trees, KD tree, Huffman Coding, Quad tree, 2-3 tree, Red Black trees, Knapsack problem. Searching and sorting, Graphs–Definitions, Graph Representations–Adjacency matrix, Adjacency lists, warshall's algorithm, shortest path algorithm, Graph traversal methods – Depth First Search and Breadth First Search, Graph spanning tree – prims algorithm and kruskal's algorithm

**TEXT BOOKS:**

1. Data structures, using C and C++, 2nd Edition, Yedidyah Langsam, Aaron M. Tenenbaum. Pearson
2. M. A. Weiss, "Data Structures and Algorithm Analysis in C", 2nd ed, Pearson Education Asia

**REFERENCE BOOKS:**

1. Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures – A Pseudocode Approach with C", Thomson Brooks / COLE.
2. Aho, J. E. Hopcroft and J. D. Ullman, "Data Structures and Algorithms", Pearson education Asia. Data structures and Algorithms in C++, M.T. Goodrich, R. Tamassia and D. Mount, Wiley India.
3. Data structures and Algorithm Analysis in C++, 3rd edition, M. A. Weiss, Pearson.
4. Classic Data Structures, D. Samanta, 2nd edition, PHI.

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**MCA 603.1 [E1]: OBJECT ORIENTED PROGRAMMING WITH JAVA****Total No. of Lectures: 48****Total Marks: 100****[ L – T – P – S ]****No. of Lectures / Week: 4****Credits : 4****[ 3 – 1 – 0 – 2 ]****Learning Objectives:**

- Provide in depth knowledge of Object oriented programming starting from basics.
- Explore the OOP concepts like constructors, method overloading, objects as parameters and nested classes.
- Explore some more advanced OOP concepts like inheritance, interfaces, packages, exception handling, multithreading and generics to understand their use and implementation.

**Learning outcomes:** The candidate will be able to understand

- Understand the Object Oriented Concepts well with real world problems and will be able to model the requirements to solutions.
- Students will be able to build Java applications where they can read from and write to files.
- End of the course student will be able to develop and deliver the power of multithreaded programming and handle the packages well.

**SYLLABUS:**

Principles of Object Oriented Programming, Java Programming Fundamentals, Classes, Objects and Methods, Constructors, Arrays and Strings, Inheritance, Interfaces, Exception Handling, Multithreaded Programming, File Input/Output.

**Text Book:**

1. Herbert Schildt, "Java: The Complete Reference", 8<sup>th</sup> Edition, Indian Edition, Oracle Press, McGraw-Hill.
2. Paul Deitel, Harvey Deitel, "Java How to Program", 8<sup>th</sup> Edition, PHI

**Reference books:**

1. Cay Horstman, Gary Cornel, "Core Java: Fundamentals", 8<sup>th</sup> Edition, 2010, Pearson Asia.
2. Jana, Debashish, "Java and Object Oriented Programming Paradigm", PHI Learning

3. Joyce Farrell, "Java For Beginners", Cengage Learning India
  4. Rashmi Kanta Das, "Core Java for Beginners", Vikas Publishing House Pvt. Ltd.
  5. Khalid A. Mughal, Rolf W. Rasmussen, "A Programmer's Guide to Java SCJP Certification", 3<sup>rd</sup> Edition, Pearson
  6. Walter Savitch, "Java An Introduction to Problem Solving and Programming", Pearson
  7. "Java 7 Programming Black Book", Kogent Learning Solutions Inc., Dreamtech Press.
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## **MCA 603.1 [E2] : ENTERPRISE COMPUTING WITH ADVANCED JAVA**

**Total No. of Lectures: 48**

**Total Marks: 100**

**[ L – T – P – S ]**

**No. of Lectures / Week: 4**

**Credits : 4**

**[ 3 – 1 – 0 – 2 ]**

**Learning Objectives:** This course is introduced to familiarize with Java EE Architecture; Learn how to use Servlet and JSP; Be able to create and use custom JSP tags; An overview of database access and details for managing information using the JDBC API

**Learning outcomes:** Upon successful completion of this course, students are expected to

- Develop server side programs using JSP and Servlets
- Update and retrieve the data from the databases using Derby
- Create session and entity beans using EJB

### **SYLLABUS:**

**Overview of Java EE Architecture, Servlets, Java Server Pages (JSP), JDBC:** JDBC Architecture-Types of JDBC Drivers, The Connectivity Model, The java.sql package **EJB**, EJB architecture and concepts, Responsibilities of EJB Container and Server, Classification of EJB, Anatomy of Session and Entity beans, Differences between CMP and BMP, Annotations, Dependency Injection

#### **Text books:**

1. Antonio Gonsalvis, "Beginning Java EE 7", Apress
2. Kogent Solutions Inc, "Java Server Programming Java EE 7 Black Book", Dreamtech Press

#### **Reference books:**

1. Joe Wigglesworth, Paula McMillan, "Java Programming: Advanced Topics", 3<sup>rd</sup>, Edition, 2011, Cengage
  2. Santhosh Kumar, "JDBC, Servlets, JSP Black Book", 2008, Wiley Dreamtech
  3. George Reese, "Database Programming with JDBC and Java", 2<sup>nd</sup> Edition, O'Reilly
  4. Subrahmanyam Allamaraju, Cedric Buest and others, "Professional Java Server Programming J2EE 1.3 Edition", APress
  5. K Somasundaram, "Advanced Programming in Java2: Updated To J2SE6 with Swing, Servlet and RMI", Jaico Publishing House
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## **MCA 603.1 [E3]: ENTERPRISE COMPUTING: JAVA EE Frameworks**

**Total No. of Lectures: 48**

**Total Marks : 100**

**[ L – T – P – S ]**

**No. of Lectures / Week: 4**

**Credits : 4**

**[ 3 – 1 – 0 – 2 ]**

**Learning Objectives:**

- To understand Java EE Architecture and MVC Framework
- To understand Servlets, JSP, JSTL, EJB
- To Build Java applications that use Hibernate to create, retrieve, update, and delete objects.

**Learning Outcomes:**

- Developing web applications using Servlet, JSP, JSF
- Develop enterprise applications using EJB
- Accessing databases with JDBC
- Map Java classes to database tables using Hibernate

**SYLLABUS:**

**Java EE**, Servlets, Java Server Pages(JSP), JSP Standard Tag Library (JSTL), JDBC, **EJB** – EJB architecture and concepts, Responsibilities of EJB Container and Server, **JSF**: Overview, Benefits, JSF UI Component model, JSF Life Cycle, JSF Managed Beans, Page Navigation, Basic Tags, Facelet tags, Convertor tags, Validator tags, Data tables and various operations. **Hibernate**: Origins of Hibernate and Object-Relational Mapping, Architecture of Hibernate, Hibernate Sessions, Persistent class, Mapping Files, Mapping Types, Hibernate annotations, Querying in Hibernate: HQL, Criteria Queries, Native SQL, Hibernate Caching, Batch Processing, Hibernate Interceptors

**Text books:**

1. Joe Wigglesworth, Paula McMillan, "Java Programming: Advanced Topics", 3<sup>rd</sup> Edition, Cengage Learning International
2. Kogent Solutions Inc, "Java Server Programming Java EE 7 Black Book", 1<sup>st</sup> Edition, Dreamtech Press

**Reference books:**

1. Richard Reese, "EJB 3.1 Cookbook", 1<sup>st</sup> Edition, 2013, SPD/ Packt Publishers
2. Santhosh Kumar, "JDBC, Servelets and JSP Black Book", New Edition, Dreamtech
3. Antonio Gonsalvis, "Beginning Java EE 7", 1<sup>st</sup> Edition, Wiley Apress
4. Subrahmanyam Allamaraju, Cedric Buest and others, "Professional Java Server Programming J2EE 1.3 Edition", APress
5. Dave Minter, Jeff Linwood "Beginning Hibernate From Novice to Professional", Apress

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**MCA 604.1 [E1]: WEB DESIGN with HTML 5, CSS, Java Script**

**Total No. of Lectures : 48**

**Total Marks : 100**

**[ L – T – P – S ]**

**No. of Lectures / Week : 4**

**Credits : 4**

**[ 3 – 1 – 0 – 2 ]**

**Learning Objectives:**

- Students will learn to develop web pages using HTML
- They will apply styles to the web pages using CSS
- They can bring dynamic behavior to the web pages using JavaScript

**Learning Outcomes:** At the end of the course, the

- Students will be able to develop websites and web based projects.
- Students can be employed on entry-level jobs of web development in software industry.
- Students will be able to develop interactive and dynamic webpages

#### **SYLLABUS:**

HTML – Introduction, elements, attributes, headings, paragraphs, styles, formatting, quotations, comments, colors, links, images, image maps, tables, lists, blocks, classes, id, iframes.

HTML – Layout elements, computercode, entities, symbols . Html Form, Html Canvas, HTML SVG, CSS, CSS – navigation bars, dropdowns, forms. JavaScript. JavaScript – Date, switch, loops, break, continue, type conversion, regular expressions, this, classes, form validation.

#### **Text Books:**

1. Jon Duckett, "Beginning HTML, XHTML, CSS, and JavaScript", Wiley INDIA Edition
2. Elizabeth Castro, Bruce Hyslop, "HTML and CSS", 8<sup>th</sup> Edition, Pearson

#### **References:**

1. Scott Duffy, "JavaScript A Beginners Guide", Dreamtech Press
2. Ian Pouncey, Richard York, "Beginning CSS Cascading Style Sheets for Web Design", Wiley
3. Chris Bates, "Web Programming Building Internet Applications", 2<sup>nd</sup> Edition
4. Rachel Andrew, "The CSS3 Anthology Take your sites to new Heights", SPD
5. Elizabeth Castro, "HTML for the World Wide Web", 5<sup>th</sup> Edition, Peachpit Press
6. Marco Casario & others, "HTML5 Solutions Essential Techniques for HTML5 Developers"
7. Ben Frain, "Responsive Web Design with HTML5 & CSS3", 2<sup>nd</sup> Edition, Packt Publishing
8. Zak Ruvalcaba, Anne Boehm, "HTML5 and CSS3", SPD

## **MCA 604.1[E2]: WEB PROGRAMMING WITH PHP and MYSQL**

**Total No. of Lectures: 48**

**Total Marks: 100**

**[L – T – P – S]**

**No. of Lectures / Week: 4**

**Credits: 4**

**[3 – 1 - 0 - 2]**

#### **Learning Objectives:**

- To produce dynamic, animated, interactive and database driven web sites to prepare students for internet marketing and web site administration.
- Students will learn different languages like HTML5, CSS, JavaScript and PHP (Server Side Programming ;)
- Students will work with different technologies and software components like web browsers, web servers (Apache) and database connectivity's.

#### **Learning Outcomes:**

- To create personal and / or business websites following current professional and /or industry standards or responsive web sites with use of HTML, CSS and java script.
- To know client side scripting using Java script with its features like event handling and form validations.

- To create effective scripts using JavaScript and JQuery to enhance the end user experience.
- Get know about server side scripting using PHP and its essentials.
- To develop interactive and dynamic website using PHP and MySQL database connectivity.

#### **SYLLABUS:**

HTML 5, CSS, Java Script, Super Global Objects, Java Script Objects, JS Browser objects, jQuery UI, PHP Basics, Types and operators , Condition and Looping statements , Arrays and Multi-dimensional arrays; Strings and String functions; Regular Expressions; Date and Time function; Mathematical functions; User-Defined Functions;, Working with web forms, PHP POST & GET form elements, ; Handling Errors, Throwing and Catching Exceptions. Logging exceptions., PHP Intermediate, Using MySQL. Managing Database Connections, PHP's Database & SQL APIs, Performing Queries, Processing Result Sets, Retrieving uploaded files, Mail functions.

#### **Textbook:**

1. Robin Nixon, "Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5", 5<sup>th</sup> Ed, 2018, O'Reilly Publishers.
2. Christopher Murphey, R Clark, "Beginning HTML 5 and CSS 3", 1<sup>st</sup> Ed, 2015, Wiley Apress.

#### **Reference Books:**

1. Steve Prettyman, "Learn PHP 7: Object Oriented Modular Programming using HTML5, CSS3, JavaScript, XML, JSON, and MySQL", 2016, Apress.
2. Vaibhav Vinayak, Hiren Jayantilal, Rajendra Patil, "Web programming with HTML5, JavaScript and PHP", 2017, SPD Pvt. Ltd.
3. Simon Sarris,"HTML5 Unleashed", 2014, Pearson Education.
4. Piotr Sikora, "Professional CSS3", 2016, Packt Publishing.
5. Joel Murach, Ray Harris , "Murach's PHP and MySQL", 2<sup>nd</sup> Ed, 2014, Mike Murach & Associates
6. Anirudh Prabhu , "Beginning CSS Preprocessors: With SASS and Less",2015, Apress.
7. Eric Sarrion, "jQuery UI", 2014, Oreilly Publishers.

## **MCA 604.1[E3] WEB APPLICATION DEVELOPMENT USING PYTHON**

**Total No. of Lectures : 45**

**Total Marks : 100**

**[ L-T-P-S ]**

**No. of Lectures / Week : 3**

**Credits : 4**

**[ 3-0-2-2 ]**

#### **Learning Objectives:**

- Describe the core syntax and semantics of Python programming language.
- Discover the need for working with the strings and functions.
- Illustrate the process of structuring the data using lists, dictionaries, tuples and sets.
- Indicate the use of regular expressions and built-in functions to navigate the file system.
- Infer the Object-oriented Programming concepts in Python.
- Learn to build web applications using Djanago framework

**Learning Outcomes:** At the end of this course students will be able

- To understand why Python is a useful scripting language for developers.
- To learn how to design and program Python applications.
- To learn how to use lists, tuples, and dictionaries in Python programs.
- To learn how to use indexing and slicing to access data in Python programs.
- To define the structure and components of a Python program.

- To learn how to write loops and decision statements in Python.
- To learn how to write functions and pass arguments in Python.
- To learn how to build and package Python modules for reusability.
- To learn how to read and write files in Python.
- To learn how to design object oriented programs with Python classes.
- To learn how to use class inheritance in Python for reusability.
- To learn how to use exception handling in Python applications for error handling.
- To develop a secure and robust web applications using Django framework

#### **SYLLABUS:**

Introduction to Python, Program Flow Control & Functions, String, List, Dictionary & File handling, OO Programming & Regular Expressions, Exception Handling & Database Interaction, Web development using Python and Django Framework, Django Models and HTML forms.

#### **TEXT BOOK**

1. R. Nageswara Rao, "Core Python Programming", 2<sup>nd</sup> Edition, Dreamtech Press
2. Michel Anders , "Python 3 Web Development Beginner's Guide", Packt Publishing

#### **REFERENCE BOOKS:**

1. Eric Matthes, "Python Crash Course, 2nd Edition: A Hands-On, Project-Based Introduction to Programming", No Starch Press; 2 edition
  2. Zed A. Shaw, "Learn Python 3 the Hard Way", Addison Wesley, 2017
  3. John M Zelle, "Python Programming: An Introduction to Computer Science", Ingram short title
  4. Jeff Forcier, Paul Bissex, Wesley J Chun "Python Web Development with Django"
  5. Sanjeev Jaiswal, Ratan Kumar "Learning Django Web Development", PACKT publishing
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## **MCA 605.1 [E3] STATISTICAL TECHNIQUES FOR COMPUTING**

**Total no of lectures: 48**

**Total marks : 100**

**[L – T – P –S]**

**No of lectures / week: 4**

**Credits: 3**

**[3 – 1 – 1 – 1]**

#### **Learning Objectives:**

The objective of this course is to frame real life problems in appropriate statistical terms in order use data to make better decisions. This also gives make sense of data along with the basics of regression analysis They will develop critical and integrative thinking in order to communicate the results of the analysis clearly in the context of the problem. This course will help to unambiguously articulate the conclusions and limitations of the analysis with a clear separation between data and judgment.

#### **Learning outcomes:**

- Select appropriate statistical techniques for summarizing and displaying data
- Analyze and draw inferences from data using appropriate statistical methods.
- Analyze the dispersion in the data and draw inference.
- Understand the concept of a frequency distribution for sample data, and be able to summarize the distribution by diagrams and statistics.
- Understand correlation and regression, and be able to make predictions and understand their limitations.

#### **SYLLABUS:**

Classification, tabulation and graphical representation of data, Data Visualization, Measure of central tendency: Measure of Dispersion: range, interquartile deviation, quartile deviation, mean deviation, variance, standard deviation, coefficient of variation, combined variance of grouped and ungrouped data, Identifying outliers: boxplot, merits and demerits. Regression: Simple linear regression model, method of least squares to fit a regression line, properties of regression coefficient, multiple regression, Correlation, Analysis of categorical data.

**Text books:**

1. Mathematical Statistics and data Analysis, Rice, John A, Cengage learning, 2014
2. Applied Statistics and Probability for Engineers, Douglas C. Montgomery, George C. Runger, John Wiley & Sons, Inc, 2011

**Reference books:**

1. Probability & Statistics for Engineers & Scientists, N Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, 9<sup>th</sup> edition, Prentice Hall, 2011.
  2. A Modern Introduction to Probability and Statistics Understanding Why and How, F.M. Dekking C. Kraaikamp H.P. Lopuhua, L.E. Meester, Springer, 2005.
  3. Introduction to the Statistical Analysis of Categorical Data, Erling B. Andersen, Springer, 1997.
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## **MCA 605.1 [E1] PROBABILITY AND STOCHASTIC PROCESS**

**Total no of lectures: 48**

**Total marks: 100**

**[L – T – P –S]**

**No of lectures / week : 4**

**Credits: 4**

**[3 – 1 – 1 – 1]**

**Learning Objectives:**

This course deals with basic concepts of probability theory and random variables, How to deal with multiple random variables? Conditional probability and conditional expectation, joint distribution and independence.

**Learning outcomes:**

- Introduction to the basic concepts of probability and their importance.
- Understand the principles of probability and the concept of probability distributions,
- To be familiar with Binomial, Poisson, Geometric, Normal and Exponential probability distributions and their applications.
- To be familiar with the random variables and their use.
- Understand the concept of Markov chains and study the transition diagram.

**SYLLABUS:**

**Introduction to basic concepts, Probability:** multiplicative(compound) theorem of probability, odds in favor and odds against, conditional probability, De-Morgan's law, Results of probability and their

proofs, Bayes' theorem, Applications. , **Random variables:** discrete and continuous, probability mass function, probability density functions, distribution function. Expectation: properties, mean, variance. Two dimensional random variableS, **Probability distributions:** Discrete distribution and their properties, Bernoulli, Binomial: mean, variance, approximation to Poisson distribution, fitting of binomial distribution **Stochastic process:** , Markov chains, transition probability and matrix, Gambler ruin, Brand switching, chapman –Kolmogorov equations, Period of a state, classification of states and chains

**Text books:**

1. Probability and Statistics for Computer Scientists, Michael Baron, CRC press, 2014.
2. Applied Probability and Stochastic Processes, Frank Beichelt, CRC press, 2016.
3. Fundamentals of Probability with Stochastic processes, Saeed Ghahramani, CRC press, 2015.

**Reference books:**

1. Probability and statistics, Degroot, Morris H;Schervish, Mark J, Pearson Education,2017.
  2. Probability and statistics, Kumar, Mukesh; Singh, A P; Kumar, Ashok; Chauhan, Anand, 2018
  3. Probability and statistics with reliability queuing and computer science applications, Trivedi, Kishor S, Wiley India Pvt Ltd, 2014.
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## **MCA 605.1 [E2] OPERATIONS RESEARCH**

Total no of lectures: 48

Total marks: 100

[L – T – P –S]

No of lectures / week: 4

Credits: 4

[3 – 1 – 0 – 1]

**Learning Objectives:** This course deals with the various techniques to find the optimal solution. It helps to introduce how to use variables for formulating complex mathematical models in management science, industrial engineering and transportation science. This course focuses on mathematical modeling. A strong emphasis will be given to model formulation.

**Learning outcomes:**

- Proficiency with tools for optimization
- Facility with mathematical and computational modeling of real decision-making problems.
- To proficiently allocate scarce resources to optimize and maximize profit or minimize loss
- Facilitates the optimal method of allocating jobs to persons.
- Turn real life problems into formulation of models to be solved by linear programming

**SYLLABUS:**

Introduction, Linear programming, Transportation Problem, Assignment Problem, Decision theory, Job sequencing, Queuing theory.

**Text books:**

1. Operations research, Mote, Vasant Lakshman; Madhavan, T, Wiley Pvt Ltd, 2016
2. Operations research an introduction, Handy A Taha ,Pearson education, 10<sup>th</sup> edition, 2019.

#### Reference Books:

- 1) Operations Research Theory and Applications, J K Sharma, Macmillan publishers, 5<sup>th</sup> edition, 2013.
  - 2) Optimization techniques in operations research, Gupta C B, I K international publishing house,
  - 3) Operations Research, Prem Kumar Gupta, D S Hira , S. Chand Publishing, Year: 2014.
- 

## MCA 608.1 ENTREPRENEURSHIP AND INNOVATION

Total no of lectures: 36      Total marks: 100      [L – T – P – S]

No of lectures / week: 4      Credits: 3      [3 – 1 – 0 – 1]

**About the Course:** This course is the first of a two-part entrepreneurship development curriculum from Wadhwani Foundation. It is aimed at empowering you with an entrepreneurial mindset and business skills to enhance your job prospects, help you develop intrapreneurship skills, and get you started on the entrepreneurship journey. You will also learn about the risks and rewards in choosing entrepreneurship as a career option.

This is not a theoretical course – you will actually start your venture and build it as you progress through this course. The course follows the “Watch – Think – Do – Explore – Collaborate” pedagogy in a highly experiential learning format. Every lesson has one or more videos/animations to help you understand and master key entrepreneurship concepts. The videos have been interspersed with knowledge check questions at strategic points – these will help you reflect on the concepts presented, and internalize them. You also get to experience entrepreneurship through the activities and assignments provided throughout the course. Additionally, if you want to dig deeper and learn more, read through the reference materials provided.

You will start this course by discovering yourself and your entrepreneurial style. You will then identify a problem “worth” solving, delve into the problem to understand it better through Design Thinking principles, generate ideas to solve that problem using Brainstorming, and go on to develop your Business Model.

#### SYLLABUS:

Self-Discovery : Opportunity Discovery ,Customer and Solution ,Business Model ,Validation, Money, Team, Marketing Sales, Support.

#### TextBook:

1. Robert D. Hisrich, Mathew J. Manimala, Michael P. Peters, Dean A. Shepherd, "Entrepreneurship, 6<sup>th</sup> Edition, 2013, Tata McGraw Hill Publishers
2. Rajeev Roy, "Entrepreneurship", 2<sup>nd</sup> Edition, 2011, Oxford University Press
3. C B Gupta, N P Srinivasan, "Entrepreneurship Development in India", 1<sup>st</sup> Ed, 2013, Sultan Chand

#### **Reference Books:**

1. Bruce R Barrianger, "Entrepreneurship: Successfully Launching New Ventures", 3<sup>rd</sup> Ed, 2011, Pearson
  2. Arya Kumar, "Entrepreneurship: Creating and Leading an Entrepreneurial Organization", 2012, Pearson
  3. D F Kuratko, Rao, "Entrepreneurship: A South Asian Perspective", 1<sup>st</sup> Ed, 2012, Cengage Learning
  4. N V R Naidu, T Krishana Rao, "Management and Entrepreneurship", 1<sup>st</sup> Ed, 2008, IK International
  5. Jack m Kaplan, "Patterns of Entrepreneurship", 1<sup>st</sup> Edition, 2007, Wiley India
  6. Madhurima Lal, shikha Shai, "Entrepreneurship", 2<sup>nd</sup> Ed, 2008, Excel books
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## **II Semester**

### **MCA 601.2 [E1] CLOUD COMPUTING WITH AMAZON WEB SERVICES**

**Total No. of Lectures : 48**

**Total Marks : 100**

**[ L – T – P – S ]**

**No. of Lectures / Week : 4**

**Credits : 4**

**[ 3 – 1 – 0 – 2 ]**

#### **Learning Objectives:**

Unhindered by typical IT restraints like configuring servers, storage and virtual machines, developers at born-on-the-cloud start-up companies can move from concept to development to market in a matter of weeks, taking home Internet-sized returns on byte-sized investments. Sure, it works for start-ups. But is it possible to create a “lean” enterprise? So, the students are exposing to learn the newest technology like AWS. With cloud computing in education, you get powerful software and massive computing resources where and when you need them. Analyze the components of cloud computing showing how business agility in an organization can be created ,

#### **Learning Outcomes**

- Understand the basic concepts of cloud computing, cloud security and Technologies required for enabling cloud computing
- Learn about AWS terminology and identity access management
- Acquaint yourself with important elements of the cloud with features such as computing, ELB, and VPC
- Back up your database and ensure high availability by having an understanding of database-related services in the AWS cloud
- Integrate AWS services with your application to meet and exceed non-functional requirements
- Create and automate infrastructure to design cost-effective, highly available applications

## **SYLLABUS:**

Introduction to Cloud Computing, Historical Developments, Distributed Systems, Virtualization, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing, Virtualization, Cloud Computing Architecture, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Cloud Definition, Cloud Interoperability and Standards Scalability and Fault ToleranceSecurity, Trust, and Privacy Organizational Aspects, Energy efficiency in clouds, Market-oriented cloud computing, Reference model, A reference model for MOCC, Cloud Applications- Scientific applications(Healthcare, Biology, Geoscience), Business and consumer applications. Designing Cloud Applications. Scalability. Event handling at scale . High Availability.

### **Text Books**

1. Rajkumar Buyya, Christian Vecchiola, S Thamarai Selvi, "Mastering Cloud Computing", 1<sup>st</sup> Edition, 2015, Tata Mcgraw Hill Publishing Co Ltd
2. Aurobindo Sarkar, Amith Shah "Learning AWS" Second edition 2018,Packt Publishing Ltd

### **Reference Books**

1. Atul V. Mistry , "Expert AWS Development", Packt Publishing Ltd ,First edition 2018
  2. Kris Jamsa, "Cloud Computing", 1<sup>st</sup> Edition, 2013, Jones & Bartlett Publishers
  3. Anthony T Velte, "Cloud Computing: A practical Approach", 1<sup>st</sup> Ed, 2010, Tata McGraw Hill.
  4. Fern Halper, Kaufman, Bloor Robin, Hurwit, "Cloud Computing for Dummies", 1<sup>st</sup> Ed, 2010, Wiley
  5. Joshy Joseph , Craig Fellenstein, "Grid Computing", 4<sup>th</sup> Ed, 2013, PearsonAsia
  6. Ahmar Abbas, "Grid Computing: A Practical Guide to technology and Applications", 2010, CRC Press
  7. Kaitwang Geoffrey C.Fox, Jack J Dongrra,"Distributed and Cloud Computing",1<sup>st</sup> Ed, 2012, Elsevier
- 

## **MCA 601.2 [E2] Grid and Cluster Computing**

**Total No. of Lectures : 48**

**Total Marks : 100**

**[ L-T-P-S ]**

**No. of Lectures / Week : 4**

**Credits : 4**

**[ 3-1-0-2 ]**

### **Learning Objective :**

The Learning objectives are to:

- Expose the characteristics of cluster and grid computing.
- Explore the design principles of grid computing ;
- Illustrate security mechanisms in grid computing applications
- Illustrate data management in grid computing applications

### **Learning Outcomes:**

At the end of the course students are able to

- understand fundamentals of cluster computing and Environments
- To enable resource sharing across networks.
- To integrate heterogeneous computing systems and data resources with the aim of providing a global computing space.
- To manage and schedule the resources in grid environments.

- To know the standards and protocols used.
- To Know the middleware in grid computing.
- To understand the latest advances in the field of computation to optimize the utilization of resources.

#### **SYLLABUS:**

Overview of Cluster Computing, Cluster Computer and its Architecture, Clusters Classifications, Components for Clusters. Introduction to grid computing, cluster computing , parallel computing and high performance computing. Types of grids, Grid environment, Layered grid architecture, OGSA, WSRF. Grid Monitoring Architecture (GMA), An Overview of Grid Monitoring Systems – GridICE, JAMM, MDS3, Network Weather Service, R GMA, Ganglia and GridMon, Hawkeye, Network weather service. *Security primer, cryptography, Grid security, Job scheduling and resource management, Data Management.*

#### **Text Book:**

1. Maozhen Li , Mark Baker ,The grid core technologies , 1<sup>st</sup> edition, 2005Wiley-India edition
2. Laurence T.Yang, Minyi Guo – High Performance Computing Paradigm and Infrastructure John Wiley

#### **Reference Books:**

1. [www.globus.org](http://www.globus.org)
  2. Joshy Joseph , Craig Fellenstein Grid Computing ,Pearson Education
  3. Grid computing : a practical guide to technology and applications , AHMAR ABBAS
  4. Distributed data bases principles and systems by Ceri & Pelagatti (McGraw Hill Publications)
  5. A.D. Kshemkalyani, M. Singhal, [Distributed Computing: Principles, Algorithms, and Systems](#), Cambridge University Press
  6. Joshy Joseph and Craig Fellenstein , “Grid Computing” Pearson Education, 2004. 4.Ian Foster, et al., “The Open Grid Services Architecture”, Version 1.5 (GFD.80). Open Grid Forum, 2006.
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## **MCA 601. 2 [E3] HIGH PERFORMANCE COMPUTING**

Total No. of Lectures : 48	Total Marks : 100	[ L-T-P-S ]
No. of Lectures / Week : 4	Credits : 4	[ 3-1-0-2 ]

#### **Learning Objective:**

Parallel programming is ubiquitous in today's multi-core era and solves many real-world scientific problems. Massive parallelism entails significant hardware and software challenges. The course is structured so that the participants understand challenges in efficient execution of large-scale parallel applications & design, analysis, and implementation, of high performance computational science and engineering applications. The assignments will be designed to strengthen understanding of parallel programming.

#### **Learning Outcomes:**

At the end of the course, the candidate will be able to

- To Study various computing technology architecture.
- To know Emerging trends in computing technology.

- To highlight the advantage of deploying computing technology.
- demonstrate understanding of learned concepts of parallel algorithm design, performance evaluation, communication operators by writing algorithms and programs exploiting parallel architecture
- analyze the efficiency of parallel algorithms designed for matrix, graph and sorting operations

#### **SYLLABUS:**

Introduction: Computational Science and Engineering, High-End Computer Systems, Memory Hierarchies, Multi-core Processors, Vector Computers, Distributed Memory Computers, Supercomputers and Petascale Systems, Novel computers. Introduction to Parallel Computing and Programming, Principles of Parallel Algorithm Design, Sorting and graph algorithms, Graph Algorithms.

#### **Text Book:**

- 1) A Grama et.al – Introduction to Parallel Computing, 2<sup>nd</sup> ed. Pearson Education, New Delhi 2003.
- 2) Petascale Computing: Algorithms and Applications, David A. Bader (Ed.), Chapman & Hall/CRC Computational Science Series, 2007

#### **Reference Books:**

- 1) M.J. Quinn – Parallel Computing : Theory and Practice, 2nd ed., McGraw Hill, New York, 1994.
- 2) Peter S Pacheco, An Introduction to Parallel Programming, Morgan Kaufmann, 2011.
- 3) DE Culler, A Gupta and JP Singh, Parallel Computer Architecture: A Hardware/Software Approach Morgan-Kaufmann, 1998.
- 4) Marc Snir, Steve W. Otto, Steven Huss-Lederman, David W. Walker and Jack Dongarra, MPI - The Complete Reference, Second Edition, Volume 1, The MPI Core.
- 5) L Hennessy and DA Patterson, Computer Architecture: A Quantitative Approach, 4th Ed., Morgan Kaufmann/Els India, 2006.

## **MCA 602.2 [E1]: SOFTWARE ENGINEERING and UML**

**Total No. of Lectures: 48**

**Total Marks: 100**

**[L – T – P – S]**

**No. of Lectures/Week: 4**

**Credits: 4**

**[3 – 1 – 0 – 2]**

**Learning Objectives:** Knowledge of basic SW engineering methods and practices, and their appropriate application. A general understanding of software process models such as the waterfall and evolutionary models. Understanding of software requirements and the SRS documents. The student shall be able to take up a software projects and plan, develop and estimate its cost.

**Learning outcomes:** Upon completion of this course, students should be able to:

- Plan and deliver an effective software engineering process, based on development lifecycle models.
- Employ group working skills including general organization, planning and time management and negotiation.
- Apply software engineering principles and techniques.
- Understand the principles of large scale software systems, and the processes that are used to build them
- Analyze a problem, and identify and define the computing requirements appropriate to its solution.

- Design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.
- Function effectively on teams to accomplish a common goal.

#### **SYLLABUS:**

Introduction, Basics of Software Engineering, Software Requirements, Software Process, Software Requirements Analysis and Specification, Requirement Specification. Software Design, Software Coding, Software Testing, Software Maintenance, Software Project Management, Software Quality, Software Metrics, Software Scheduling, Software Cost Estimation.

#### **Text Books:**

1. R. S. Pressman, "Software Engineering – A Practitioner's approach", 7<sup>th</sup> Ed, 2012, McGraw Hill Int. Ed.,.
2. Ian Sommerville, "Software Engineering", 10<sup>th</sup> Edition, 2013, Pearson Education. Published by Dorling Kindersley (India) Pvt. Ltd.

#### **Reference:**

1. Frank Tsui, Orlando Karam and Barbara Bernal, "Essentials of Software Engineering", Third Edition, 2015, Jones and Bartlett India Pvt. Ltd.
  2. Kelkar, "Software Engineering", 1<sup>st</sup> Edition, 2010, Prentice Hall of India Ltd.
  3. K.K. Aggarwal and Yogesh Singh, "Software Engineering", 3<sup>rd</sup> Edition, New Age International.
  4. James Peter, W Pedrycz, "Software Engineering", 4<sup>th</sup> Edition, 2011, Wiley India.
  5. Rohith Kurana, "Software Engineering Principles and Practices", 3<sup>rd</sup> Edition, 2011, Vikas
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## **MCA 602.2 [E2]: OBJECT ORIENTED SOFTWARE ENGINEERING**

**Total No. of Lectures: 48**

**Total Marks: 100**

**[L – T – P – S]**

**No. of Lectures/Week: 4**

**Credits: 4**

**[3 – 1 – 0 – 2]**

**Learning Objectives:** Object-Oriented Software Development is an approach/paradigm of developing software by identifying and implementing a set of objects and their interactions to meet the desired objectives. This course introduces the object oriented software engineering, it will enable the learner how to use the OO technology efficiently in software design and development process.

**Learning outcomes:** Upon completion of this course, students should be able to:

- Display understanding and the ability to apply object-oriented programming principles.
- Have detailed knowledge of the software development lifecycle.
- Apply skills relevant for academic progression and career development within the sector.
- Explore and analyze different analysis and design models, such OO Models, Structured Analysis and Design Models, etc.
- Show an ability to use the graphical UML representation using tools.
- Apply software engineering perspective through software design and construction, requirements analysis, verification, and validation, to develop solutions to modern problems such as security, data science, and systems engineering.

#### **SYLLABUS:**

Software Engineering: Introduction, Requirement Analysis, Object Methodology & Requirement Elicitation, Requirement Engineering, Software Engineering Models, System Design, Basic Behavioral

Modeling, A Case Study, Object Oriented Analysis and Design, Software Testing, Object Oriented Testing, Metrics and Quality, Quality of OOD, Quality Management.

#### Text Books:

- [1] Bernd Bruegge and Allen H. Dutoit, "Object-Oriented Software Engineering", 2<sup>nd</sup> Edition, Pearson.
- [2] Ali Bahrami, "Object Oriented Systems Development", 2<sup>nd</sup> Edition, 2012, McGraw Hill Publishers.

#### References:

- [1] Hans Van Vliet, "Software Engineering – Principles and Practice", Second Edition, Vrije Universiteit, Amsterdam.
  - [2] Waman S. Jawadekar, "Software Engineering – Principles and Practice", Computer Engineering Series, Tata McGraw-Hill Publishing Company Limited.
  - [3] Pankaj Jalote, "An Integrated Approach to Software Engineering", third Edition, Narosa Publishing House.
  - [4] Stephen Schach, "Classical Object Oriented Software Engineering with UML and Java", 2008, McGraw-Hill.
  - [5] Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language", 3<sup>rd</sup> Edition, 2009, Pearson.
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## MCA 602.2 [E3]: AGILE SOFTWARE DEVELOPMENT

**Total No. of Lectures: 48**

**Total Marks: 100**

**[L – T – P – S]**

**No. of Lectures/Week: 4**

**Credits: 4**

**[3 – 1 – 0 – 2]**

**Learning Objectives:** Examine the common agile development practices and methods, including XP and Scrum; Carry out all stages of an agile software process in a team, to produce working software; Continually negotiate project requirements during an ongoing Scrum framework; use test driven development to ensure software quality; Utilize CASE Tools during the software development process.

**Learning outcomes:** Upon completion of this course, students are expected to achieve the following learning outcomes:

- Understand concept of agile software engineering and its advantages in software development.
- Recognize various agile methods.
- Articulate the agile principles, practices, and roles of Scrum.
- Perform Scrum Release Planning, and Scrum Sprint Planning.
- Deconstruct user stories into tasks and ideal day estimates.
- End a Sprint with Sprint Reviews and Sprint Retrospectives.
- Use Scrum with multiple, or distributed, project teams.

#### SYLLABUS:

Introduction, Software Development, Agile and Its Significance, Roles for Agile Requirements Engineering, Agile Methodology, Agile Project Planning, Creating Agile Software, Agile Testing, Agile Practicing and Testing.

**Text Books:**

- [1] Craig Larman, "Agile and Iterative Development - A Manager's Guide", Pearson Education.
- [2] Lisa Crispin, Janet Gregory, Mike Cohn, Brain Marick, "Agile Testing: A Practical guide for Testers and Agile Teams", Addison-wesley publication.

**References:**

- [1] Jonathan Rasmusson, "The Agile Samurai – How Agile Masters Deliver Great Software", Shroff publishers and distributors Pvt. Ltd. July 2016.
- [2] Hazzan and Dubinsky, "Agile Software Engineering, Series: Topics in Computer Science" Springer 2009.
- [3] Robert C. Martin, "Agile Software Development, Principles, Patterns and Practices", 1<sup>st</sup> edition, PHI.
- [4] Alistair, "Agile Software Development Series", Cockburn Publishers International.
- [5] Kevin C. Desouza, "Agile information systems: Conceptualization, Construction and Management", Butterworth-Heinemann Publishers.

## **MCA 603.2 [E1]: Mobile Application Development using Android**

**Total No. of Lectures : 48**

**Total Marks : 100**

**[ L – T – P – S ]**

**No. of Lectures / Week: 4**

**Credits : 4**

**[ 3 – 1 – 0 – 2 ]**

**Objectives:**

- To understand the development environments, Architectures and programming paradigms of Android devices.
- To develop an understanding of how to design, implement, and debug/test applications for mobile devices.
- To exploit the many capabilities of modern mobile devices to produce creative solutions to everyday challenges.
- Develop applications that effectively combine mobile device capabilities such as communication, computing, and particularly sensing.

**Learning Outcomes:** Students must be able to

- Understand the architecture, working and environment setup of Android
- Create simple GUI based Android Apps
- Use the Building Blocks of Android Completely according to its necessity
- Use Widgets and components to create professional android applications
- Work with Databases and advanced sensors of the phone

**SYLLABUS:**

Introduction to Android – Architecture, Features of Android SDK, Creating Android Applications, Building User Interfaces, Building Blocks of Android, Content Providers, Services. Data Access in Android, Introducing Android Databases, Advanced Android, Using Sensors and the Sensor Manager, Using Accelerometer, Compass and GPS, Audio, Video and Using the Camera; Using Telephony and SMS.

**TEXT BOOKS:**

1. Reto Meier, Ian Lake, "Professional Android", 4<sup>th</sup> edition, Wiley Wrox Publications, 2018
2. Dawn Griffiths, David Griffiths, "Head First Android Development", 2<sup>nd</sup> Edition, O'Reilly Media, 2017

**REFERENCE BOOKS:**

1. Bill Phillips, Chris Stewart, Kristin Marsicano, "Android Programming: The Big Nerd Ranch Guide", Big Nerd Ranch Guides; 3<sup>rd</sup> edition 2017
  2. John Horton, "Android Programming for Beginners", Ingram short title; 2<sup>nd</sup> edition, 2018
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**MCA 603.2 [E2]: Cross Mobile App Development using React Native**

Total No. of Lectures : 48

Total Marks: 100

[ L-T-P-S ]

No. of Lectures / Week: 4

Credits : 4

[ 3-1-0-2 ]

**Objectives:**

- To Introduce a way to develop cross platform apps just using React Native of Facebook
- To develop an understanding of how to design, implement, and debug/test apps with React Native
- To exploit the many capabilities of modern JavaScript libraries to produce creative solutions to everyday challenges.
- Develop applications that effectively run in any Phone running iOS or Android.

**Learning Outcomes:** Students must be able to

- Write JavaScript code with ease
- Create simple React JS based Apps
- Understand React Native and write apps that simultaneously work in Android and iOS
- Use Widgets and components to create professional mobile applications
- Dig Deeper into the React Native way of developing apps that can run in multiple platforms

**SYLLABUS:**

**Javascript, ReactJS, Introduction to React Native, Components and APIs in React Native, Advanced React Native,**

**TEXT BOOKS:**

1. Kirupa Chinnathambi, "Learning React: A hands-on guide to building web applications using React and Redux", Addison-Wesley Professional; 2<sup>nd</sup> edition, 2018.

2. Akshat Paul, Abhishek Nalwaya, "React Native for Mobile Development", Apress; 2<sup>nd</sup> edition 2019

**REFERENCE BOOKS:**

1. Eric Freeman, Elisabeth Robson, "Head First JavaScript Programming: A Brain-Friendly Guide", O'Reilly Media, 2014
  2. Adam Boduch, "React and React Native: Complete guide to web and native mobile development with React, 2nd Edition", Packt Publishing, 2018.
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**MCA 603.2 [E3]: Mobile App Development for iOS with Swift**

**Total No. of Lectures : 48**

**Total Marks: 100**

**[ L – T – P – S ]**

**No. of Lectures / Week: 4**

**Credits : 4**

**[ 3 – 1 – 0 – 2 ]**

**Objectives:**

- To understand the development environment, Architecture and programming paradigm of iOS devices.
- To develop an understanding of how to design, implement, and debug/test applications for Apple mobile devices.
- To exploit the many capabilities of Swift to produce creative solutions to everyday challenges.
- Develop applications that effectively combine mobile device capabilities such as communication, computing, and particularly sensing.

**Learning Outcomes:** Students must be able to Understand the working of mobile devices and compare the various architectures available

- Do programming with the Swift Language
- Use advanced concepts of Swift to solve complex issues
- Use Widgets and components to create professional iOS applications
- Develop iOS apps to perform the various advanced tasks like Database handling.

**SYLLABUS:**

**Overview of Mobile Devices,** Mobile devices vs. desktop devices , XCode & Android Studio , Android and iOS , Underlying OS (Darwin vs. Linux) . Basics of Swift, Advanced Swift: Functions, Closures, Enumerations, Structures, Classes, Properties, Methods, Subscripts, Inheritance, Initialization, Deinitialization, ARC Overview, Optional Chaining, Type Casting, Extensions, Protocols, Generics, Access Control, Introduction to iOS, Advanced iOS Concepts: Accelerometer, Universal Applications, Camera Management, Location Handling, SQLite Database, Sending Email, Audio & Video, File Handling, Accessing Maps, In-App Purchase, iAd Integration, Storyboards, Auto Layouts, Twitter & Facebook, Memory Management, Application Debugging

**Text Books:**

1. Greg Lim, "Beginning iOS 13 & Swift App Development", 2019
2. Ahmad Sahar, Craig Clayton, "iOS 13 Programming for Beginners", Packt Publishing Limited; 4<sup>th</sup> Revised edition, 2020.

**Reference Books:**

1. Abhishek Mishra, "Swift iOS 24-Hour Trainer", Wiley Publications, 2016
  2. Wallace Wang, "Beginning iPhone Development with Swift 5: Exploring the iOS SDK", Apress; 5<sup>th</sup> edition, 2019.
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**MCA 604.2 [E1]: NATURAL LANGUAGE PROCESSING**

Total No. of Lectures : 48

Total Marks: 100

[L – T – P – S]

No. of Lectures / Week: 4

Credits : 3

[3 – 2 - 0 - 2]

**Learning Objectives:**

- To understand natural language processing and to learn how to apply basic algorithms in this field.
- To get acquainted with the basic concepts and algorithmic description of the main language levels: morphology, syntax, semantics, and pragmatics.
- To design and implement applications based on natural language processing
- To implement various language Models.
- To design systems that uses NLP techniques

**Learning Outcomes:**

The students will:

- Have a broad understanding of the field of natural language processing.
- Have a sense of the capabilities and limitations of current natural language technologies,
- Be able to model linguistic phenomena with formal grammars.
- Be able to Design, implement and test algorithms for NLP problems
- Understand the mathematical and linguistic foundations underlying approaches to the various areas in NLP
- Be able to apply NLP techniques to design real world NLP applications such as machine translation, text categorization, text summarization, information extraction....

**SYLLABUS:**

Introduction, Basic English Concepts, Word Level Analysis, Syntax Analysis, Parsing Techniques & Grammar, Semantic Analysis, Knowledge Representation for NLP, Natural Language Generation, Machine Translation, Pragmatics.

**Text Books:**

1. Daniel Jurafsky and James H. Martin, "Speech and Language Processing", 2nd Ed, 2014, Pearson Education.
2. James Allen, "Natural Language Understanding", 2nd edition. Benjamin Cummings publishing.

**Reference Books:**

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1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press.
  2. Manning, Christopher and Heinrich, Schutze, "Foundations of Statistical Natural Language Processing", 2016, Create Space Independent Publishing Platform.
  3. Jacob Eisenstein, "Introduction to Natural Language Processing", 2019, MIT Press
  4. Carol Genetti, "How Languages Work: An Introduction to Language and Linguistics", 2019, Cambridge University Press.
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## **MCA 604.2 [E2]: IMAGE PROCESSING AND PATTERN RECOGNITION**

**Total No. of Lectures : 48**

**Total Marks: 100**

**[L – T – P – S]**

**No. of Lectures / Week: 4**

**Credits : 3**

**[3 – 2 - 0 - 2]**

### **Learning Objectives:**

- To understand the image fundamentals and mathematical transforms necessary for image processing and to study the image enhancement techniques.
- To understand the image segmentation and representation techniques.
- To understand how image are analyzed to extract features of interest.
- Students will learn importance of pattern recognition in various applications.
- Students will learn how to classify patterns.

### **Learning Outcomes:**

The students will be able to:

- Understand image formation, role human visual system plays in perception of gray and color image data.
- Apply image processing techniques in both the spatial and frequency (Fourier) domains.
- Design image analysis techniques, image segmentation and to evaluate the Methodologies for segmentation.
- Conduct independent study and analysis of feature extraction techniques.
- Apply different de-noising models to recover original image.
- Identify different pattern recognition methods and apply them in problem areas.

### **SYLLABUS:**

Digital Image Processing, Digital Image Fundamentals, Image Enhancement in the Spatial Domain, Image Enhancement in the Frequency Domain, Image Restoration, Image Segmentation, Image Feature Extraction, Image Representation, Introduction to Pattern Recognition, Pattern Classification

### **Text Books:**

1. Rafael C Gonzalez and Richard E. Woods: "Digital Image Processing", 4<sup>th</sup> Edition, 2018, Pearson Publication.
2. Sergios Theodoridis, Konstantinos Koutroumbas, "Pattern Recognition", 5th Edition, 2018, Academic Press.

### **Reference Books:**

1. Scott. E. Umbaugh, "Digital Image Processing and Analysis", 3<sup>rd</sup> Edition, 2017, CRC Press

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2. M. Sonka Milan, Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis and Machine Vision", 4<sup>th</sup> Edition, 2014, Cengage Learning
  3. Rafael C. Gonzalez, Richard Eugene Woods, "Digital Image Processing Using MATLAB", 2<sup>nd</sup> Edition, 2013. Tata McGraw Hill Ed.
  4. Chris Solomon, Toby Breckon, "Fundamentals of Digital Image Processing: A Practical Approach with Examples".
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5. W. K. Pratt, Introduction to "Digital Image Processing", 2014, CRC Press.
  6. Richard O. Duda, Peter E. Hart, David G. Stork, "Pattern Classification", 2<sup>nd</sup> Ed, 2012, John Wiley & sons
  7. Christopher M. Bishop, "Pattern Recognition and Machine Learning", 2016, Springer.
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## **PS 604.2 [E3] : Bioinformatics Algorithms, Databases and Tools**

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Total No. of Lectures : 48

Total Marks : 100 [ L-T-P-S ]

No. of Lectures / Week : 4

Credits : 3 [ 3-1-0-2 ]

**Learning Objective:** The subject aims to introduce students to

- Understand fundamentals concepts in Bioinformatics
- Have an overview of the most important methods and tools used
- Appreciate the need for methods to be accurate and efficient to implement some of the algorithms
- Capable of performing simple sequence analyses using existing tools

**Learning Outcome:** Upon completion of the subject, students shall be able to

- Gain a knowledge of simple biology and Bioinformatics
- Gain knowledge of database and tools with respect to Genomics and Proteomics
- Understand different Biological algorithms
- Apply different algorithms for biological problems
- Usage of HMM for Profiling

### **SYLLABUS:**

The Origin and Evolution of Cells, Molecules of Cells, Heredity, Genes, and DNA, Protein Synthesis, Introduction to Bioinformatics, Biological Databases, Genome Information Resources, Protein Information Resources, Algorithms and Complexity, Exhaustive Search, Dynamic Programming Algorithms, Divide-and-Conquer Algorithms, Graph Algorithms, Hidden Markov Models.

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### **Text Books :**

1. Geoffrey M. Cooper,, " The Cell, A Molecular Approach", 8<sup>th</sup> Edition, Oxford University Press
2. Jin Xiong, "Essential Bioinformatics", Cambridge University Press
3. 'Teresa K Attwood and David J. Parry-smith, "Introduction to Bioinformatics", Prentice Hall
4. Neil C. Jones and Pavel A. Pevzner, "An Introduction to Bioinformatics Algorithms", The MIT Press

### **Reference Books:**

1. Anna Tramontano, "Introduction to Bioinformatics", 3<sup>rd</sup> Edition, 2012, CRC Press
2. Orpitha Bosu, S K Thukral, "Bioinformatics Databases, Tools, Algorithms", 2<sup>nd</sup> Ed, 2012, Oxford University Press

3. Ion Mandoiu, A Zelinkovisky, "Bioinformatics Algorithms: Techniques and Applications", 2012, Wiley
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## **MCA 605.2 [E1] : DATA WAREHOUSING AND DATA MINING**

**Total No. of Lectures : 48**

**Total Marks: 100**

**No. of Lectures / week : 4**

**Credits : 3**

### **Learning Objectives:**

- To introduce the basic concepts and techniques of data mining.
- To develop the skills using recent data mining software for solving practical problems.
- To assess the strengths and weaknesses of various methods and algorithms
- Identify the key processes of data mining, data warehousing and knowledge discovery process.
- Basic principles and algorithms used in practical data mining and understand their strengths and weaknesses
- Apply data mining techniques to solve problems in other disciplines in a mathematical way.

**Learning outcomes:** After completing this course, students will be able to

- List the definitions, concepts and architectures of data mining
- Demonstrate the impact of business reporting, information visualization and dashboards
- Explain data mining, support vector machines and text mining.
- Define social impacts of data mining.
- Handle classification through statistical methods used in prediction.

### **SYLLABUS:**

Data Warehousing, Data Mining, Data Preprocessing, Association Rule Mining, Classification and Prediction, Cluster and Outlier Analysis, Data Mining Applications.

### **Text Books:**

1. Jain Pei, Jiawei Han, Micheline Kamber, "Data Mining : Concepts and Techniques", 3<sup>rd</sup> Ed, 2011, Elsevier
2. Alex Berson, Stephen J. Smith "Data Warehousing, Data Mining & OLAP", 3<sup>rd</sup> Ed, 2011, McGraw Hill
3. Witten, Frank, Hall, "Data Mining : Practical Machine Learning Tools & Techniques", 3<sup>rd</sup> 2010, Elsevier

### **Reference Books:**

1. Reema Theraja "Data Warehousing", 1<sup>st</sup> Edition, 2011, Oxford University Press.
2. Paulraj Ponniah, "Data Warehousing: Fundamentals for IT Professionals", 2<sup>nd</sup> Ed, 2012, Wiley India
3. Prabhu C.S.R., "Data Warehousing Concepts, Techniques, Products and Applications", 3<sup>rd</sup> Edition, 2011, PHI Learning Private Limited.
4. Sam Anahory, Dennis Murray, "Data Warehousing In The Real World : A Practical Guide For Building Decision Support Systems", 1<sup>st</sup> Edition, 2011, Pearson Asia
5. K.P. Soman, ShyamDiwakar, V. Ajay "Insight into Data mining Theory and Practice", 2<sup>nd</sup> Ed, 2010, PHI
6. Pang-Ning Tan, Michael Steinbach, Vipin Kumar "Introduction to Data Mining", 3<sup>rd</sup> Ed, 2011, Pearson
7. Vikram Pudi, Radhakrishna, "Data Mining", 2<sup>nd</sup> Edition, 2011, Oxford University Press.
8. Richard Roiger, Michael Getz, "Data Mining : A Practical Based Primer", 1<sup>st</sup> Ed, 2010, Pearson

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9. Margaret Dunham, "Data Mining : Introductory & Advanced Topics", 1<sup>st</sup> Edition, 2011, Pearson
  10. Arun K Pujari, "Data Mining Techniques", 2<sup>nd</sup> Ed, 2013, University Press
  11. Peter Adrians, Rolf Zantinge, "Data Mining", 1<sup>st</sup> Edition, 2010, Pearson Education
  12. Gordon S. Linoff Michael J. A. Berry, "Mastering Data Mining: The Art And Science Of Customer Relationship Management", 1<sup>st</sup> Edition, 2013, Wiley India
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## **MCA 605.2 [E2] : BUSINESS INTELLIGENCE & ADVANCED DATA MINING**

**Total No. of Lectures : 48**

**Total Marks : 100**

**No. of Lectures / week : 4**

**Credits : 3**

### **Learning Objectives:**

- To introduce the basic concepts and techniques of business intelligence.
- To develop the skills using recent data mining software for solving practical problems.
- To assess the strengths and weaknesses of various methods and algorithms
- Identify the key processes of data mining, data warehousing and knowledge discovery process.
- Basic principles and algorithms used in practical data mining and understand their strengths, weaknesses
- Apply data mining techniques to solve problems in other disciplines in a mathematical way.

**Learning outcomes:** After completing this course, students will be able to

- Identify the major frameworks of business intelligence (BI).
- List the definitions, concepts and architectures of data mining
- Demonstrate the impact of business reporting, information visualization and dashboards
- Explain data mining, neural networks, support vector machines, text mining, web mining, social network analysis.

Handle classification through statistical methods used in prediction

### **SYLLABUS:**

Business Intelligence, Data Warehousing, Modeling the Data Warehouse, Building Data Warehouse, Classification and Prediction, Advanced Pattern Mining, Cluster and Outlier Analysis, Mining Sequential Patterns in Transactional Database.

### **Text Books:**

1. Delen Dursun Delen, Efraim Turban, Ramesh Sharda, "Decision Support And Business Intelligence Systems", 9<sup>th</sup> Edition, 2013, Pearson
2. R N Prasad, Seema Acharya, "Fundamentals of Business Analytics", 1<sup>st</sup> Ed, 2011, Wiley India
3. Jain Pei, Jiawei Han, Micheline Kamber, "Data Mining : Concepts and Techniques", 3<sup>rd</sup> Ed, 2011, Elsevier

### **Reference Books:**

1. Reema Theraja "Data Warehousing", 1<sup>st</sup> Edition, 2011, Oxford University Press.
2. Paulraj Ponniah, "Data Warehousing: Fundamentals for IT Professionals", 2<sup>nd</sup> Ed, 2012, Wiley India
3. Alex Berson, Stephen J. Smith "Data Warehousing, Data Mining & OLAP", 3<sup>rd</sup> Ed, 2011, McGraw Hill
4. Pang-Ning Tan, Michael Steinbach, Vipin Kumar "Introduction to Data Mining", 3<sup>rd</sup> Ed, 2011, Pearson
5. Witten, Frank, Hall, "Data Mining : Practical Machine Learning Tools & Techniques", 3<sup>rd</sup> 2010, Elsevier

6. Vikram Pudi, Radhakrishna, "Data Mining", 2<sup>nd</sup> Edition, 2011, Oxford University Press.
  7. Richard Roiger, Michael Getz, "Data Mining : A Practical Based Primer", 1<sup>st</sup> Ed, 2010, Pearson
  8. Margaret Dunham, "Data Mining : Introductory & Advanced Topics", 1<sup>st</sup> Edition, 2011, Pearson
  9. Peter Adrians, Rolf Zantinge, "Data Mining", 1<sup>st</sup> Edition, 2010, Pearson Education
  10. Carlo Vercellis, "Business Intelligence: Data Mining and Optimization for Decision Making", 2013, Wiley.
  11. Effraim Turban, Ramesh Sharda, Dursun Delen, David King, "Business Intelligence : A Managerial Approach", 1<sup>st</sup> Edition, 2012, Pearson.
  12. Mark Rittman, "Oracle Business Intelligence 11G Developers Guide", 1<sup>st</sup> Ed, 2012, McGraw Hill.
  13. Gert H. N. Laursen, Jesper Thorlund, "Business Analytics for Managers : Taking Business Intelligence Beyond Reporting", 1<sup>st</sup> Edition, 2013, Wiley
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## **MCA 605.2 [E3] : DATA SCIENCE AND ANALYTICS**

**Total No. of Lectures : 48**

**No. of Lectures / week : 4**

**Total Marks : 100**

**Credits : 3**

**Learning Objectives:** The objectives of this course are to provide with

- Data sampling/cleaning in order to get an informative, manageable data set
- Data storage and management in order to be able to access data.
- Exploratory data analysis to generate hypotheses and intuition about the data.
- Prediction based on statistical tools such as regression, classification, and clustering.
- Communication of results through visualization, stories, and interpretable summaries

**Learning Outcomes :** After successful completion of this course, you will be able to...

- Use data management techniques to store data
- Use statistical methods and visualization to quickly explore data
- Apply statistics and computational analysis to make predictions based on data
- Implement data-intensive computations on cluster and cloud infrastructures.
- Effectively communicate the outcome of data analysis using descriptive statistics and visualizations

### **SYLLABUS:**

Data Science, Data Analytics Life Cycle, Data Mining, Association Rule Mining, Classification, Cluster Analysis, Predictive Analytics, Simple linear regression:, Multiple linear regression, Logistic and Multinomial Regression. Hypothesis testing, Forecasting, Application of predictive analytics.

### **Text Books:**

1. Nina Zumel, John Mount, "Practical Data Science with R", Manning Publications, 2014.
2. Jain Pei, Jiawei Han, Micheline Kamber, "Data Mining : Concepts and Techniques", 3<sup>rd</sup> Ed, 2011, Elsevier
3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", 2<sup>nd</sup> Edition, 2011, Springer Series in Statistics.
4. Daniel T. Larose, Chantal D. Larose "Data Mining and Predictive Analytics", 2<sup>nd</sup> Ed, 2016, John Wiley & Sons Inc.,

### **Reference Books:**

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1. Ken Black, "Applied BUSINESS STATISTICS Making better business decisions", 7<sup>th</sup> Ed, 2016, John Wiley & Sons Inc.,
  2. R N Prasad, Seema Acharya, "Fundamentals of Business Analytics", 1<sup>st</sup> Ed, 2011, Wiley India
  3. Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Dasgupta, "Practical Data Science Cookbook", 1<sup>st</sup> Ed, 2014, Packt Publishing Ltd..
  4. Nathan Yau, "Visualize This: The Flowing Data Guide to Design, Visualization", 2011, Wiley
  5. Daniel T. Larose, "Discovering Knowledge in Data: An Introduction to Data Mining", 2011, Wiley Int'l
  6. Thomas W Miller, "Modeling Techniques in Predictive Analytics", 1<sup>st</sup> Ed, 2013, Pearson
  7. Peter Adrians, Rolf Zantinge, "Data Mining", 1<sup>st</sup> Edition, 2010, Pearson Education
  8. Vikram Pudi, Radhakrishna, "Data Mining", 2<sup>nd</sup> Edition, 2011, Oxford University Press.
  9. Richard Roiger, Michael Getz, "Data Mining : A Practical Based Primer", 1<sup>st</sup> Ed, 2010, Pearson
  10. Arun K Pujari, "Data Mining Techniques", 2<sup>nd</sup> Ed, 2013, University Press
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## **MCA 608.2 : MINI PROJECT AND ADVANCED ENTREPRENEURSHIP**

**Total No. of Lectures : 48**

**Total Marks : 150**

**[ L-T-P-S ]**

**No. of Lectures / Week : 4**

**Credits : 4**

**[ 3-0-2-2 ]**

**Objectives :** By now you are well aware that in this curriculum you learn by "doing" and that it is not a theoretical course. Here, you will actually start your venture and build it and bring it to life!

You start this part of the journey with a quick recap of some fundamentals of entrepreneurship. Then you revisit your existing business model and refine it as you deem fit. Based on the updated business model, you will make your Sales plan, People plan, and Financial plan. The next step is to increase the revenue options and look at funding options for your venture for further growth.

### **SYLLABUS:**

Refining the Business Model, Product and Services, Business Planning, Exploring ways to increase Revenue, Funding the Growth / Scalability, Building the A Team, Creating Branding and Channel Strategy, Leveraging Technologies and Available Platforms, Measuring your Progress, Legal Matters, Mentorship and Seeking Support.

### **Reference Books :**

- 1) Cliffton: Davis s and Fyvie, David E. "Project Feasibility Analysis". John wiley, New York
  - 2) Desai, A.N. "Entrepreneur & Environment". Ashish, New Delhi.
  - 3) Drucker, Peter. "Innovation and Entrepreneurship". Heinemann, London.
  - 4) Jain Rajiv. "Planning a Small Scale Industry: A guide to Entrepreneurs". S.S. Book, Delhi.
  - 5) Kumar S.A. "Entrepreneurship in Small Industry". Discovery, New Delhi.
  - 6) McClelland, D.C. and Winter, W.G. "Motivating Economic Achievement Free Press, New York
  - 7) Pareek, Udita and Venkateswara Rao, t. "Developing Entrepreneurship-A Handbook on learning system". Learning systems Delhi.
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## **SEMESTER III**

**MCAH 601.3 [E1] : FUNCTIONAL PROGRAMMING PARADIGM**  
**MCAH 601.3 [E2] : INTERNET OF THINGS ARCHITECTURE & DEVELOPMENT**  
**MCAH 601.3 [E3] : AUGMENTED AND VIRTUAL REALITY**

**MCAH 602.3 [E1]** WEB DEVELOPMENT WITH ANGULAR .JS, NODE .JS  
**MCAH 602.5 [E2]** CONTENT MANAGEMENT WITH JOOMLA & WORDPRES  
**MCAH 602.3 [E3]** Blockchain Technology with Ethereum

**MCAH 603.3 [E1]:** Computing with C# and .NET Framework  
**MCAH 603.3 [E2]:** Web Technologies and .NET Framework  
**MCAH 603.3 [E3]** Cross Platform Development using .NET Core

**MCAS 604.3 [E1]:** Cognitive Computing and Artificial Intelligence  
**MCAS 604.3 [E2]:** Computational Intelligence and Machine Learning  
**MCAS 604.3 [E3]:** Deep Learning and Neural Networks

**MCAS 605.3 [E1]:** BIG DATA ANALYTICS with MAP REDUCE AND HADOOP  
**MCAS 605.3 [E2]:** BIG DATA ANALYTICS WITH SCALA AND SPARK  
**MCAS 605.3 [E3]:** BIG DATA VISUALIZATION USING TABLEAU

**MCAPR 608.3 BUSINESS CONSULTANCY PROJECT**  
**MCAAQ 609.5 SEMINAR AND TECHNICAL COMMUNICATION - II**

## **IV SEMESTER**

**MCA 601.4 : INDUSTRY INTERNSHIP / PROJECT WORK**