

**Supporting Document for 1.1.2**

**Syllabus Revision carried out in 2020**

**Program : MCA- Master of Computer Applications**

**Regulations: SVEC-19**

*This document details the following:*

1. Courses where syllabus has been changed 20% and more.
2. Course-wise revised syllabus with changes highlighted.

**Note:** For SVEC-19 revised syllabus, SVEC-16 (previous syllabus) is the reference.

**List of Courses where Syllabus content has been  
changed (20% and more)**

| S. No.  | Course Code | Name of the course  | Percentage of Syllabus changed | Page Number in which Details are Highlighted |
|---|-------------|---------------------|--------------------------------|--|
| 1.  | 19MC50101   | Cloud Computing     | 20                             | 02   |
| 2.  | 19MC50102   | Data Analytics      | 20                             | 05-06  |
| 3.  | 19MC50104   | Data Visualization  | 100                            | 08-10  |
| 4.  | 19MC50105   | .Net Technologies   | 100                            | 11-12  |
| 5.  | 19MC50106   | Social Networks     | 100                            | 13-14  |
| 6.  | 19MC50108   | M-Commerce          | 60                             | 17   |
| 7.  | 19MC50109   | Machine Learning    | 100                            | 19-20  |
| 8.  | 19MC50111   | Software Security   | 100                            | 22-23  |
| 9.  | 19MC50131   | Cloud Computing Lab | 100                            | 25-26  |
| Average % (A)   |             |                     | 77.77                          | -  |
| Total No. of Courses in the Program (T)   |             |                     | 17                             |  |
| No. of Courses where syllabus (more than 20% content) has been changed (N)      |             |                     | 09                             |  |
| Percentage of syllabus content change in the courses (C) = $(A \times N) / 100$ |             |                     | 6.99                           |  |
| Percentage of Syllabus Content changed in the Program (P) = $C/T \times 100$    |             |                     | 41.12                          |  |



**DEAN (Academics)**  
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**SREE VIDYANIKETHAN ENGINEERING COLLEGE**  
**Sree Sainath Nagar, A. RANGAMPET**  
**CHITTOOR (DT.)-517 102, A.P.**



**PRINCIPAL**  
**PRINCIPAL**  
**SREE VIDYANIKETHAN ENGINEERING COLLEGE**  
**(AUTONOMOUS)**  
**Sree Sainath Nagar, A. RANGAMPET**  
**Chittoor (Dist.) - 517 102, A.P., INDIA.**

## MCA V - SEMESTER

### (19MC50101)CLOUD COMPUTING (Theory)

| Int. Marks | Ext. Marks | Total Marks | L | T | P | C |
|------------|------------|-------------|---|---|---|---|
| 40         | 60         | 100         | 4 | - | - | 4 |

#### PRE-REQUISITES:

Courses on Computer Networks and Operating Systems.

#### COURSE DESCRIPTION:

Virtualization, Cloud Computing Fundamentals, Deployment Models; Cloud Computing Architecture; Cloud Computing Mechanisms; Cloud Security Mechanisms; Cloud Service Models.

#### COURSE OUTCOMES:

*After successful completion of this course, the students will be able to:*

- CO1:** Demonstrate the concepts of Cloud Computing, Cloud-Enabling Technology, and Cloud Architectures.
- CO2:** Apply virtualization and develop virtual environments for the deployment of cloud applications.
- CO3:** Design applications using cloud service models salesforce.com(SaaS), Google App Engine(PaaS), Amazon (IaaS) and deploy in cloud
- CO4:** Identify and analyze the Cloud-Enabling Technologies and architectures for developing the applications to solve e-commerce problems.
- CO5:** Adhere to ethics and adapt cloud security mechanisms and Cloud-Based Security Groups for providing security to societal applications.

#### DETAILED SYLLABUS:

##### UNIT I- FUNDAMENTAL CLOUD COMPUTING

(10 Periods)

**Understanding Cloud Computing:** Origins and Influences, Concepts and Terminology, Goals and Benefits, Risks and Challenges.

**Fundamental Concepts and Models:** Roles and Boundaries, Cloud Characteristics, Cloud Delivery Models, Cloud Deployment Models.

##### UNIT II – CLOUD COMPUTING MECHANISMS AND ARCHITECTURE (11 Periods)

**Cloud-Enabling Technology:** Broadband Networks and Internet Architecture, Data Center Technology, Virtualization Technology, Web Technology, Multitenant Technology, Service Technology.

**Fundamental Cloud Architectures:** Workload Distribution, Resource Pooling, Dynamic Scalability, Elastic Resource Capacity, Service Load Balancing, Cloud Bursting, Elastic Disk Provisioning, Redundant Storage.

### **UNIT III – CLOUD COMPUTING ADVANCED ARCHITECTURES (12 Periods)**

**Advanced Cloud Architectures:** Hypervisor Clustering, Load Balanced Virtual Server Instances, Non Disruptive Service Relocation, Zero Downtime, Cloud Balancing, Resource Reservation, Dynamic Failure Detection and Recovery, Bare-Metal Provisioning, Rapid Provisioning, Storage Workload Management.

**Specialized Cloud Architectures:** Direct I/O Access, Direct LUN Access, Dynamic Data Normalization, Elastic Network Capacity, Cross-Storage Device Vertical Tiering, Intra Storage Device Vertical Data Tiering, Load Balanced Virtual Switches, Multipath Resource Access, Persistent Virtual Network Configuration, Redundant Physical Connection for Virtual Servers, Storage Maintenance Window.

### **UNIT IV – CLOUD SECURITY (11 periods)**

**Fundamental Cloud Security:** Threat Agents, Cloud Security Threats, Additional Considerations, Case Study Example.

**Cloud Security Mechanisms:** Encryption, Hashing, Digital Signature, Public Key Infrastructure, Identity and Access Management, Single Sign-On, Cloud-Based Security Groups, Hardened Virtual Server Images.

### **UNIT V – CLOUD SERVICE MODELS (11 Periods)**

**Cloud Service Models:** Software as a Service (SaaS)- Characteristics, Examples and Applications. Platform as a Service (PaaS)- Characteristics, Examples and Applications. Infrastructure as a Service (IaaS)- Characteristics, Examples and Applications.

**Case Study:** SaaS: Salesforce.com, Facebook.com; PaaS: Google App Engine, MS-Azure and IBM Bluemix; IaaS: Amazon EC2, Amazon S3 and Netflix.

**Total Periods: 55**

**Topics for self-study are provided in the lesson plan.**

#### **TEXT BOOKS:**

1. Thomas Erl, Zaigham Mahmood, and Ricardo Puttini "Cloud Computing- Concepts, Technology & Architecture," Pearson Publication, 2014.
2. George Reese "Cloud Application Architectures," O'Reilly Publications, 2009.

#### **REFERENCE BOOKS:**

1. Barrie Sosinsky, "Cloud Computing Bible", Wiley India Pvt. Ltd, 2011.
2. Rajkumar Buyya, James Broberg and Andrzej Goscinski, "Cloud computing principles and paradigms", John Wiley and Sons, 2011.
3. John W. Rittinghouse, James F. Ransome, "Cloud Computing implementation, Management and Security," CRC Press, Taylor and Francis group, 2010.

**ADDITIONAL LEARNING RESOURCES:**

1. <https://nptel.ac.in/courses/106/105/106105167/>
2. <https://www.coursera.org/browse/information-technology/cloud-computing>
3. <https://www.edx.org/learn/cloud-computing>
4. <https://www.udemy.com/course/introduction-to-cloud-computing/>
5. <https://www.eduonix.com/courses/Software-Development/Learn-Cloud-Computing-from-Scratch-for-Beginners#courseContentNav>

## MCA V- SEMESTER

### (19MC50102) DATA ANALYTICS (Theory)

| Int. Marks | Ext. Marks | Total Marks | L | T | P | C |
|------------|------------|-------------|---|---|---|---|
| 40         | 60         | 100         | 4 | - | - | 4 |

**PRE-REQUISITES:** Courses on Data Warehousing and Data Mining and Object Oriented Programming through JAVA.

#### COURSE DESCRIPTION:

Big data Analytics usage and Outcomes; Types of big data; Challenges of analyzing big data; Analytics tools for big data; Requirements of Hadoop; Adapting Hadoop File systems and I/O; MapReduce Application; Administration of Hadoop; Big data analytics; R Programming and HIVE on Hadoop.

#### COURSE OUTCOMES:

*After successful completion of this course, the students will be able to:*

- CO1:** Demonstrate the concepts of Big Data Analytics, Life Cycle, techniques, Integrated Development Environment (IDE) and trends to use MapReduce framework, HDFS, Apache Hive and R Studio.
- CO2:** Apply Hadoop, HiveQL Indexes and Eclipse IDE tools to perform analytics on Hadoop platform to infer insights of Big Data applications.
- CO3:** Implement Hadoop features, Hadoop Distributed File system, Hadoop I/O and administering Hadoop to develop applications in Hadoop Environment.
- CO4:** Analyze Map Reduce framework, varieties of data formats, Methods, Dimensions, and practices to manage Weather sensors data and preprocess data for map reduce applications.
- CO5:** Apply Data Structures, functions, Matrices, Arrays and Lists to implement R programming on Hadoop.

#### DETAILED SYLLABUS:

##### UNIT I- INTRODUCTION TO DATA ANALYTICS

(11 periods)

**Big Data Analytics:** Concepts of Big Data Analytics, State of the practice in analytics; Data Analysis Life Cycle: Life cycle, discovery, data preparation, model planning, model building, communicating result, operationalization, Big Data Analytics Examples, Big Data Analytics Solutions.

**Meet Hadoop:** Data Storage and Analysis, Comparison with Other Systems, History of Hadoop, Apache Hadoop and the Hadoop Ecosystem.

## UNIT II- HADOOP

(10 Periods)

**MapReduce:** A Weather Dataset Ecosystem, Analyzing the Data with UNIX Tools, Analyzing the Data with Hadoop, Scaling Out, Hadoop Streaming, Hadoop Pipes.

**The Hadoop Distributed File system:** The Design of HDFS, HDFS Concepts, The Command-Line Interface, Hadoop File systems.

**Hadoop I/O:** Data Integrity, Compression, Serialization, File-Based Data Structures.

## UNIT III- APPLICATIONS OF HADOOP MAPREDUCE

(11 Periods)

**Developing a MapReduce Application:** The Configuration API, Configuring the development Environment, Writing a Unit Test, Running Locally on Test Data, Running on a Cluster.

**How MapReduce Works:** Anatomy of a MapReduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution.

**MapReduce Types and Formats:** MapReduce Types, Input Formats, Output Formats.

## UNIT IV- FEATURES AND ADMINISTERING HADOOP AND APACHE HIVE

(11 Periods)

**MapReduce Features:** Counters, Sorting, Joins, Side Data Distribution, MapReduce Library Classes.

**Setting Up a Hadoop Cluster:** Cluster Specification, Cluster Setup and Installation, SSH Configuration, Hadoop Configuration, Security, Benchmarking a Hadoop Cluster, HDFS.

**Apache Hive Concepts:** Hive QL queries, Hive QL views- reduce query complexity.

**Hive QL Indexes-** create, show, drop, Aggregate functions, Bucketing and Partitioning.

## UNIT V- R PROGRAMMING ON HADOOP

(12 Periods)

**Introduction to R:** R Data Structures, Help functions in R, Vectors, Scalars, Declarations, Common Vector operations, Using all and any, Vectorised operations: NA and NULL values, Filtering, Vectorised if-then else.

**Matrices, Arrays And Lists:** Creating matrices, Matrix operations, Applying Functions to Matrix Rows and Columns, Adding and deleting rows and columns, Vector/Matrix, Distinction, lists, Creating lists, General list operations, Accessing list components and values – applying functions to lists.

**Case Study:** Applications on Big Data Using Hadoop and its supporting Tools.

**Total Periods: 55**

*Topics for self-study are provided in the lesson plan.*

**TEXT BOOKS:**

1. Tom White, "*Hadoop: The Definitive Guide*," Oreilly and Yahoo press, 3<sup>rd</sup> Edition, 2012.
2. EMC Education services, "*Data Science and Big Data analytics*," John wiley publications, 2015.

**REFERENCE BOOKS:**

1. Norman Matloff, "The Art of R Programming", William Pollock, 2011.
2. Frank J. Ohlhorst, "*Big Data Analytics: Turning Big Data into Big Money*," Wiley Publication, December 2012.

**ADDITIONAL LEARNING RESOURCES:**

1. <https://www.ngdata.com/big-data-analysis-resources/>
2. <https://www.analyticsvidhya.com/resources-big-data/>
3. <https://hadoop.apache.org/docs/r3.1.3/>
4. [https://cran.r-project.org/doc/contrib/Paradis-rdebuts\\_en.pdf](https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf)



## MCA V - SEMESTER

### (19MC50104) DATA VISUALIZATION (Theory)

#### (Professional Elective - III)

| Int. Marks | Ext. Marks | Total Marks | L | T | P | C |
|------------|------------|-------------|---|---|---|---|
| 40         | 60         | 100         | 4 | - | - | 4 |

#### PRE-REQUISITES:

Courses on "Probability and Statistics", "Database Management System", "Data Warehousing and Data Mining".

#### COURSE DESCRIPTION:

Data Foundation; Human Perception and Visualization; Visualization Techniques; Designing Comparing and Evaluating Visualization Techniques; Visualization Systems and Research Directions.

#### COURSE OUTCOMES:

*After successful completion of this course, the students will be able to:*

- CO1:** Demonstrate the concepts of visualization, data vs information visualization, data pre-processing, visualization process and human perception, text and issues to perform basic visualizations.
- CO2:** Analyze visualization tools such as prefuse and weave to perform visualizations based on data and analysis types and pre attentive theories for information processing.
- CO3:** Apply visualization techniques such as 1-D, 2-D, 3-D, point, line, region, document and text visualization to analyze spatial and multivariate data.
- CO4:** Design and implement visualizations, trees, graphs and networks for comparing and evaluating visualization techniques using user, data and visualization characteristics.
- CO5:** Adhere to ethics and adapt cyber regulations in pre-processing and analysing the data.

#### DETAILED SYLLABUS:

#### UNIT I – INTRODUCTION AND FOUNDATION (12 Periods)

Visualization in everyday life, importance of visualization, relationship between visualization and other fields-visualization and computer graphics, scientific data

visualization vs information visualization; visualization process-computer graphics pipeline, visualization pipeline, knowledge discovery pipeline, role of perception; pseudocode conventions, scatter plot.

**Data Foundations:** Types of data-(), structure within and between records, other forms of structure, Data pre-processing-metadata and statistics, missing values and data cleaning, normalization, segmentation, sampling and sub setting, dimension reduction, aggregation and summarization, smoothing and filtering.

## **UNIT II – HUMAN PERCEPTION AND VISUALIZATION (12 Periods)**

**Human perception and information processing:** Perception, perceptual processing-preattentive processing theories.

**Visualization foundations:** Visualization process in detail, semiology of graphical symbols-symbols and visualizations, features of graphics; the eight visual variables.

**Visualization techniques for spatial data:** One-dimensional data, Two-dimensional data, Three-dimensional data, visualization technique for geo-spatial data: visualization of point data, visualization of line data, visualization of area data.

**Case Study:** Visualize the “quakes” data using Google Maps API and attributes of depth, magnitude, and stations for each data point in the map with suitable glyph visualization.

## **UNIT III – VISUALIZATION TECHNIQUES (10 Periods)**

**Visualization techniques for multivariate data:** Point based techniques, line based techniques, region based techniques, combination of techniques; Visualization techniques for trees, graphs and networks-displaying hierarchical structures, displaying arbitrary graphs or networks and issues.

**Case Study:** Display a data set using a choice of three or more of the glyph types. Test on a data set with a modest number of records (less than 300) and dimensions (less than 10). Identify the most effective glyphs.

**Text and Document Visualization:** Levels of text representations, vector space model, Extended text visualizations.

**Case Study:** A common task when dealing with data is dividing into categories, such as low, medium, and high. Write a program that reads in a document and divides the words into three classes: simple, optimal and complex.

## **UNIT IV - DESIGNING, COMPARING AND EVALUATING VISUALIZATIONS**

**(11 Periods)**

**Designing effective visualizations:** Steps in designing visualizations, problems in designing effective visualizations.

**Comparing and evaluating visualization techniques:** User tasks, user characteristics, data characteristics, visualization characteristics, structures for evaluating visualizations, benchmarking procedures, an example of visualization benchmarking

## **UNIT V- VISUALIZATION SYSTEMS, RESEARCH DIRECTIONS (10 Periods)**

**Visualization Systems:** Systems based on data types, systems based on analysis types, Text analysis and visualization, Tool kits-Prefuse, visualization tool kit, weave.

**Research Directions in visualizations:** Issues of data, issues of cognition, perception and Reasoning, issues of system design, issues of evaluation, issues of hardware, issues of application.

**Case Study:** For at least three different types of data (e.g., spatial, multivariate, relational), discuss the impact on typical visualization techniques if the data is dynamic rather than static.

**Total Periods: 55**

**Topics for self-study are provided in the lesson plan.**

### **TEXT BOOK:**

1. Matthew Ward, Georges Grinstein, Daniel Kaim, "*Interactive Data Visualization foundations, Techniques and Applications*," CRC Press, Taylor & Francis Group, 2<sup>nd</sup> Edition, 2010.

### **REFERENCE BOOK:**

1. Chun-houh Chen, Wolfgang Karl Hardle, Antony Unwin, "*Hand Book of Data Visualization*," Springer, ISBN: 9783540330370, 2008.

### **ADDITIONAL LEARNING RESOURCES:**

1. <https://indico.cern.ch/event/681081/contributions/2790760/attachments/1729504/2794629/Principles-of-Visualization-Course-Pt1-Full.pdf>
2. <https://indico.cern.ch/event/681081/contributions/2790760/attachments/1729504/2794629/Principles-of-Visualization-Course-Pt1-Full.pdf>

## MCA V-SEMESTER

### (19MC50105).NET TECHNOLOGIES (Theory)

#### (Professional Elective-III)

| Int. Marks | Ext. Marks | Total Marks | L | T | P | C |
|------------|------------|-------------|---|---|---|---|
| 40         | 60         | 100         | 4 | - | - | 4 |

**PRE-REQUISITES:** Course on "Object Oriented Programming through JAVA".

#### **COURSE DESCRIPTION:**

Introduction to .NET and Building blocks to the .NET Platform; Concepts of C# Programming; Implementation of interfaces, creating custom delegates and Events; Applications on ADO.NET; Design and development of ASP.NET Web Forms.

#### **COURSE OUTCOMES:**

After successful completion of this course, the students will be able to:

- CO1:** Demonstrate knowledge on .NET Framework, Microsoft Visual C# and Visual Studio.
- CO2:** Design and develop web applications using ADO.NET and ASP.NET.
- CO3:** Apply Microsoft Visual Studio tool to develop web applications.
- CO4:** Analyze principles of C#, mechanisms of ASP.NET, web controls, sessions and cookies techniques to design Client/Server applications.
- CO5:** Analyze object oriented programming principles to solve Exception Handling and Multithreading problems to implement C# Programming.
- CO6:** Adhere to ethics and adapt Key security standards of .NET to design secure web applications for an individual and society.

#### **DETAILED SYLLABUS:**

##### **UNIT I- INTRODUCING C# AND.NET PLATFORM (11 Periods)**

Benefits of the .NET platform, Building blocks of the .NET platform, Overview of .NET assemblies, Common type system, Common language specification, Common language runtime, Platform-independent nature of .NET, Introduction to Visual Studio; the role of the .NET framework, Building .NET application using visual studio, Anatomy of a simple C# program, System. Console class, System data types and corresponding c# keywords. Working with string data, C# iteration constructs Decision constructs and the Relational/equality operators.

##### **UNIT II- CORE C# PROGRAMMING, OOP WITH C# AND EXCEPTION HANDLING (10 Periods)**

C# arrays, C# class type, Constructors, The role of the this keyword, The static keyword, Pillars of OOP, C# access modifiers, C# encapsulation services, automatic properties, mechanics of inheritance, polymorphic support.

Role of .NET Exception Handling, example, System level exceptions, Application level exceptions, processing multiple exceptions.

### **UNIT III- INTERFACES, GENERICS, DELEGATES AND EVENTS (12 Periods)**

Interface types, custom interfaces, Implementing an interface, Implementing an interfaces using visual studio, Role of generic type parameters, Creating custom generic methods, Creating custom generic structures and classes, .NET delegate type, Delegate example, Generic delegate, and C #events, operator overloading.

### **UNIT IV- ADO.NET (12 Periods)**

High level definition of ADO.NET, ADO.NET data provider, ADO.NET namespaces, Connected layer of ADO.NET, Data Readers , Database transactions, Disconnected layer of ADO.NET, Role of the dataset, Working with Data Columns, Data Rows, Data Table , Binding Data Table objects to windows forms GUIs, Data Adapters.

### **UNIT V- ASP.NET WEB PAGES AND WEB CONTROLS (10 Periods)**

ASP.NET, ASP.NET web forms, Role of http, Web applications and web servers, Role of client side scripting, posting back to the web server. ASP.NET API, Building a single file ASP.NET web page, building an ASP.NET webpage using Code Files, ASP.NET web sites vs. ASP.NET Web applications, ASP.NET web site directory structure, the life cycle of an ASP.NET web page, Role of the web.config file, nature of web controls, Major categories of ASP.NET web control, The Role of validation controls, Maintaining session data and Cookies.

**Key Security Concepts in .NET:** Type safety and security, Principle, Authentication and Authorization.

**Total Periods: 55**

***Topics for self-study are provided in the lesson plan.***

#### **TEXT BOOK:**

1. Andrew Troelsen, "Pro C# 5.0 and the .NET 4.5 Framework," 6th Edition, Apress, 2013.

#### **REFERENCE BOOKS:**

1. Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner, "Professional C# 4 and .NET 4," Wrox Publications, 2010, ISBN:978-0-470-50225-9.
2. Mathew Mac Donald "The Complete Reference ASP.NET," TATA McGraw Hill,2010.

#### **ADDITIONAL LEARNING RESOURCES:**

1. <https://docs.microsoft.com/en-us/dotnet/standard/security/key-security-concepts>

## MCA V - Semester

### (19MC50106) SOCIAL NETWORKS (Theory)

#### (Professional Elective-III)

| Int. Marks | Ext. Marks | Total Marks | L | T | P | C |
|------------|------------|-------------|---|---|---|---|
| 40         | 60         | 100         | 4 | - | - | 4 |

**PRE-REQUISITES:** A Course on "Computer Networks".

#### **COURSE DESCRIPTION:**

Social Networks, Visualizing Online Social Networks, Modeling and aggregating social network data, Aggregating and reasoning with social network data, Framework, Algorithms and Systems for Expert Location in Social Networks, Text Mining in Social Networks.

#### **COURSE OUTCOMES:**

*After successful completion of this course, the student will be able to:*

- CO1:** Demonstrate the concepts of semantic web, current web, social web to analyze the applications of social networks
- CO2:** Identify and analyze web based social networks, human behavior for social communities, the role of ontology in modeling, aggregating and representing the social relationships using social network data.
- CO3:** Analyze tools of Web Ontology Language (OWL), Resource Description Framework (RDF) and SPARQL (Query Language for RDF) to design social networks.
- CO4:** Design Node-Edge diagrams, Node-Link diagrams, Trust models based on subjective logic for Visualizing social networks using matrix-based representations.
- CO5:** Adhere to ethics and adapt XML, URI and Unicode standards, responsibilities, and norms to managing the social network data.

#### **DETAILED SYLLABUS:**

#### **UNIT I-WEB-BASED NETWORKS (11 periods)**

**Semantic Web Concepts:** Limitations of current Web, Development of Semantic Web, Emergence of the Social Web; Social Network analysis: Development of Social Network Analysis, Key concepts and measures in network analysis; Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities, Web-based network, Applications of Social Network Analysis.

## **UNIT II – MODELING, AGGREGATING AND KNOWLEDGE REPRESENTATION**

**(11 periods)**

**Ontology and their role in the Semantic Web:** Ontology-based knowledge Representation, Ontology languages for the Semantic Web: Resource Description Framework, Web Ontology Language, Modeling and aggregating social network data: State-of-the-art in network data representation, Ontological representation of social individuals, Ontological representation of social relationships, Aggregating and reasoning with social network data, Advanced representations.

## **UNIT III – EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL**

### **NETWORKS**

**(11 periods)**

Extracting evolution of Web Community from a Series of Web Archive, Detecting communities in social networks, Definition of community, Evaluating communities, Methods for community detection and mining, Applications of community mining algorithms, Tools for detecting communities, social network infrastructures and communities, Decentralized online social networks, Multi-Relational characterization of dynamic social network communities.

## **UNIT IV – PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES (11 periods)**

Understanding and predicting human behavior for social communities, User data management, Inference and Distribution, Enabling new human experiences, Reality mining, Context, Awareness, Privacy in online social networks, Trust in online environment, Trust models based on subjective logic, Trust network analysis, Trust transitivity analysis, Combining trust and reputation, Trust derivation based on trust comparisons, Attack spectrum and counter measures.

## **UNIT V – VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS**

**(11 periods)**

Graph theory, Centrality, Clustering, Node-Edge Diagrams, Matrix representation, Visualizing online social networks, Visualizing social networks with matrix-based representations, Matrix and Node-Link Diagrams, Hybrid representations, Applications, Cover networks, Community welfare, Collaboration networks, Co-Citation networks.

**Total Periods: 55**

***Topics for self-study are provided in the lesson plan.***

**TEXT BOOKS:**

1. Peter Mika, "*Social Networks and the Semantic Web*", Springer, 1<sup>st</sup> Edition, 2007.
2. Borko Furht, "*Handbook of Social Network Technologies and Applications*", Springer, 1<sup>st</sup> Edition, 2010.

**REFERENCE BOOKS:**

1. Guandong Xu, Yanchun Zhang and Lin Li, "*Web Mining and Social Networking – Techniques and applications*", Springer, 1<sup>st</sup> Edition, 2011.
2. Dion Goh and Schubert Foo, "*Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively*", IGI Global Snippet, 2008.

**ADDITIONAL LEARNING RESOURCES:**

1. <https://www.uky.edu/celt/instructional-resources/teaching-technology/social-networking-tools>
2. <https://nptel.ac.in/courses/106/106/106106169/>
3. <https://www.edx.org/learn/social-media-marketing>
4. <http://www.iitrpr.ac.in/social-media>



## MCA V - SEMESTER

(19MC50108) **M-COMMERCE (Theory)**

**(Professional Elective-IV)**

| Int. Marks | Ext. Marks | Total Marks | L | T | P | C |
|------------|------------|-------------|---|---|---|---|
| 40         | 60         | 100         | 4 | - | - | 4 |

### **PRE-REQUISITES:**

Courses on "Database Management Systems" and "Computer Networks".

### **COURSE DESCRIPTION:**

Electronic Commerce; E-Commerce applications and web; Process models; Electronic payment systems; Mobile Commerce; Wireless/wired Commerce; Framework for the study of Mobile Commerce; NTT Docomo's I-Mode; Classification framework for Mobile Location Based Services; Mobile Data Technologies and Small Business Adoption And Diffusion; M-Commerce business models.

### **COURSE OUTCOMES:**

*After successful completion of this course, the students will be able to:*

- CO1:** Demonstrate knowledge on E-Commerce, electronic payment systems, architectures/ Frameworks/ Mercantile models used for E-Commerce applications.
- CO2:** Identify and analyze wireless technologies, mobile data technologies used for developing M-Commerce applications.
- CO3:** Analyze M-Commerce applications, framework of M-Commerce, technologies of wireless business to design business models.
- CO4:** Apply marketing business model, advertising business model and MMS, SMS for mobile commerce applications in marketing and advertising to Customers.
- CO5:** Adhere to ethics and adapt cyber regulations to design electronic payment systems, mobile business services of E-commerce and M-commerce applications.

### **DETAILED SYLLABUS:**

#### **UNIT I- ELECTRONIC COMMERCE**

**(11 periods)**

**Electronic Commerce:** Electronic Commerce Framework, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce Organization Applications. **Electronic commerce and World Wide Web:** Architectural Framework

for E-Commerce, WWW as the Architecture, Technology behind the Web, Security and the Web.

## **UNIT II – CONSUMER ORIENTED ELECTRONIC COMMERCE (12 periods)**

**Consumer Oriented Electronic commerce:** Mercantile Process models, Mercantile Models from Consumer's Perspective, Mercantile Models from Merchant's Perceptive.

**Electronic payment systems:** Types of Electronic Payment Systems- Digital Token-Based, Smart Cards, Credit Cards; Risks and Electronic Payment systems, Designing Electronic payment System.

## **UNIT III – MOBILE COMMERCE (10 periods)**

**Mobile Commerce:** Infrastructure of M-Commerce, Types of Mobile Commerce Services, Technologies of Wireless Business, Benefits and Limitations, Support, Mobile Marketing and Advertisement, Non-Internet applications in M-Commerce, Wireless/Wired Commerce comparisons.

## **UNIT IV – MOBILE COMMERCE TECHNOLOGY (10 periods)**

A framework for the study of Mobile Commerce, NTT Docomo's I- Mode, Wireless devices for Mobile Commerce, Classification framework for Mobile Location Based Services, Wireless personal and Local Area Networks, the impact of technology advances on strategy formulation in mobile communications networks.

## **UNIT V – MOBILE COMMERCE THEORY AND APPLICATIONS (12 periods)**

The Ecology of Mobile Commerce, the Wireless Application Protocol, Mobile Business Services, Mobile Portal, factors influencing the adoption of Mobile Gaming Services, Mobile Data Technologies and Small Business Adoption and Diffusion, M-Commerce in the automotive industry, Location-Based services, Criteria for adoption and solution deployment, the role of Mobile advertising in building a brand, M-Commerce business models.

**Total Periods: 55**

***Topics for self-study are provided in the lesson plan.***

### **TEXT BOOKS:**

1. Ravi Kalakota, B. Andrew Whinston, "*Frontiers of Electronic Commerce*," Pearson Education, 2003.
2. E. Brian Mennecke, J. Troy Strader, "*Mobile Commerce: Technology, Theory and*

*Applications,*" Idea Group Inc., IIR press, 2003.

**REFERENCE BOOKS:**

1. P. J. Louis, *"M-Commerce Crash Course,"* McGraw- Hill Companies, 2001.
2. Paul May, *"Mobile Commerce: Opportunities, Applications, and Technologies of Wireless Business,"* Cambridge University Press, 2001.

**ADDITIONAL LEARNING RESOURCES:**

1. <https://www.edx.org/learn/ecommerce>
2. <https://www.coursera.org/learn/digital-business-models>
3. <https://www.udemy.com/topic/e-commerce/>
4. <https://www.oxfordhomestudy.com/courses/online-management-courses/e-commerce-online-course>

## MCA V- SEMESTER

### (19MC50109) MACHINE LEARNING (Theory)

#### (Professional Elective-IV)

| Int. Marks | Ext. Marks | Total Marks | L | T | P | C |
|------------|------------|-------------|---|---|---|---|
| 40         | 60         | 100         | 4 | - | - | 4 |

#### PRE-REQUISITES:

Courses on "Data Warehousing and Data Mining" and "Probability and Statistics".

#### COURSE DESCRIPTION:

Learning problems; designing a learning system; Issues in machine learning; decision tree learning; artificial neural networks; evaluation hypotheses; estimation hypothesis accuracy; Bayesian learning and computational learning theory; learning sets of rules and analytical learning; combining inductive and analytical learning; reinforcement learning and Dynamic Programming.

#### COURSE OUTCOMES:

- CO1:** Demonstrate knowledge on Machine learning concepts, learning problems, decision tree learning, artificial neural networks and Bayesian learning, computational learning theory and probabilities.
- CO2:** Select and apply decision tree learning algorithms, artificial neural networks algorithms and probabilities to evaluate Learning problems of an application.
- CO3:** Analyze learning sets of rules, analytical learning of domain theories, inductive-analytical approaches to infer insights of learning.
- CO4:** Apply reinforcement learning, Bayesian learning and computational learning approaches to classify and assess cues in real time applications.
- CO5:** Demonstrate knowledge on reinforcement learning and Analytical Learning to know the consequences of actions and process information in specific environment.

#### DETAILED SYLLABUS:

#### UNIT I- INTRODUCTION TO MACHINE LEARNING (10 Periods)

Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning; Concept learning and the general to specific ordering, concept learning task, concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and candidate elimination algorithm, Remarks on version spaces and candidate elimination, inductive bias.

## **UNIT II - DECISION TREE LEARNING, ARTIFICIAL NEURAL NETWORKS AND EVALUATION HYPOTHESES (12 Periods)**

**Decision Tree Learning:** Decision tree representation, problems for decision tree learning, basic decision tree learning algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning.

**Artificial Neural Networks:** Neural network representation, problems for neural network learning, perceptions, multilayer networks and the back propagation algorithm, remarks on the back propagation algorithm.

**Evaluation Hypotheses:** Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms.

## **UNIT III - BAYESIAN LEARNING AND COMPUTATIONAL LEARNING THEORY**

**(12 Periods)**

**Bayesian Learning:** Bayes theorem, concept learning, maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, gibbs algorithm, Naive Bayes classifier, example learning to classify text, Bayesian belief networks- the EM algorithm.

**Computational learning theory:** Probability learning, approximately correct hypothesis, sample complexity for Finite Hypothesis Space, Sample Complexity for infinite Hypothesis Spaces, mistake bound model of learning.

## **UNIT IV - LEARNING SETS OF RULES AND ANALYTICAL LEARNING (11 Periods)**

**Learning Sets of Rules:** Sequential Covering Algorithms, Learning Rule Sets: Summary, Learning First Order Rules; Learning Sets of First Order Rules: FOIL, Induction as Inverted Deduction, Inverting Resolution.

**Analytical Learning:** Learning with perfect domain theories- Prolog-EBG; Remarks on Explanation-based Learning, Explanation-based Learning of Search Control Knowledge.

## **UNIT V - COMBINING INDUCTIVE AND ANALYTICAL LEARNING,**

**REINFORCEMENT LEARNING (10 Periods)**

**Combining Inductive and Analytical Learning:** Motivation, inductive-analytical approaches to Learning, Prior Knowledge to initialize the Hypothesis, Prior Knowledge to alter the Search Objective, Prior Knowledge to Augment Search Operators.

**Reinforcement Learning:** Learning Task, Q-Learning, Non-Deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to Dynamic Programming.

**Total Periods: 55**

***Topics for self-study are provided in the lesson plan.***

**TEXT BOOKS:**

1. Tom M. Mitchell, "*Machine Learning*," Mc Graw Hill, Indian Edition, 2017.
2. Stephen Marsland, "*Machine Learning: An Algorithmic Perspective*," Taylor & Francis (CRC), 2<sup>nd</sup> Edition, 2015.

**REFERENCE BOOKS:**

1. William W Hsieh, "*Machine Learning Methods in the Environmental Sciences, Neural Networks*," Cambridge University Press, 2009.
2. Richard O. Duda, Peter E. Hart and David G. Stork, "*Pattern classification*," John Wiley & Sons Inc., 2001.
3. Chris Bishop, "*Neural Networks for Pattern Recognition*," Oxford University Press, 1995.
4. Peter Flach, "*Machine Learning*," Cambridge University Press, 2012.

**ADDITIONAL LEARNING RESOURCES:**

1. <http://www.cs.cmu.edu/~tom/mlbook-chapter-slides.html>

## MCA V - SEMESTER

### (19MC50111) SOFTWARE SECURITY (Theory)

#### (Professional Elective-IV)

| Int. Marks | Ext. Marks | Total Marks | L | T | P | C |
|------------|------------|-------------|---|---|---|---|
| 40         | 60         | 100         | 4 | - | - | 4 |

#### PRE-REQUISITES:

Courses on "Software Engineering" and "Computer Networks".

#### COURSE DESCRIPTION:

Importance of Software Security - Security a Software Issue, Secure Software; Requirements Engineering for Secure Software; Security Principles in SDLC - Secure Software Architecture and Design, Secure Coding and Testing; Security and Complexity - System Assembly Challenges; Governance and Managing for more Secure Software.

#### COURSE OUTCOMES:

*After successful completion of this course, the students will be able to:*

- CO1:** Demonstrate knowledge on software security, security issues of a software, properties of secure software, Security practices for Software Architecture, Design, Secure Coding and Testing to manage secure software development.
- CO2:** Analyze the requirements engineering for secure software using SQUARE process model to build security in requirements phase of project development
- CO3:** Analyze the challenges of security failures in functional and attacker perspectives to overcome the technical complexity in project management.
- CO4:** Apply software security framework to design roadmap for secured project management.
- CO5:** Adhere to ethics and adapt cyber regulations using Governance and security standards for developing secure software, security guidelines and maturity of practice.

#### DETAILED SYLLABUS:

#### UNIT I- IMPORTANCE OF SECURITY IN SOFTWARE (11 Periods)

**Security a Software Issue:** Software Assurance and Software Security, Threats to software security, Sources of software insecurity, Benefits of detecting software security defects early, managing secure software development.

**Secure Software:** Properties of Secure Software, Influencing the security properties of software, Asserting and specifying the desired security properties.

## **UNIT II – REQUIREMENTS ENGINEERING (11 Periods)**

**Requirements Engineering for Secure Software:** Misuse and abuse cases, the SQUARE process Model, SQUARE sample outputs, Requirements elicitation, Requirements prioritization. IEEE Standard 1074-2006, Developing Software Project Life Cycle Processes

## **UNIT III – SECURITY PRINCIPLES IN SDLC (12 Periods)**

**Secure Software Architecture and Design:** Software Security practices for Architecture and Design - architectural risk analysis, Software security knowledge for Architecture and Design - Security principles, Security guidelines and Attack patterns.

**Secure Coding and Testing:** Code analysis, Coding Practices, Software Security testing, Security testing considerations throughout of the SDLC.

## **UNIT IV – SECURITY AND COMPLEXITY (11 Periods)**

**System Assembly Challenges:** Security failures, functional and attacker perspectives for security analysis in web services and identity management, system complexity drivers and security, Deep technical problem complexity.

## **UNIT V – GOVERNANCE AND MANAGING (10 Periods)**

**Governance and Managing for more Secure Software:** Governance and security, adopting an enterprise software security framework, Defining adequate security, Risk Management framework for software security, Security and Project Management, Maturity of Practice.

**Total Periods: 55**

***Topics for self-study are provided in the lesson plan.***

### **TEXT BOOK:**

1. Julia H. Allen, Sean Barnum, Robert J. Ellison, Gary McGraw, and Nancy R. Mead, "Security Engineering: A Guide for Project Managers," Pearson Education, 2009.

### **REFERENCE BOOKS:**



1. Gary McGraw, *"Software Security: Building Security In,"* Addison-Wesley, 2006.
2. Mark Dowd, John McDonald and Justin Schuh, *"The Art of Software Security Assessment: Identifying and Preventing Software Vulnerabilities,"* Addison-Wesley, 1<sup>st</sup> Edition, 2006.
3. John Viega and Gary McGraw, *"Building Secure Software: How to Avoid Security Problems the Right Way,"* Addison-Wesley, 2001.
4. G. Hoglund and G. McGraw, *"Exploiting Software: How to Break Code,"* Addison-Wesley, 2004.

**ADDITIONAL LEARNING RESOURCES:**

1. [https://swayam.gov.in/nd2\\_nou20\\_cs01/preview](https://swayam.gov.in/nd2_nou20_cs01/preview)
2. <https://www.coursera.org/learn/software-security>
3. <http://www.sei.cmu.edu/publications/books/cert/software-security-engineering.html>
4. <http://www.informit.com/store/product.aspx?isbn=032150917X>
5. <http://www.cert.org/podcast/show/20080527allen.html>

## MCA V SEMESTER

### (19MC50131) CLOUD COMPUTING LAB

| Int. Marks | Ext. Marks | Total Marks | L | T | P | C   |
|------------|------------|-------------|---|---|---|-----|
| 50         | 50         | 100         | - | - | 3 | 1.5 |

#### PRE-REQUISITES:

Courses on Cloud Computing, Computer Networks, Operating Systems and Object Oriented Programming through JAVA.

#### COURSE DESCRIPTION:

Practice on installation and configuration of IaaS and PaaS for developing the applications in cloud; Designing web applications in SaaS using JAVA and APEX Programming.

#### COURSE OUTCOMES:

*After successful completion of this course, the students will be able to:*

- CO1:** Demonstrate the web applications of IaaS, PaaS, and SaaS in cloud environment.
- CO2:** Identify and analyse the applications to install and configure the PaaS, SaaS and IaaS environments to develop applications and deploy in cloud environment.
- CO3:** Design and develop Cloud applications using service models of Amazon Web Services (IaaS), Google App Engine (PaaS) and Salesforce.com(SaaS).
- CO4:** Apply Java and Apex programming languages for the development of web applications in SaaS and PaaS environments.
- CO5:** Work independently or in teams to solve problems with effective communication.

#### LIST OF EXERCISES:

1. Create a word document of your class time table and store locally and on the cloud with doc, and pdf format.
2. Create a spread sheet which contains employee salary information and calculate gross and total sal using the formula DA=10% OF BASIC HRA=30% OF BASIC PF=10% OF BASIC IF BASIC<=3000 12% OF BASIC IF BASIC>3000 TAX=10% OF BASIC IF BASIC<=1500 =11% OF BASIC IF BASIC>1500 AND BASIC<=2500

=12% OF BASIC IF BASIC>2500 NET\_SALARY=BASIC\_SALARY+DA+HRA-PF-TAX.

3. Prepare a presentation on cloud computing introduction, models, services, and Architectures. Presentation should contain content, images of minimum 15 slides.
4. Create resume using google and zoho cloud programs in PaaS.
5. Write a Google app engine program to generate 'n' even numbers and deploy it to Google Cloud.
6. Write a Google app engine program to multiply two matrices.
7. Installation and configuration of JustCloud.
8. Create an EC2 instance and invoke Ubuntu operating system with a set of configuration on amazon web services under IaaS.
9. Create S3 bucket and store a file in the bucket using AWS.
10. Configure web server on Amazon Linux instance with ElasticIP.

### **Mini Project**

#### **REFERENCE BOOKS:**

1. Barrie Sosinsky, "*Cloud Computing Bible*", Wiley India Pvt. Ltd, 2011.
2. Rajkumar Buyya, James Broberg and Andrzej Goscinski, "*Cloud computing principles and paradigms*", John Wiley and Sons, 2011.
3. John W. Rittinghouse, James F. Ransome, "*Cloud Computing implementation, Management and Security*," CRC Press, Taylor and Francis group, 2010.

#### **SOFTWARE/TOOLS USED:**

1. Google App Engine
2. Amazon Web Services
3. Salesforce.com

#### **ADDITIONAL LEARNING RESOURCES:**

1. <https://mkyong.com/tutorials/google-app-engine-tutorial/>
2. <https://aws.amazon.com>