## SCHEME OF COURSES FOR MCA (2013-16)

### First Semester

| Sr. No | Course No. | Course Name | L | T | P | Cr. |
|---|---|---|---|---|---|---|
| 1. | PCA103 | Problem Solving And Programming in C | 3 | 0 | 4 | 5.0 |
| 2. | PCA205 | Statistics and Combinatorics | 3 | 1 | 2 | 4.5 |
| 3. | PCA104 | Operating Systems | 3 | 0 | 2 | 4.0 |
| 4. | PCA101 | Discrete Mathematical Structure | 3 | 1 | 0 | 3.5 |
| 5. | PCA105 | Computer Organization and Architecture | 3 | 1 | 0 | 3.5 |
| | | **Total** | **15** | **3** | **6** | **19.5** |

### Second Semester

| Sr. No | Course No. | Course Name | L | T | P | Cr. |
|---|---|---|---|---|---|---|
| 1. | PCA207 | Personality Development and Communication Skills | 3 | 1 | 0 | 3.5 |
| 2. | PCA203 | Object Oriented Programming | 3 | 0 | 2 | 4.0 |
| 3. | PCA204 | System Analysis and Design | 3 | 1 | 2 | 4.5 |
| 4. | PCA304 | Operation Research | 3 | 1 | 2 | 4.5 |
| 5. | PCA201 | Fundamentals of Scripting Languages | 3 | 0 | 2 | 4.0 |
| 6. | PCA202 | Fundamental of Microprocessors and Interfacing | 3 | 1 | 2 | 4.5 |
| | | **Total** | **18** | **4** | **10** | **25** |

### Third Semester

| Sr. No | Course No. | Course Name | L | T | P | Cr. |
|---|---|---|---|---|---|---|
| 1. | PCA305 | Computer Networks | 3 | 1 | 2 | 4.5 |
| 2. | PCA201 | Data Structure | 3 | 0 | 2 | 5.0 |
| 3. | PCA302 | Data Base Management System | 3 | 0 | 2 | 5.0 |
| 4. | PCA401 | Advanced Java Programming | 3 | 0 | 4 | 5.0 |
| 5. | PCA301 | Software Engineering | 3 | 0 | 2 | 4.0 |
| 6. | PCA414 | Theory of Computation | 3 | 1 | 0 | 3.5 |
| | | **Total** | **18** | **2** | **12** | **25** |

**Fourth Semester**

| Sr. No | Course No. | Course Name | L | T | P | Cr. |
|---|---|---|---|---|---|---|
| 1. | PCA503 | .Net Framework & C# Programming | 3 | 0 | 2 | 4.0 |
| 2. | PCA303 | Design and Analysis of Algorithms | 3 | 1 | 0 | 3.5 |
| 3. | PCA403 | ERP and Tools | 3 | 0 | 2 | 4.0 |
| 4. | | Elective I | 3 | 0 | 2 | 4.0 |
| 5. | | Elective II | 3 | 0 | 2 | 4.0 |
| 6. | PCA491 | Minor Project | 0 | 0 | 4 | 2.0 |
| | | **Total** | **15** | **1** | **12** | **21.5** |

**Fifth Semester**

| Sr. No | Course No. | Course Name | L | T | P | Cr. |
|---|---|---|---|---|---|---|
| 1. | PCA408 | Mobile Application Development | 3 | 0 | 2 | 4.0 |
| 2. | PCA402 | Computer Graphics | 3 | 0 | 2 | 4.0 |
| 3. | PCA514 | Cryptography and Network Security | 3 | 0 | 2 | 4.0 |
| 4. | | Elective III | 3 | 0 | 2 | 4.0 |
| 5. | | Elective IV | 3 | 0 | 2 | 4.0 |
| | | **Total** | **15** | **0** | **10** | **20** |

**Sixth Semester**

| Sr. No | Course No. | Course Name | L | T | P | Cr. |
|---|---|---|---|---|---|---|
| 1. | PCA692 | System Development Project | - | - | - | 10.0 |

**Elective - I**

| Sr. No | Course No. | Course Name | L | T | P | Cr. |
|---|---|---|---|---|---|---|
| 1. | PCA423 | Parallel and Distributed Computing | 3 | 0 | 2 | 4.0 |
| 2. | PCA421 | Database Administration | 3 | 0 | 2 | 4.0 |
| 3. | PCA412 | Software Testing and Quality Management | 3 | 0 | 2 | 4.0 |
| 4. | PCA213 | Graph Theory with Applications | 3 | 0 | 2 | 4.0 |

**Elective- II**

| Sr. No | Course No. | Course Name | L | T | P | Cr. |
|---|---|---|---|---|---|---|
| 1. | PCA401 | Network Programming | 3 | 0 | 2 | 4.0 |
| 2. | PCA541 | Data Warehousing and Data Mining | 3 | 0 | 2 | 4.0 |
| 3. | PCA542 | Digital Image Processing | 3 | 0 | 2 | 4.0 |

**Elective - III**

| Sr. No | Course No. | Course Name | L | T | P | Cr. |
|---|---|---|---|---|---|---|
| 1. | PCA409 | Cloud Computing and Virtualization | 3 | 0 | 2 | 4.0 |
| 2. | PCA410 | Artificial Intelligence and Its Applications | 3 | 0 | 2 | 4.0 |
| 3. | PCA502 | Software Project Management | 3 | 0 | 2 | 4.0 |
| 4. | | Soft Computing | 3 | 0 | 2 | 4.0 |

**Elective- IV**

| Sr. No | Course No. | Course Name | L | T | P | Cr. |
|---|---|---|---|---|---|---|
| 1. | | Distributed and Mobile Databases | 3 | 0 | 2 | 4.0 |
| 2. | | Soft Mining and Re-engineering | 3 | 0 | 2 | 4.0 |
| 3. | PCA521 | Open Source Web Development Using LAMP Tecnology | 2 | 0 | 4 | 4.0 |
| 4. | PCA533 | System Programming | 3 | 0 | 2 | 4.0 |

**Total Credits = 121**

*Note: Syllabus of subjects which were dropped from 2014 MCA Course scheme are attached.*

## PCA205: STATISTICS AND COMBINATORICS

| L | T | P | Cr |
|---|---|---|---|
| 3 | 1 | 2 | 4.5 |

**Prerequisite(s): None**

**Course Objective:** The main objective of this study is to

- Understand about the generation of random numbers, probability distribution and its properties.
- Discuss about the concept of various discrete and continuous probability distributions for solving various day-to-day life problems.
- Develop a framework for testing the hypothesis and correlation analysis for estimating and prediction purposes.
- Deal with concept of counting principle, recurrence and generating functions for solving ordinary difference equations.

**Random Number Generation and Statistical Data**: Basic concepts in random number generation; Methods for generating random numbers and their efficiency test; Methods for generating random numbers for probability distributions; Frequency distribution; Frequency curve and histogram; Measure of central tendency and dispersion.

**Random variable and probability distributions:** Basic concepts of probability and its properties; Additive and Multiplicative theorem of probability; Conditional probability and independent events; Random variable, Notion of sample space; Marginal, Conditional and joint distributions; Mathematical expectation, Binomial, Poisson, Rectangular, Exponential and Normal distributions; Bivariate Distributions.

**Sampling distributions:** Notion of random sample and sampling distributions; Parameter and statistics, Standard error; Chi-square, t, F distributions; Basic ideas of testing of hypothesis; Testing of significance based on normal, Chi-square, t and F distributions; Analysis of Variance, One way ANOVA and Two way ANOVA with fixed effect; Interval estimation.

**Design of experiments:** Basic principles, Study of completely randomized and randomized block designs.

**Principle of Least Square**: Curve fitting; Correlation and Regression coefficients (two variables only); Rank Correlation.

**Permutations and Combinations**: Basic Concepts; Rules of counting; Combinational distribution of distinct and non-distinct objects; Generating functions for permutation and combinatorial enumeration.

**Recurrence Relations**: Linear recurrence relation with two indices; Inclusion and Exclusion principle; Formula derangement; Restrictions on relative positions; Homogenous recurrence relation, Characteristic equation, Solution of non-homogenous finite order linear recurrence relation; Generating functions and its applications using Catalan numbers, data structure.

**Laboratory Work**: Implementation of statistical techniques using C/C++ including Generation of Random Numbers for some distributions; Regression analysis using least square approximation; Correlation Analysis; Hypothesis Testing; Program to obtain Frequency Charts for large data set and fitting a distribution.

**Course Outcome:** Upon successful completion of the course the students will be able to

- Understand the various approaches for dealing the data using theory of probability.
- Analyze the different samples of data at different level of significance using various hypothesis testing.
- Develop a framework for estimating and predicting the different sample of data for handling the uncertainties.
- Solve the difference equation and its various applications using recurrence and generating functions.

***Recommended Books:***


1. *Hogg, Robert V, Elliot A Tanis and Rao, Jagan M., Probability and Statistical Inference, Pearson Education (2009).*
2. *Grimaldi, R.P. and Ramana B.V., Discrete and Combinatorial Mathematics, Pearson Education (2007).*
3. *Meyer P.L, Introductory Probability and Statistical Applications, Oxford and IBH (1970).*
4. *Krishnamurthy V., Combinatorics: Theory and Applications, Affiliated East-West Press (2008).*

## PCA201: FUNDAMENTALS OF SCRIPTING LANGUAGES

| L | T | P | Cr |
|---|---|---|---|
| 3 | 0 | 2 | 4.0 |

**Prerequisite(s): None**

**Course Objective:** On completion of the course, student will be able to

- Understand the major protocols for internetworking in today's Internet
- Understand client-server architecture
- Perform basic website design
- Perform basic client side programming
- Create HTML documents and forms and usage of XML tools with different XML technologies to generate XML documents

**INTERNET :** Evolution of the Internet and the Growth of the World Wide Web,Client-Server model, Internet Applications-FTP, Telnet, Email and Chat, Architecture of the Intranet/ Internet /Extranet, Firewall design issues, Introduction to Proxy servers, Portals , Email: email clients, server and gateways; WWW – HTTP and HTTPS: Role of W3C.

**HTML:** Introduction: HTML History, HTML Document: Headers, Body, Tags, Format, Elements, Paragraphs, Titles, Lists, Formatting HTML Documents : Logical styles, Physical Styles (Bold, Italic, underlined, crossed),Managing Images , Frames and Tables , Hyperlinks, Types of links: Internal Links and External Links, Link Tags, Links with images and buttons, Links that send email messages,Special Effects in HTML Documents: Text fonts , Sensitive Images, Tip tables, Page background, Rotating messages ( Marquee),Counters, Multimedia: Inserting audio files and video files, Managing Forms: Creating data entry forms, Calling CGI scripts for modifying entered data,CGI Primer, Handling Form Output with CGI, CGI Documentation Links, Filling out HTML forms, Creating output documents

**JavaScript:** Introduction to java script, Advantage of java script, Java script syntax, Data type- Variable, Array, Operator and Expression looping constructor, Function, Dialog Box, DOM, Event handling, Window object, Document object, Browser object, Form object, Navigator object, Screen object, Built in object, User defined object,
Cookies

**XML:** Introduction and Overview, Namespace, Fundamentals: Creating XML document, Defining structure,Rules for well formed and valid XML, XML Syntax, XML Namespaces, XML DTD, XML Schema Definition (XSD), XQuery and XPath, Publishing XML, XSL, Transformation with XSLT, Xlink, XPointer, XForms, XML Applications, XML parser, API for XML(SAX), XML case study.

**Course Outcome:** After Completion of course, students should be able to

- Understand the major protocols for internetworking in today's Internet
- Understand client-server architecture
- Perform basic website design
- Perform basic client side programming
- Create HTML documents and forms and usage of XML tools with different XML technologies to generate XML documents

***Recommended Books:***


1. *Preston Gralla and Michael Troller., How the Internet Works, Que, (2006).*
2. *Thomas A Powell, HTML and XHTML Complete Reference, McGraw Hill (2003).*
3. *Thomas A Powell and Fritz Schneider, Java Script Complete Reference, McGraw Hill (2012).*
4. *Niederst, J., Web Design in a Nutshell, O'Reilly (2001)*

## PCA202: FUNDAMENTAL OF MICROPROCESSORS AND INTERFACING

| L | T | P | Cr |
|---|---|---|---|
| 3 | 1 | 2 | 4.5 |

**Prerequisite(s): None**

**Course Objective:** On completion of the course, student will be able to

- Develop an understanding of basic understanding of microprocessor.
- Understanding the various programming features of 8085 and 8086 microprocessors
- Learn the internal organization of microcontrollers
- Design the memory system and their interfacing.
- Understand the various features and interfacing of Peripheral controllers.

**Introduction to Microprocessors:** Need for flexible logic, Evolution of microprocessors, Microprocessor applications, Generic Architecture of microprocessor, Microcomputer system.

**Intel 8085 Microprocessor:** Pin functions, Architecture, Addressing modes, Instruction set, Microprocessor

**Programming Techniques:** Counters & Delays, Subroutines and Stacks, Programming examples, Timing diagrams, Interrupts.

**Intel 8086 Microprocessor:** PIN functions, Architecture, Characteristics and basic features of family, Segmented memory, Instruction set: data transfer instructions, Arithmetic, Logical, Shift and rotate instructions, String instructions, Flag control instructions, Transfer of control instructions, Processor control instructions. Programming examples, Interrupt structure.

**Intel 8086 System Configuration:** Basic 8086 CPU hardware design, Generating the 8086 System clock and reset signals, Min/Max mode system configuration.

**Main Memory System Design:** Types of main memories, Memory organization, CPU read/write timing diagrams, RAM and ROM interface requirements, DRAM interfacing and DRAM controller (8203).

**Basic Input/Output:** Serial I/O, Parallel I/O, Programmed I/O, Interrupt driven I/O, Direct memory access, DMA controller (8237).

**Peripheral Controllers:** Programmable peripheral interface (8255), Programmable interrupt controller (8259), Programmable timer (8253/8254), Programmed keyboard and display interface (8279), Serial Interface controller (8251), interfacing with A/D & D/A converters.

Main Features of advanced microprocessors like 80186, 80286, 80386, 80486 and Pentium processors.

**Laboratory Work:** Lab work will be based on various addressing modes, Data Transfer techniques, Testing all Arithmetic and Logical Instructions and their affect on various flags. Programs on Branch and Loop, String Instructions, Sorting, Sum Of natural Numbers, Multiplication, Division, Factorial, etc. Built-in Software Routines will also be used in the

programs. Interfacing like programs to introduce delays, to generate square & rectangular waves at different frequencies will be implemented.

**Course Outcome:** After Completion of course, students should be able to

- Understand various programming and theoretical features of 8085 microprocessors
- Understand various programming and theoretical features of 8086 microprocessors
- Design the different type of memory systems and their interfacing.
- Understand the various features and interfacing of Peripheral controllers.
- Understand various features used in advances microprocessors

***Recommended Books:***


1. *Gaonkar R. S., The 8085 Microprocessor – Architecture, Programming and Interfacing, Penram International (2002).*
2. *YU-Cheng Liu and Glenn A. Gibson, Microprocessor Systems: The 8086/8088 Family Architecture, Programming and Design, Prentice Hall of India (2004).*
3. *Hall, D. V., Microprocessor – Interfacing, Programming and Hardware, Tata Mc Graw Hill (2006).*
4. *Barry B. Brey, The Intel Microprocessors – 8086 Family, Prentice Hall Of India (1994).*
5. *John Uffenbeck, The 8086/8088 Family – Design, Programming and Interfacing, Prentice Hall of India (1999).*

## PCA303: DESIGN AND ANALYSIS OF ALGORITHMS

| L | T | P | Cr. |
|---|---|---|---|
| 3 | 1 | 2 | 4.5 |

**Prerequisite(s): Good Knowledge of C-Programming and Data Structures**

**Course Objective:**

- To introduce the concepts of algorithm analysis using time complexity.
- To introduce the algorithm design methodologies.

**Introduction:** Introducing the concept of algorithm and need of its analysis, Euclid's algorithm, Problem, Instance, RAM model, Asymptotic complexity, Analysis of Algorithms, Principles of Algorithm Design, Finding Maximum and Minimum.

**Divide and Conquer:** Introduction, Sorting, Median Finding.

**Greedy Algorithms:** Introduction, Set of Intervals, Fractional Knapsack, Huffman Coding.
**Backtracking:** 8 queens problem, sum of subsets.

**Dynamic Programming:** Introduction, Knapsack problem, Longest common subsequence, Optimal search trees, Machine Scheduling Problem.

**NP-Completeness:** Introduction to NP-Complete, Search/Decision, SAT, Exact Cover, Multi Set, Subset Sum and Partition, Hamiltonian Circuit.

**Laboratory Work:** Implementation of programs related to algorithm design techniques shall be implemented in laboratory work.

**Course Outcome:**

- After going through this course, a student shall be able to appreciate the requirements of algorithm analysis.
- One shall understand the concepts behind divide and conquer; greedy technique, backtracking and dynamic programming after going through this course.
- One will be able to understand the concept behind NP-completeness.
- A student will also have hands on experience in implementing these strategies on machine.

***Recommended Books:***


1. *Horowitz, Ellis, Sahni, S. and Rajasekaran, S., Fundamentals of Computers Algorithms, University Press(2008).*
2. *Cormen, Thomas, H., Leiserson, Charles E., Rivest, Ronald L., Stein, Clifford, Introduction to Algorithms, MIT Press (2001) 2nd ed.*
3. *Levitin, Anany,V., Introduction to the design and analysis of algorithms, Addison Wesley (2006) 2nd ed..*
4. *Aho, A.V., Hopcraft, J.E. and Dulman, J., Design and Analysis Algorithms, Dorling Kindersley (2008).*

## PCA541: DATA WAREHOUSING AND DATA MINING

| L | T | P | Cr |
|---|---|---|---|
| 3 | 0 | 2 | 4.0 |

**Prerequisite(s): Data Base Management System**

**Course Objective**: Students will be enabled to

- Understand and implement classical models and algorithms in data warehousing and data mining.
- Learn how to analyze the data, identify the problems, and choose the relevant models and algorithms to apply.
- Apply preprocessing statistical methods for any given raw data.
- Select and apply proper data mining algorithms to build analytical applications.
- Study the methodology of engineering legacy databases for data warehousing and data mining to derive business rules for decision support systems.

**Data Warehousing:** Data warehousing components, Building a Data warehouse, Mapping the data warehouse to a multiprocessor architecture, DBMS schemas for decision support, Data extraction, Cleanup, and Transformation tools, Metadata.

**Data Mining**: Introduction of data mining, Data, Types of data, Data mining functionalities, Interestingness of Patterns, Classification of data mining systems, Data mining task primitives, Integration of a data mining system with a data warehouse issues, Data preprocessing, Association rule mining and classification.

**Data Preprocessing**: Needs preprocessing the data, Data cleaning, Data integration and transformation, Data reduction, Discretization and concept hierarchy generation, Online data storage.

**Business Analysis:** Reporting and query tools and applications, Tool categories, The need for applications, Cognos Impromptu, Online Analytical Processing (OLAP), Multidimensional data model, OLAP guidelines, Multidimensional versus Multirelational OLAP, Categories of Tools, OLAP Tools.

**Mining Association Rules in Large Databases**: Association rule mining, Mining single, Dimensional, Boolean association rules from transactional databases.

**Classification and Prediction**: Issues regarding classification and prediction, Classification by decision tree induction, Bayesian classification, Classification by back propagation, Prediction, Classifier accuracy.

**Cluster Analysis Introduction:** Types of data in cluster analysis, A categorization of major clustering methods, Partitioning methods, Density-based methods, Model-based clustering methods, Outlier analysis.

**Laboratory Work:** Implementation of association rule mining algorithms, Performance evaluation of algorithms, Classification algorithm, Bayesian method, Estimating predictive accuracy of classification methods, Cluster analysis method.

**Course Outcome:** Having successfully completed the course, student will be able to:

- Implement the models and algorithms according to the type of problem and evaluate their performance.
- Assess raw input data , process it to provide suitable input for a range of data mining algorithms.
- Derive business rules for large databases using decision support systems.
- Classification and estimation of predictive accuracy of different algorithms.

***Recommended Books:***


1. *Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint (2007).*
2. *Paulraj pooniah, Data Warehousing Fundamentals, willey interscience Publication, (2001).*
3. *Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", Person Education ( 2007).*
4. *Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques", Morgan Kaufmann Publishers ( 2006).*

## PCA542: DIGITAL IMAGE PROCESSING

| L | T | P | Cr |
|---|---|---|---|
| 3 | 0 | 2 | 4.0 |

**Prerequisite(s): None**

**Course Objective:** On completion of the course, student will be able to:

- Built an understanding of the fundamental concepts of computer networking.
- Identify the different types of network topologies and layer design issues.
- Understand the working of different protocols at different layers.
- Setup and configuration of various types of networks.
- Develop practical networking knowledge and skills in a professional environment.

**Introduction**- Image analysis and computer vision, Imaging systems, Fundamental Steps in Image Processing, Elements of Digital image processing systems, Sampling and quantization, some basic relationships like neighbours, connectivity, Distance measure between pixels, Imaging Geometry.

**Image Transforms**: Discrete Fourier Transform, Some properties of the two-dimensional Fourier transform, Fast Fourier transform, Inverse FFT. Wavelet transforms.

**Image Enhancement**: Spatial domain methods, Frequency domain methods, Enhancement by point processing, Spatial filtering, Lowpass filtering, Highpass filtering, Homomorphic filtering, Colour Image Processing.

**Image Restoration**: Degradation model, Diagnolization of Circulant and Block-Circulant Matrices, Algebraic Approach to Restoration, Inverse filtering, Wiener filter, Constrained Least Square Restoration, Interactive Restoration, Restoration in Spatial Domain.

**Image Compression**: Coding, Interpixel and Psychovisual Redundancy, Image Compression models, Error free comparison, Lossy compression, Image compression using wavelets, Image compression standards-JPEG and JPEG2000.

**Image Segmentation**: Detection of Discontinuities, Edge linking and boundary detection, Thresholding, Region Oriented Segmentation, Motion based segmentation.

**Representation and Description**: Representation schemes like chain coding, Polygonal Approximation, Signatures, Boundary Segments, Skeleton of region, Boundary description, Regional descriptors, Morphology.

**Recognition and Interpretation**: Elements of Image Analysis, Pattern and Pattern Classes, Decision-Theoretic Methods, Structural Methods, Interpretation.

**Laboratory Work:** The lab work will be based on operations like image enhancement, image zooming, image cropping, image restoration, image compression and image segmentation etc.

**Course Outcome:** After Completion of course, students should be able to

- Understand the basics of computer networks.
- Understand network layer design issues.
- Understand the working of different protocols at different layers.
- Setup and configuration of various types of networks.
- Develop practical networking knowledge and skills in a professional environment.

***Recommended Books****:*


1. *R. C. Gonzalez, and R. E. Woods, Digital Image Processing, Tata McGraw Hill (2010).*
2. *A. K. Jain, Fundamentals of Digital Image Processing, Pearson Education, (2001).*
3. *R. C. Gonzalez, and R. E. Woods, Digital Image Processing using MATLAB, Pearson Education (2004).*
4. *W. K. Pratt, Digital Image Processing, John Wiley (1991).*

## PCA409: CLOUD COMPUTING AND VIRTUALIZATION

| L | T | P | Cr |
|---|---|---|---|
| 3 | 0 | 2 | 4.0 |

**Prerequisite(s): None**

**Course Objectives:** On completion of the course, student will be able

- To understand the basic concepts like cloud types, cloud architecture, cloud models etc.
- To understand the key characteristics, various software and service providers of cloud computing
- To understand the taxonomy, types and different hypervisors of clouds for the virtualization.
- To highlight the advantages of deploying Cloud Computing
- To illustrate the practical adoption of a Cloud deployment through real life case studies.

**Cloud Computing:** Basics of emerging cloud computing paradigm, Deployment models, Reference models, Cloud cube model, Cloud software and service providers, Cloud migration, Benefits and challenges to cloud computing, Characteristics of Clouds .

**Virtualization:** Concept and types, Advantages of Virtualization, Taxonomy of virtulization, Physical and logical partitioning, Migration and deployment of virtual machines, XEN ,QEMU, VMware, Hyper-V etc., Uses of virtual server consolidation.

**Cloud Storage:** Architecture of storage (S3), Different storage models, Blobs, Buckets, Tables, ACL, Storage network design considerations, NAS and Fibre channel SANs, Global storage management locations, scalability, operational efficiency.

**Cloud Monitoring:** Architecture for federated Cloud Computing, Service Oriented Architecture, Foundation for SLA, Components of the SLA, Selected business use cases.

**Cloud Security:** Trust models for clouds, Security and disaster recovery, Security base line, Fear Uncertainty Doubt and Disinformation factor, Challenges, Data center security recommendations, Statement of audit standards, Cloud security alliance, Recovery time objectives and vendor security process.

**Demystifying the Cloud:** Using case studies like Hadoop, Google App Engine, Amazon EC2, Eucalyptus, Open Nebula etc.

**Laboratory work:** To Set up your own cloud using open source or cloud simulator, Configuring Open Source Hypervisor, Virtual machine creation, Configuring SSH, Installation of NFS.

**Course Outcomes:** After Completion of this course, the students would be able to:

- Understand the basic concepts of Cloud Computing.
- Identify the pros and cons of the cloud computing technology, and determine its impact on businesses.
- Differentiate cloud categories, currently available cloud services and adoption measures.
- Identify risks involved, and risk mitigation measures.

- Prepare for any upcoming Cloud deployments and be able to get started with a potentially available Cloud setup.

***Recommended Books:***


1. *Rajkumar Buyya, James Broberg, Andrzej Goscinski, Cloud Computing: Principles and Paradigms, John Wiley and Sons (2011).*
2. *David E.Y. Sarna, Implementing and Developing Cloud Computing Applications, CRC (2011).*
3. *William von Hagen, Professional Xen Virtualization, Wrox Publications, (2008).*
4. *Chris Wolf , Erick M. Halter, Virtualization: From the Desktop to the Enterprise, APress (2005).*
5. *George Reese, Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, O'Reilly Publishers (2009).*