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

### First Semester

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<tr>
<th>Sr. No</th>
<th>Course No.</th>
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<tbody>
<tr>
<td>1.</td>
<td>PCA103</td>
<td>Problem Solving And Programming in C</td>
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<td>2.</td>
<td>PCA205</td>
<td>Statistics and Combinatorics</td>
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<td>3.</td>
<td>PCA104</td>
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### Second Semester

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<td>1.</td>
<td>PCA207</td>
<td>Personality Development and Communication Skills</td>
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<td>PCA201</td>
<td>Fundamentals of Scripting Languages</td>
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<td>PCA202</td>
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<td>PCA305</td>
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Fourth Semester

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<td>1.</td>
<td>PCA503</td>
<td>.Net Framework &amp; C# Programming</td>
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<td>PCA403</td>
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Elective - I

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<tr>
<td>1.</td>
<td>PCA423</td>
<td>Parallel and Distributed Computing</td>
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Elective- II

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<td>3.</td>
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<td>Digital Image Processing</td>
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### Elective - III

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<tr>
<td>1.</td>
<td>PCA409</td>
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<td>2.</td>
<td>PCA410</td>
<td>Artificial Intelligence and Its Applications</td>
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**Total Credits = 121**

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

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.


JavaScript: Introduction to JavaScript, Advantage of JavaScript, JavaScript 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


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:

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 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:**

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.


Backtracking: 8 queens problem, sum of subsets.


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:

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.

**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:**

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  

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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 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:

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 virtualization, 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 fact or, 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:**