

MCA II-Semester

MCA 201A : PROBABILITY AND STATISTICS FOR COMPUTER APPLICATIONS

UNIT I

Probability: Sample space and events – Probability – The axioms of probability – some elementary theorems – conditional probability – Bayes Theorem.

UNIT II

Random variables – Discrete and continuous – Distribution – Distribution, function. Binomial Poisson and Normal distributions – related properties.

UNIT III

Sampling distribution: Population and samples – sampling distributions of mean (Known and unknown) proportions, sums and differences: Point estimation – interval estimation – Bayesian estimation.

UNIT IV

Test of hypothesis – mean and proportions – Hypothesis concerning one and two means

– Type I and Type II errors. One tail, two-tail tests. Test of significance – students t-test, f-test, χ^2 -test. Estimation of proportions.

UNIT V

Curve fitting: The method of least squares – Inferences based on the least squares estimation Curvilinear regression – multiple regressions – correlation for univariate and bivariate distributions.

TEXT BOOKS:

1. W. Mendenhall, R.J. Beaver and B. M. Beaver, Introduction to Probability and Statistics, Twelfth Edition, Thomson, 2007
2. Erwin Miller and John E. Freund. Probability and Statistics for engineers, 6th edition, Pearson

REFERENCE BOOKS:

1. Hogg R V, and Craig A L, *Introduction to Mathematical Statistics*, American Publishing.
2. Blake I E, *An Introduction to Applied Probability*, John Wiley.
3. Lipschutz S, *Probability* (Schaum Series) Mc Graw-Hill.
4. Montgomery D C, *Introduction to Statistical Quality Control*, Wiley.
5. Montgomery D C, *Design and Analysis of Experiments*, 5th edition, Wiley, 2000.
6. Grant E.L. and Leavenworth R.S. Statistical Quality Control 7th edition, Mc Graw – Hill 2003.
7. Dr. Shahnaz Bathul, Text Book of Probability and Statistics, VGS Publishers,

MCA 201 B – Statistical Methods for Computer Applications

UNIT – I

Elementary Concepts in Statistics: variables, Statistical Significance, How to measure the magnitude of relations between variables, common general format of most Statistical test, how the level of Statistical significance is calculated, why the normal Distribution is important. Basic Statistics and Tables: Descriptive Statistics, Correlations, t-test for Independent and Dependent Samples. ANOVA/MANOVA: Overview, complex design, Analysis of Covariance, Multivariate Designs, Contrast Analysis and post-hoc Test.

UNIT - II

Association Rules: Overview Computational Procedures and Terminology, Tabular Representation of Associations, Graphical representations of associations. Boosting Tree: Gradient Boosting trees, Stochastic Gradient Boosting, Stochastic Gradient Boosting Trees and Classification. Canonical Tree: General Ideas, sum scores, canonical roots, number of roots, and extraction of roots.

UNIT - III

CHAID Analysis: Basic tree-Building algorithm, CHAID and Exhaustive CHAID, General Computation Issues of CHAID, CHAID, CART, and QUEST. Classification and Regression Trees: Overview Computational Details, Computational Formulas.

UNIT - IV

Cluster Analysis: Statistical Significance testing, area of application, Joining, Two-way joining, k-Means Clustering, EM Clustering, finding the right number of clusters in k-Means and EM Clustering: V-Flod cross-validation.

UNIT – V

A brief introduction to SPSS: Introduction, Data Entry, Storing and retrieving data files, the statistics menus, the output viewer, the chart editor, programming in SPSS, Data Description and simple inference for continuous data: the Lifespans of rates and ages at marriage in the US: Description of data, methods of analysis, analysis using SPSS, example programming's.

Test Books:

1. Statistical Methods and Applications by Thomas Hill and Pawel Lewicki copyright © 2006 1st Edi.
2. A Handbook Statistical Analysis using SPSS by Sabine Landau and Brian S. Everitt, copyright © 2004 chapman & Hall/CRC Press LLC.

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MCA 202: DATA STRUCTURES USING JAVA

UNIT I

LINEAR DATA STRUCTURES : Abstract Data Types - Asymptotic Notations: Big-Oh, Omega and Theta – Best, Worst and Average case Analysis: Definition and an example – Arrays and its representations – Stacks and Queues – Linked lists – Linked list based implementation of Stacks and Queues – Evaluation of Expressions – Linked list based polynomial addition.

UNIT II

NON-LINEAR DATA STRUCTURES; Trees – Binary Trees – Binary tree representation and traversals – Threaded binary trees – Binary tree representation of trees – Application of trees: Set representation and Union-Find operations – Graph and its representations – Graph Traversals – Connected components.

UNIT III

SEARCH STRUCTURES AND PRIORITY QUEUES: AVL Trees – Red-Black Trees – Splay Trees – Binary Heap – Leftist Heap

UNIT IV

SORTING: Insertion sort – Merge sort – Quick sort – Heap sort – Sorting with disks – k-way merging – Sorting with tapes – Polyphase merge.

UNIT V

SEARCHING AND INDEXING: Linear Search – Binary Search - Hash tables – Overflow handling – Cylinder Surface Indexing – Hash Index – B-Tree Indexing.

TEXT BOOK:

1. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures, Galgotia Book Sorce, Gurgaon, 1976.
2. Gregory L. Heilman, Data Structures, Algorithms and Object Oriented Programming, Tata Mcgraw-Hill, New Delhi, 2002.

REFERENCES:

1. Jean-Paul Tremblay and Paul G. Sorenson, An Introduction to Data Structures with Applications, Second Edition, Tata McGraw-Hill, New Delhi, 1991.
2. Alfred V. Aho, John E. Hopcroft and Jeffry D. Ullman, Data Structures and Algorithms, Pearson Education, New Delhi, 2006.

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MCA 203 OPERATING SYSTEMS

UNIT I

Introduction to Operating Systems, Types of Operating Systems, Computing Environments, Computer system operation, I/O structure, and Hierarchy, Hardware protection, Network structure, Operating system components and services – system calls, Systems programs, System Structure, Virtual machines, System design and Implantation.

UNIT II

CPU Scheduling: Scheduling criteria, Scheduling Algorithms, Multiple processor Scheduling, Real-time scheduling. Process Synchronization:- The critical-section problem, Synchronization hardware, Semaphores, Classic problems of

Synchronization, Critical regions, Monitors. Dead Locks: Deadlock characterization, Deadlock handling, Deadlock prevention, Deadlock avoidance, Deadlock detection, and Recovery.

UNIT III

Memory Management: Swapping, Contiguous memory allocation, Paging, Segmentation with paging Concept of Virtual memory Demand paging Page replacement, Allocation of frames, Thrashing. File System Interface & Implementation: File concept, Access methods, Directory structure, File System Mounting File sharing Protection, File system structure, and implementation, Directory implementation, Allocation methods. Free space management, Efficiency and performance, Recovery.

UNIT IV

I/O Systems: overview, I/O hardware, Application I/O interface, Kernel I/O subsystem, Transforming I/O to Hardware operations, STREAMS, Performance of I/O. Mass Storage Structure:- Disk Structure Disk Scheduling, Disk management, Swap-space Management, RAID Structure, Disk Attachment, Stable – Storage implementation, Tertiary – storage structure. Protection: Goals, Domain of protection, Access matrix and implementation, Access rights, capability – based systems, Language – based protection.

UNIT V

User authentication, program threats, system threats, security systems Facilities,. Linux system: History, Design principles, Kernel modules, process management, Scheduling Memory Management, File Systems, Input and output, IPC, Network structure, security.

TEXT BOOKS:

1. Silberschatz A, Galvin P.B, and Gagne G. Operating System Concepts, 6th edition, John Wiley, 2002.
2. Tenenbaum A.S., Modern Operating Systems, 2nd edition, Pearson Education, 2001.

REFERENCE BOOKS:

1. Dhamdhere D.M., Operating Systems – A concept based Approach, Tata McGraw-Hill, 2002.
2. Flynn I M, and Mc Hoes A.M., Understanding Operating Systems, 3rd edition, Thomson Brooks/Cole, 2001.
3. Bhatt P.C.P., An Introduction to Operating Systems – Concepts and Practice, PHI, 2003.
4. Harris J.A., Operating Systems, Tata McGraw-Hill (Schaum's Outlines series), 2002.
5. Remy Card, Eric Dumas, Linux Kernel Book , O'Reilly

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MCA 204 ADVANCED DATABASE MANAGEMENT SYSTEMS

UNIT I

Introduction, Database- System Application – Purpose of Database Systems – View of Data – Database Languages – Relational Databases – Database Design – Object – based and Analysis – Database Architecture. Entity – Relationship mode: Structure of Relational Databases - . Relational Algebra Operations – Modification of the Database.

SQL : Data Definition- Structure of SQL Queries- Set Operations- Aggregate Functions- Nested Sub queries- Complex Queries – SQL Data Types and Schemas- Integrity Constraints-Authorization- Embedded SQL- Dynamic SQL

UNIT II

The Entity – Relationship Model-Constraints-Entity-Relationship Diagrams, Design Issue-Weak Entity Sets-Database Design for Banking Enterprise- The Unified a Modeling Temporal Data- User Interfaces and Tools- Triggers-Authorization in SQL.

UNIT III

OBJECT- DATABASES AND XML: Object-based databases – Complex data types, structured types and inheritance in SQL, table inheritance, array and multiset types in SQL, object identity and reference types in SQL, implementing O-R features, Persistent programming languages, OO vs OR. XML – Structure of XML, Document Schema, Querying and Transformation, API in XML, XML applications.

UNIT IV

Query Processing: Measures of Query Cost-Selection Operation-Sorting-Joint Operation-Evaluation of Expressions-Query Optimization: Transformation of Relational Expressions-Estimating Statistics of Expression Results-Choice of Evaluation Plans.

UNIT V

Transactions: Transaction concept, Transaction State-Implementation of Atomicity and Durability-Concurrent Executions-Serializability-Recoverability-Implementation of Isolation-Testing for Serializability, Concurrency Control: Lock Based Protocols-Timestamp-Based Protocols-Validation-Based Protocols-Multiple Granularity-Multiversion Schemes-Deadlock handling-Insert and Delete Operations-Weak Levels of Consistency-Concurrency in Index Structures, Recovery System: Failure Classification-Storage Structure-Recovery and Atomicity-Log-Based Recovery-Recovery with Concurrent Transactions-Buffer Management-Failure with lose of Nonvolatile Storage-Advanced Recovery Techniques-Remote Backup Systems. ORACLE Backup and recovery utilities.

Book:

1. Silberschatz A. Korth H F, and Sudarsan S, *Database System Concepts*, 5th edition, McGraw-Hill 2002. (Chapters 1to 4, 6 to 10 and 13 to 17)

Reference Books:

1. Date C J, *An Introducton to Database Systems*, 7th edition, Pearson Educaiton, 2000.
2. Elmasri R, and Navathe S B, *Fundamentals of Database Systems*, 4th edition, Pearson Education, 2004.

3. Ramakrishnan R, and Gehrke J, *Database Management Systems, 2nd edition*, McGraw-Hill, 2000.
4. Mannino M V, *Database Application Development and Design*, McGraw-Hill, 2001.

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MCA 205 DATA SCIENCE ESSENTIALS

UNIT- I

Introduction: What is Data Science? - Big Data and Data Science, Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model - Intro to R Language.

UNIT-II

Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA - Philosophy of EDA - The Data Science Process - Case Study: RealDirect (online real estate firm)

UNIT-III

Feature Generation and Feature Selection (Extracting Meaning From Data) - Motivating application: user (customer) retention - Feature Generation (brainstorming, role of domain expertise, and place for imagination) - Feature Selection algorithms – Filters; Wrappers; Decision Trees; Random Forests

UNIT-IV

Data Visualization - Basic principles, ideas and tools for data visualization 3 - Examples of inspiring (industry) projects - Exercise: create your own visualization of a complex dataset

UNIT V

Data Science and Ethical Issues - Discussions on privacy, security, ethics - A look back at Data Science - Next-generation data scientists

Text Book:

1. Cathy O'Neil and Rachel Schutt. *Doing Data Science, Straight Talk From The Frontline*. O'Reilly. 2014.

REFERENCES BOOKS:

1. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. *Mining of Massive Datasets*. v2.1, Cambridge University Press. 2014. (free online)
2. Kevin P. Murphy. *Machine Learning: A Probabilistic Perspective*. ISBN 0262018020. 2013.
3. Foster Provost and Tom Fawcett. *Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking*. ISBN 1449361323. 2013.
4. Trevor Hastie, Robert Tibshirani and Jerome Friedman. *Elements of Statistical Learning*, Second Edition. ISBN 0387952845. 2009. (free online)
5. Avrim Blum, John Hopcroft and Ravindran Kannan. *Foundations of Data*

Science. (Note: this is a book currently being written by the three authors. The authors have made the first draft of their notes for the book available online. The material is intended for a modern theoretical course in computer science.)

6. Mohammed J. Zaki and Wagner Miera Jr. Data Mining and Analysis: Fundamental Concepts and Algorithms. Cambridge University Press. 2014.
 7. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. ISBN 0123814790. 2011.
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MCA 206 LEADERSHIP VALUES

UNIT I

Concept and Nature of leadership: concept and Significance, Importance, evaluations of leadership, Leadership at different levels, Leadership and Gender, Male and Female Leadership styles.

UNIT II

Leadership Qualities: List of Qualities, Charismatic Leadership, working leader, psychopathology of leadership

UNIT III

Leadership in groups: groups, teams, group vs teams and team formation process, stages of group, group dynamics, and managing team performance & team conflicts.

UNIT IV

Leadership ethics: Definition, ethical theories, principles of ethical leadership, core leadership values: respect, making a difference, integrity, authenticity, courage, service, humility, wisdom.

UNIT V

Leadership values across globe: leader vs manager, leadership in india, china and America.

Text Books:

1. **Leadership- Philip Sadler**, Fast Track Series, Crest Publishing House.
 2. Leadership and Management – Dr. A. Chandra Mohan, Himalaya Publishing House
 3. **John C. Maxwell (2014);** “The 5 Levels of Leadership”, Centre Street, A division of Hachette Book Group Inc.
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