

**DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY  
LUCKNOW**



**Evaluation Scheme & Syllabus**

**for**

**MCA First Year**

**On**

**Choice Based Credit System**

**(Effective from the Session: 2016-17)**

# Dr. APJ Abdul Kalam Technical University, Lucknow

## Study and Evaluation Scheme

MCA (Master of Computer Applications)

(Effective From Session 2016-17)

### Year – I Semester - I

Sl. No.	Subject Code	Subject Name	Periods			Evaluation Scheme					Credit
			L	T	P	Session Exams			ESE	Subject Total	
						CT	TA	Total			
1	RCA105	Professional Communication	3	1	0	20	10	30	70	100	04
2	RCA101	Computer Concepts & Principals of Programming	3	1	0	20	10	30	70	100	04
3	RCA102	Accounting & Financial Management	3	1	0	20	10	30	70	100	04
4	RCA103	Discrete Mathematics	3	1	0	20	10	30	70	100	04
5	RCA104	Computer Organization & Architecture	3	1	0	20	10	30	70	100	04
<b>Practical</b>											
6	RCA151	Professional Communication Lab	0	0	3	30	20	50	50	100	02
7	RCA152	Programming Lab	0	0	3	30	20	50	50	100	02
		<b>Total</b>	<b>15</b>	<b>4</b>	<b>5</b>					<b>700</b>	<b>24</b>

## Year – I Semester - II

Sl. No.	Subject Code	Subject Name	Periods			Evaluation Scheme					Credit
			L	T	P	Session Exams			ESE	Subject Total	
						CT	TA	Total			
1	RCA201	Computer Based Numerical & Statistical Techniques	3	1	0	20	10	30	70	100	04
2	RCA202	Data Structures	3	1	0	20	10	30	70	100	04
3	RCA203	Introduction to Automata Theory & Languages	3	1	0	20	10	30	70	100	04
4	RCA204	Innovation & Entrepreneurship	3	1	0	20	10	30	70	100	04
5	RHU001	Human Values & Professional Ethics	3	0	0	20	10	30	70	100	03
<b>Practical</b>											
6	RCA251	Computer Based Numerical & Statistical Techniques Lab	0	0	3	30	20	50	50	100	02
7	RCA252	Data Structure Lab	0	0	6	30	20	50	50	100	03
		<b>Total</b>	<b>14</b>	<b>4</b>	<b>6</b>					<b>700</b>	<b>24</b>

# Professional Communication

## MCA I Semester

### Unit-1:

Fundamentals of Communication Technical Communication: features: Distinction between General and Technical communication; Language as a tool of communication; Levels of communication: Interpersonal, Organizational, Mass communications; The flow of Communication: Downward, Upward, Lateral of Horizontal (Peer group): Importance of technical communication; Barriers to Communication.

### Unit-II:

Constituents of Technical Written Communication Words and Phrases: Word formation. Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; Correct Usage: all Parts of Speech; Modals; Concord; Articles; Infinitives; Requisites of Sentence Construction: Paragraph

Development: Techniques and Methods- Inductive, Deductive, Spatial, Linear, Chronological etc; The Art of Condensation-various steps.

### Unit-III

Business Communication Principles, Sales & Credit letters; Claim and Adjustment Letters; Job application and Resumes. Reports: Types; Significance; Structure, Style & Writing of Reports. Technical Proposal; Parts; Types; Writing of Proposal; Significance, Negotiation & Business Presentation skills

### Unit-IV

Presentation Strategies and Listening Skills. Defining Purpose; Audience & Local; Organizing Contents; Preparing Outline; Audio-visual Aids; Nuances of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Listening Skills: Active Listening, Passive Listening. methods for improving Listening Skills

### Unit-V

Value-Based Text Readings Following essays form the suggested text book with emphasis on Mechanics of writing.

- (i) Humanistic and Scientific Approaches to Human Activity by Moody E. Prior
- (ii) The Language of Literature and Science by A. Huxley
- (iii) Man and Nature by J.Bronowski
- (iv) The Social Function of Literature by Ian Watt
- (v) Science and Survival by Barry Commoner
- (vi) The Mother of the Sciences by A.J.Bahm
- (vii) The Effect of Scientific Temper on Man by Bertrand Russell.

### Text Books

1. Improve Your Writing ed. V.N.Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi
2. Technical Communication: A Practical Approach: Madhu Rani and Seema Verma- Acme Learning
3. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press

### Reference Books

1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt.Ltd,2011, New Delhi
2. Business Correspondence and Report Writing by Prof. R.C.Sharma & Krishna Mohan, Tata McGraw Hill & Co.Ltd.,2001, New Delhi
3. Word Power Made Easy by Norman Lewis, W.R.Goyal Pub. & Distributors, 2009, Delhi.
4. Developing Communication Skills by Krishna Mohan, Mecra Bannerji- Macmillan India Ltd. 1990, Delhi
5. Manual of Practical Communication by L.U.B.Pandey: A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi
6. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi.
7. Spoken English- A manual of Speech and Phonetics by R.K.Bansal & J.B.Harrison, Orient Blackswan, 2013, New Delhi
8. Business English by Ken Taylor, Orient Blackswan, 2011, New Delhi

## MCA 1<sup>st</sup> Semester

Effective from 2016-17

### COMPUTER CONCEPTS AND PRINCIPLES OF PROGRAMMING

#### UNIT 1:

08 Hours

##### Introduction to Computers:

Generations of Computer, Classification of Computers on various Parameters viz. Size, Purpose, Number of Users, Software, Application and System Software, Computer Hardware, Storage Devices, Memory Hierarchy, Magnetic Tape, Flash Memory, Cache and its Levels, SSD.

**Number System:** Binary, Octal and Hexadecimal Number Systems, Inter-Conversions in Various Numbers Systems, Binary Arithmetic.

#### UNIT 1:

06 Hours

Introduction to Operating System, Its Various Functions, Popular Operating Systems— Android, Windows, Difference between Linux and Unix, iOS, Google Chrome, Modern Computing Models: Cloud Computing Model and Its Benefits, Grid Computing, Green Computing, Internet of Things (IoT), Big Data Analytics, Modern Applications of IT

#### UNIT 1:

10 Hours

A Short History of Programming Languages, Development of Early Languages, Evolution of Software Architectures, Role of Programming Languages, Attributes of a Good Language? Approaches to Problem Solving, Concept of Algorithm and Flow Charts, Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

Language Standardization and Internationalization Translators and Virtual Architectures, Binding Times, Syntactic Elements of a Programming Language, Program-Sub Program Structure, Stages in Translation, Analysis of Source Program, Synthesis of Object Program, Introduction to Python Programming.

#### UNIT 1:

08 Hours

Data Objects, Variables and Constants, Data Types, Declarations, Type Checking and Type Conversion, Assignment and Initialization, Condition Checking, Looping, Structured Data Types, Arrays, Records, Lists, Executable Objects, Methods

#### UNIT 1:

08 Hours

Naming and Referencing Environments, Recursive Sub Programs, Static and Dynamic Scope, Encapsulation, Abstraction, Abstract Data Types, Classes, Inheritance, Objects and Message Passing,

Text Books:

1. Programming Languages: Design and Implementation by Terrance W. Pratt, Marvin V. Zalkowitz, T. V. Gopal, Fourth Edition, Pearson
2. Fundamentals of Computers, V. Raja Raman and Neeharika Adabala, Sixth Edition, PHI
3. Concepts, Techniques and Models of Computer Programming by Peter Van Roy and Seif Haridi, MIT Press
4. Computer Concepts: Introductory by June Jamrich Parsons & Dam Oja Eighth Edition Cengage Learning

Reference:

1. Programming Languages: Design and Implementation, Terrence W. Pratt, Prentice Hall Publishers
2. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition [India Edition], 2007.
3. Object- Oriented Programming with C++ by E. Balagurusamy

## MCA I Semester

### ACCOUNTING AND FINANCIAL MANAGEMENT

**Unit I:** (6 Hrs)

Overview: Accounting concepts, conventions and principles; Accounting Equation, International Accounting principles and standards; Matching of Indian Accounting Standards with International Accounting Standards

**Unit II:** (12 Sessions)

Mechanics of Accounting: Double entry system of accounting, journalizing of transactions; preparation of final accounts, Trading Account, Manufacturing Accounts, Profit & Loss Account, Profit & Loss Appropriation account and Balance Sheet, Policies related with depreciation, inventory and intangible assets like copyright, trademark, patents and goodwill.

**Unit III** (12 Sessions)

Analysis of financial statement: Ratio Analysis- solvency ratios, profitability ratios, activity ratios, liquidity ratios, market capitalization ratios ; Common Size Statement ; Comparative Balance Sheet and Trend Analysis of manufacturing, service & banking organizations.

**Unit IV** (10 Sessions)

Funds Flow Statement: Meaning, Concept of Gross and Net Working Capital, Preparation of Schedule of Changes in Working Capital, Preparation of Funds Flow Statement and its analysis ; Cash Flow Statement: Various cash and non-cash transactions, flow of cash, preparation of Cash Flow Statement and its analysis.

#### Suggested Readings

- 1) Narayanswami - Financial Accounting: A Managerial Perspective (PHI, 2nd Edition)
- 2) Mukherjee - Financial Accounting for Management (TMH, 1st Edition)
- 3) Ramchandran&Kakani - Financial Accounting for Management (TMH, 2nd Edition)
- 4) Ghosh T P - Accounting and Finance for Managers (Taxman, 1st Edition).
- 5) Maheshwari S.N &Maheshwari S K – An Introduction to Accountancy (Vikas, 9th Edition)
- 6) Ashish K. Bhattacharya- Essentials of Financial Accounting (PHI, New Delhi)
- 7) Ghosh T.P- Financial Accounting for Managers (Taxman, 3rd Edition)
- 8) Maheshwari S.N &Maheshwari S K – A text book of Accounting for Management (Vikas, 1st Edition)
- 9) Gupta Ambrish - Financial Accounting for Management (Pearson Education, 2nd Edition)
- 10) Chowdhary Anil - Fundamentals of Accounting and Financial Analysis (Pearson Education, 1st Edition).



# DISCRETE MATHEMATICS

## MCA I Semester

### Unit-I:

(10 Hrs)

**Set Theory:** Introduction, Size of sets and cardinals, Venn diagrams, Combination of sets, Multisets, Ordered pairs and Set identities.

**Relations & Functions:** Relations - Definition, Operations on relations, Composite relations, Properties of relations, Equality of relations, Partial order relation. Functions - Definition, Classification of functions, Operations on functions, Recursively defined functions.

**Notion of Proof:** Introduction, Mathematical Induction, Strong Induction and Induction with Nonzero base cases.

### Unit-II:

(08 Hrs)

**Lattices:** Introduction, Partial order sets, Combination of partial order sets, Hasse diagram, Introduction of lattices, Properties of lattices – Bounded, Complemented, Modular and Complete lattice.

### Unit-III:

(08 Hrs)

**Boolean Algebra:** Introduction, Axioms and Theorems of Boolean algebra, Boolean functions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra.

### Unit-IV:

(08 Hrs)

**Propositional & Predicate Logic:** Propositions, Truth tables, Tautology, Contradiction, Algebra of propositions, Theory of Inference and Natural Deduction. Theory of predicates, First order predicate, Predicate formulas, quantifiers, Inference theory of predicate logic.

### Unit-V:

(06 Hrs)

**Recurrence Relations:** Introduction, Growth of functions, Recurrences from algorithms, Methods of solving recurrences.

**Combinatorics:** Introduction, Counting Techniques, Pigeonhole Principle, Pólya's Counting Theory.

### Text Books:

1. Discrete Mathematics and Its Applications, Kenneth H. Rosen, McGraw-Hill, 2006.
2. Discrete Mathematical Structures, B. Kolman, R. C. Busby, and S. C. Ross, Prentice Hall, 2004.
3. Discrete and Combinatorial Mathematics, R.P. Grimaldi, Addison Wesley, 2004.
4. Discrete Mathematical Structures, Y N Singh, Wiley-India, First Edition, 2010.

# Computer Organization

## MCA I Semester

### **Unit-1: Digital Electronics** (08 Hrs)

#### **Data Representation in Computer Systems**

Introduction, Positional Numbering Systems, Converting Between Bases, Signed Integer Representation, Floating-Point Representation, Character Codes

#### **Arithmetic**

Overview, Fixed Point Addition and Subtraction, Fixed Point Multiplication and Division, Floating Point Arithmetic

#### **Boolean Algebra and Digital Logic**

Introduction, Boolean Algebra, Boolean Expressions, Boolean Identities, K-Maps & Map minimization, Logic Gates, Digital Components, Combinational Circuits, Sequential Circuits

### **Unit-2: Memory, Register and Register transfer** (08 Hrs)

Register Transfer Language, Bus and Memory Transfers, Bus Architecture, Bus Arbitration, Arithmetic Logic, Shift Micro-operation, Arithmetic Logic Shift Unit, Design of Fast address, Arithmetic Algorithms (addition, subtraction, Booth Multiplication), IEEE standard for Floating point numbers.

Memory Hierarchy, Main Memory (RAM and ROM Chips), organization of 2D and  $2^{1/2}$  D, Auxiliary memory, Cache memory, Virtual Memory, Memory management hardware

### **Unit 3: Control Design** (08 Hrs)

Hardwired & Micro Programmed (Control Unit): Fundamental Concepts (Register Transfers, Performing of arithmetic or logical operations, Fetching a word from memory, storing a word in memory), Execution of a complete instruction, Multiple-Bus organization, Hardwired Control, Micro programmed control (Microinstruction, Microprogram sequencing, Wide-Branch addressing, Microinstruction with Next-address field, Prefetching Microinstruction).

### **Unit 4:** (08 Hrs)

**Processor Design:** Processor Organization: General register organization, Stack organization, Addressing mode, Instruction format, Data transfer & manipulations, Program Control, Reduced Instruction Set Computer.

**Input-Output Organization:** I/O Interface, Modes of transfer, Interrupts & Interrupt handling, Programmed I/O, Direct Memory access, Input-Output processor, Serial Communication.

### **Unit 5:** (8 Hrs)

RISC & CICS Architecture, Basic MIPS Implementation, Pipelining, Instruction-level Parallelism, Parallel Processing Challenges, Flynn's Classification, Hardware Multi-threading, Multicore processing.

**Text-Books(TB)**

1. Logic and Digital Design, *Morris mano and Kimicharels 4<sup>th</sup> Edition, Prentice Hall.*
2. Computer System Architecture, M. Mano(PHI)
3. Computer Organization, Vravice, Zaky&Hamacher (TMH Publication)

**Reference Books (RB)**

1. Structured Computer Organization, Tannenbaum(PHI)
2. Computer Organization, Stallings(PHI)
3. Computer Organization, John P.Hayes (McGraw Hill)

# MCA – II Semester

## Computer Based Numerical & Statistical Techniques

1. **Unit-I**
2. **Floating point Arithmetic:** Representation of floating point numbers, Operations, Normalization, Pitfalls of floating point representation, Errors in numerical computation
3. **Iterative Methods:** Zeros of a single transcendental equation and zeros of polynomial using Bisection Method, Iteration Method, Regula-Falsi method, Newton Raphson method, Secant method, Rate of convergence of iterative methods.
- 4.
5. **Unit-II**
6. **Simultaneous Linear Equations:** Solutions of system of Linear equations, Gauss Elimination direct method and pivoting, Ill Conditioned system of equations, Refinement of solution. Gauss Seidal iterative method, Rate of Convergence
7. **Interpolation and approximation:** Finite Differences, Difference tables  
Polynomial Interpolation: Newton's forward and backward formula  
Central Difference Formulae: Gauss forward and backward formula, Stirling's, Bessel's
8. **Interpolation with unequal intervals:** Lagrange's Interpolation, Newton Divided difference formula
- 9.
10. **Unit-III**
11. **Numerical Differentiation and Integration:** Introduction, Numerical Differentiation, Numerical Integration, Trapezoidal rule, Simpson's rules, Boole's Rule
12. **Solution of differential equations:** Picard's Method, Euler's Method, Taylor's Method, Runge-Kutta methods, Predictor-corrector method, Automatic error monitoring, stability of solution.
- 13.
14. **Unit-IV**
15. **Curve fitting, Cubic Spline and Approximation:** Method of least squares, fitting of straight lines, polynomials, exponential curves etc
16. **Frequency Chart:** Different frequency chart like Histogram, Frequency curve, Pi-chart.
17. **Regression analysis:** Linear and Non-linear regression, Multiple regression
- 18.
19. **Unit-V**
20. **Time series and forecasting:** Moving averages, smoothening of curves, forecasting models and methods.

21. **Testing of Hypothesis:** Test of significance, Chi-square test, t-test, F-Test Application to medicine, agriculture etc.

22.

**23. References:**

24. 1. Rajaraman V., "Computer Oriented Numerical Methods", PHI

25. 2. Gerald & Wheatley, "Applied Numerical Analyses", AW

26. 3. Jain, Iyengar and Jain, "Numerical Methods for Scientific and Engineering Computations", New Age Int.

27. 4. Grewal B. S., "Numerical methods in Engineering and Science", Khanna Publishers, Delhi

28. 5. T. Veerarajan, T Ramachandran, "Theory and Problems in Numerical Methods", TMH

29. 6. Pradip Niyogi, "Numerical Analysis and Algorithms", TMH

30. 7. Francis Scheld, "Numerical Analysis", TMH

31. 9. Gupta S. P., "Statistical Methods", Sultan and Sons

## **MCA II Semester**

### **Subject: Data Structures**

1. **Unit –I:** Introduction:
2. Basic Terminology, Elementary Data Organization, Data Structure operations, Algorithm Complexity and Time-Space trade-off.
3. **Arrays:** Array Definition, Representation and Analysis, Single and Multidimensional Arrays, address calculation, application of arrays, Ordered List, Sparse Matrices and Vectors.
4. **Stacks:** Array Representation and Implementation of stack, Operations on Stacks: Push & Pop, Array Representation of Stack, Linked Representation of Stack, Operations Associated with Stacks,
5. **Application of stack:** Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack. Recursion: Recursive definition and processes, recursion in C, example of recursion, Tower of Hanoi Problem, simulating recursion.
- 6.
7. **Unit - II**
8. **Queues:** Array and linked representation and implementation of queues, Operations on Queue: Create, Add, Delete, Full and Empty. Circular queue, Deque, and Priority Queue.
9. **Linked list:** Representation and Implementation of Singly Linked Lists, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists algorithm (Beginning, end and middle), Doubly linked list, Linked List in Array, Polynomial representation and addition, Generalized linked list, Garbage Collection and Compaction.
- 10.
11. **Unit - III**
12. **Trees:** Basic terminology, Binary Trees, Binary Tree Representation, Algebraic Expressions, Complete Binary Tree. Extended Binary Trees, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees, Traversing Threaded Binary trees,
- 13.
14. **Binary Search Trees:** Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees.
- 15..
16. **Unit -IV**
17. **Searching :** Sequential search, binary search, comparison and analysis
- 18.
19. **Sorting:** Insertion Sort, Bubble Sorting, Quick Sort, Two Way Merge Sort, Heap Sort, Sorting on Different Keys, Practical consideration for Internal Sorting

**20..**

**21. Unit - V**

**22. Graphs:**

**23.** Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.

**24. File Structures:** Physical Storage Media File Organization, Organization of records into Blocks, Sequential Files, Indexing and Hashing, Primary indices, Secondary indices, B+ Tree index Files, B Tree index Files, Indexing and Hashing Techniques and their Comparisons.

**25.**

**26. References**

**27.**

**28. Text Books**

**29.1.** Y. Langsam, M. Augenstein and A. Tannenbaum, Data Structures using C and C++, Pearson Education Asia, 2nd Edition, 2002.

**30.2.** Ellis Horowitz, S. Sahni, D. Mehta Fundamentals of Data Structures in C++, Galgotia Book Source, New Delhi.

**31.**

**32. Reference Books**

**33.1.** S. Lipschutz, Data Structures Mc-Graw Hill International Editions

**34.2.** Jean-Paul Tremblay, Paul. G. Soresan, An introduction to data structures with Applications, Tata Mc-Graw Hill International Editions

**35.3.** A. Michael Berman, Data structures via C++, Oxford University Press

**36.4.** M. Weiss, Data Structures and Algorithm Analysis in C++, Pearson Education

**37.**

# Introduction to Automata Theory & Formal Languages

## MCA II Semester

### 1. Unit-I:

**Basic concepts of Automata Theory:** Alphabets, Strings and Languages, Deterministic Finite Automata (DFA) and Nondeterministic Finite Automata (NFA) – Definition, Representation using Transition Tables and State Diagrams, Language of DFA and NFA. NFA with  $\epsilon$ -transitions, Language of NFA with  $\epsilon$ -transitions, Equivalence of NFA and DFA

38.

### 2. Unit – II:

**3. Regular Expressions and Languages:** Introduction, Definition of regular expression, Kleen's Theorem, Equivalence of regular expression and Finite Automata, Pumping Lemma for regular Languages, Closure properties of Regular Languages, Decision properties of Regular Languages, Finite Automata with Output: Moore and Mealy Machine, Equivalence of Moore and Mealy Machines.

4.

### 5. Unit – III:

**6. Non-Regular Grammars:** Definition of Grammar, Classification of Grammars, Chomosky's Hierarchy. Context Free Grammars (CFG) and Context Free Languages (CFL) - Definition, Examples, Derivation trees, Ambiguous Grammars, Simplification of Grammars, Normal forms of CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs, Pumping lemma for CFLs. Push Down Automata (PDA): Definition and Description, Language of PDA and its applications.

7.

### 8. Unit – IV:

**9. Turing Machines:** Introduction, Basic Features of a Turing Machine, Language of a Turing Machine, Variants of Turing Machine: Multitapes, Nondeterministic Turing Machine, Universal Turing Machine. Turing Machine as Computer of Integer functions, Halting problem of Turing Machine, Church-Turing Thesis

10.

### 11. Unit – V:

**12. Undecidability:** Introduction, Undecidable problems about Turing Machines, Rice's Theorem, Post's Correspondence problem (PCP) and Modified PCP. Tractable and Intractable Problems: P and NP, NPComplete Problems, Introduction to recursive function theory

13.

14.

### 15. Text Books:

16. 1. Introduction to Automata theory, Languages and Computation, J.E.Hopcraft, R.Motwani, and Ullman. 2nd edition, Pearson Education Asia

17. 2. Introduction to languages and the theory of computation, J Martin, 3rd Edition, Tata McGraw Hill

18. 3. Elements and Theory of Computation, C Papadimitrou and C. L. Lewis, PHI

19. 4. Mathematical Foundation of Computer Science, Y.N.Singh, New Age International

## Subject: Innovation and Entrepreneurship

### MCA II Semester

**Unit-I: Innovation and Entrepreneurship**

**(8 Hrs)**



What is innovation and entrepreneurship? Innovation Types and sources, recognizing opportunities, acting on the opportunities, innovation strategies and management, strengthening the national innovation system, fostering innovation and entrepreneurship

## **Unit II: Entrepreneurship**

**(8 Hrs)**

Meaning, Definition and concept of Enterprise, Entrepreneurship and Entrepreneurship Development, Evolution of Entrepreneurship, Theories of Entrepreneurship, Characteristics and Skills of Entrepreneurship, Entrepreneurship and Economic Development; Classification and Types of Entrepreneurs; Entrepreneurial Competencies; Factor Affecting Entrepreneurial Growth – Economic, Non-Economic Factors; Concepts of Intrapreneurship, Entrepreneur v/s Intrapreneur, Traits/Qualities of an Entrepreneur; Manager Vs. Entrepreneur, Problems of Entrepreneurship.

## **Unit III: Opportunity / Identification and Product Selection**

**(8 Hrs)**

Meaning and concept of Entrepreneurial Competency, Developing Entrepreneurial Competencies, Entrepreneurial Culture, Entrepreneurial Mobility, Factors affecting Entrepreneurial mobility, Types of Entrepreneurial mobility. Entrepreneurial Opportunity Search and Identification; Criteria to Select a Product; Conducting Feasibility Studies; Project Finalization; Sources of Information

## **Unit IV:**

**(8 Hrs)**

Role of Government in promoting Entrepreneurship, MSME policy in India,

**Agencies for Policy Formulation and Implementation:** District Industries Centers (DIC), Small Industries Service Institute (SISI), Entrepreneurship Development Institute of India (EDII), National Institute of Entrepreneurship & Small Business Development (NIESBUD), National Entrepreneurship Development Board (NEDB),

**Financial Support System:** Forms of Financial support, Long term and Short term financial support, Sources of Financial support, Development Financial Institutions, Investment Institutions

## **Unit V:**

**(8 Hrs)**

Women Entrepreneurship: Meaning, Characteristic features, Problems of Women Entrepreneurship in India, Developing Women Entrepreneurship in India, Concept of Social Enterprise and Social Entrepreneurship, Social Entrepreneurs, Sustainability Issues in Social Entrepreneurship, Rural Entrepreneurship, Family Business Entrepreneurship

**Project Management:** Concept, Features, Classification of projects, Issues in Project Management, Project Identification, Project Formulation, Project Design and Network Analysis, Project Evaluation, Project Appraisal, Project Report Preparation, Specimen of a Project Report

**Case Studies** - At least 4 (four) during this Course

## **Suggested Readings:**

1. Lall & Sahai: Entrepreneurship (Excel Books)
2. Couger, C- Creativity and Innovation (IPP, 1999)
3. Kakkar D N - Entrepreneurship Development (Wiley Dreamtech)
4. A.K.Rai – Entrepreneurship Development, (Vikas Publishing)
5. Sehgal & Chaturvedi- Entrepreneurship Development (UDH Publishing)
6. R.V. Badi & N.V. Badi - Entrepreneurship (Vrinda Publications)
7. Holt - Entrepreneurship : New Venture Creation (Prentice-Hall).
8. Barringer M J - Entrepreneurship (Prentice-Hall)
9. Nina Jacob, - Creativity in Organisations (Wheeler, 1998) Desai, Vasant (2003). Small-Scale Industries and Entrepreneurship. Himalaya Publishing House, Delhi.

10. Kaulgud, Aruna (2003). Entrepreneurship Management. Vikas Publishing House, Delhi.38
11. Cynthia, L. Greene (2004). Entrepreneurship Ideas in Action. Thomson Asia Pvt. Ltd., Singapore.
12. Chandra, Ravi (2003). Entrepreneurial Success: A Psychological Study. Sterling Publication Pvt.Ltd., New Delhi.
13. Balaraju, Theduri (2004). Entrepreneurship Development: An Analytical Study. Akansha Publishing House, Uttam Nagar, New Delhi.
14. David, Otes (2004). A Guide to Entrepreneurship. Jaico Books Publishing House, Delhi.
- Taneja (2004). Entrepreneurship. Galgotia Publishers.

## Semester II

### Cyber Security

#### UNIT-1

Introduction to information systems, Types of information Systems, Introduction to Cyber Security: Information Security, Computer Security, Network Security, and Application Security, Need for Information security, Information Assurance and Security Risk Analysis.

#### UNIT-2

Introduction to Threats and Threat Vectors, Threat Sources and Targets, Types of Threats: Viruses, Worms, Trojans, Advanced Persistent Threats (APT's), Steganography, Types of Attacks: Manual, Physical, Network and Application Layer Attacks; Electronic Payment System, e- Cash, Credit/Debit Cards.

#### UNIT-3

**Data/Information Security:** Introduction to Structured and Unstructured Data, Approaches to Securing Unstructured Data, Data Loss Prevention (DLP), Overview of Information Rights Management (IRM); Introduction to Encryption: Symmetric Key Cryptography, Public Key Infrastructure, Digital Signatures.

#### UNIT-4

**Network Security:** Overview of Firewalls, Types of Firewalls, Functions of Firewall, Overview of Virtual Private Networks (VPN's), Types of VPN's, Basics of VPN Protocols, Overview of Intrusion Detection Systems (IDS), Types and Features of IDS

#### UNIT-5

Overview of ISO Standard for Computer and Information Security, IT Act 2000 and subsequent amendments, Copyright Act, Patent Law; Intellectual Property Law: Copy Right Law, Software License, Semiconductor Law and Patent Law.

#### **References :**

1. Rhodes-Ousley, Mark. Information Security: The Complete Reference, Second Edition, McGraw Hill.
2. V.K. Pachghare, "Cryptography and information Security", PHI Learning Private Limited, Delhi India.
3. Dr. Surya PrakashTripathi, RitendraGoyal, Praveen kumarShukla , "Introduction to Information Security and Cyber Law" Willey Dreamtech Press.
4. CHANDER, HARISH, "Cyber Laws and It Protection", PHI Learning Private Ltd.

**UTTAR PRADESH TECHNICAL UNIVERSITY  
LUCKNOW**



**Modified Syllabus  
For  
Master of Computer Applications  
of  
Second Year**

**(Effective from the Session: 2014-15)**

**STUDY AND EVALUATION SCHEME**  
**MCA (Master of Computer Application)**  
(Effective from Session: 2014-15)  
**YEAR II, SEMESTER –III**

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME				
						SESSIONAL EXAM			ESE	Subject Total
			L	T	P	CT	TA	Total		
1.	NMCA-311	Operating Systems	3	1	0	30	20	50	100	150
2.	NMCA-312	Design & Analysis of Algorithms	3	1	0	30	20	50	100	150
3.	NMCA-313	Database Management System	3	1	0	30	20	50	100	150
4.	NMCA-314	Internet & Java Programming	3	1	0	30	20	50	100	150
5.	NMCA-315	Computer Based Optimization Techniques	3	1	0	30	20	50	100	150
6	AUC-001/ AUC-002	Human Values & Professional Ethics/ Cyber Security	2	0	0	15	10	25	50	75*
<b>PARCTICALS</b>										
6.	NMCA-351	DBMS Lab	0	0	3	30	20	50	50	100
7.	NMCA-352	Java Programming Lab	0	0	3	30	20	50	50	100
8.	NGP-301	General Proficiency	0	0	0	-	-	50	-	50
		<b>Total</b>	<b>15</b>	<b>5</b>	<b>6</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1000</b>

**YEAR-II**

**SEMESTER-IV**

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME				
						SESSIONAL EXAM			ESE	Subject Total
			L	T	P	CT	TA	Total		
1	NMCA-411	Management Information Systems	3	1	0	30	20	50	100	150
2	NMCA-412	Web Technology	3	1	0	30	20	50	100	150
3	<b>Elective-I</b>		3	1	0	30	20	50	100	150
4	NMCA-413	Artificial Intelligence	3	1	0	30	20	50	100	150
5	NMCA-414	Mobile Computing	3	1	0	30	20	50	100	150
6	AUC-002/ AUC-001	Cyber Security / Human Values & Professional Ethics	2	0	0	15	10	25	50	75*
<b>PRACTICALS</b>										
7	NMCA-451	Web Technology Lab	0	0	3	30	20	50	50	100
8	NMCA-452	Mini Project	0	0	3	30	20	50	50	100
9	NGP-401	General Proficiency	0	0	0	-	-	50	-	50
		<b>Total</b>	<b>15</b>	<b>5</b>	<b>6</b>					<b>1000</b>

\* Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 0% in aggregate.

**List of Electives for MCA**  
**MCA-Elective-I**

NMCAE11	Compiler Design
NMCAE12	Client Server Computing
NMCAE13	Data Warehousing & Mining
NMCAE14	Advance Computer Architecture
NMCAE15	Distributed system

**Note:-** To be opted by the students who did not study these courses in earlier semesters.

# OPERATING SYSTEMS

## NMCA 311

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**3 1 0**

### Unit-I

**Introduction:** Definition and types of operating systems, Batch Systems, multi programming, time-sharing parallel, distributed and real-time systems, Operating system structure, Operating system components and services, System calls, system programs, Virtual machines.

### Unit-II

**Process Management:** Process concept, Process scheduling, Cooperating processes, Threads, Interprocess communication, CPU scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real-time scheduling and Algorithm evaluation.

### Unit-III

**Process Synchronization and Deadlocks:** The Critical-Section problem, synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, Monitors, Deadlocks-System model, Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock, Combined approach to deadlock handling.

### Unit-IV

**Storage management:** Memory Management-Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation with paging in MULTICS and Intel 386, Virtual Memory, Demand paging and its performance, Page replacement algorithms, Allocation of frames, Thrashing, Page Size and other considerations, Demand segmentation, File systems, secondary Storage Structure, File concept, access methods, directory implementation, Efficiency and performance, recovery, Disk structure, Disk scheduling methods, Disk management, Recovery, Disk structure, disk scheduling methods, Disk management, Swap-Space management, Disk reliability.

### Unit-V

**Security & Case Study:** Protection and Security-Goals of protection, Domain of protection, Access matrix, Implementation of access Matrix, Revocation of Access Rights, language based protection, The Security problem, Authentication, One Time passwords, Program threats, System threats, Threat Monitoring, Encryption.

Windows NT-Design principles, System components, Environmental subsystems, File system, Networking and program interface, Linux system-design principles, Kernel Modules, Process Management, Scheduling, Memory management, File Systems, Input and Output, Interprocess communication, Network structure, security

### References

1. Abraham Siberschatz and Peter Baer Galvin, "Operating System Concepts", Addison-Wesley
2. Milan Milankovic, "Operating Systems, Concepts and Design", Tata McGraw-Hill.
3. Harvey M Deital, "Operating Systems", Addison Wesley
4. Richard Peterson, "Linux: The Complete Reference", Osborne Tata McGraw-Hill.
5. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education
6. D M Dhamdhare, "Operating Systems : A Concept based Approach", McGraw Hill.
7. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education".
8. Stuart E. Madnick & John J. Donovan. *Operating Systems*. McGraw Hill.

**DESIGN AND ANALYSIS OF ALGORITHMS**  
**NMCA 312**

**L T P**  
**3 1 0**

**Unit-I**

Introduction: Algorithms, Analysis of Algorithms, Design of Algorithms, Complexity of Algorithms, Asymptotic Notations, Growth of function, Recurrences and their solution methods.

Sorting in polynomial Time: Insertion sort, Merge sort, Heap sort, and Quick sort

Sorting in Linear Time: Counting sort, Radix Sort, Bucket Sort, Medians and order statistics

**Unit-II**

Advanced Data Structure: Red Black Trees, Augmenting Data Structure, Binomial Heap, B-Tree, Fibonacci Heap, and Data Structure for Disjoint Sets, All kinds of Algorithms on these data structures, Dictionaries and priority Queues, mergeable heaps, concatenable queues

**Unit-III**

Advanced Design and Analysis Techniques: Dynamic programming, Greedy Algorithm, Backtracking, Branch-and-Bound, Amortized Analysis

**Unit-IV**

Graph Algorithms: Elementary Graph Algorithms, Breadth First Search, Depth First Search, Minimum Spanning Tree, Kruskal's Algorithms, Prim's Algorithms, Single Source Shortest Path, All pair Shortest Path, Maximum flow and Traveling Salesman Problem

**Unit-V**

Randomized Algorithms, String Matching, NP-Hard and NP-Completeness, Approximation Algorithms, Sorting Network, Matrix Operations, Polynomials and FFT, Number Theoretic Algorithms

**References**

1. Thomas H Cormen Leiserson "Introduction to Algorithms", PHI Learning Private Limited, Delhi India.
2. Sara Baase and Allen Van Gelder ,Computer Algorithms : "Introduction to Design and Analysis", Pearson Education
3. Jon Kleinberg and Eva Tardos "Algorithm Design", Pearson Education
4. Brassard Bratley "Fundamental of Algorithms", PHI Learning Private Limited, Delhi India.
5. M T Goodrich "Algorithms Design", John Wiley
6. Aho, "Design and Analysis of Computer Algorithms", Pearson Education.
7. Horowitz and Sahani , "Fundamentals of Computer Algorithms", Galgotia Publications Pvt Ltd Delhi India.

**Unit- I**

**Introduction:** An overview of database management system, Database System Vs File System, Database system concepts and architecture, data models schema and instances, data independence and data base language and interfaces, Data definitions language, DML, Overall Database Structure.

**Data Modeling using the Entity Relationship Model:** ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree.

**Unit- II**

**Relational data Model and Language:** Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus.

**Introduction to SQL:** Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators and their procedure, Tables, views and indexes, Queries and sub queries, Aggregate functions, Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors in SQL.

PL/SQL, Triggers and clusters.

**Unit- III**

**Data Base Design & Normalization:** Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependencies, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

**Unit- IV**

**Transaction Processing Concepts:** Transaction system, Testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling.

**Unit- V**

**Concurrency Control Techniques:** Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi-version schemes, Recovery with concurrent transaction. Transaction Processing in Distributed system, data fragmentation. Replication and allocation techniques for distributed system, overview of concurrency control and recovery in distrusted database.

**References**

1. Date C J, "An Introduction To Database System", Addison Wesley
2. Korth, Silbertz, Sudarshan, "Database Concepts", Tata Mcgraw-hill Education (India) Pvt. Ltd.
3. Elmasri, Navathe, "Fundamentals Of Database Systems", Pearson Education New Delhi India.
4. G.K. Gupta, "Database Management System", Tata Mcgraw-hill Education (India) Pvt. Ltd.
5. Bipin C. Desai, "An introduction to Database Systems", Galgotia Publication Pvt. Ltd. New Delhi.
6. Majumdar & Bhattacharya, "Database Management System", Tata Mcgraw-hill Education (India) Pvt. Ltd.
7. Ramakrishnan, Gehrke, "Database Management System", McGraw Hill (India) Pvt Ltd. New Delhi.
8. Chakravarti, "Advanced Database Mngement System" Wiley Dreamtech Publications.

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### **Unit-1**

**Internet:** Internet, Connecting to Internet: Telephone, Cable, Satellite connection, Choosing an ISP, Introduction to Internet services, E-Mail concepts, Sending and Receiving secure E-Mail, Voice and Video Conferencing.

### **Unit-2**

**Core Java:** Introduction, Operator, Data type, Variable, Arrays, Control Statements, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Networking, Event handling, Introduction to AWT, AWT controls, Layout managers, Menus, Images, Graphics.

### **Unit-3**

**Java Swing:** Creating a Swing Applet and Application, Programming using Panes, Pluggable Look and feel, Labels, Text fields, Buttons, Toggle buttons, Checkboxes, Radio Buttons, View ports, Scroll Panes, Scroll Bars, Lists, Combo box, Progress Bar, Menus and Toolbars, Layered Panes, Tabbed Panes, Split Panes, Layouts, Windows, Dialog Boxes, Inner frame.

**JDBC:** The connectivity Model, JDBC/ODBC Bridge, (5) java.sql package, connectivity to remote database, navigating through multiple rows retrieved from a database.

### **Unit-4**

**Java Beans:** Application Builder tools, The bean developer kit(BDK), JAR files, Introspection, Developing a simple bean, using Bound properties, The Java Beans API, Session Beans, Entity Beans, Introduction to Enterprise Java beans (EJB),

**Introduction to RMI (Remote Method Invocation):** A simple client-server application using RMI.

### **Unit-5**

**Java Servlets:** Servlet basics, Servlet API basic, Life cycle of a Servlet, Running Servlet, Debugging Servlets, Thread-safe Servlets, HTTP Redirects, Cookies, Introduction to Java Server pages (JSP).

### **References:**

1. Margaret Levine Young, "The Complete Reference Internet", Tata Mcgraw-hill Education Pvt. Ltd.
2. Thampi, "Object Oriented Programming in JAVA" Wiley Dreamtech Publication.
3. Balagurusamy E, "Programming in JAVA", Tata Mcgraw-hill Education Pvt. Ltd.
4. Dustin R. Callway, "Inside Servlets", Addison Wesley.
5. Mark Wutica, "Java Enterprise Edition", QUE.
6. Steven Holzner, "Java2 Black book", Wiley Dreamtech Publication.
7. Liang, "Introduction to Java Programming, Comprehensive Version", Pearson Education.
8. Deitel and Deitel, "Java: How to Program" PHI Learning Private Limited, Delhi India.

# COMPUTER BASED OPTIMIZATION TECHNIQUES

## NMCA 315

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3 1 0

### Unit I

**Preliminaries: Inventory Models and Replacement problems:** Inventory models –various costs-deterministic inventory models, Single period inventory model with shortest cost, stochastic models, Application of inventory models, Economic lot sizes-price breaks, Replacement problems-capital equipment-discounting costs-replacement in anticipation of failure- group replacement-stochastic nature underlying the failure phenomenon.

### Unit II

**Linear Programming Problems (LPP):** Definition of LPP, Graphical Solutions of Linear Programming Problems, Simplex Method, and Artificial Variable Method, Two Phase Method, Charnes' Big-M Method, Sensitivity Analysis, Revised Simplex Method, Duality, Dual Simplex Method

### Unit III

**Integer Linear Programming Problems:** Integer Linear Programming Problems, Mixed

Integer Linear Programming Problems, Cutting Plane Method, Branch and Bound Method, 0-1 integer linear programming problem.

**Transportation Problems:** Introduction to Transportation Model, Matrix Form of TP, Applications of TP Models, Basic Feasible Solution of a TP, Degeneracy in TP, Formation of Loops in TP, Solution Techniques of TP, Different Methods for Obtaining Initial Basic Feasible Solutions viz. Matrix Minima Method, Row Minima Method, Column Minima Methods, Vogel's Approximation Method, Techniques for Obtaining Optimal Basic Feasible Solution.

**Assignment Problems:** Definition, Hungarian Method for AP.

### Unit IV

**Introduction to NLP:** Definition of NLP, Convex Programming Problems, Quadratic Programming Problems, Wolfe's Method for Quadratic Programming, Kuhn-Tucker Conditions, Geometrical Interpretation of KT-Conditions, KT-Points etc.

**Dynamic Programming:** Bellman's Principle of optimality of Dynamic Programming, Multistage decision problem and its solution by Dynamic Programming with finite number of stages, Solution of linear programming problems as a Dynamic Programming problem

### Unit V

**Queuing Theory** Introduction to Queues, Basic Elements of Queuing Models, Queue Disciplines, Memoryless Distribution, Role of Exponential and Poisson Distributions, Markovian Process, Erlang Distribution, Symbols and Notations, Distribution Of Arrivals, Distribution of Service Times, Definition of Steady and Transient State, Poisson Queues.

### References:

1. Hadley, G., "Linear Programming, and Massachusetts", Addison-Wesley .
2. Taha, H.A, "Operations Research – An Introduction", Macmillian
3. Hiller, F.S., G.J. Lieberman, " Introduction to Operations Research", Holden-Day.
4. Harvey M. Wagner, "Principles of Operations Research with Applications to Managerial Decisions", Prentice Hall of India Pvt. Ltd.
5. Swarup K , "Operation Research", S. Chand New Delhi.

## **NMCA -351 : DBMS**

**L T P**

**0 0 3**

The programme to be implemented using SQL

1. Create Table, SQL for Insertion, Deletion, Update and Retrieval using aggregating functions.
2. Write Programs in PL/SQL, Understanding the concept of Cursors.
3. Write Program for Join, Union & intersection etc.
4. Creating Views, Writing Assertions, Triggers.
5. Creating Forms, Reports etc.
6. Writing codes for generating read and update operator in a transaction using different situations.
7. Implement of 2PL concerning central algorithm.
8. Developing code for understanding of distributed transaction processing.

Students are advised to use Developer 2000 Oracle 8+ version for above experiments. However, depending on the availability of Software's students may use power builder/SQL Server/DB2 etc. for implementation.

# Java Programming Lab

NMCA-352

**L T P**  
**0 0 3**

1. Write a program in Java for illustrating, overloading, over riding and various forms of inheritance.
2. Write programs to create packages and multiple threads in Java.
3. Write programs in Java for event handling Mouse and Keyboard events.
4. Using Layout Manager create different applications.
5. Write programs in Java to create and manipulate Text Area, Canvas, Scroll Bars, Frames and Menus using swing/AWT.
6. Using Java create Applets.
7. Use Java Language for Client Server Interaction with stream socket connections.
8. Write a program in java to read data from disk file.

**MANAGEMENT INFORMATION SYSTEMS**  
**NMCA 411**

**L T P**  
**3 1 0**

**Unit 1: Foundation of Information Systems:** Introduction to information system in business, fundamentals of information systems, Solving business problems with information systems, Types of information systems, Effectiveness and efficiency criteria in information system.

**Unit 2: An overview of Management Information Systems:** Definition of a management information system, MIS versus Data processing, MIS & Decision Support Systems, MIS & Information Resources Management, End user computing, Concept of an MIS, Structure of a Management information system.

**Unit 3: Concepts of planning & control:** Concept of organizational planning, The Planning Process, Computational support for planning, Characteristics of control process, The nature of control in an organization.

**Unit 4: Business applications of information technology:** Internet & electronic commerce, Intranet, Extranet & Enterprise Solutions, Information System for Business Operations, Information System for Managerial Decision Support, Information System for Strategic Advantage.

**Unit 5: Managing Information Technology:** Enterprise & global management, Security & Ethical challenges, Planning & Implementing changes.

**Advanced Concepts in Information Systems:** Enterprise Resource Planning, Supply Chain Management, Customer Relationship Management, and Procurement Management.

**References**

1. Brian, "Management Information System", Tata Mcgraw-hill Education Pvt. Ltd.
2. Gordon B. Davis & Margrethe H. Olson, "Management Information System", Tata Mcgraw-hill Education Pvt. Ltd.
3. Brian, "Introduction to Information System", Tata Mcgraw-hill Education Pvt. Ltd.
4. Murdick, "Information System for Modern Management", PHI Learning Private Limited, Delhi India.
5. Jawadekar, " Management Information System", Tata Mcgraw-hill Education Pvt. Ltd.
6. Jain Sarika, "Information System", PPM Publication.
7. Davis, "Information System", Palgrave Macmillan.

**WEB TECHNOLOGY**  
**NMCA-412**

**L T P**  
**3 1 0**

**Unit I: Introduction:**

Introduction to web, protocols governing the web, web development strategies, Web applications, web project, web team.

**Unit II: Web Page Designing:**

HTML: list, table, images, frames, forms, CSS;

XML: DTD, XML schemes, presenting and using XML

**Unit III: Scripting:**

Java script: Introduction, documents, forms, statements, functions, objects; event and event handling; introduction to AJAX, VB Script

**Unit IV: Server Site Programming:**

Introduction to active server pages (ASP), ASP.NET, java server pages (JSP), JSP application design, tomcat server, JSP objects, declaring variables, and methods, debugging, sharing data between JSP pages, Session, Application: data base action , development of java beans in JSP, introduction to COM/DCOM.

**Unit V: PHP (Hypertext Preprocessor):**

Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form ,mail, file upload, session, error, exception, filter, PHP-ODBC.

**References**

- 1.Xavier, C, “ Web Technology and Design” , New Age International.
- 2.Ivan Bayross,” HTML, DHTML, Java Script, Perl & CGI”, BPB Publication.
- 3.Ramesh Bangia, “Internet and Web Design” , New Age International
- 4.Bhave, “Programming with Java”, Pearson Education
- 5.Ullman, “PHP for the Web: Visual QuickStart Guide”, Pearson Education
- 6.Deitel, “Java for programmers”, Pearson Education

# ARTIFICIAL INTELLIGENCE

NMCA 413

L T P

3 1 0

## Unit-I

**Introduction** : Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.

## Unit-II

**Introduction to Search** : Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

## Unit-III

**Knowledge Representation & Reasoning**: Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

## Unit-IV

**Machine Learning** : Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data - EM algorithm, Reinforcement learning,

## Unit-V

**Pattern Recognition** : Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

## References:

1. Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata Mcgraw-hill Education Pvt. Ltd.
3. E.Charniak and D McDermott, “Introduction to Artificial Intelligence”, Pearson Education
4. Dan W. Patterson, “Artificial Intelligence and Expert Systems”, Prentice Hall of India.

**MOBILE COMPUTING**  
**NMCA-414**

**L T P**  
**3 1 0**

**Unit – I**

Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM:air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.

**Unit - II**

Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.

**Unit – III**

Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations.

**Unit - IV**

Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.

**Unit – V**

Adhoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

**References:**

1. J. Schiller, "Mobile Communications", Addison Wesley.
2. Charles Perkins, "Mobile IP", Addison Wesley.
3. Charles Perkins, "Ad hoc Networks", Addison Wesley.
4. Upadhyaya, "Mobile Computing", Springer New York.



## Elective I

### NMCAE11 : COMPILER DESIGN

L T P  
3 1 0

#### Unit-1

**Compiler Structure:** Compilers and Translators, Various Phases of Compiler, Pass Structure of Compiler, Bootstrapping of Compiler

**Programming Languages:** High level languages, The lexical and syntactic structure of a language, Data elements, Data Structure, Operations, Assignments, Program unit, Data Environments, Parameter Transmission.

**Lexical Analysis:** The role of Lexical Analyzer, A simple approach to the design of Lexical Analyzer, Regular Expressions , Transition Diagrams, Finite state Machines, Implementation of Lexical Analyzer, Lexical Analyzer Generator: LEX, Capabilities of Lexical Analyzer

#### Unit-II

**The Syntactic Specification of Programming Languages:** CFG, Derivation and Parse tree, Ambiguity, Capabilities of CFG.

**Basic Parsing Techniques:** Top-Down parsers with backtracking, Recursive Descent Parsers, Predictive Parsers, Bottom-up Parsers, Shift-Reduce Parsing, Operator Precedence Parsers, LR parsers (SLR, Canonical LR, LALR)

Syntax Analyzer Generator: YACC

#### Unit-III

**Intermediate Code Generation:** Different Intermediate forms: three address code, Quadruples & Triples. Syntax Directed translation mechanism and attributed definition.

Translation of Declaration, Assignment, Control flow, Boolean expression, Array References in arithmetic expressions, procedure calls, case statements, postfix translation.

#### Unit-IV

**Run Time Memory Management:** Static and Dynamic storage allocation, stack based memory allocation schemes, Symbol Table management

**Error Detection and Recovery:** Lexical phase errors, Syntactic phase errors, Semantic errors.

#### Unit-V

**Code Optimization and Code Generation:** Local optimization, Loop optimization, Peephole optimization, Basic blocks and flow graphs, DAG, Data flow analyzer, Machine Model, Order of evaluation, Register allocation and code selection

#### References:

1. Alfred V Aho , Jeffrey D. Ullman, "Principles of Compiler Design", Narosa
2. A.V. Aho, R. Sethi and J.D Ullman, "Compiler: principle, Techniques and Tools", AW
3. H.C. Holub "Compiler Design in C", PHI Learning Private Limited, Delhi India..
4. Apple, "Modern Computer Implementation in C: Basic Design", Cambridge press.

## Elective I

### NMCAE12 : CLIENT SERVER COMPUTING

L T P  
3 1 0

#### Unit I

**Client/Server Computing:** DBMS concept and architecture, Single system image, Client Server architecture, mainframe-centric client server computing, downsizing and client server computing, preserving mainframe applications investment through porting, client server development tools, advantages of client server computing.

#### Unit II

**Components of Client/Server application:** The client: services, request for services, RPC, windows services, fax, print services, remote boot services, other remote services, Utility Services & Other Services, Dynamic Data Exchange (DDE), Object Linking and Embedding (OLE), Common Object Request Broker Architecture (CORBA).

The server: Detailed server functionality, the network operating system, available platforms, the network operating system, available platform, the server operating system.

#### Unit III

**Client/Server Network:** connectivity, communication interface technology, Interposes communication, wide area network technologies, network topologies (Token Ring, Ethernet, FDDI, CDDI) network management, Client-server system development: Software, Client–Server System Hardware: Network Acquisition, PC-level processing unit, Macintosh, notebooks, pen, UNIX workstation, x-terminals, server hardware.

#### Unit IV

**Data Storage:** magnetic disk, magnetic tape, CD-ROM, WORM, Optical disk, mirrored disk, fault tolerance, RAID, RAID-Disk network interface cards.

Network protection devices, Power Protection Devices, UPS, Surge protectors.

**Client Server Systems Development:** Services and Support, system administration, Availability, Reliability, Serviceability, Software Distribution, Performance, Network management, Help Desk, Remote Systems Management Security, LAN and Network Management issues.

#### Unit V

**Client/Server System Development:** Training, Training advantages of GUI Application, System Administrator training, Database Administrator training, End-user training.

The future of client server Computing Enabling Technologies, The transformational system.

#### References:

1. Patrick Smith & Steave Guengerich, “Client / Server Computing”, PHI Learning Private Limited, Delhi India.
2. Dawna Travis Dewire, “Client/Server Computing”, Tata Mcgraw-hill Education Pvt. Ltd.
3. Majumdar & Bhattacharya, “Database management System”, Tata Mcgraw-hill Education Pvt. Ltd.
4. Korth, Silberchatz, Sudarshan, “Database Concepts”, Tata Mcgraw-hill Education Pvt. Ltd.
5. Elmasri, Navathe, S.B, “Fundamentals of Data Base System”, Addison Wesley

## Elective I

### NMCAE13 : DATA WAREHOUSING & MINING

L T P  
3 1 0

#### Unit – I

Dss-Uses, definition, Operational Database. Introduction to DATA Warehousing. Data-Mart, Concept of Data-Warehousing, Multi Dimensional Database Structures. Client/Server Computing Model & Data Warehousing. Parallel Processors & Cluster Systems. Distributed DBMS implementations.

#### Unit – II

DATA Warehousing. Data Warehousing Components. Building a Data Warehouse. Warehouse Database. Mapping the Data Warehouse to a Multiprocessor Architecture. DBMS Schemas for Decision Support. Data Extraction, Cleanup & Transformation Tools. Metadata.

#### Unit – III

Business Analysis. Reporting & Query Tools & Applications. On line Analytical Processing(OLAP). Patterns & Models. Statistics. Artificial Intelligence.

#### Unit – IV

Knowledge Discovery, Data Mining. Introduction to Data-Mining. Techniques of Data-Mining. Decision Trees. Neural Networks. Nearest Neighbor & Clustering. Genetic Algorithms. Rule Introduction. Selecting & Using the Right Technique.

#### Unit – V

Multimedia Data-Mining, Multimedia-Databases, Mining Multimedia Data, Data-Mining and the World Wide Web, Web Data-Mining, Mining and Meta-Data. Data Visualization & Overall Perspective. Data Visualization. Applications of Data-Mining.

#### References:

1. Berson, "Data Warehousing, Data-Mining & OLAP", Tata Mcgraw-hill Education Pvt. Ltd.
2. Mallach, "Decision Support and Data Warehousing System", Tata Mcgraw-hill Education Pvt. Ltd.
3. Bhavani Thura-is-ingham, "Data-Mining Technologies, Techniques Tools & Trends", CRC Press
4. Navathe, "Fundamental of Database System", Pearson Education.
5. Margaret H. Dunham, "Data-Mining. Introductory & Advanced Topics", Pearson Education
6. Pieter Adriaans, Dolf Zantinge, "Data-Mining", Pearson Education.

## **Elective I**

### **NMCAE14: ADVANCED COMPUTER ARCHITECTURE**

#### **Unit - I:**

##### **Introduction**

Parallel Computing, Parallel Computer Model, Program and Network Properties, Parallel Architectural Classification Schemes, Flynn's & Feng's Classification, Performance Metrics and Measures, Speedup Performance Laws: Multiprocessor System and Interconnection Networks; IEEE POSIX Threads: Creating and Exiting Threads, Simultaneous Execution of Threads, Thread Synchronization using Semaphore and Mutex, Canceling the Threads.

#### **Unit – II:**

##### **Pipelining and Memory Hierarchy**

Basic and Intermediate Concepts, Instruction Set Principle; ILP: Basics, Exploiting ILP, Limits on ILP; Linear and Nonlinear Pipeline Processors; Super Scalar and Super Pipeline Design; Memory Hierarchy Design: Advanced Optimization of Cache Performance, Memory Technology and Optimization, Cache Coherence and Synchronization Mechanisms.

#### **Unit – III:**

##### **Thread and Process Level Parallel Architecture**

Introduction to MIMD Architecture, Multithreaded Architectures, Distributed Memory MIMD Architectures, Shared Memory MIMD Architecture, Clustering, Instruction Level Data Parallel Architecture, SIMD Architecture, Fine Grained and Coarse Grained SIMD Architecture, Associative and Neural Architecture, Data Parallel Pipelined and Systolic Architectures, Vector Architectures.

#### **Unit – IV:**

##### **Parallel Algorithms**

PRAM Algorithms: Parallel Reduction, Prefix Sums, Preorder Tree Traversal, Merging two Sorted lists; Matrix Multiplication: Row Column Oriented Algorithms, Block Oriented Algorithms; Parallel Quicksort, Hyper Quicksort; Solving Linear Systems: Gaussian Elimination, Jacobi Algorithm; Parallel Algorithm Design Strategies.

#### **Unit –V:**

##### **Developing Parallel Computing Applications**

OpenMP Implementation in 'C': Execution Model, Memory Model; Directives: Conditional Compilation, Internal Control Variables, Parallel Construct, Work Sharing Constructs, Combined Parallel Work-Sharing Constructs, Master and Synchronization Constructs; Run-Time Library Routines: Execution Environment Routines, Lock Routines, Timing Routines; Simple Examples in 'C'. Basics of MPI.

##### **Books:-**

1. Kai Hwang, "Advance Computer Architecture", TMH
2. Matthew, "Beginning Linux Programming", SPD/WROX
3. Hennessy and Patterson, "Computer Architecture: A Quantitative Approach", Elsevier
4. Dezsó and Sima, "Advanced Computer Architecture", Pearson
5. Quinn, "Parallel Computing: Theory & Practice", TMH
6. Quinn, "Parallel Programming in C with MPI and Open MP", TMH

## Elective I

### NMCAE15 : DISTRIBUTED SYSTEM

#### Unit-I

**Characterization of Distributed Systems:** Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models.

**Theoretical Foundation for Distributed System:** Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks.

**Concepts in Message Passing Systems:** causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.

#### Unit-II

**Distributed Mutual Exclusion:** Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.

**Distributed Deadlock Detection:** system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

#### Unit-III

**Agreement Protocols:** Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.

**Distributed Resource Management:** Issues in distributed File Systems, Mechanism for building distributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory.

#### Unit-IV

**Failure Recovery in Distributed Systems:** Concepts in Backward and Forward recovery, Recovery in Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems.

**Fault Tolerance:** Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamic voting protocols.

#### Unit -V

**Transactions and Concurrency Control:** Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control.

**Distributed Transactions:** Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

**References:**

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna,Gehrke," Database Management Systems", Mc Grawhill
3. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education
4. Tenanuanbaum, Steen," Distributed Systems", PHI
5. Gerald Tel, "Distributed Algorithms", Cambridge University Press

# UTTAR PRADESH TECHNICAL UNIVERSITY LUCKNOW



## Syllabus for Master of Computer Applications of Third Year

(Effective from the Session: 2015-16)

**U.P. TECHNICAL UNIVERSITY, LUCKNOW**  
**STUDY AND EVALUATION SCHEME**  
**MCA (Master of Computer Application)**  
(Effective from Session 2015-16)

**Year-III, Semester V**

Sr. No.	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	NMCA-511/NMCA-513	Computer Network / Dot Net Framework & C#*	3-1-0	30	20	50	100	150
2	<b>MCA-Elective-II</b>		3-1-0	30	20	50	100	150
3	NMCA-512	Software Engineering	3-1-0	30	20	50	100	150
4	<b>MCA-Elective-III</b>		3-1-0	30	20	50	100	150
5	<b>MCA-Elective-IV</b>		3-1-0	30	20	50	100	150
<b>Practicals / Training /Projects</b>								
6	NMCA-551/ NMCA-553	Computer Network Lab/ Dot Net Framework & C# Lab*	0-0-3	30	20	50	50	100
7	NMCA-552	Project Based On Software Engineering	0-0-3	30	20	50	50	100
8	NGP-501	General Proficiency	-	-	-	-	-	50

Note:- \*To be opted by the students who did not study these courses in earlier semesters.



## Year-III, Semester VI

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	NMCA-611	Colloquium	0-0-2	-	200	200	-	200
2	NMCA-612	Project	0-0-24	-	300	300	500	800

### List of Electives for MCA

#### MCA-Elective-II

NMCAE 21	Network Security & Cryptography
NMCAE 22	Neural Network
NMCAE 23	Pattern Recognition
NMCAE 24	Cloud Computing
NMCAE25*	Computer Network
NMCAE 26*	Dot Net Framework & C#

#### MCA-Elective-III

NMCAE 31	Image Processing
NMCAE 32	Simulation & Modeling
NMCAE 33	Software Project Management
NMCAE 34	Real Time Systems

#### MCA-Elective-IV

NMCAE 41	Advanced Database Management Systems
NMCAE 42	Information Storage & Management
NMCAE 43	Software Testing
NMCAE 44	Big Data

Note:- \*To be opted by the students who did not study these courses in earlier semesters.

## **NMCA-511 COMPUTER NETWORK**

### **Unit -I**

Introduction Concepts: Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design, Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling.

### **Unit-II**

Medium Access sub layer: Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.

### **Unit - III**

Network Layer: Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking -TCP / IP, IP packet, IP address, IPv6.

### **Unit - IV**

Transport Layer: Transport Layer - Design issues, connection management, session Layer- Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.

### **Unit-V**

Application Layer: Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application. Example Networks - Internet and Public Networks.

### **Text Books :**

1. Forouzen, "Data Communication and Networking", TMH
2. A.S. Tanenbaum, Computer Networks, Pearson Education
3. W. Stallings, Data and Computer Communication, Macmillan Press

### **References :**

1. Anuranjan Misra, "Computer Networks", Acme Learning
2. G. Shanmugarathinam, "Essential of TCP/ IP", Firewall Media

## NMCA 512: Software Engineering

### Unit-I: Introduction

Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

### Unit-II: Software Requirement Specifications (SRS)

Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS.

**Software Quality Assurance (SQA):** Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

### Unit-III: Software Design

Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

### Unit-IV: Software Testing

Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products.

Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

### Unit-V: Software Maintenance and Software Project Management

Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

### References:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
3. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
4. Pankaj Jalote, Software Engineering, Wiley
5. Carlo Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.
6. Ian Sommerville, Software Engineering, Addison Wesley.

7. Kassem Saleh, "Software Engineering", Cengage Learning.
8. Pfleeger, Software Engineering, Macmillan Publication.

## **NMCA 513: Dot Net Framework and C#**

### **Unit-1**

**The .Net framework:** Introduction, The Origin of .Net Technology, Common Language Runtime (CLR), Common Type System (CTS), Common Language Specification (CLS), Microsoft Intermediate Language (MSIL), Just-In -Time Compilation, Framework Base Classes.

### **Unit-II**

**C -Sharp Language (C#):** Introduction, Data Types, Identifiers, Variables, Constants, Literals, Array and Strings, Object and Classes, Inheritance and Polymorphism, Operator Overloading, Interfaces, Delegates and Events. Type conversion.

### **Unit-III**

**C# Using Libraries:** Namespace- System, Input-Output, Multi-Threading, Networking and sockets, Managing Console I/O Operations, Windows Forms, Error Handling.

### **Unit-IV**

**Advanced Features Using C#:** Web Services, Window Services, Asp.net Web Form Controls, ADO.Net. Distributed Application in C#, Unsafe Mode, Graphical Device interface with C#.

### **Unit-V**

**.Net Assemblies and Attribute:** .Net Assemblies features and structure, private and share assemblies, Built-In attribute and custom attribute. Introduction about generic.

### **References**

1. Wiley, "Beginning Visual C# 2008", Wrox
2. Fergal Grimes, "Microsoft .Net for Programmers". (SPI)
3. Balagurusamy, "Programming with C#", (TMH)
4. Mark Michaelis, "Essential C# 3.0: For .NET Framework 3.5, 2/e, Pearson Education
5. Shibi Parikkar, "C# with .Net Frame Work", Firewall Media.

## **NMCA-551 Computer Network Lab**

1. Programs using TCP Sockets (like date and time server & client, echo server & client, etc.)
2. Programs using UDP Sockets (like simple DNS)
3. Programs using Raw sockets (like packet capturing and filtering)
4. Programs using RPC
5. Simulation of sliding window protocols

## **MCA-Elective-II**

### **NMCAE21: Network Security & Cryptography**

#### **Unit-I**

Introduction to security attacks, services and mechanism, Classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers.

Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, feistel structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES

#### **Unit-II**

Introduction to group, field, finite field of the form  $GF(p)$ , modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm,

Advanced Encryption Standard (AES) encryption and decryption

Fermat's and Euler's theorem, Primality testing, Chinese Remainder theorem, Discrete Logarithmic Problem,

Principals of public key crypto systems, RSA algorithm, security of RSA

#### **Unit-III**

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA)

Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,

#### **Unit-IV**

Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure.

Authentication Applications: Kerberos

Electronic mail security: pretty good privacy (PGP), S/MIME.

#### **Unit-V**

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

Introduction to Secure Socket Layer, Secure electronic, transaction (SET)

.

System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls

**References:**

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, TMH
3. Bruce Schneier, "Applied Cryptography". John Wiley & Sons
4. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
5. Atul Kahate, "Cryptography and Network Security", TMH

## **NMCAE22: Neural Networks**

### **Unit-I:**

Neurocomputing and Neuroscience

Historical notes, human Brain, neuron Mode 1, Knowledge representation, AI and NN. Learning process: Supervised and unsupervised learning, Error correction learning, competitive learning, adaptation, statistical nature of the learning process.

### **Unit-II:**

Data processing

Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, covariance matrix, eigen values & eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.

### **Unit-III**

Multilayered network architecture, back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptron.

### **Unit-IV**

Recurrent network and temporal feed-forward network, implementation with BP, self organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.

### **Unit-V**

Complex valued NN and complex valued BP, analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Soft computing. Neuro-Fuzzy-genetic algorithm Integration.

### **References:**

1. J.A. Anderson, An Introduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning
3. R.L. Harvey, Neural Network Principles, PHI
4. Kosko, Neural Network and Fuzzy Sets, PHI



## NMCAE23: Pattern Recognition

### Unit-I

**Introduction:** Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

### Unit-II

**Statistical Pattern Recognition:** Bayesian Decision Theory, Classifiers, Normal density and discriminant functions,

### Unit – III

**Parameter estimation methods:** Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

### Unit - IV

**Nonparametric Techniques:** Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.

### Unit - V

**Unsupervised Learning & Clustering:** Criterion functions for clustering, Clustering Techniques: Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.

### References:

1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", 2<sup>nd</sup> Edition, John Wiley, 2006.
2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4<sup>th</sup> Edition, Academic Press, 2009.

## **NMCAE24: CLOUD COMPUTING**

### **UNIT I**

#### Introduction

Cloud-definition, benefits, usage scenarios, History of Cloud Computing - Cloud Architecture - Types of Clouds - Business models around Clouds – Major Players in Cloud Computing- issues in Clouds - Eucalyptus - Nimbus - Open Nebula, Cloud Sim.

### **UNIT II**

#### Cloud Services

Types of Cloud services: Software as a Service-Platform as a Service –Infrastructure as a Service - Database as a Service - Monitoring as a Service –Communication as services.Service providers- Google, Amazon, Microsoft Azure, IBM, Sales force.

### **UNIT III**

#### Collaborating Using Cloud Services

Email Communication over the Cloud - CRM Management - Project Management-Event Management - Task Management – Calendar - Schedules - Word Processing – Presentation – Spreadsheet - Databases – Desktop - Social Networks and Groupware.

### **UNIT IV**

#### Virtualization For Cloud

Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization –System Vm, Process VM, Virtual Machine monitor – Virtual machine properties - Interpretation and binary translation, HLL VM - Hypervisors – Xen, KVM , VMWare, Virtual Box, Hyper-V.

### **UNIT V**

#### Security, Standards And Applications

Security in Clouds: Cloud security challenges – Software as a Service Security,Common Standards: The Open Cloud Consortium – The Distributed management Task Force – Standards for application Developers – Standards for Messaging – Standards for Security, End user access to cloud computing, Mobile Internet devices and the cloud.

### **TEXT BOOKS:**

1. John Rittinghouse & James Ransome, Cloud Computing, Implementation, Management and Strategy, CRC Press, 2010.
2. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Que Publishing, August 2008.
3. James E Smith, Ravi Nair, Virtual Machines, Morgan Kaufmann Publishers, 2006.

### **REFERENCES:**

1. David E.Y. Sarna Implementing and Developing Cloud Application, CRC press 2011.
2. Lee Badger, Tim Grance, Robert Patt-Corner, Jeff Voas, NIST, Draft cloud computing synopsis and recommendation, May 2011.
3. Anthony T Velte, Toby J Velte, Robert Elsenpeter, Cloud Computing : A Practical Approach, Tata McGraw-Hill 2010.
4. Haley Beard, Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.
5. G.J.Popek, R.P. Goldberg, Formal requirements for virtualizable third generation Architectures, Communications of the ACM, No.7 Vol.17, July 1974

## **NMCAE25\*: COMPUTER NETWORK**

### **Unit -I**

Introduction Concepts: Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design, Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling.

### **Unit-II**

Medium Access sub layer: Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.

### **Unit - III**

Network Layer: Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking -TCP / IP, IP packet, IP address, IPv6.

### **Unit - IV**

Transport Layer: Transport Layer - Design issues, connection management, session Layer- Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.

### **Unit-V**

Application Layer: Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application. Example Networks - Internet and Public Networks.

### **Text Books :**

1. Forouzen, "Data Communication and Networking", TMH
2. A.S. Tanenbaum, Computer Networks, Pearson Education
3. W. Stallings, Data and Computer Communication, Macmillan Press

### **References :**

1. Anuranjan Misra, "Computer Networks", Acme Learning
2. G. Shanmugarathinam, "Essential of TCP/ IP", Firewall Media

## NMCAE 26\*: Dot Net Framework and C#

### Unit-1

**The .Net framework:** Introduction, The Origin of .Net Technology, Common Language Runtime (CLR), Common Type System (CTS), Common Language Specification (CLS), Microsoft Intermediate Language (MSIL), Just-In –Time Compilation, Framework Base Classes.

### Unit-II

**C -Sharp Language (C#):** Introduction, Data Types, Identifiers, Variables, Constants, Literals, Array and Strings, Object and Classes, Inheritance and Polymorphism, Operator Overloading, Interfaces, Delegates and Events. Type conversion.

### Unit-III

**C# Using Libraries:** Namespace- System, Input-Output, Multi-Threading, Networking and sockets, Managing Console I/O Operations, Windows Forms, Error Handling.

### Unit-IV

**Advanced Features Using C#:** Web Services, Window Services, Asp.net Web Form Controls, ADO.Net. Distributed Application in C#, Unsafe Mode, Graphical Device interface with C#.

### Unit-V

**.Net Assemblies and Attribute:** .Net Assemblies features and structure, private and share assemblies, Built-In attribute and custom attribute. Introduction about generic.

### References

1. Wiley, "Beginning Visual C# 2008", Wrox
2. Fergal Grimes, "Microsoft .Net for Programmers". (SPI)
3. Balagurusamy, "Programming with C#", (TMH)
4. Mark Michaelis, "Essential C# 3.0: For .NET Framework 3.5, 2/e, Pearson Education
5. Shibi Parikkar, "C# with .Net Frame Work", Firewall Media.

## **MCA-Elective-III**

### **NMCAE 31: Image Processing**

#### **UNIT-I**

##### **Introduction and Fundamentals**

Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

##### **Image Enhancement in Frequency Domain**

Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

#### **UNIT-II**

##### **Image Enhancement in Spatial Domain**

Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

#### **UNIT-III**

##### **Image Restoration**

A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

#### **UNIT-IV**

##### **Morphological Image Processing**

Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

#### **UNIT-V Registration**

Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

#### **Segmentation**

Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

**References:**

1. Digital Image Processing 2<sup>nd</sup> Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.

## **NMCAE32: Simulation and Modeling**

### **Unit-1**

System definition and components, stochastic activities, continuous and discrete systems, system modeling, types of models, static and dynamic physical models, static and dynamic mathematical models, full corporate model, types of system study.

### **Unit-II**

System simulation, why & when to simulate, nature and techniques of simulation, comparison of simulation and analytical methods, types of system simulation, real time simulation, hybrid simulation, simulation of pure-pursuit problem, single-server queuing system and an inventory problem, Monte-Carlo simulation, Distributed Lag models, Cobweb model.

### **Unit-III**

Simulation of continuous systems, analog vs. digital Simulation, Simulation of water reservoir system, Simulation of a servo system, simulation of an autopilot,  
Discrete system simulation, fixed time-step vs. even to even model, generation of random numbers, test for randomness, Monte-Carlo computation vs. stochastic simulation.

### **Unit-IV**

System dynamics, exponential growth models, exponential decay models, modified exponential growth models, logistic curves, generalization of growth models, system dynamic diagrams  
Introduction to SIMSCRIPT: Program, system concepts, origination, and statements, defining the telephone system model.

### **Unit-V**

Simulation of PERT Networks, critical path computation, uncertainties in activity duration , resource allocation and consideration.

Simulation languages and software, continuous and discrete simulation languages, expression based languages, object oriented simulation, general purpose vs. application - oriented simulation packages, CSMP-III, MODSIM-III.

### **References**

1. Geoffrey Gordon, “ System Simulation”, PHI
2. Jerry Banks, John S. C Barry L. Nelson David M. Nicol, “Discrete Event System Simulation”, Pearson Education
3. V P Singh, “System Modeling and simulation”, New Age International.
4. Averill M. Law, W. David Kelton, “System Modeling and simulation and Analysis”, TMH

## **NMCAE 33: Software Project Management**

### **UNIT-I: Introduction and Software Project Planning**

Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

### **UNIT-II: Project Organization and Scheduling**

Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

### **UNIT-III: Project Monitoring and Control**

Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

### **UNIT-IV: Software Quality Assurance and Testing**

Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model (CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

### **UNIT-V: Project Management and Project Management Tools**

Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

### **References:**

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
3. Kieron Conway, Software Project Management, Dreamtech Press
4. S. A. Kelkar, Software Project Management, PHI Publication.



## **NMCAE34: Real Time System**

### **UNIT-I: Introduction**

Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

### **UNIT-II: Real Time Scheduling**

Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

### **UNIT-III: Resources Sharing**

Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

### **UNIT-IV: Real Time Communication**

Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols

### **UNIT-V: Real Time Operating Systems and Databases**

Features of RTOS, Time Services, UNIX as RTOS, POSIX

Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases

### **References:**

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Mall Rajib, "Real Time Systems", Pearson Education
3. Albert M. K. Cheng , "Real-Time Systems: Scheduling, Analysis, and Verification", Wiley.

## **MCA-Elective-IV**

### **NMCAE41: Advanced Database Management Systems**

#### **UNIT-I**

Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.

#### **UNIT –II**

Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializability by Locks, Locking system with multiple lock modes, architecture for Locking scheduler

#### **UNIT III**

Distributed Transactions Management, Data Distribution, Fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions, Moss Concurrency protocol.

#### **UNIT –IV**

Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems, Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.

#### **UNIT V**

Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques

#### ***References***

1. Silberschatz, Korth and Sudershan, Database System Concept', Mc Graw Hill
2. Ramakrishna and Gehrke,' Database Management System, Mc Graw Hill
3. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education
4. Ceei and Pelagatti,'Distributed Database', TMH
5. Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill

## **NMCAE42: Information Storage & Management**

### **Unit-I: Introduction to Storage Technology**

Data proliferation and the varying value of data with time & usage, Sources of data and states of data creation, Data center requirements and evolution to accommodate storage needs, Overview of basic storage management skills and activities, The five pillars of technology, Overview of storage infrastructure components, Evolution of storage, Information Lifecycle Management concept, Data categorization within an enterprise, Storage and Regulations.

### **Unit-II: Storage Systems Architecture**

Intelligent disk subsystems overview, Contrast of integrated vs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, Logical partitioning of disks, RAID & parity algorithms, hot sparing, Physical vs. logical disk organization, protection, and back end management, Array caching properties and algorithms, Front end connectivity and queuing properties, Front end to host storage provisioning, mapping, and operation, Interaction of file systems with storage, Storage system connectivity protocols.

### **Unit-III: Introduction to Networked Storage**

JBOD, DAS, SAN, NAS, & CAS evolution, Direct Attached Storage (DAS) environments: elements, connectivity, & management, Storage Area Networks (SAN): elements & connectivity, Fibre Channel principles, standards, & network management principles, SAN management principles, Network Attached Storage (NAS): elements, connectivity options, connectivity protocols (NFS, CIFS, ftp), & management principles, IP SAN elements, standards (SCSI, FCIP, FCP), connectivity principles, security, and management principles, Content Addressable Storage (CAS): elements, connectivity options, standards, and management principles, Hybrid Storage solutions overview including technologies like virtualization & appliances.

### **Unit-IV: Introduction to Information Availability**

Business Continuity and Disaster Recovery Basics, Local business continuity techniques, Remote business continuity techniques, Disaster Recovery principles & techniques.

### **Unit-V: Managing & Monitoring**

Management philosophies (holistic vs. system & component), Industry management standards (SNMP, SMI-S, CIM), Standard framework applications, Key management metrics (thresholds, availability, capacity, security, performance), Metric analysis methodologies & trend analysis, Reactive and pro-active management best practices, Provisioning & configuration change planning, Problem reporting, prioritization, and handling techniques, Management tools overview.

### **References**

1. Information Storage and Management Storing, Managing, and Protecting Digital Information , by EMC, Hopkinton and Massachusetts, Wiley, **ISBN:** 9788126521470

## **NMCAE43: Software Testing**

### **Unit-I: Introduction**

Faults, Errors, and Failures, Basics of software testing, Testing objectives, Principles of testing, Requirements, behavior and correctness, Testing and debugging, Test metrics and measurements, Verification, Validation and Testing, Types of testing, Software Quality and Reliability, Software defect tracking.

### **Unit-II: White Box and Black Box Testing**

White box testing, static testing, static analysis tools, Structural testing: Unit/Code functional testing, Code coverage testing, Code complexity testing, Black Box testing, Requirements based testing, Boundary value analysis, Equivalence partitioning, state/graph based testing, Model based testing and model checking, Differences between white box and Black box testing.

### **Unit-III: Integration, System, and Acceptance Testing**

Top down and Bottom up integration, Bi-directional integration, System integration, Scenario Testing, Defect Bash, Functional versus Non-functional testing, Design/Architecture verification, Deployment testing, Beta testing, Scalability testing, Reliability testing, Stress testing, Acceptance testing: Acceptance criteria, test cases selection and execution,

### **Unit-IV: Test Selection & Minimization for Regression Testing**

Regression testing, Regression test process, Initial Smoke or Sanity test, Selection of regression tests, Execution Trace, Dynamic Slicing, Test Minimization, Tools for regression testing, Ad hoc Testing: Pair testing, Exploratory testing, Iterative testing, Defect seeding.

### **Unit-V: Test Management and Automation**

Test Planning, Management, Execution and Reporting, Software Test Automation: Scope of automation, Design & Architecture for automation, Generic requirements for test tool framework, Test tool selection, Testing in Object Oriented Systems.

### **References:**

1. S. Desikan and G. Ramesh, "Software Testing: Principles and Practices", Pearson Education.
2. Aditya P. Mathur, "Fundamentals of Software Testing", Pearson Education.
3. Naik and Tripathy, "Software Testing and Quality Assurance", Wiley
4. K. K. Aggarwal and Yogesh Singh, "Software Engineering", New Age International Publication.

NMCAE44: BIG DATA		3 1 0
Unit	Topic	Proposed Lectures
I	<b>UNDERSTANDING BIG DATA</b> What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics	8
II	<b>NOSQL DATA MANAGEMENT</b> Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schema less databases, materialized views, distribution models, sharding, master-slave replication, peer-peer replication, sharding and replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning and combining, composing map-reduce calculations	8
III	<b>BASICS OF HADOOP</b> Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro file-based data structures	8
IV	<b>MAP REDUCE APPLICATIONS</b> Map Reduce workflows, unit tests with MRUnit, test data and local tests – anatomy of Map Reduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats	8
V	<b>HADOOP RELATED TOOLS</b> Hbase, data model and implementations, Hbase clients, Hbase examples – praxis. Cassandra, cassandra data model, cassandra examples, cassandra clients, Hadoop integration. Pig, Grunt, pig data model, Pig Latin, developing and testing Pig Latin scripts. Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation – HiveQL queries	8
<b>Text Books:</b> 1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013. 2. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012. 3. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilly, 2012. 4. Eric Sammer, "Hadoop Operations", O'Reilly, 2012. 5. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilly, 2012. 6. Lars George, "HBase: The Definitive Guide", O'Reilly, 2011. 7. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilly, 2010. 8. Alan Gates, "Programming Pig", O'Reilly, 2011.		