JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.Tech. Neural Networks   w.e.f 2007-2008

COUSRE STRUCTURE AND SYLLABUS

I SEMESTER

SCODE	SUBJECTS	L	P
MTNN1.1	Design and Analysis of Algorithms	4	-
MTNN1.2	Computer Organization	4	-
MTNN1.3	Computer Communications	4	-
MTNN1.4	Database Management Systems	4	-
MTNN1.5	Introduction to Artificial Intelligence	4	-
MTNN1.6	Introduction to Neural Networks	4	-
MTNN1.7	Data Structures through C++ and DBMS Lab	-	4

II SEMESTER

SCODE	SUBJECTS	L	P
MTNN2.1	Expert Systems	4	-
MTNN2.2	Functional Programming	4	-
MTNN2.3	Pattern Recognition	4	-
MTNN2.4	Machine Learning	4	-
MTNN2.5	Elective-I	4	-
MTNN2.6	Elective-II	4	-
MTNN2.7	Web Tech, Prolog and LISP Lab	-	4

Elective-I

MTNN 2.5.1   Advanced Computing Concepts
MTNN 2.5.2   Object Oriented Software Engineering
MTNN 2.5.3   Network Security and Cryptography

Elective-II

MTNN 2.6.1   Advanced Neural Networks and Fuzzy Systems
MTNN 2.6.2   Genetic Algorithms
MTNN 2.6.3   Data Mining & Data Warehousing

III-Semester & VI Semester
Seminar
Project Work

- Note: Eligibility for admission to this course is any B.E. / B.Tech / MCA / M.Sc (Maths) / B Level

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I Year   1 Semester

MTNN1.1   DESIGN AND ANALYSIS OF ALGORITHMS

UNIT-I: **INTRODUCTION :** Overview of C++ classes, pointers, parameters passing, templates, using Matrices.

UNIT-II: **ALGORITHM ANALYSIS :** Basics of time complexity estimates, General norms for running time calculation

UNIT-III: **LISTS, STACKS & QUEUES :** Abstract Data Types, Representation & implementation of ADT list, Doubly linked list, Circular linked lists, Representation, Implementation and applications of ADT stack and Queue.

UNIT-IV: **TREES** : Implementation and traversal of trees, Binary Trees and Binary search trees in C++, Concepts of AVL Trees, Splay Trees and B-Trees.

UNIT-V: **HASHING**. : Hash Function, Separate chains, Open addressing, rehashing, Extendible Hashing.

UNIT-VI: **INTERNAL SORTING ALGORITHMS**. : Sorting like insertion Sort, shell Sort, Heap Sort, Merge Sort, Quick Sort and Simple external Sorting algorithm.

UNIT-VII: **Greedy Technique :** Prim's and Krushkal's Algorithms, Dijkistra's Algorithm, Huffman Trees

UNIT-VIII: **GRAPH ALGORITHMS :** Representation of graph Topological Sort, shortest-path Algorithm, Network flow problem, Minimum spanning tree algorithm, Applications of Depth – First search. Introduction to NP-Completeness.

TEXT BOOKS:
1) Data Structures & Algorithm Analysis in C++ , Mark Allen Weiss. Second edition, Pearson Edition. Asia.
2) Fundamentals of Computer Algorithms,Horowitz and Sahni, Galgothia publications.

REFERENCE BOOKS:
1. Data Structures & Algorithm in C++, Adam Drozdek. Vikas publication House.
2. Data Structure, Algorithm and OOP, Gregory L. Heileman (Tata Mc Graw Hill Edition)

I Year   1 Semester

MTNN1.2 COMPUTER ORGANIZATION

UNIT-I: BASIC STRUCTURE OF COMPUTERS: Computer Types, Functional unit, Basic OPERATIONAL concepts, Bus structures, Software, Performance, multiprocessors and multi computers. Data Representation. Fixed Point Representation. Floating – Point Representation. Error Detection codes.
COMPUTER ARITHMETIC: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit Decimal Arithmetic operations

UNIT-II: REGISTER TRANSFER LANGUAGE AND MICROOPERATIONS: Register Transfer language. Register Transfer Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit. Instruction codes. Computer Registers Computer instructions – Instruction cycle.
Memory – Reference Instructions. Input – Output and Interrupt. STACK organization. Instruction formats. Addressing modes. DATA Transfer and manipulation. Program control. Reduced Instruction set computer.

UNIT-III: MICRO PROGRAMMED CONTROL: Control memory, Address sequencing, micro program example, design of control unit Hard wired control. Micro programmed control

UNIT-IV: PROGRAM AND NETWORK PROPERTIES
Conditions of Parallelism. Program Partitioning and Scheduling, Program flow Mechanism, System Interconnect Architectures.
SCALABILITY AND PERFORMANCE
Principles of Scalable Performance, Performance Metrics and Measures, Parallel Processing Applications. Speedup Performance Laws. Scalability Analysis and Approaches.

UNIT-V: THE MEMORY SYSTEM: Basic concepts semiconductor RAM memories. Read-only memories Cache memories performance considerations, Virtual memories secondary storage. Introduction to RAID.

UNIT-VI: INPUT-OUTPUT ORGANIZATION: Peripheral Devices, Input-Output Interface, Asynchronous data transfer Modes of Transfer, Priority Interrupt Direct memory Access, Input –Output Processor (IOP) Serial communication; Introduction to peripheral component, Interconnect (PCI) bus. Introduction to standard serial communication protocols like RS232, USB, IEEE1394.

UNIT-VII:
PIPELINE AND VECTOR PROCESSING:
Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Vector Processing, Array Processors.

UNIT-VIII: MULTI PROCESSORS: Characteristics or Multiprocessors, Interconnection Structures, Inter processor Arbitration. Inter Processor Communication and Synchronization Cache Coherence. Shared Memory Multiprocessors.

MULTIPROCESSING
Multiprocessor System Interconnects. Cache Coherence and Synchronization Mechanisms.
Vector Processing Principles. SIMD Computer Implementation Models.
Latency Hiding Techniques. Principles of Multi Threading.
Data Flow Architecture Evaluation.

TEXT BOOKS:
1. Computer Systems Architecture – M. Morris Mano, IIIrd Edition, Pearson/PHI
2. Computer Organization – Car Hamacher, Zvonks Vranesic, SafeaZaky, Vth Edition, McGraw Hill.

REFERENCE:
1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson
3. Fundamentals or Computer Organization and Design, - Sivaraama Dandamudi Springer Int. Edition.
4. Computer Organization, Anjaneyulu, Himalaya Pub house.

I Year   1 Semester

MTNN1.3 COMPUTER COMUNICATIONS

UNIT-I: Introduction: Uses of computer Networks, Network H/w, Network S/W, Reference Models, Example Networks , Network Standardization.

UNIT-II: Physical Layer: Guided transmission media – Magnetic media, Twisted Pair, coaxial cable, fiber optics . **Data Link Layer:** Design Issues, Error detection and correction , Elementary Data Link Protocols, Sliding Window Protocols, Protocol Verification, Example Data Link protocols.

UNIT-III: The Medium Access Sub Layer : The channel allocation problem, Multiple access Protocols, Ethernet , Wireless LANs , Broadband Wireless, Bluetooth ,Data Link Layer Switching.

UNIT-IV: The Network Layer : Network Layer Design Issues, Routing Algorithms ,Congestion Control Algorithms ,Quality Of Service, Internet Working ,Network Layer in Internet.

UNIT-V: The Transport Protocol: The Transport Service, Elements of transport protocol , A simple Transport   Protocol , Internet Transport Protocols UDP, Internet Transport Protocols TCP, Performance   Issues.

UNIT-VI: The Application Layer: DNS-(Domain Name System), Electronic Mail, World Wide Web Multimedia,

UNIT-VII: Network Security: Cryptography, Symmetric _key Algorithms, Public–Key Algorithms, Digital Signatures, Management of public keys.

UNIT-VIII: Communication Security, Authentications Protocols, E-mail Security, Web security, Social Issues.

TEXT BOOKS:

1. Computer Networks -- Andrew S Tanenbaum,4th Edition. Pearson Education/PHI

REFERENCE BOOKS:

1. Computer Communications and Networking Technologies –Michael A. Gallo, William M .Hancock   - Thomson Publication

2. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

I Year   1 Semester

MTNN1.4   DATABASE MANAGEMENT SYSTEMS

UNIT – I: Data base System Applications, data base System VS file System – View of Data – Data Abstraction – Instances and Schemas – data Models – the ER Model – Relational Model – Other Models – Database Languages – DDL – DML – database Access for applications Programs – data base Users and Administrator – Transaction Management – data base System Structure – Storage Manager – the Query Processor – History of Data base Systems. Data base design and ER diagrams – Beyond ER Design Entities, Attributes and Entity sets – Relationships and Relationship sets – Additional features of ER Model – Concept Design with the ER Model – Conceptual Design for Large enterprises.

UNIT – II: Relational Model: Introduction to the Relational Model – Integrity Constraint Over relations – Enforcing Integrity constraints – Querying relational data – Logical data base Design – Introduction to Views – Destroying /altering Tables and Views.
Relational Algebra and Calculus: Relational Algebra – Selection and projection set operations – renaming – Joins – Division – Examples of Algebra overviews – Relational calculus – Tuple relational Calculus – Domain relational calculus – Expressive Power of Algebra and calculus.

UNIT – III: Form of Basic SQL Query – Examples of Basic SQL Queries – Introduction to Nested Queries – Correlated Nested Queries Set – Comparison Operators – Aggregative Operators – NULL values – Comparison using Null values – Logical connectivity's – AND, OR and NOTR – Impact on SQL Constructs – Outer Joins – Disallowing NULL values – Complex Integrity Constraints in SQL Triggers and Active Data bases.

UNIT – IV: Schema refinement – Problems Caused by redundancy – Decompositions – Problem related to decomposition – reasoning about FDS – FIRST, SECOND, THIRD Normal forms – BCNF – Lossless join Decomposition – Dependency preserving Decomposition – Schema refinement in Data base Design – Multi valued Dependencies – forth Normal Form.

UNIT – V: Overview of Transaction Management: ACID Properties – Transactions and Schedules – Concurrent Execution of transaction – Lock Based Concurrency Control – Performance Locking – Transaction Support in SQL – Introduction to Crash recovery.

UNIT – VI: Concurrency Control: Serializability, and recoverability – Introduction to Lock Management – Lock Conversions – Dealing with Dead Locks – Specialized Locking Techniques – Concurrency without Locking.
Crash recovery: Introduction to ARIES – the Log – Other Recovery related Structures – the Write-Ahead Log Protocol – Check pointing – re3covering from a System Crash – Media recovery – Other approaches and Interaction with Concurrency control.

UNIT – VII:
Overview of Storage and Indexing: Data on External Storage – File Organization and Indexing – Cluster Indexes, Primary and Secondary Indexes – Index data Structures – Hash Based Indexing – Tree base Indexing – Comparison of File Organizations – Indexes and Performance Tuning.

UNIT – VIII:
Storing data: Disks and Files: - The Memory Hierarchy – Redundant Arrays of Independent – Disks – Disk Space Management – Buffer Manager – Files of records – Page Formats – record formats.
Tree Structured Indexing: Intuitions for tree Indexes – Indexed Sequential Access Methods (ISAM) – B+ Trees: A Dynamic Index Structure.
Hash Based Indexing: Static Hashing – Extendable hashing – Linear Hashing – Extendable vs. Liner hashing.

TEXT BOOKS:

1.   Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGraw Hill 3rd Edition
2.   Data base System Concepts, Silberschatz, Korth, McGraw hill, IV edition.

REFERENCE BOOK:

1.   Introduction to Database Systems, C.J.Date Pearson Education
2.   Data base Systems design, Implementation, and Management, Rob & Coronel 5th Edition. Thomson
3.   Data base Management System, Elmasri Navrate Pearson Education
4.   Data base Management System Mathew Leon, Leon Vikas.
5.   Data base Systems, Connoley Pearson education

I Year   1 Semester

MTNN 1.5   INTRODUCTION TO ARTIFICIAL INTELLIGENCE

UNIT-I: Introduction to AI - Roots and Scope of AI, Definition, Turing Test, Application Areas of AI

UNIT-II: AI as Representation and Search - Predicate Calculus - Structures and Strategies for State Space Search

UNIT-III: Heuristic Search - Control and Implementation of State Space Search

UNIT-IV: Representation and Inference - Knowledge Representation - Strong Methods for Problem Solving Reasoning in Uncertain Situations

UNIT-V: Machine Learning - Symbol-Based: Framework for Symbol – Based Learning, Version Space Search, ID3 Algorithm, Un-supervised learning, Reinforcement Learning

UNIT-VI: Connectionist: Perceptron Learning, Backpropagation Learning, Competitive Learning, Hebbian Coincidence Learning, Attractor Networks

UNIT-VII: Advanced Topics of AI Problem Solving - Automated Reasoning: Weak Methods in Theorem Proving, GPS and Difference Table, Resolution for Theorem Proving, Automated reasoning with PROLOG

UNIT-VIII: Understanding Natural Language: Role of Knowledge, Symbolic Analysis, Syntax, ATN Parsers, Stochastic Tools for Language Analysis, Natural Language Applications

Text Book:

"Artificial Intelligence – Structures and Strategies for Complex Problem Solving", George F. Luger, 4th Edition, Pearson Education , 2003.

Reference Books:

"Artificial Intelligence", Knight, Tata McGraw Hill
"Artificial Intelligence 'a Modern Approach" Russell & Norvig, second edition , Pearson Education , 2003.

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I Year   1 Semester

MTNN 1.6   NEURAL NETWORKS

UNIT I: INTRODUCTION - what is a neural network? Human Brain, Models of a Neuron, Neural networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks (p. no's 1 –49)

UNIT II: LEARNING PROCESS – Error Correction learning, Memory based learning, Hebbian learing, Competitive, Boltzmann learning, Credit Asssignment Problem, Memory, Adaption, Statistical nature of the learning process, (p. no's 50 –116)

UNIT III: SINGLE LAYER PERCEPTRONS – Adaptive filtering problem, Unconstrained Organization Techniques, Linear least square filters, least mean square algorithm, learning curves, Learning rate annealing techniques, perceptron –convergence theorem, Relation between perceptron and Bayes classifier for a Gaussian Environment (p. no's 117 –155)

UNIT IV: MULTILAYER PERCEPTRON – Back propagation algorithm XOR problem, Heuristics, Output representation and decision rule, Comuter experiment, feature detection, (p. no's 156 –201)

UNIT V: BACK PROPAGATION - back propagation and differentiation, Hessian matrix, Generalization, Cross validation, Network pruning Techniques, Virtues and limitations of back propagation learning, Accelerated convergence, supervised learning. (p. no's 202 –234)

UNIT VI: SELF ORGANIZATION MAPS – Two basic feature mapping models, Self organization map, SOM algorithm, properties of feature map, computer simulations, learning vector quantization, Adaptive patter classification   (p. no's 443 –469, 9.1 –9.8)

UNIT VII: NEURO DYNAMICS – Dynamical systems, stavility of equilibrium states, attractors, neurodynamical models , manipulation of attarctors as a recurrent network paradigm   (p. no's 664 –680, 14.1 –14.6)

UNIT VIII: HOPFIELD MODELS – Hopfield models, computer experiment I (p. no's 680-701, 14.7 –14.8)

TEXT BOOKS:
1. Neural networks A comprehensive foundations, Simon Hhaykin, Pearson Education 2nd edition 2004

 REFERENCE BOOKS

1. Artifical neural networks - B.Vegnanarayana Prentice Halll of India P Ltd 2005
2. Neural networks in Computer intelligence, Li Min Fu TMH 2003
3. Neural networks James A Freeman David M S kapura pearson education 2004

I Year   1 Semester

MTNN 1.7   DATA STRUCTURES THROUGH C++ & DBMS LAB

C++:

1. Write C++ programs to implement the following using an array
        a. Stack ADT   b. Queue ADT
2. Write C++ programs to implement the following using a singly linked list
        a. Stack ADT   b. Queue ADT
3. Write C++ programs to implement the deque ADT using a doubly linked list
4. Write a C++ program to perform the following operations
    a) Insert an element into a binary search tree
    b) Delete an element from a binary search tree
    c) Search for a key element in a binary search tree
5. Write a C++ programs that use non-recursive functions to traverse the given binary tree in
    a) Preorder   b) inorder and   c) postorder

6. Write C++ programs for implementing the following sorting methods:
    a) Quick sort   b) Merge Sort   c) Heap Sort

DBMS:
1. Creating tables for various relations (in SQL)
2. Implementing the queries in SQL for :
    a) Insertion
    b) Retrieval
    c) Updation
    d) Deletion
3. Creating views
4. Writing triggers.

Text Books :

1. C++ programming from Problem Analysis to Program Design, 2nd Edition, D.S.Malik, Thomson.
2. **SQL: The Complete Reference** - By James R. Groff, Paul N. Weinberg

I Year   I1 Semester

MTNN 2.1   EXPERT SYSTEMS

UNIT-I: Expert System Architectures: Introduction, characteristic features of Expert Systems, Background history, Applications, Importance of Expert Systems, Rules-based system architectures, Frame architectures, Decision tree architectures, Black board architectures, Neural Network architectures.

UNIT-II: Knowledge Representations: OAV-Triplets, Semantic Networks, Frames, representation via logic statements, neural networks, representation via rule-based systems.

UNIT – III : Reasoning under Uncertainty: Uncertainty, Types of errors, errors and induction, classical probability, compound probability, conditional probability

UNIT-IV : **Temporal reasoning and Marcov Chains**, TMS, Fuzzy logic and natural language computations, probabilistic reasoning, probabilistic networks, Bayesian networks.

UNIT –V : **Design of Expert Systems:** Introduction, selecting the appropriate problem, stages in development of Expert Systems, Errors in Development Stages

UNIT-VI: **Software Engineering and Expert Systems**. The Expert System Life Cycle.

UNIT-VII : **Expert System Design Examples**: Introduction, Certainty factors, decision trees, Backward Chaining.

 UNIT-VIII : A case-study on DENDRAL, MYCIN

Text Books:
    Expert Systems Principles and programming-Giarratano, Riley.2003
Introduction to Artificial Intelligence & Expert Systems-Pan W.Patterson.PHI

Reference Books: Introduction to Expert Systems-James P. Ignizio.Mc. Graw-Hill,Inc.

I Year   I1 Semester

MTNN 2.2   FUNCTIONAL PROGRAMMING USING LISP & PROLOG

UNIT-I: Introduction to Functional Programming, Functional Programming Vs System Programming Vs Structure programming Vs Objected Oriented Programming
Basic Principles: Expressions, Elementary Types, Cartesian Product, Functions, Polymorphism, Syntax, Scope of Identifiers, More about Function Types, Examples

UNIT-II: Introduction to LISP, LISP Data Structures: Record or Named Cartesian Products, Sums with Constructors, Lists, Examples

UNIT-III: **Semantics in LISP**: Evaluation, Defining Strategies, Program Semantics, Proving the Correctness of Program, Typing Expressions, Examples

UNIT-IV: **Imperative Aspects in LISP**: Exceptions, Input and Output, Character Streams, Modifiable Data Structures, Semantics of Destructive Operations , Examples, Formal Terms, Pattern Matching, Unification: Trees, Terms with variables, Application: Type Synthesis, Examples

UNIT-V: Introduction to Programming in PROLOG, Data Structures – Notation – Semantics, imperative Aspects.

UNIT-VI: Implementation of Balanced Trees using PROLOG: Binary Trees, Tree Traversals, Order and Pre-order Relations. Binary Search Trees, Balanced Trees, Dictionaries, Ordered sets, Functional Queues, Examples

UNIT-VII: **Graphs and Problem Solving**: Algorithms to Explore Graphs, The Red Donkey, The Game of Solitaire, Examples
Syntactic Analysis: Regular Expressions, Context-Free Grammar, Recognizers, Analysis, Streams and Pattern Matching, Compiling Regular Expressions, Examples

UNIT-VIII: **Exact Arithmetic**: Representing Integers by Lists, Other representations of Natural Numbers, Signed Integers, Both Negative and Positive, Rational Numbers, An application computing **pie**

Text Book:
1.   The Functional Approach to Programming By Guy Cousineau, Michel Mauny
2.   Prolog Program and logic – An Algebraic View of Lisp Programming Fundation and Applications. By W. Richard Start – Springer Vertag Publication
3.   micro – PROLOG : Programming in Logic By K.L.Clark and F.G.McCabe

Reference Book:
1. Functional and Logic Programming Languages By Peter H. Salus
2. Programming in PROLOG By W.F. CLOCKSIN C.S.Mallish – Narosa Publication
3. LISP Programming By Winston

I Year   I1 Semester

MTNN 2.3   PATTERN RECOGNITION

UNIT – I : **Introduction :**   Machine perception, pattern recognition example, pattern recognition systems, the design cycle, learning and adaptation (Text Book – 1, p.nos.1-17).

UNIT – II : **Bayesian Decision Theory** : Introduction, continuous features – two categories classification, minimum error – rate classification – zero- one loss function, classifiers, discriminant functions, and decision surfaces (Text book – 1, p.nos:20-27,29-31).

UNIT- III : **Normal density** : Univariate and multivariate density, discriminant functions for the normal density – different cases, Bayes decision theory – discrete features, compound Bayesian decision theory and context (text book – 1, p.nos.31-45,51-54,62-63).

UNIT – IV : **Maximum likelihood and Bayesian parameter estimation** : Introduction, maximum likelihood estimation, Bayesian estimation, Bayesian parameter estimation – Gaussian case (Text book – 1, p.nos : 84-97).

UNIT – V : **Un-supervised learning and clustering** : Introduction, mixture densities and identifiability, maximum likelihood estimates, application to normal mixtures, K-means clustering. Data description and clustering – similarity measures, criteria function for clustering (text book1, p.nos:517-526,537-546).

UNIT-VI : **Component analyses :** Principal component analysis, non-linear component analysis; Low dimensional representations and multi dimensional scaling (Text book – 1, p.nos:568-570,573-576,580-581).

UNIT-VII : **Discrete Hidden Morkov ModelS** : introduction, discrete-time markov process, extensions to hidden markov models, three basic problems for HMMs.

UNIT – VIII : **Continuous hidden markov models** : Observation densities, training and testing with continuous HMMs, types of HMMs (text book -2, p.nos.348-352).

Text Books. :
1. Pattern classifications, RichardO. Duuda, Peter E. Hart David G. Stroke, Wiley student edition, Second Edition.
2. fumndamentals of speech Recognition, Lawerence Rabiner, Bing- Hwang juang Pearson Education.

Reference::
1. pattern Recognition and image Analysis – eari Gose, Richard John baugh, steve josi PHI2004

I Year   I1 Semester
MTNN 2.4   MACHINE LEARNING

UNIT – I : **Introduction**: An illustrative learning task, and a few approaches to it. What is known from algorithms? Theory, Experiment. Biology. Psychology.

UNIT – II : **Concept Learning**: Version spaces. Inductive Bias. Active queries. Mistake bound/ PAC model. basic results. Overview of issues regarding data sources, success criteria.

UNIT – III : **Decision Tree Learning**: - Minimum Description Length Principle. Occam's razor. Learning with active queries

UNIT – IV : **Neural Network Learning**: Perceptions and gradient descent back propagation.

UNIT –V : **Sample Complexity and Over fitting**: Errors in estimating means. Cross Validation and jackknifing VC dimension. Irrelevant features: Multiplicative rules for weight tuning.

UNIT—VI : **Bayesian Approaches**: The basics Expectation Maximization. Hidden Markov Models

UNIT—VII : **Instance-based Techniques**: Lazy vs. eager generalization. K nearest neighbor, case- based reasoning.

UNIT—VIII : **Genetic Algorithms**: Different search methods for induction - Explanation-based Learning: using prior knowledge to reduce sample complexity.

Text Books:
  - ➢ Tom Michel, Machine Learning, McGraw Hill, 1997
  - ➢ Trevor Has tie, Robert Tibshirani & Jerome Friedman. The Elements of Statically
  - ➢ Learning, Springer Verlag, 2001

REFERENCE BOOKS:

Richard o. Duda,Peter E. Hart and David G. Stork, pattern classification, John Wiley & Sons Inc.,2001
Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995

I Year   I1 Semester

MTNN 2.5.1   ADVANCED COMPUTING CONCEPTS
(Elective -I)

UNIT – I: Grid Computing : Data & Computational Grids, Grid Architectures and its relations to various Distributed Technologies.

UNIT – II: Autonomic Computing, Examples of the Grid Computing Efforts (IBM)

UNIT-III: Cluster setup & its Advantages, Performance Models & Simulations; Networking Protocols & I/O messaging systems.

UNIT – IV: Process scheduling, Load sharing and Balancing, Distributed shared memory, parallel I/O.

UNIT – V: Example cluster System – Beowlf; Cluster Operating systems: COMPaS and NanOS.

UNIT – VI: Pervasive Computing concepts & Scenarios; Hardware & Software; Human –machine interface.

UNIT – VII: Device connectivity; Java for Pervasive devices, Application examples.

UNIT- VIII: Classical Vs Quantum logic gates, One, two & three QUbit Quantum gates; Fredkin & Toffoli gates; Quantum circuits; Quantum algorithms.

TEXT BOOK :
1. "Selected Topics in Advance computing" Edited by Dr. P. Padmanabham and Dr. M.B.Srinivas, 2005 Pearson Education.

References :

1. J. Joseph & C. Fellenstein: 'Grid Comu8ting', Pearson Education
2. J. Burkhardt et.al: Pervasive computing Pearson Education
3. Marivesar.'Approaching quantum computing', Pearson Education
4. Raj Kuma Buyya.'High performance cluster computing', Pearson Education
5. neilsen & Chung L:'Quantum computing and Quantum information', Cambridge University Press.
6. A networking approach to Grid Computing, Minoli, Wiley.

I Year   I1 Semester

MTNN 2.5.2   OBJECT ORIENTED SOFTWARE ENGINEERING
(Elective - I)

UNIT – I : **Software Engineering**: - Software related problems, software engineering, concepts, development activities

UNIT – II : **Modeling**: - Concepts, Modeling with UML

UNIT – III : **Project Organization & Communication**: - Project Organization & communication concepts and their activities

UNIT – IV : **Requirements**: - Requirements elicitation & its activities and managing requirements elicitation - Analysis: - Analysis overview, concepts, activities and managing analysis

UNIT – V : **System Design** - Design overview, concepts, and activities, addressing design goals and managing system design

UNIT – VI : **Object Design**: - Object reuse, its activities & managing reuse, Interface specification concepts & its - activities and Managing object design

UNIT – VII : **Testing**; - Testing concepts, activities and managing testing

UNIT – VIII : **Software Configuration Management**: - Configuration Management overview, concepts, activities and managing configuration management

Text Book:
Object-Oriented Software Engineering: Using UML, Patterns and Java, Bernd Bruegge and Allen H. Dutoit, 2nd Edition, Pearson Education Asia

Reference Book:
1. Object-Oriented Software Engineering: Practical software development using UML and Java
Timothy C. Lethbridge and Robert Laganiere , McGraw-Hill Higher education
2. An Introduction to Object Oriented Systems Analysis and Design with UML and the Unified Process, Stephen R Schach, Tata McGraw-Hill

I Year   I1 Semester

MTNN 2.5.3   NETWORK SECURITY AND CRYPTOGRAPHY

UNIT-I: Introduction: Attacks, Services and Mechanisms, Security attacks, Security services, A Model for Internetwork security. Classical Techniques: Conventional Encryption model, Steganography, Classical Encryption Techniques.

UNIT-II: Modern Techniques: Symplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operations. Algorithms: Triple DES, International Data Encryption algorithm, Blowfish, RC5, CAST-128, RC2, Characteristics of Advanced Symmetric block cifers.

UNIT-III: Conventional Encryption: Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation. Public Key Cryptography: Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptograpy.

UNIT-IV: Number theory: Prime and Relatively prime numbers, Modular arithmetic, Fermat's and Euler's theorems, Testing for primality, Euclid's Algorithm, the Chinese remainder theorem, Discrete logarithms. Message authentication and Hash functions: Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs.

UNIT-V: Hash and Mac Algorithms: MD File, Message digest Algorithm, Secure Hash Algorithm, RIPEMD-160, HMAC. Digital signatures and Authentication protocols: Digital signatures, Authentication Protocols, Digital signature standards.

UNIT-VI: Authentication Applications: Kerberos, X.509 directory Authentication service. Electronic Mail Security: Pretty Good Privacy, S/MIME.

UNIT-VII: IP Security: Overview, Architecture, Authentication, Encapsulating Security Payload, Combining security Associations, Key Management. Web Security: Web Security requirements, Secure sockets layer and Transport layer security, Secure Electronic Transaction.

UNIT-VIII: Intruders, Viruses and Worms: Intruders, Viruses and Related threats.
Fire Walls: Fire wall Design Principles, Trusted systems.

Text Books:
1. Cryptography and Network Security: Principles and Practice - William Stallings, Pearson Education.
2. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.

Reference Books:
1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
2. Network Security - Private Communication in a Public World by Charlie Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.
3. Principles of Information Security, Whitman, Thomson.
5. Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH
6. Introduction to Cryptography, Buchmann, Springer.

I Year   I1 Semester

MTNN 2.6.1 ADVANCED NEURAL NETWORKS & FUZZY SYSTEMS
(Elective - II)

UNIT-I: Neural Networks and Fuzzy Systems - Neural and Fuzzy Machine Intelligence, Fuzziness as Multivalence, The Dynamical- Systems Approach to Machine Intelligence, Intelligent Behavior as Adaptive Model- Free Estimation.

UNIT-II: **Neural Dynamics I**: Activations and Signals - Neurons as Functions, Signal Monotonicity, Biological Activations and Signals, Neuron - Fields, Neuronal Dynamical Systems, Common Signal Functions, Pulse-Coded Signal Functions.

UNIT-III: **Neuronal Dynamics II**: Activation Models - Neuronal Dynamical Systems, Additive Neuronal Dynamics, Additive Neuronal - Feedback, Additive Bivalent Models, BAM Connection Matrices, Additive Dynamic and the Noise-Saturation Dilemma, General Neuronal Activations: Cohen-Grossberg and Multiplicative Models.

UNIT-IV: **Synaptic Dynamics I**: Unsupervised Learning - Learning as Encoding, Change, and Quantization, Four Unsupervised Learning Laws, - Probability Spaces and Random Processes, Stochastic Unsupervised Learning and Stochastic Equilibrium, Signal Hebbian Learning, Competitive Learning, Differential - Hebbian Learning, Differential Competitive Leering.

UNIT-V: **Synaptic Dynamics II**: Supervised Learning - Supervised Function Estimation, Supervised Learning as Operant Conditioning, - Supervised Learning as Stochastic Pattern Learning with known Class Memberships, Supervised Learning as stochastic Approximation, The Back propagation Algorithm.

UNIT-VI: **Fuzziness versus Probability** - Fuzzy Sets and Systems, Fuzziness in a Probabilistic World, Randomness vs. Ambiguity: Whether vs. How much, the Universe as a Fuzzy Set, The Geometry of Fuzzy Set, The Geometry of Fuzzy Sets: Sets as Points.

UNIT-VII: **The Fuzzy Entropy Theorem**, The Subsethood - theorem. The Entropy-Subsethood Theorem.

UNIT-VIII: **Fuzzy Associative Memories** - Fuzzy Systems as Between-Cube Mappings, Fuzzy and Neural Function Estimators, - Fuzzy Hebb FAMs, Adaptive FAMs: Product-Space Clustering in FAM Cells.

Text Book:
Neural Networks & Fuzzy Systems, Bark Kosko, PHI
Refernce Books:
1. Neural network Design, Hagan, Demuth and Beale, Vikas Publishing House
2. FUZZY LOGIC Intelligence Control and Information by Yen Langari – Pearson Edition
3. Fuzzy Set Theory & its Applica tion, H.J. Zimmerman Allied Published Ltd.

I Year   I1 Semester

MTNN 2.6.2 GENETIC ALGORITHMS
(Elective - II)

UNIT – I : **Genetic Introduction to Generic Algorithms** – Notation – Random Heuristic Search (Representation, Non Determinism, Markov chain.

UNIT – II : **Genetic Algorithms revisited : Mathematical foundations, Genetic Algorithms in problem solving** – Evolving Computer Programs, Data Analysis and Prediction, Evolving Neural Networks, Thought exercises

UNIT – III : **Genetic Algorithms in Scientific Models** - Modeling Interaction between Learning and Evolution, Modeling sexual selection, Modeling Ecosystems, Measuring Evolutionary Activity, Thought Exercises. - Theoretical foundation of Genetic Algorithms – Schemas and the Two – Armed Bandit Problem, Royal Roads, Exact Mathematical Models of simple genetic algorithm

UNIT – IV : Simple genetic algorithms – algebra, selection, Mutation, Crossover, mixing, SGA Heuristic.

UNIT – V : **Computer Implementation of Genetic Algorithms,** Implementation of Genetic Algorithm selection, Mutation, Crossover, The classical SGA Random sampling, Walsh Transformation.

UNIT – VI : Some Application of Genetic Algorithms,

UNIT – VII : Advanced Operation and Genetic Algorithms, Computing with Heuristic - Basic Examples, The inverse Heuristic, Focuses Heuristic.

UNIT – VIII : Introduction to Genetic Base Search, Linear Fitness Perturbation Arguments, Transient Behavior, Asymptotic Behavior

TEXT BOOKS :

1.   Genetic algorithms in search, optimization and Mechine learning, By David E. Gold
        Berg Pearson Edition
2.   An Introduction to Genetic Algorithm by Melanie Mitchell

REFERENCE BOOK :

1. The Simple Genetic Algorithm Foundation & Theores by Michael P. Vosk

I Year   I1 Semester

MTNN 2.6.3   DATA WAREHOUSING AND MINING
(Elective - II)

UNIT-I: Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Major issues in Data Mining, Data Warehouse and OLAP Technology for Data Mining Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Further Development of Data Cube Technology,   From Data Warehousing to Data Mining,

UNIT-II: Data Preprocessing: Needs Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation, Online Data Storage.

UNIT-III: Data Mining Primitives, Languages, and System Architectures: Data Mining Primitives, Data Mining Query Languages, Designing Graphical User Interfaces Based on a Data Mining Query Language Architectures of Data Mining Systems,

UNIT-IV: Concepts Description: Characterization and Comparison: Data Generalization and Summarization-Based Characterization,   Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons: Discriminating between Different Classes, Mining Descriptive Statistical Measures in Large Databases.

UNIT-V: Mining Association Rules in Large Databases: Association Rule Mining, Mining Single-Dimensional Boolean Association Rules from Transactional Databases, Mining Multilevel Association Rules from Transaction Databases, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

UNIT-VI: Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification Based on Concepts from Association Rule Mining, Other Classification Methods, Prediction, Classifier Accuracy.

UNIT-VII: Cluster Analysis Introduction : Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Outlier Analysis.

UNIT-VIII: Mining Complex Types of Data: Multidimensional Analysis and Descriptive Mining of Complex, Data Objects, Mining Spatial Databases, Mining Multimedia Databases, Mining Time-Series and Sequence Data, Mining Text Databases, Mining the World Wide Web.

TEXT BOOKS:
1. Data Mining – Concepts and Techniques - JIAWEI HAN & MICHELINE
    KAMBER Harcourt India.
2. Data Mining Techniques – ARUN K PUJARI, University Press
3. Building the DataWarehouse- W. H. Inmon, Wiley Dreamtech India Pvt. Ltd..
REFERENCE BOOKS:
1. Data Warehousing in the Real World – Sam Anahory & Dennis Murray Pearson Edn Asia.
2. Data Warehousing Fundamentals – Paulraj Ponnaiah Wiley Student   Edition
3. The Data Warehouse Life Cycle Tool Kit – Ralph Kimball Wiley Student Edition
4. Data Mining Introductory And Advanced Topics –Margaret H Dunham Pearson Education

I Year   I1 Semester

MTNN 2.7   WEB PROGRAMMING, LISP & PROLOG LABORATORY

1. Design of the Web pages using various features of HTML and DHTML
2. Client server programming using servlets, JSP on the server side and java script on the client side
3. Web enabling of databases
4. Multimedia effects on web pages design using Flash.
5. Programs on LISP and PROLOG

Reference Books:
1. Internet and Web Technologies by Raj Kamal, Tata McGraw-Hill
2. Programming the World Wide Web by Robert W. Sebesta, Pearson Education
3. Programming in PROLOG By W.F. CLOCKSIN C.S.Mallish – Narosa Publication
4. LISP Programming By Winston