DAVUNIVERSITY JALANDHAR

Course Scheme For

Scheme of Courses M. TECH.
(Program ID-44)

1st TO 4th SEMESTER
Examinations 2014 Session Onwards

Syllabi Applicable For Admissions in 2014

DAV UNIVERSITY, JALANDHAR

Scheme of Courses M. TECH.
COMPUTER SCIENCE & ENGINEERING

SEMESTER 1

S.No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	CSE501	Advance Computer Networks & Simulation	4	-	-	4	25	25	25	25	100
2	CSE503	Data Mining & Warehousing	4	-	-	4	25	25	25	25	100
3	CSE505	Parallel Computing & Architecture	4	-	-	4	25	25	25	25	100
4	MGT551	Research Methodology	4	0	-	4	25	25	25	25	100
5	MTH551	Numerical Analysis	4	1	-	4	25	25	25	25	100
6	CSE507	Advance Computer Networks & Simulation-Lab	-	-	4	2	-	-	-	-	50
7	CSE509	Data Mining & Warehousing-Lab	-	-	4	2	-	-	-	-	50
			20	**1**	**8**	**24**					**600**

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type & Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type & Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

DAV UNIVERSITY, JALANDHAR

Scheme of Courses M. TECH.
COMPUTER SCIENCE & ENGINEERING

SEMESTER 2

S.No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	CSE502	Digital Image Processing	4	1	-	4	25	25	25	25	100
2	CSE504	Software Metrics and Quality Engineering	4	-	-	4	25	25	25	25	100
3	CSE506	Wireless Data Networks	4	1	-	4	25	25	25	25	100
4	CSE5xx	DE-I	4	-	-	4	25	25	25	25	100
5	CSE5xx	DE-II	4	-	-	4	25	25	25	25	100
6	CSE524	Wireless Data Networks Laboratory	-	-	4	2	-	-	-	-	50
6	CSE526	Seminar	-	-	4	2	-	-	-	-	50
			20	**2**	**8**	**24**					**600**

Department Elective-I

Course code	Course Title
CSE508	Information Security & Risk Management
CSE510	Grid Computing
CSE512	Advanced Data Structure & Algorithms
CSE514	Network & System Administration

Department Elective-II

Course Code	Course Title
CSE516	Natural Language Processing and Information Retrieval
CSE518	Distributed Computing Systems
CSE520	Network Security
CSE522	Cryptography

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type & Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type & Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

DAV UNIVERSITY, JALANDHAR

Scheme of Courses M. TECH.
COMPUTER SCIENCE & ENGINEERING

SEMESTER 3

S.No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1.	CSE601	Evolutionary Methods	4	1	0	4	25	25	25	25	100
2.	CSE6xx	DE-III	4	1	0	4	25	25	25	25	100
3.	CSE613	Dissertation Part-I	0	0	0	12	-	-	-	-	300
4.	CSE615	Research Seminar	0	0	8	4	-	-	-	-	100
			8	**2**	**8**	**24**					**600**

Department Elective-III

Course Code	Course Title
CSE603	Software Project Management
CSE605	Cloud Computing
CSE607	Machine Learning
CSE609	System Security Engineering

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type & Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type & Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

DAV UNIVERSITY, JALANDHAR

Scheme of Courses M. TECH.
COMPUTER SCIENCE & ENGINEERING

SEMESTER 4

S.No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	CSE600	Dissertation Part-II	-	-	-	24	-	-	-		600
			0	**0**	**0**	**24**					**600**

GRAND TOTALS OF CREDITS = 96

Instruction for candidates (Theory Paper)

- The question paper for end-semester examination will have a weightage of 25%. It will consist of 100 objective questions of equal marks. All questions will be compulsory.
- Two preannounced test will be conducted having a weightage of 25% each. Each preannounced test will consist of 20 objective type, 5 short questions/problems on the UGC-NET (objective type) pattern as well as one long answer type question. The student is expected to provide reasoning/solution/working for the answer. The candidates will attempt all question. Choice will be given only in long answer type. The question paper is expected to contain problems to the extent of 40% of total marks.
- Four objective/MCQ type surprise test will be taken. Two best out of four objective/MCQ type surprise test will be considered towards final each of 12.5% weightage to the final. Each surprise test will include 20-25 questions.
- The books indicated as text-book(s) are suggestive However, any other book may be followed.

* Wherever specific instructions are required these are given at the starting of that particular subject/paper

Instruction for candidates (Practical Paper)

- Total marks of practical will include 20% weightage of Continuous Assessment and 80% end semester exam including Notebook / Viva / Performance/ written test**.**

SEMESTER -I

Course Tile: Advanced Computer Networks and Simulation

Paper Code: CSE501

L	T	P	Credits	Marks
4	0	0	4	100

PART-A **14 Hours**

Introduction: Review of Computer Networks and the Internet: What is the Internet, The Network edge, The Network core, Access Networks and Physical media, ISPs and Internet Backbones, Delay and Loss in Packet-Switched Networks, History of Computer Networking and the Internet - Foundation of Networking Protocols: 5-layer TCP/IP Model, 7-Layer OSI

Networking Devices: Multiplexers, Modems and Internet Access Devices, Switching and Routing Devices, Router Structure. The Link Layer and Local Area Networks: Link Layer: Introduction and Services, Error- Detection and Error-Correction techniques, Multiple Access Protocols, Interconnections: Hubs and Switches.

PART-B **14 Hours**

ATM: Asynchronous Transfer Mode Switching (ATM): Overview of ATM: - Introduction, What is ATM, Genesis of ATM, Basic Principles of ATM, ATM Standards, ATM Protocol Stack: Physical Layer, ATM Layer and AAL Layer

Traffic Management in ATM-Traffic Contracting, Traffic Shaping, Traffic Policing, Priority Control, Flow Control, ATM Traffic Descriptors, ATM Service Descriptors (QoS Parameters), ATM Signalling and its Protocol, ATM Addressing & Routing, ATM Networking Standard.

PART-C **14 Hours**

Transport and End-to-End Protocols: Transport Layer, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), IPv6 packet format-transition from IPv4 to IPv6-Mobile IP, TCP Congestion Control Application Layer: Principles of Network Applications, The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, Domain Name System (DNS), P2P File Sharing, Building a Simple Web Server

Medium Access Control (MAC) Techniques-goals and requirements of Medium Access Control (MAC) techniques, Classify various contention based techniques such as ALHOA, CSMA, CSMA/CD and CSMA/CA.

PART-D **14 Hours**

Mobile Communication: GSM (Global system for mobile communication)-Services and Architecture, GPRS (General Packet Radio Service)-reference model, DECT (Digital Enhanced Cordless Telecommunications), CDMA (Code Division Multiple access)

Mobile A-Hoc Networks: Overview of Wireless Ad-Hoc Networks, Routing in Ad-Hoc Networks, Routing Protocols for Ad-Hoc Networks – Wireless Sensor Networks: Sensor Networks and Protocol Structures, Communication Energy Model, Clustering Protocols, Routing Protocols.

Networking Simulation Tools- OPNET, Ns 2, QualNet.

Reference books:

1. Forouzan, Behrouz A. *Data Communications and Networkin.* Fourth Edition, Tata McGraw Hill,2007.
2. Tomsho, Greg and Tittel, Ed *Guide to Networking Essentials*. David Johnson, Fifth Edition, Thomson.
3. Keshav, S. *An Engineering Approach to Computer Networking.* Pearson Education.
4. Teare, Diane and Paquet, Catherine. *Campus Network Design Fundamentals*. Pearson Education. (CISCOPress)
5. Tanenbaum, Andrew S. *Computer Network.* Fourth Edition, Prentice Hall.
6. A.Farrel, Elsevier. *The Internet and Its Protocols.*

Course Title: Data Mining and Warehousing
Paper Code: CSE503

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This course will be an introduction to data mining and warehousing. Topics will range from statistics to database, with a focus on analysis of large data sets. Another objective is to study the methodology of engineering legacy databases for data warehousing and data mining to derive business rules for decision support systems.

Learning Outcomes: Upon completion of the course, students will be able to:

- Understand the nature and purpose of data warehousing
- Describe the theoretical constructs and core processes of data warehousing
- Understand the role of data mining and warehousing in institutional research.
- Understand the basic statistical concepts related to data mining warehousing
- Describe the predictive modelling functions of data mining and warehousing
- Describe the potential applications of data mining in higher education i.e., decision support, assessment, accountability, resource allocation, enrolment management, and quality improvement initiatives.
- Use a data mining program to analyse sample data and develop predictive models.
- Be able to compare and evaluate the accuracy of predictive models based on classification and clustering.

PART-A **14 hours**

Data mining: Overview, Definition & Functionalities,
Data Processing: Form of Data Pre-processing,
Data Cleaning: Missing Values, Noisy Data,(Binning Clustering, Regression, Computer and Human inspection),Inconsistent Data, Data Integration and Transformation.
Data Reduction: Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation

PART-B

Concept Description: Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical class Description, Mining Association Rules in Large Databases, **14 hours**
Association rule mining: mining Single-Dimensional Boolean Association rules from
Transactional Databases– Apriori Algorithm Mining Multilevel Association rules from
Transaction Databases Mining Multi-Dimensional Association rules from Relational Databases

PART-C

Classification and Predictions: What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods K-nearest neighbor classifiers, Genetic Algorithm. **14 Hours**

Cluster Analysis: Data types in cluster analysis, Categories of clustering methods: Partitioning methods. Hierarchical Clustering-CURE and Chameleon, Density Based Methods-DBSCAN, OPTICS, Grid Based Methods-STING, CLIQUE, Model Based Method –Statistical Approach, Neural Network approach, Outlier Analysis

PART-D

Mining Complex Types of Data: Multidimensional analysis & Descriptive mining of Complex data objects, Mining Spatial Databases, Mining Multimedia Databases, Mining Time-series & Sequence data, Mining Text databases, Mining World -Wide Web **14 hours**

Data Mining Applications and Trends in Data Mining: Massive Datasets/Text mining, Agent-Based Mining

Reference books

1. Dunham, M.H. *Data Mining: Introductory and Advanced Topics.* Pearson Education.
2. Han, Jiawei and Kamber, Micheline. *Data Mining Concepts & Techniques.* Elsevier
3. Bishop, C. M. *Pattern Recognition and Machine Learning.* Springer.
4. Theodoridis, S. and Koutroumbas, K. Pattern Recognition, Pujari, Arun k. *Data Mining Techniques*, Universities Press Private Limited, 4th Edition, Academic Press, 2009.

Course Title: Parallel Computing & Architecture
Paper Code: CSE505

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: Students will learn about programming paradigms used in parallel computation, about the organization of parallel systems.

Learning Outcomes: After the completion of this course the participants would gain the knowledge of parallel organization of computers, their working and different components

PART-A

Parallel Computer Introduction: Basic issues and models, Computational speed laws, Computer Structures: Types of parallel computers: Parallel Processors, Array Computers, Multiprocessors, shared and distributed memory machines: MIMD, networked computers as a multi complier platform, symmetric multiprocessing. **7 hours**

Hardware Organization: Flynn's Classifications: SISD, SIMD, MISD, MIMD, Handler's classifications **7 hours**

PART-B

Software Organization: Kung's Classification, SPMD: Single Program Multiple Data **7 hours**

Parallel Computational Models: Combinational Circuits, PRAM Models: Constrained PRAM Models, PRAM-CREW, EREW models, Handling Shared Memory Access Conflicts, Parallelism approaches: Data Parallelism, Control Parallelism. **7 hours**

PART-C

Performance of Parallel Systems: Laws governing performance measurements, Load Balancing: Fully Distributed, Semi distributed and centralized distributed, Bench Marks: Wet Stone, Dry Stone. **7 Hours**

Programming of Parallel Computers: Shared Memory Programming, Distributed Memory Programming, Object Oriented Programming, Data Parallel Programming, Functional and Dataflow Programming **6 hours**

PART-D

Parallel Architecture: Taxonomy and topology, Shared memory Multiprocessors, Distributed memory networks. Processor organization - Static and dynamic interconnections. Embeddings and simulations **8 hours**

Scheduling and Parallelization: Scheduling Parallel Programs, Loop scheduling, Parallelization of sequential programs. **7 hours**

Reference books

1. Kai, and Hwang. *Computer Architecture and parallel processing.* Tata McGraw Hill Co.
2. Kumar, Vipin., Grama, Ananth., Gupta, Anshul., and Karypis, George. *Introduction to Parallel Computing.* Addison Wesley (2003) 2nd edition.
3. Wilkinson, Barrey and Allen, Michael. *Parallel Programming*. Pearson Education.
4. Hwang & F.A., Briggs. *Computer Architecture and Parallel Processing*. Tata McGraw Hill Co.
5. Quinn, Michael J. *Parallel Computing: Theory and Practice*. Tata McGraw-Hill, 4th Edition, ISBN: 9780070512948, 2004.
6. Zomaya, Albert YH. *Parallel and distributed computing handbook*. McGraw-Hill, Inc.

L	T	P	Credits	Marks
4	0	0	4	100

Course Title: Research Methodology
Course Code: MGT551

Course Objective: The course is designed to introduce the students to research methodology and application of research techniques and procedures. The primary goal of this course is to develop a sound understanding of research methods.
Learning Outcomes: The students will be able to apply the various research methods by using computerized data analysis software's to solve the real life problems.

Unit – A

Introduction to Research: Meaning of Research, Objectives of Research, Types of Research, Research Approaches, Significance of Research, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India. **2 hour**

Defining the Research Problem: What is a Research Problem?, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem **1 hour**

Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, factors affecting RDs, Relation among RDs, Developing a Research Plan. **2 hour**

Unit – B

Sampling design and Procedures: Sample or Census, The Sampling Design Process, A Classification of Sampling Techniques, Choosing Nonprobability Versus Probability Sampling, Uses of Non probability Versus Probability Sampling. **2 hours**

Measurement and Scaling: Non-comparative Scaling Techniques, Continuous Rating Scale, Itemized Rating Scale, Non-comparative Itemized Rating Scale Decisions, Multi-item Scales, Scale Evaluation, Choosing a Scaling Technique. **3 hours**

Methods of Data Collection: Collection of Primary Data, Observation Method, Interview Method, Collection of Data through Questionnaires, Collection of Data through Schedules, Some Other Methods of Data Collection, Collection of Secondary Data, Selection of Appropriate Method for Data Collection. **3 hours**

Questionnaire & form design: questionnaire & observation forms, questionnaire design process. **2 hours**

Unit – C

Data preparation: editing, coding, transcribing **1 Hours**

Data analysis: tests of significance based on t, f and z distribution and chi-square test; cross tabulation **3 hours**

Multiple Regression: Overview of Multiple Regression, Statistics Associated with Multiple Regression, Conducting Multiple Regression, Stepwise Regression, Multicollinearity	**3 hours**
Discriminant Analysis: Discriminant Analysis Model, Statistics Associated with Discriminant Analysis, Conducting Discriminant Analysis	**4 hours**
Conjoint Analysis: Basic Concepts in Conjoint Analysis, Statistics Associated with Conjoint Analysis, Conducting Conjoint Analysis, Assumptions & Limitations of Conjoint Analysis, Hybrid Conjoint Analysis	**4 hours**

Unit – D

Multi-Dimensional Scaling: Basic Concepts in Multidimensional Scaling (MDS), Statistics Associated with MDS, Conducting Multidimensional Scaling, Selecting an MDS Procedure, Deciding on the Number of Dimensions, Labeling the Dimensions & Interpreting the Configuration, Assessing Reliability and Validity, Assumptions & Limitations of MDS, Scaling Preference Data	**3 hours**
Correspondence Analysis: Relationship between MDS, FA, & DA	**2 hours**
Factor Analysis: Factor Analysis Model, Statistics Associated with Factor Analysis, Conducting Factor Analysis, Applications of Common Factor Analysis	**3 hours**
Cluster Analysis: Statistics Associated with Cluster Analysis, Conducting Cluster Analysis, and Applications of Non-hierarchical Clustering, Clustering Variables.	**5 hours**
Research Report Writing: Contents of Report, Executive Summary, Bibliography format. Presentation of Report.	**2 hours**
Total	**45 hours**

Reference Books:

1. Naval, Bajpai. *Business Research Methods*, Pearson Publications.
2. Malhotra, Naresh K. *Marketing Research: An Applied Orientation,* 5th Edition. Pearson/Prentice-Hall. 2007.
3. Tony, Proctor. *Essentials of Marketing Research,* Prentice Hall, 4th Edition.
4. Beri G. C. *Marketing research,* Mcgrawhill, 4th Edition.
5. C.R Kothari. *Research Methodology,* New Age Publishers.

Course Title: Numerical Analysis
Paper Code: MTH551

L	T	P	Credits	Marks
4	1	0	4	100

Course Objective: The aim of this course is to teach the applications of various numerical techniques for a variety of problems occurring in daily life. At the end of the course, the students will be able to do programming in MATLAB and understand the basic concepts in Numerical Analysis of differential equations.

PART-A

Algebraic and transcendental equations: Errors in approximations, Review of some concepts, Solution of algebraic and transcendental equations: Bisection method, RegulaFalsi, Newton Rap son, Lin Barstow's, convergence. **13 hours**

Systems of simultaneous Equations: Matrices, Types of Matrices, Direct methods: Crammer's rule, Gauss elimination, Gauss Jordon method, Matrix inversion method, Iterative methods: Jacobi method and Gauss-Seidel method, partition method, Eigenvalues and Eigen vectors: Cayley Hamilton theorem, Power method for finding largest Eigen value

PART-B

Finite Difference Methods: Forward, Backward, Central differences, Newtons forward, backward and divided difference formulae, Stirling, Bessel central difference formulae. **13 hours**

PART-C

Numerical Differentiation and Numerical Integration: Numerical Differentiation, Trapezoidal and Simpson's one third, Simpson's three eight rule for numerical integration, adaptive integration, Taylor's series method, Euler, modified Euler method, Runge-Kutta methods, Boole, weddle rule, Double integration. **13 Hours**

PART-D

Ordinary and Partial Differential Equations: Solution of second and higher order differential equations, boundary value problems, Solution of partial differential equations: Laplace, Heat, Wave equation. **13 hours**

References Books:

1. Atkinson, K.E. *An Introduction to Numerical Analysis*, Wiley, 1989.
2. Estep, K. Eriksson, Hansbo, D. P. and Johnson, C. *Computational Differential Equations*, Cambridge Univ. Press, Cambridge, 1996.
3. Golub, G.H. and Ortega, J.M. *Scientific Computing and Differential Equations*: An Introduction to Numerical Methods, Academic Press, 1992.
4. Conte, S.D. and Boor. Carl De *Elementary Numerical Analysis,* An Algorithmic Approach**,** Tata McGraw Hill, New Delhi, 1981.
5. Jain, M.K. *Numerical Analysis for Scientists and Engineers*.NewDelhi:S.B.W. Publishers, 1971.

Course Title: Advance Computer Networks and Simulation Laboratory
Paper Code: CS507

L	T	P	Credits	Marks
0	0	4	2	50

1. Introduction to Network Simulator OPNET/NS2.
2. Simulation of Wireless data Network with different with physical characteristics.
3. Comparative investigation on Hub and Switch as Interconnecting Device for verifying performance of LAN with various applications.
4. To plan and analyze the Wireless Local Area Network using OPNET.
5. Simulation of Ad-hoc based WLAN.
6. Simulation of Cluster Topology.
7. Rapid Configuration of Wired Network (Token Ring Topology).
8. Implementation of CSMA/CD Protocol and its comparative investigation with ALOHA Protocol.
9. Implementation of CSMA/CD Protocol and its comparative investigation with ALOHA Protocol.
10. Design a Project having two scenarios: (a) Star Topology Wireless Network using rapid configuration method. (b) Ring Topology Wireless network also using rapid configuration method, Compare the performance parameters like: End to End Delay for data, Traffic Received, Queue size etc.
11. Design Wireless network using Carrier Sensing Multiple Access Technique, Check the performance parameters like: Channel Throughput, Signal to Noise Ratio etc.
12. Designs a Star shaped Wireless topology and suggest a suitable way to import traffic.

* Students are advised to use **OPNET/NS2** for above listed experiments.

This is only the suggested list of Practicals. Instructor may frame additional Practicals relevant to the course contents.

Course Title: **Data Mining and Warehousing Lab.**
Paper Code: **CSE509**

L	T	P	Credits	Marks
0	0	4	2	50

Students are required to perform practicals in Oracle/MS SQL Server and STATISTICA Data Miner

1. Building a Database Design using ER Modelling and Normalization Techniques
2. Implementation of functions, Procedures, Triggers and Cursors
3. Load Data from heterogeneous sources including text files into a predefined warehouse schema.
4. Design a data mart for a bank to store the credit history of customers in a bank .Use this credit profiling to process future loan applications.
5. Feature Selection and Variable Filtering (for very large data sets)
6. Association mining in large data sets
7. Interactive Drill-Down, Roll up, Slice and Dice operations
8. Generalized EM & k-Means Cluster Analysis
9. Generalized Additive Models (GAM)
10. General Classification and Regression Trees (GTrees)
11. General CHAID (Chi-square Automatic Interaction Detection) Models
12. Interactive Classification and Regression Trees

SEMESTER -II

Course Title: Digital Image Processing
Paper Code: CSE502

L	T	P	Credits	Marks
4	1	0	4	100

Course Objective: This course provides an introduction to basic concepts, methodologies and algorithms of digital image processing focusing on the following two major problems concerned with digital images: (1) image enhancement and restoration for easier interpretation of images, and (2) image analysis and object recognition.

Learning Outcomes: To understand (i.e., be able to describe, analyse and reason about) how digital images are represented, manipulated, encoded and processed, with emphasis on algorithm design, implementation and performance evaluation.

PART-A

Digital Image Fundamentals: Why is Computer Vision Difficult? Different stages of image processing and analysis, Components of image processing system, Sampling and Quantization, Some basic relationships like neighbor's connectivity, distance measure between pixels. **7 hours**

Image Enhancement and Restoration: Basic Intensity Transformation Functions, Histogram processing, Spatial Domain methods: Fundamentals of spatial filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Frequency domain methods: low pass filtering, high pass filtering, Image Degradation/Restoration model **7 hours**

PART-B

Image Compression: Fundamentals of image compression, error criterion, Coding Inter-pixel and Psycho visual redundancy, Image Compression models, Error free compression: Huffman, Arithmetic, Run length Coding, Lossy Compression: Block Transform Coding based on DCT and DWT, Image Compression standard: JPEG. **7 hours**

Morphological image processing: Basic Morphology concepts, Binary dilation and erosion, Opening and Closing operations, Basic Morphological Algorithms: Boundary extraction, Hole Filling, Extraction of Connected Components. **7 Hours**

PART-C

Image Segmentation and Edge Detection: Fundamentals, Point, Line and Edge Detection: Detection of isolated points, lines, Basic Edge Detection, Advanced Edge detection using canny edge detector, Laplacian edge detector and Laplacian of Gaussian edge detector. Edge Linking and Boundary Detection, Thresholding: Basic Global Thresholding and Optimum Global Thresholding using Otsu's Method, Region Based Segmentation: Region Growing, Region Splitting and Merging. **8 hours**

Representation and Description: Representation schemes like chain coding, Polygonal approximation using minimum perimeter polygon, Signatures, Boundary Descriptors: Shape Numbers, Fourier, and Statistical moments. Regional Descriptors: Topological Descriptors, Texture, Moment Invariants **6 hours**

PART-D

Recognition and Interpretation: Pattern and pattern classes, Decision Theoretic methods: minimum distance classifier, matching by correlation, Structural Methods: Matching Shape Numbers **7 hours**

Feature selection: Divergence analysis, Bhattacharya and Mahalanobis distance, JM distance, separability analysis **7 hours**

Reference Books:

1. Gonzales, Rafael C. and Woods. Richard E *Digital Image Processing* Pearson Education.
2. Sonka, Hlavac. *Digital Image Processing and Computer Vision.* Boyle Cengage Learning.
3. Jain. *Fundamentals of Digital Image Processing* . Pearson Education.
4. Chanda & Majmuder. *Digital Image Processing and Analysis*. PHI.
5. Pratt, W. K., and Wiley, John. *Digital Image Processing.*
6. Duda, R.D., and Hart. *Pattern Classification*, P.E., Stork, D. G.

Course Title: Software Metrics and Quality Engineering
Paper Code: CSE504

L	T	P	Credits	Marks
4	0	0	4	100

Course Objectives: This course aims to give students a theoretical foundation in software engineering. Students will learn about the principles and methods of software engineering, including current and emerging software engineering practices and support tools.

Learning outcomes: This course offers a good understanding of the concepts, methods and techniques of software testing and quality assurance and prepares students to be in a position to develop error free and quality software.

PART-A

Introduction to Software Engineering, System Engineering Vs. Software Engineering, Software Evolution, Software Characteristics, Cost of Software Production, Software Components, Crisis – Problem and Causes, Challenges in Software Engineering. Software Process Models: SDLC, Waterfall Model, Incremental Model, Prototyping Model, Evolutionary Model, Spiral Model, Rapid Application Development Model, Formal Methods, Open Source Development, Object Oriented Life Cycle Model. **14 hours**

PART-B

Project Management Concepts: Management Activities, Project Planning, Project Scheduling, Size Estimation – LOC, FP; Cost Estimation Models – COCOMO, COCOMO-II. Software Requirements Analysis and Specification Concepts: Requirement Engineering, Requirement Elicitation Techniques, Requirements Documentation, Characteristics and Organization of SRS **14 hours**

PART-C

Software Design and Coding Concepts: Design Principles, Data Design, Architectural design, Interface Design, Component Level Design, Object Oriented Design Concepts, Cohesion and Coupling and their classification, top-down, bottom-up and middle-out design, Coding, Coding Standards,Coding,Conventions,ProgrammingStyle.VerificationandValidation,Process,DesignofTestCases,SoftwareTestingStrategies,Testing,IntegrationTesting, Top Down and Bottom Up Integration Testing, Alpha & Beta Testing, System Testing and Debugging. **14 Hours**

Software Quality Assurance Concepts and Standards : Quality Concepts, Quality Control, Quality Assurance, SQA Activities, Software Reviews, Formal Technical Reviews, Review Guidelines, Software Reliability, Software Safety, Quality Assurance Standards, ISO 9000, ISO 9001:2000, ISO 9126 Quality Factors, CMM, TQM, Six Sigma, SPICE, Software Quality Assurance Metrics

PART-D

Technical Metrics for Software: Software Measurements: What and Why, A Framework for Technical Software Metrics, Metrics for the Analysis Model, Metrics for Design Model, Metrics for Source Code, Metrics for Testing, Metrics for Software Quality, Metrics for Maintenance. Software Quality Metrics: **14 hours**

Product Quality Metrics: Defect Density, Customer Problems Metric, Customer Satisfaction Metrics, Function Points , In-Process Quality Metrics: Defect Arrival Pattern, CASE (Computer Aided Software Engineering) and Introduction to UML: CASE and its Scope, Building blocks of CASE, CASE Tools, CASE Environment

References Books:

1. Sommerville, Ian. *Software Engineering, Seventh Edition,* Pearson Education.
2. Pressman, R.S. *Software Engineering: A Practitioner's Approach, Sixth Edition*. McGraw Hill.
3. Pfleeger, S.L., and Atlee J.M. *Software Engineering: Theory and Practice, Second Edition*. Pearson Education.
4. Bell, Douglas. *Software Engineering for Students, Fourth Edition*. Pearson Education.
5. Jalote, Pankaj. *An Integrated Approach to Software Engineering, Second Edition*. Narosa.
6. Aggarwal, K.K. and Singh, Yogesh. *Software Engineering, Second Edition*. New Age International.

Course Tile: Wireless Data Networks
Paper Code: CSE506

L	T	P	Credits	Marks
4	1	0	4	100

Course Objective: This course is designed to provide the students with a basic understanding and experiential learning of wireless communications and networking.

Learning Outcomes: After the completion of this course the participants would gain the knowledge of how a Wireless networks work during data communication between wireless end points and how to implement the Security on it.

PART-A

Introduction: Differences between wireless and fixed telephone networks, Evolution of wireless networks, Examples of Wireless Communication Systems: Paging Systems, Cordless Telephone Systems, Cellular Telephone Systems, Comparison of common Wireless Communication systems, Traffic routing in wireless networks: circuit switching and packet switching. **14 hours**

GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services.

PART-B

Wireless Local Area Networks: Introduction, WLAN topologies, requirements, working and function of physical layer and MAC layer, IEEE standards for wireless networks, Wi-Fi, Bluetooth, WiMax. **14 hours**

PART-C

14 Hours

Wireless Internet: Mobile IP components, process of agent discovery, registration and de-registration, care-of-address, concept of tunnelling, Limitations of Mobile IP, introduction to micro-mobility protocols.

Protocols and Tools: Wireless Application Protocol-WAP. (Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management) and J2ME.

PART-D

Ad Hoc Wireless Networks: Introduction, Challenges in ad hoc networks: spectrum allocation, media access, routing, multicasting, energy efficiency, security and privacy; problems in ad hoc channel access, receiver-initiated MAC protocols, sender-initiated MAC protocols and existing ad hoc MAC protocols; Ad hoc routing protocols: Destination sequenced distance vector (DSDV), Ad hoc on demand distance vector routing (AODV), Dynamic source routing (DSR), Temporally ordered routing algorithm (TORA). **14 hours**

Reference Books:

1. Pahlavan and Krishnamurthy. *Principles of Wireless Networks.* Prentice Hall, 2002.
2. J ,Schiller. *Mobile Communications*. Addison-Wesley, 2000.
3. Gibson, Jerry D. *The Mobile Communications Handbook*. CRC Press, 1999.

4. Held, G. *Data over Wireless Network.* McGraw-Hill, 2001.
5. Blake. *Wireless Communication System.* Cengage Learning, New Delhi

DAV UNIVERSITY, JALANDHAR

DEPARTMENT ELECTIVE-I

Course Title: Information Security & Risk Management
Paper Code: CSE508

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The aim of this course is to provide attendees with a thorough understanding of the issues associated with the design, provision and management of security services for modern communication and information systems. Students will learn the different aspects of information and network security and you will be able to speak about a multitude of security attacks and the defensive strategies used to combat them.

Learning Outcomes: After completing this course the student should be able to:
Describe the fundamental concepts of information system security. Understand the following terms: security policy, host based security, firewall, and packet filtering and intrusion detection. Use various software tools to analyze network and host vulnerabilities.

PART-A

Overview: Services, Mechanisms, and Attacks, the OSI Security Architecture, A Model for Network, Security. **14 hours**

Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography.

Block Ciphers And The Data Encryption Standard: Simplified DES, Block Cipher Principles, The Data Encryption Standard, The Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operation.

Introduction To Finite Fields: Groups, Rings, and Fields, Modular Arithmetic, Euclid's Algorithm, Finite Fields of the Form GF(p), Polynomial Arithmetic, Finite Fields of the Form GF(2n).

PART-B

Advanced Encryption Standard: Evaluation Criteria for AES, The AES Cipher. **14 hours**

Contemporary Symmetric Ciphers: Triple DES, Blowfish, RC5, Characteristics of Advanced Symmetric Block Ciphers, RC4 Stream Cipher.

Confidentiality Using Symmetric Encryption: Placement of Encryption Function, Traffic Confidentiality, Key Distribution, Random Number Generation.

Public-Key Encryption and Hash Functions: Introduction to Number Theory: Prime Numbers, Format's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms.

Public-Key Cryptography and RSA: Principles of Public-Key Cryptosystems, the RSA Algorithm, Recommended Reading and Web Site, Key Terms, Review Questions, and Problems.

Key Management and Other Public-Key Cryptosystems: Key Management, Diffie-Hellman Key Exchange, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.

PART-C

Message Authentication and Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security of Hash Functions and MACs. **14 Hours**

Hash Algorithms: MD5 Message Digest Algorithm, Secure Hash Algorithm, RIPEMD-160, and HMAC.

Digital Signatures and Authentication Protocols: Digital Signatures, Authentication Protocols, Digital Signature Standard.

PART-D

Network Security Practice: Authentication Applications: Kerberos, X.509 Authentication Service, Electronic Mail Security: Pretty Good Privacy, S/MIME. IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations, Key Management, Web Security: Web Security Considerations, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction. **14 hours**

System Security: Intruders: Intruders, Intrusion Detection, Password Management, Malicious Software: Viruses and Related Threats, Virus Countermeasures, Firewalls: Firewall Design Principles, Trusted Systems.

Reference books

1. Stallings, William. *Cryptography and network Security.* Pearson Education, 2003.
2. Trappe & Washington. *Introduction to Cryptography with Coding Theory.* Prentice-Hall, 2001.
3. Stinson, D. *Cryptography: Theory and Practice.* Second Edition Chapman & Hall, 2002.
4. Perlman, Kaufman, and Speciner. *Network Security.* Prentice-Hall Second Edition, 2001.
5. Whitman, Michael E. *Principles of information Security.* Cengage Learning, New Delhi.

Course Title: Grid Computing

Paper Code: CSE510

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This Course introduces the Grid Computing and their applications to students. This course covers the different compression standards used in business, some current technology and related issues.

Learning Outcomes: After the completion of this course the participants would gain the knowledge of the various technical and management issues regarding Grid business**.**

PART-A

Introduction: Fundamentals of Grid Computing, Types of resources, Problems in Grid computing, Global Distribution System for Grid Computing, Ecosystem of the Grid, Early Grid Activities. **14 hours**

PART-B

Grid Architecture: Autonomic Computing, Service-Oriented Architecture and Grid, Semantic Grids, Merging the Grid Services Architecture with the Web Services Architecture. Open Grid Services Architecture (OGSA) **12 hours**

Grid Computing in Business: Grid-specializing vendors and niche vendors, Grid resource providers, Departmental grids, Enterprise grids, Partner grids, Open grids.

PART-C

Grid software components: Management components, Donor software, Submission software, Distributed grid management, Schedulers, Enrolling and installing grid software, Logging onto the grid, Logging onto the grid **13 Hours**

Grid administration: Planning, Installation, Managing enrollment of donors and users, Certificate authority, Resource management, Data sharing

PART-D

Technical and Management Issues: Building and selling Grid business case, transition period management, Role of consultants, Risk Mitigation, Organizational security requirements and firewalls, Authorization scalability and federations. **15 hours**

Case Study: The MCNC Enterprise Grid: Service, Customers, Financials, Resources, Location.

Reference books

1. Joseph, Joshy, and Fellenstein, Craig. *Grid Computing.* IBM Press.
2. Li, Maozhen, and Baker, Mark. *The Grid: Core Technologies.* John Wiley & Son's Publisher.
3. Abbas,Ahmar. *Grid Computing: Practical guide to technology and applications*. Publisher: Charles River Media.
4. Plaszczak, Pawel., and Wellner, Rich. *Grid Computing: The Savvy Manager's Guide*. Morgan Kaufmann Publishers.
5. Dikaiakos, Marios D. *Grid Computing.* Spinger.

Course Title: Advanced Data Structures and Algorithms
Paper Code: CSE512

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: To impart knowledge of Data Structure and How to design algorithms to solve different types Of problems and to differentiate linear and nonlinear data structure.
Learning outcomes:-After completion of this course, student will be able to explain data structure, its scope in computer science and sstudents will be able to find the best solution about specific types logical and mathematical problems.

PART-A

Elementary Data Structures and Complexity Analysis: **14 hours**
Overview of Basic Data Structures: Arrays, Linked List, Stack, Queues. Implementation of Sparse Matrices, Algorithm Complexity: Average, Best and worst case analysis, asymptotic notations, Simple Recurrence Relations and use in algorithm analysis
Search Structures:
Binary search trees, AVL trees, 2-3 trees, 2-3-4 trees, Red-black trees, Btrees.
PART-B

Graph Algorithms: **14 hours**
Representation of Graphs, Traversals, Single-source shortest path Algorithms, All-pairs shortest path algorithms, Sub graphs, Disjoint Graphs, Connected Components, Articulation Points, Spanning tree, Minimum Spanning Trees Algorithms, Topological sort
PART-C

String Matching Algorithms: **12 Hours**
Introduction, The Brute-Force- Algorithm, Rabin-Karp Algorithm, String Matching with Finite automata, Knuth-Marries-Pratt Algorithm
PART-D

Heap Structures: **15 hours**
Min-max heaps, Deaps, Leftist heaps, Binomial heaps, Fibonacci heaps, Skew heaps
Multimedia Structures:
Segment trees, k-d trees, Point Quad trees, MX-Quad trees, R-trees.

Reference Books:
1. Horowitz, E. Sahni, S. and Mehta, Dinesh. *Fundamentals of Data structures in C++*. Galgotia. 1999.
2. Drozdex, Adam. *Data Structures and algorithms in C++, Second Edition*. Thomson learning vikas publishing house. 2001.
3. Brassard, G. and Bratley, P. Algorithmics. *Theory and Practice.* Printice –Hall, 1988.
4. Corman, Thomas H. and Leiserson, Charles E. Ronald L. Rivest. *Introduction to Algorithms.* PHI.

Course Title: Network & System Administration
Paper Code: CSE514

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This course is designed to provide the students with a basic understanding and experiential learning fundamentals of how to secure the system and network using various techniques.
Learning Outcomes: After the completion of this course the participants would gain the knowledge of the various techniques for securing the system and its applications.

PART-A

Introduction to System & Network Administration, roles and responsibilities of a system and network administrator, Scope, Goals, Duties, Ethics, Career Paths **14 hours**
Introduction to Operating Systems, operating system concepts, Characterize different file system formats, operating system installation procedures, Operating Systems: Windows and Unix Variants, Processes and Job Control, Memory Management, Concept of Swap Space, File Systems, File Systems and Standards (UFS, NFS, NTFS), File System Layout (inode and FAT based file systems), Formatting, Partitioning and Building a File System, Installation of Operating Systems, Linux Boot Process, Single OS, Dual Boot, Cloning, Host Management, Plan and execute system management procedures.

PART-B

Booting and Shutting Down of an Operating System, Installation and configuration of Software, Proprietary Software, Open Source Software, Installation and configuration of devices and drivers, Super user/Administrator Privileges, User Management, Adding / Removing users, Controlling User Resources, Disk Space Allocation and quotas, Process Management and Monitoring, Scheduling Processes, Killing/Stopping processes, Restarting a Process, Monitoring Process Activity, Maintaining Log Files, File System Repair, Backup and Restoration, Handling Man Pages/ Help System, Kernel Customization, Managing Heterogeneous Systems, File System Sharing (Samba), Printer Sharing (Samba/CUPS), User IDs, Passwords and Authentication (LDAP), Systems Performance Tuning . **14 hours**

PART-C

Introduction to Network Administration Approaches, TCP/IP Networking Basics, IP Addressing and Sub-netting VLAN Principles and Configuration, Routing Concepts , Network Address Translation , Configuring a Linux Box for Networking, LAN and Wireless LAN, Dial-up and Broadband, Configuring a Linux Box as a Router Configuring a Web Server (Apache) , Configuring a DNS Server (BIND), Configuring Mail Transfer Agents Configuring a Proxy Caches (Squid), TCP/IP Troubleshooting: ping, traceroute, ifconfig, netstat, ipconfig, Network Management, SNMP Ver 2 Basic Components , Commands , Management Information Base , RMON. **14 Hours**

PART-D

Security Planning & System Audits, Security standards and Levels (ISO 15408 standard), Password Security, Access Control and Monitoring: Wrappers, Firewalls, Filtering Rules, Detection and Prevention of Denial of Service (DOS) Attacks, Automatic Identification of Configuration Loopholes (Tripwire), Intrusion Detection Systems, Security Information Resources: CERT automating System Administration, Use of Scripting tools, Shell Scripting, Perl/Python Scripting, Use of Make Option. **14 hours**

References Books:

1. Burgess, Mark. *Principles of Network and System Administration*, 2nd Edition. John Wiley and Sons Ltd. 2004.
2. Hunt, Craig. *TCP/IP Network Administration,* 3rd Edition. O'Reilly and Associates Inc. 2002.
3. Dalheimer, Matthias Kalle, and Welsh,Matt. *Running Linux,* 5th Edition, O'Reilly and Associates Inc.. 2007.
4. Frisch, Eleen. *Essential System Administration,* 3rd Edition. O'Reilly and Associates Inc. 2003.
5. Chan,T. *UNIX Systems Programming using C++* .PHI.

DAV UNIVERSITY, JALANDHAR

DEPARTMENT ELECTIVE-II

Course Title: Natural Language Processing and Information Retrieval
Paper Code: CSE516

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This course is designed to provide natural language processing methods and procedure.
Learning Outcomes: After the completion of this course the participants would gain the knowledge of various types of grammars used in language processing.

PART-A

Introduction to Natural Language Understanding: The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English syntax. Introduction to semantics and knowledge representation, Some applications like machine translation, database interface**.** **12 hours**

PART-B

Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top-Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks. **14 hours**

Grammars for Natural Language: Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling questions in Context-Free Grammars. Human preferences in Parsing, Encoding uncertainty, Deterministic Parser.

PART-C

Computational morphology: Lemmatization, Part-of-Speech Tagging, Finite-State Analysis. **15 Hours**

Ambiguity Resolution: Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part-of-Speech tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Best First Parsing. Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in Logical Form.

PART-D

Application of NLP: Intelligent Work Processors: Machine Translation; User Interfaces; Man-Machine Interfaces: Natural language Querying Tutoring and Authoring Systems. Speech Recognition Commercial use of NLP. **13 hours**

Reference books:

1. Bharti, Akshar., Chaitanya,Vineet., and Sangal, Rajeev. NLP. *A Paninian Perspective.* New Delhi: Prentice Hall.
2. Allen, James. *Natural Language Understanding,* 2/e. Pearson Education. 2003.
3. Jurafsky, D., and Martin, J. H. *Speech and Language Processing.* Pearson Education. 2002.
4. Ivansca, L.M., and Shapiro, S. C. *Natural Language Processing and Language Representation.*
5. Winograd, T. *Language as a Cognitive Process*. Addison-Wesley.

Title: Distributed Computing Systems
Paper Code: CSE518

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The course is intended to provide basic foundation with fundamental concepts and mechanisms of distributed computing systems. Most of the issues discussed in this course material are the essence of advanced operating systems. Broad coverage as: Introduction to distributed computing systems (DCS) DCS design goals, Transparencies, Fundamental issues, Distributed Coordination, Process synchronization, Inter-process communication.

Learning Outcomes: After the completion of this course the participants would gain the knowledge of the working of the each functional and finally the student will be exposed to the recent trends in distributed computing systems and multithreaded application.

PART-A

Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. **14 hours**

System Models: 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, Causal ordering of messages, global state, and termination detection.

PART-B

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. **13 hours**

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.

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.

PART-C

Distributed Objects and Remote Invocation: Communication between distributed objects, Remote procedure call, Events and notifications, Java RMI case study. **15 Hours**

Security: Overview of security techniques, Cryptographic algorithms, Digital signatures Cryptography pragmatics, Case studies: Needham Schroeder, Kerberos, SSL & Millicent.

Distributed File Systems: File service architecture, Sun Network File System, The Andrew File System, Recent advances.

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

PART-D

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. **14 hours**

Distributed Algorithms: Introduction to communication protocols, Balanced sliding window protocol, Routing algorithms, Destination based routing, APP problem, Deadlock free Packet switching, Introduction to wave & traversal algorithms, Election algorithm.CORBA Case Study: CORBA RMI, CORBA services.

Reference books:

1. Singhal, Shivaratri. *Advanced Concept in Operating Systems*. McGraw Hill.
2. Coulouris, Dollimore, Kindberg. *Distributed System: Concepts and Design.* Pearson Ed.
3. Tel, Gerald. *Distributed Algorithms.* Cambridge University Press.
4. Lynch, Nancy. *Distributed Algorithms*. Morgan Kaufmann.
5. Tanenbaum, Andrew. S. *Distributed Operating Systems*. ACM Press.

Course Title: Network Security
Paper Code: CSE520

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The objective of this course is to gain an understanding of various methods, and protocols used in network security.

Learning Outcomes: After the completion of this course the participants would gain the knowledge of various protocols of networking, security issues and password authentication protocols.

PART-A

Introduction to information Security, Types of information security controls and purposes of Information Security Management. Allocation of information security responsibilities. Telecommunications Security: Objectives, Threats and Countermeasures, Identification of Security threats and development of countermeasures, Technologies and Security policies, real time Communication security. **14 hours**

An introduction to LAN/WAN Security and internet Security, Security Management for the World Wide Web and Internet firewalls and, Assessing inherent wireless network security deficiencies, Layers and Cryptography, Authentication and the multilevel model of security.

PART-B

Overview of Authentication schemes: Password and address based Authentication, Cryptographic Authentication protocols, Trusted Intermediaries and session key establishment. **14 hours**

Authentication of people: Passwords, Online and offline password guessing, eavesdropping, password and careless users, authentication tokens and biometrics.

PART-C

Security handshake pitfalls: Mutual authentication, Integrity for data, Mediated Authentication and strong password protocols **12 Hours**

Public key infrastructure (PKI): PKI trust models, Revocation and Authorization futures.

IPsec: Overview of IPsec, IP and IPv6, AH and ESP, IPsec: IKE, SSL/TLS.

PART-D

Overview of IT Security, Hacking and Intrusion Attacks, Denial of Service Attacks (DoS), Viruses, how these get past the Firewall, how they work and the impact they can have on operations and business, Detection and Prevention Mechanisms, The self-Hack Audit and network security. **14 hours**

Current trends in breaches to IT Security, Current trends in IT Security detection and prevention, Examples of the types of IT security breaches most common and what can be expected in the future.

Electronic Mail Security: PEM and S/MIME, PGP etc.

References Books:

1. Kaufman, Charlie. And Perlman, Radia. and Speciner, Mike. *Network Security.* Pearson Education. 2006.
2. Cimato, S. and Galdi, C. *Security in Communication Networks.* Springer. 2003.
3. Chan, H. and Gligor, V. *Information Security.* Springer. 2002.
4. UPTEC Computer Consultancy Limited, *Information Technology Tools and Applications.* ELSEVIER. 2005.
5. Rajaraman. *Introduction to Information technology.* Prentice Hall of India, Ed. 2005.
6. Thomas II. *Network Security.* Pearson Education. 2005.

Course Title: Cryptography
Paper Code: CSE522

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The objective of this course is to gain an understanding of cryptography, algorithms of cryptography, and digital signature.
Learning Outcomes: After the completion of this course the participants would gain the knowledge of cryptography and able to apply the various methods of security.

PART-A

Foundations of Cryptography and Security: Ciphers and Secret Messages, Security Attacks and Services **14 hours**
Mathematical Tools for Cryptography: Substitutions and Permutations, Modular Arithmetic, Euclid's Algorithm, Finite Fields, Polynomial Arithmetic, Discrete Logarithms
Conventional Symmetric Encryption Algorithms: Theory of Block Cipher Design, Feistel Cipher Network Structures, DES and Triple DES, Modes of Operation (ECB,CBC, OFB,CFB), Strength (or Not) of DES

PART-B

Modern Symmetric Encryption Algorithms: IDEA, CAST, Blowfish, Twofish, RC2, RC5, Rijndael (AES), Key Distribution **14 hours**
Stream Ciphers and Pseudo Random Numbers: Pseudo random sequences, Linear Congruential Generators, Cryptographic Generators, Design of Stream Cipher, One Time Pad
Public Key Cryptography: Prime Numbers and Testing for Primality, Factoring Large Numbers, RSA, Diffie-Hellman, ElGamal, Key Exchange Algorithms, Public-Key Cryptography Standards

PART-C

Hashes and Message Digests: Message Authentication, MD5, SHA, RIPEMD, HMAC **12 Hours**
Digital Signatures, Certificates, User Authentication: Digital Signature Standard (DSS and DSA), Security Handshake Pitfalls, Elliptic Curve Cryptosystems
Authentication of Systems: Kerberos V4 and V5, X.509 Authentication Service
Electronic Mail Security: Pretty Good Privacy (PGP), S/MIME, X.400

PART-D

IP and Web Security, IPSec and Virtual Private Networks, Secure Sockets and Transport Layer (SSL and TLS) **14 hours**
Electronic Commerce Security: Electronic Payment Systems, Secure Electronic Transaction (SET), CyberCash, iKey Protocols, Ecash (DigiCash)
Digital Watermarking and Steganography

References Books:

1. Hsiung, C.Y. *Elementary Theory of Numbers*.
2. Stallings, W. *Cryptography and Network Security Principles and Practice*, 2nd edition.
3. Kaufman, Charlie., and Perlman, Radia. *Network Security.*
4. Mao, Wenbo. *Modern Cryptography: Theory and Practice*. Prentice Hall. 2004.
5. Mollin, Richard A. *An Introduction to Cryptography.* Chapman and Hall/CRC. 2001.

L	T	P	Credits	Marks
0	0	4	2	50

Course Title: Wireless Data Networking Lab
Paper Code: CSE524

1. Design an 802.11 network of mesh topology, using set of suitable inputs check the performance parameters like: Battery Energy consumed, Bit error Rate, Busy, Signal to Noise ratio, Throughput, Utilization
2. Design Wireless network using Carrier Sensing Multiple Access Technique, Check the performance parameters like: Channel Throughput, Signal to Noise Ratio etc.
3. Design a Star shaped Wireless network, and suggest a way to configure a Physical layer of selected nodes.
4. To plan and analyze the Wireless Local Area Network using OPNET.
5. Simulation of Ad-hoc based WLAN
6. Create a radio network and observe variations in the quality of received signal that results from radio noise at the receiving node in a dynamic network topology.
7. Develop of a new CDMA based MAC on top of 802.11p Physical layer.
8. Design a Project having two scenarios: (a) Bus Topology Wireless Network (b) Ring Topology Wireless network makes use of the Web Reporting to compare the result of two different scenarios.
9. Designs a suitable Wireless Sensor Network and suggest a way to import traffic.
10. Designs a suitable Wireless Sensor Network and suggest a way to export traffic.
11. Design the Wireless Sensor Network to re-organize the sensor nodes.
12. Optimize the wireless Sensor Network to determine the energy efficiency by creating more than one scenario.
13. Develop two or more Wireless Sensor Network scenarios to model the lifetime maximization.

* Students are advised to use **OPNET/NS2** for above listed experiments.
This is only the suggested list of Practicals. Instructor may frame additional Practicals relevant to the course contents.

DAV UNIVERSITY, JALANDHAR

SEMESTER –III

Course Title: Evolutionary Computing
Paper Code: CSE601

L	T	P	Credits	Marks
4	1	0	4	100

Course Objective: The objective of this course is to provide the knowledge of genetic algorithm and computing technique like neural network, fuzzy logic etc.

Learning Outcomes: After the completion of this course the participants would gain the knowledge of how to design the genetic algorithm and its various applications.

PART-A

Introduction. **14 hours**

Introduction to Genetic Algorithms, Goals of Optimization, How Genetic Algorithms work, A Simple Genetic Algorithm's Computer Implementation highlighting Reproduction by Selection, Crossover, Mutation.

PART-B

GA Techniques: **14 hours**

Mapping Objective Function to Fitness Form, Fitness scaling, discretization, Different types of Selection and Crossover techniques, methods, Advanced operators in Genetic Search, Dominance, Diploidy and Abeyance. A case study of any Optimisation Problem using GA Techniques.

PART-C

Intelligent Computing Techniques: **14Hours**

Introduction to Swarm Intelligence and Optimization. Application of advance computing in Pattern Recognition & Signal Processing.

PART-D

Introduction to Neural Networks, Introduction to Fuzzy Systems and Soft Computing. **12 hours**

References Books:

1. Goldberg, David E. *Genetic Algorithms in Search Optimization and Machine Learning.* Pearson Education.
2. Vose, Michael D. *The Simple Genetic Algorithms, Foundations and Theory.* MIT Press 1999. ISBN-0-262-22058-X
3. Michalewicz, Zbigniew., and Fogel, David B. *How to Solve It: Modern Heuristics,* second Edition. Springer Verlag. 2004, ISBN- 3-540-22494-7.

DEPARTMENT ELECTIVE-III

Course Title: Software Project Management
Paper Code: CSE603

L	T	P	Credits	Marks
4	1	0	4	100

Course Objective:

- To discuss the various aspects of project management
- To understand the tasks in software project management
- To describe the project titles in the course
- To describe the requirements of a project plan

Learning Outcomes: Upon successful completion of this module, the student will be able to: understand and practice the process of project management and its application in delivering successful IT projects; evaluate a project to develop the scope of work, provide accurate cost estimates and to plan the various activities;

PART-A

Introduction: Project Management (PM) Fundamentals, People, Process, and Product, Technology Classic mistakes, PMI Processes, Software project phases, Organizational structures, Project charter Statement of Work (SOW) **6 hours**

Planning Phase: Development lifecycle models, Matching lifecycles to projects, Project plans Work Breakdown Structures **5 hours**

Estimation and Budgeting: Estimation, Budgeting, Project selection, NPV, ROI, Payback models **4 hours**

PART-B

Scheduling: Project network diagram fundamentals, PERT techniques, Gantt charts, Critical chain scheduling **5 hours**

Risk and Change Management: Risk management, Change control, More MS-Project Development Management: Team models, Requirements process, Configuration management, Software metrics, Programming languages & tools, Managing conflict and motivating, MS-Project: Assigning Resources **8 Hours**

PART-C

Status reporting: Project metrics, Earned value analysis, Communications Techniques, Process Improvement, MS Project: (a) Resource leveling (b) Other views **7 hours**

System Test Process: Test specifications, Black box and white box testing, Test scripts, Unit and integration testing, Acceptance test specifications, Test tools, MS Project: (a) Reporting **6 hours**

PART-D

Final Phases & Other Issues: Project Recovery, Documentation, Cutover/Migration, Post Project Reviews, Closing, and MS Project: (a) Advanced features Project Success Management support, Expectations, Success metrics **14 hours**

Reference books

1. Schwalbe, Kathy. *Information Technology Project Management.* International Student Ed. THOMSON Course Technology.
2. M. Cottrell and Hughes. *Software Project Management,* 3rd Edition. the McGraw-Hill Companies.
3. PM, Quantum.*Microsoft Office Project Server 2003 Unleashed.* Pearson Education India.
4. Futrell, Robert T., and Shafer, Donald F. and Shafer, Linda I. *Quality Software Project.* Pearson India.
5. Henry, J.,*Software Project Management. A Real-World Guide to Success.* Addison Wesley.

Course Title: Cloud Computing
Paper Code: CSE605

L	T	P	Credits	Marks
4	1	0	4	100

Course Objective: Analyze the components of cloud computing showing how business agility in an organization can be created. Compare and contrast the economic benefits delivered by various cloud models based on application requirements, economic constraints and business requirements.

Learning Outcomes: This module gives students the skills and knowledge to understand how Cloud Computing Architecture can enable transformation, business development and agility in an organization. .

PART-A

Cloud Computing : Overview, Applications, Intranet and the Cloud, First Movers on the cloud, the need for Cloud Computing, Benefits of cloud Computing, Limitations of the Cloud Computing, security concerns and regulatory issues, over view of different cloud computing applications which are implemented, Business case for implementing a Cloud. **14 hours**

PART-B

Cloud Computing Technologies: Hardware and Infrastructure: Clients, Security, Network, services **13 hours**
Accessing the Clouds: Platforms, WEB applications, WEB APIS, WB Browsers
Cloud Storage: Overview, Storage provides, Cloud Standards: Applications, Client, Infrastructure, Services.

PART-C

Cloud Computing Mechanisms: Software as a service: Overview, Driving Forces, Company offerings, **14 Hours**
Industries, Software + services: Overview, Mobile Device Integration, Providers, Microsoft Online
Application development: Google, Microsoft, Intuit Quick base, Cast Iron Cloud, Bungee Connect,
Development Platforms: Google, Sales Force, Azure, Trouble shooting, Application management

PART-D

Local Clouds: Virtualization, server solutions, Thin Clients **15 hours**
Migrating to the clouds: Cloud services for individuals, Mid-market, and Enterprise wide, Migration, best practices, analysing the service.

Reference Books:

1. Velte, Anthony. Toby, T. Velte, J. and Elsenpeter, Robert. *Cloud Computing a practical approach.* Tata McGraw-HILL. 2010.
2. Miller, Michael. *Cloud Computing-web Based application that change the way you work and collaborate online*. Pearson Eduction. 2009.
3. Hurwitz, Judith. Robin, Bloor. Kaufman, Marcia & Halper, Fern. *Cloud Computing for Dummie.* November 2009.

Course Title: Machine Learning
Paper Code: CSE607

L	T	P	Credits	Marks
4	1	0	4	100

Course Objective: The field of machine learning is concerned with the question of how to construct computer programs that improve automatically with experience. In recent years, many successful applications of machine learning have been developed, ranging from data-mining programs that learn to detect fraudulent credit card transactions, to autonomous vehicles that learn to drive on public highways.

Learning Outcomes: This module gives students the skills and knowledge to understand how to formulate machine learning problems corresponding to different applications.

PART-A

Introduction: Well-Posed Learning Problems, Designing a Leaning System, Perspectives and Issues in Machine Learning. **14 hours**

Concept Learning and the General-to-Specific Ordering: Introduction, A Concept Learning Task, Concept Learning as Search, FIND-S: Finding a Maximally Specific Hypothesis, Version Spaces and the CANDIDATE-ELIMINATION Algorithm

PART-B

Decision Tree Learning: Introduction, Decision Tree Representation, Appropriate problem for Decision tree Learning, The Basic Decision Tree Learning Algorithm, Hypothesis Space Search in Decision Tree Leaning, Inductive Bias in Decision Tree Leaning, Issues in Decision Tree Leaning. **14 hours**

Artificial Neural Networks: Introduction, Natural Network Representations, Appropriate Problems for Neural Network Learning, Perceptions, Multilayer Network and the BACKPROPAGATION Algorithm.

PART-C

Bayesian Learning: Introduction, Bayes Theorem, Bayes Theorem and Concept Learning, Bayes Optimal Classifier, Native Bayes Classifier, An Example: Learning to Classify Text. **12 Hours**

Instance- Based Learning: Introduction, K-NEAREST NEIGHBOUR Learning, Distance-Weighted NEAREST NEIGHBOUR Algorithm.

Genetic Algorithms: Motivation, Genetic Algorithms, Hypothesis Space Search, Genetic Programming, Parallelizing Genetic Algorithms.

PART-D

Learning Sets of Rules: Introduction, Sequential Covering Algorithms, Learning Rule Sets: Summary, Learning First-Order Rules, Learning Sets of First-Order Rules: FOIL, Induction as Inverted Deduction, Inverted Resolution. **15 hours**

Support Vector Machine: Maximum margin linear separators, Quadratic Programming Solution to finding maximum margin separators, Kernels for learning non-linear functions.

References books:

1. Alpaydin, Ethem. *Introduction to Machine Learning.* MIT Press. 2004.
2. Mitchell, Tom. *Machine Learning.* McGraw-Hill. 1997.
3. Richard O. Duda, Peter E. Hart , and Stork,David G. *Pattern Classification. Second Edition.* Wiley & Sons.
4. Sutton, Richard S. and Andrew G. Barto. *Reinforcement learning: An introduction.* MIT Press. 1998.
5. Nils J. Nilsson. *Introduction to Machine Learning*.

Course Title: System Security Engineering
Paper Code: CSE609

L	T	P	Credits	Marks
4	1	0	4	100

Course Objective: The objective of this course is to provide the deep knowledge about the security issues and the various methods to protect the system.

Learning Outcomes: after completion of this course the student can get the knowledge of various security methods and their applications.

PART-A **14hours**

Security Engineering, Protocols: Authentication, Manipulating the message, Chosen protocol attacks, Managing Encryption keys, Passwords: System issues, Technical protection of passwords, Access Control: Operating system access controls

PART-B **14hours**

Cryptography, Multilevel security, Banking and Bookkeeping: Introduction, How bank Computer works, ATM

PART-C **12hours**

Biometrics: Introduction, Handwritten signatures, Face Recognition, Voice Recognition, Finger prints, Vulnerabilities in Network Security

PART-D **15hours**

Defense against Network attack: Firewalls, Encryption, Trojans ,Viruses and Worms Intrusion Detection, Management issues

References:

1. Anderson, Ross J. *Security Engg*.
2. Oorshcot, Menezes, P., and Vanstone, S. *Handbook of Applied Cryptography*, CRC Press. Boca Raton, FL. 1997.
3. Escamilla. *Intrusion Detection Network Security Beyond the Firewall*. John Wiley & Sons Inc. 1998.
4. Stallings, W. *Cryptography and Network Security Principles and Practice,* Second Edition.