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**UNIVERSITY**  
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**School of Engineering & Technology**

**Syllabi and Course Structure**

**M. Tech. in Information Security**

**(Computer Science)**

**Academic Programmes**

**July, 2015**

School of Engineering & Technology

M.Tech. in Computer Science & Engineering (Information Security)

Course Structure

First Semester

First Semester					
Sub Code	Sub Name	L	T	P	C
MCO 001A	Advanced Topics in Algorithm Design	4	0	0	4
MCO 002A	Distributed and High Performance computing	4	0	0	4
MCO 003A	Advanced Operating Systems	4	0	0	4
MCO 005A	Advance Topics in Software Project Management	4	0	0	4
MCO 006A	Client server programming				
MCO 007A	Advance Data Communication network				
MCO 008A	Advanced Topics in Algorithms Lab	0	0	2	2
MCO 009A	Distributed and High Performance computing Lab	0	0	2	2
MCO 010A	Seminar	0	0	2	2
	<b>TOTAL</b>	<b>16</b>	<b>0</b>	<b>06</b>	<b>22</b>

School of Engineering & Technology

M.Tech. in Computer Science & Engineering (Information Security)

Second Semester

<b>SECOND SEMESTER</b>						
<b>Sub Code</b>	<b>Sub Name</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	
MCO 011A	Cloud Computing	4	0	0	4	
MCO 012A	Advance Computer Network and Security	4	0	0	4	
	Research Methodology	3	0	0	3	
MCO 013A	Secure Ecommerce	4	0	0	4	
MCO 014A	Advance Topics in Data Mining and warehousing					<b>Elective II</b>
MCO 015A	Pattern Recognition					
MCO 016A	Information system security					
	Quantitative Techniques & Computer Applications Lab	0	0	1	1	
MCO 017A	Cloud Computing lab	0	0	2	2	
MCO 018A	Network Security Lab	0	0	2	2	
MCO 019A	Project	0	0	2	2	
	<b>TOTAL</b>	<b>15</b>	<b>0</b>	<b>07</b>	<b>22</b>	

School of Engineering & Technology

M.Tech. in Computer Science & Engineering (Information Security)

Third Semester

<b>THIRD SEMESTER</b>						
<b>Sub Code</b>	<b>Sub Name</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	
MCO 020A	IPR and Cyber Laws	4	0	0	4	
MCO 021A	Digital Image Processing	4	0	0	4	
MCO 022A	Mobile Communication	4	0	0	4	
MCO 023A	Secure communication and VPN					<b>Elective III</b>
MCO 024A	Grid computing					
MCO 025A	Natural Language Processing					
MCO 026A	Biometric Security	4	0	0	4	
MCO 027A	Storage System					<b>Elective IV</b>
MCO 028A	PKI and Trust Management					
MCO 029A	Dissertation-I					
	<b>TOTAL</b>	<b>16</b>	<b>0</b>	<b>0</b>	<b>28</b>	

Fourth Semester

<b>FOURTH SEMESTER</b>					
MCO 030A	Dissertation-II	0	0	0	28
	<b>TOTAL</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>28</b>

## School of Engineering & Technology

### M.Tech. in Computer Science & Engineering (Information Security) Semester I

MCO 001A	Advanced Topics in Algorithm Design	4-0-0
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#### Course Objective

- To understand the various algorithm design technique.
- To learn analysis techniques to analyze the algorithms.
- To understand the advanced data structures, intrinsic complexity analysis, problem settings

<b>UNIT 1</b>	<b>Advanced Data Structure:</b> Graph, B-tree, binomial heaps and, Fibonacci heap. <b>Graph Algorithms:</b> Single source shortest paths-Belman-Ford algorithm, Dijkstra algorithm, all pairs shortest path and matrix multiplication, Floyd-Warshall, Johnson algorithm for sparse graph, maximum flow-Ford-Fulkerson method and maximum bipartite matching.
<b>UNIT 2</b>	<b>Linear Programming:</b> The simplex algorithm and duality. <b>Number Theoretic Algorithm:</b> GCD, modular arithmetic, solving modular linear equation and Chinese remainder theorem.
<b>UNIT 3</b>	<b>NP Completeness:</b> Polynomial time, polynomial time verification, NP completeness and reducibility, Cook's theorem, NP complete problems-clique problem, vertex cover problem, approximation algorithms-vertex cover problem, set covering problem, traveling salesman problem.
<b>UNIT 4</b>	<b>Probabilistic Algorithms:</b> Numerical probabilistic algorithm, Monte-Carlo algorithm and Las-Vegas algorithm.
<b>UNIT 5</b>	<b>Parallel Algorithms:</b> Model for parallel computation, basic techniques, work and efficiency, parallel evaluation of expressions, parallel sorting networks and parallel sorting

At the end of the course, the student should be able to:

- Understand the various algorithm design technique.
- Learn analysis techniques to analyze the algorithms.
- Understand the advanced data structures, intrinsic complexity analysis, problem settings

#### Text Books:

1. Cormen T.H., Leiserson C.E., Rivest R.L., Introduction to Algorithms , Prentice Hall of India

#### Reference Books:

1. Brassard G. & Bratley P., Fundamentals of Algorithmics , Prentice Hall of India

MCO 002A	Distributed and High Performance computing	4-0-0
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**Course Objective:**

- This course is aimed at bridging the gap between computer science and state-of-the-art technologies and research in distributed and high-performance computing (DHPC).
- The course provides an overview of distributed computing systems, vector and parallel computers, and other high-performance computing systems (or supercomputers), and examples of the types of applications that require DHPC systems.
- Some historical background is given on architectures for high-performance computing, but the emphasis is on what the software developer needs to know to exploit distributed and parallel computing hardware for maximising efficiency and performance.
- The course has a strongly applied outlook, and focuses on the most commonly used programming languages for distributed and parallel processing, with case studies and examples

<b>UNIT 1:</b>	<b>Introduction of Distributed computing</b> Definitions and need for Distributed computing, centralized and Distributed computing, Mobil and Ubiquitous computing, Significant Consequences of Distributed computing, Goals, benefits and challenges of Distributed computing, Hardware Concept of Distributed computing, software concept of Distributed computing,
<b>UNIT 2:</b>	<b>Clock Synchronization and Message communication</b> Introduction of synchronization, How computer clock is implemented, Centralized clock synchronization Algorithm, Distributed clock synchronization Algorithm, Network Operating System, Message Ordering, Mutual Exclusion, Centralized Approach, Distributed Approach, Token Ring Passing.
<b>UNIT 3:</b>	<b>Fault Tolerance and Distributed File System</b> What is Fault Tolerance, Failure Models, Failure Masking by Redundancy, Introduction of Distributed File System, Organized Architecture of Distributed File System, File System Model, Model of NFS File System, Remote File Service Model, Upload and Download Model.
<b>UNIT 4:</b>	<b>Scientific and High Performance Computing</b> What is Scientific Computing, What is High Performance Computing, Measure of Performance, Large Scale Scientific Problem, Parallel Processing, Types of Parallel Computing, Data Parallel Architectures, Limitation of Parallel Computing, Parallel Programming.
<b>UNIT 5:</b>	<b>High Performance Computing Tools</b> What is MATLAB, Elements of MATLAB, Different Windows of MATLAB, Arithmetic Operations and Scalars, Built in Functions, Display format of MATLAB, Defining Scalar Variables, Concept of Arrays in MATLAB, Graphics in MATLAB, Introduction of IDL Tool and AVS Tool.

**Outcomes:**

At the end of the course, the student should be able to:

- Understand state-of-the-art technologies and research in distributed and high-performance computing (DHPC).

- Learn vector and parallel computers, and other high-performance computing systems (or supercomputers), and examples of the types of applications that require DHPC systems.
- Learn historical background is given on architectures for high-performance computing.
- The course has a strongly applied outlook, and focusses on the most commonly used programming languages for distributed and parallel processing, with case studies and examples

**Text Books:**

1. Distributed Operating Systems by A.S. Tanenbaum, Pearson Education

**Reference Books:**

1. Distributed Systems: Concepts and Design by G. Coulouris, J. Dollimore and T. King Berg., Addison Wesley
2. *G.H. Golub, J.M. Ortega "Scientific computing -An introduction With parallel computing" Academic Press.*
3. *Lloyd D. Fosdick, Elizabeth R. Jessup, Carolyn "an introduction to High Performance Scientific computing" PHI .*

## School of Engineering & Technology

### M.Tech. in Computer Science & Engineering (Information Security) Semester I

MCO 003A	Advanced Operating Systems	4-0-0
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#### Course Objective:

- To introduce the state of the art in operating systems and distributed systems, and how to design modern operating systems.
- To understand how to engage in systems research in general and operating systems research in particular.
- To investigate novel ideas in operating systems through a semester-long research project.

UNIT 1:	<b>Operating System:</b> Definition, Operating System as Resource Manager. Types of Operating Systems: Simple Batch Processing, Multi-programmed Batch Processing, Time Sharing, Personal Computer systems, Parallel, Distributed and Real Time Operating Systems. Operating System Components, Services, Calls, System Programs, Operating System Structure, Virtual Machines, System Design and Implementation.
UNIT 2:	<b>Process Management:</b> Concepts, Scheduling, Operations, Co-operating processes, Inter-process Communication. <b>Threads:</b> Thread usage, threads in User Space, threads in Kernel, Hybrid Implementation, Scheduler Activation, Pop-up threads, Multithreading. <b>CPU Scheduling:</b> Basic Concepts, Scheduling Criteria, Algorithms, Multiple-processor Scheduling, Real Time Scheduling, Algorithm Evaluation.
UNIT 3:	<b>Process Synchronization:</b> Critical Section Problem, Synchronization Hardware, Semaphores, Classical Problem of synchronization, Critical Regions, Monitors. <b>Deadlock:</b> Characteristics, Necessary Conditions, Prevention, Avoidance, Detection and Recovery. <b>Memory Management:</b> Logical and Physical Address Space, Swapping. Contiguous Allocation: Single partitioned, Multi-partitioned. Non-contiguous Allocation: Paging, Segmentation, and Segmentation with Paging. Virtual Memory: Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing, Demand Segmentation.
UNIT 4:	<b>File and Directory System:</b> File Concepts, Access Methods, Directory Structure, Protection, File system Structure, Allocation Methods, Free Space Management, Directory Implementation, Recovery. <b>Secondary Storage Management:</b> Disk Structure, Dedicated, Shared, Virtual, Sequential Access and Random Access Devices, Disk Scheduling, Disk Management, Swap-space Management, Disk Reliability, Stable Storage Management. <b>Protection and Security:</b> Threats, Intruders, Accidental Data Loss, Cryptography, User authentication, Attacks from inside the system, Attacks from outside the system, Protection Mechanism, Trusted Systems, Domain of Protection, Access Matrix, Programs Threats, System Threats.



<b>UNIT 5:</b>	<p><b>Distributed systems</b>, topology network types, design strategies. Network operating structure, distributed operating system, remote services, and design issues. Distributed file system: naming and transparency, remote file access, Stateful v/s Stateless Service, File Replication.</p> <p><b>Distributed co-ordinations:</b> Event Ordering, Mutual Exclusion, Atomicity, Concurrency Control, Deadlock Handling, Election Algorithms, and Reaching Agreement. Case studies of Unix and MS-DOS operating system.</p>
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**Outcomes:**

At the end of the course, the student should be able to:

- Understand the state of the art in operating systems and distributed systems, and how to design modern operating systems.
- Understand how to engage in systems research in general and operating systems research in particular.
- Investigate novel ideas in operating systems through a semester-long research project.

**Text Book:**

1. Silberschatz and Galvin, "Operating System Concepts", Addison-Wesley publishing, Co., 1999.

**Reference Book:**

1. A. S. Tanenbaum, "Modern Operating Systems", Pearson Education.
2. H.M. Dietel, "An Introduction to Operating System", Pearson Education.
3. D. M. Dhamdhere, "Operating Systems – A Concept Based Approach", Tata McGraw-Hill
4. M. Singhal, N. G. Shivaratri, "Advanced Concepts in Operating Systems", Tata McGraw-Hill.
5. William Stallings, "Operating Systems", Pearson Education

**School of Engineering & Technology**

**M.Tech. in Computer Science & Engineering (Information Security) Semester I**

<b>MCO 008A</b>	<b>Advanced Topics in Algorithm Lab</b>	<b>0-0-2</b>
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**List of Experiments**

1. Write a Program to implement Efficient Matrix Multiplication
2. Write a Program to define the graphs and list all nodes and Links
3. Write a Program to implement the concept of BFS
4. Write a Program to implement the concept of DFS
5. Write a Program to implement the concept of B-tree
6. Write a Program to implement Dijkstra Algorithm
7. Write a Program to implement the concept of Binomial Heap
8. Write a program to find Greatest Common Divisor
9. Write a program using Chinese remainder theorem
- 10 Write program to solve linear equations
- 11 Write a program to solve Travelling Salesman problem
- 12 Write a program to implement Vertex cover problem
- 13 Write a program to implement all pair shortest path Algorithm

## M.Tech. in Computer Science & Engineering (Software Engineering) Semester I

MCO 009A	Distributed and High Performance computing Lab	0-0-2
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### List of Experiments

1. What is ps command in UNIX? Why it is used? Demonstrate the use of ps command for generate the information of PID and PPID of process running. Also write a program with the use of getpid() and getppid() for generate the PID and PPID.
2. Write a Program to create the a new process and demonstrate the use of that process with the function fork().
3. What is multithreading programming? Write an application in JAVA that executes two threads. One thread display “HELLO WOLD” every 1000 milliseconds and another thread display “How Are You” every 2000 miliseconds. Create the threads by implementing the Runnable interface.
4. What is Distributed operating System? Write a program to simulate the FCFS CPU scheduling algorithm in ‘C’ Programming.
5. Write a program to simulate the SJF CPU scheduling algorithm in ‘C’ Programming.
6. What is MATLAB? Demonstrate the installation of MATLAB on windows.
7. What do you understand by the different windows outlays of MATLAB? Exaplain each with its working.
8. What is format command? How many types of format used in MATLAB and why these are required? Also write the code of individual format and display the output of these.
9. Explain the Logical Operators, Conditional Statements and built in functions of the format change with suitable examples.
10. The use of following built in functions and demonstrate the use of these functions in MATLAB with proper code Discuss.

- log10(x)
- exp(x)
- log(x)
- cot(x)
- ceil(x)
- rem(x,y)

- floor(x)
- who and whos
- clear x, y,z

11. Plot three sine curves with a small phase shift between each line. Use the default line style for the first line. Specify a dashed line style for the second line and a dotted line style for the third line.
12. Create a line plot and use the LineSpec option to specify a dashed green with square markers. Use Name, Value pairs to specify the line width, marker size, and marker colors. Set the marker edge color to blue and set the marker face color using an RGB color value.
13. The plot command can also be used to plot curves defined parametrically. One simply uses the parametric equations, to generate and values from a subdivision of the parameter interval. Using this idea, generate a plot of the circle from the parametric equations, for t in  $[0, 2\pi]$ . Use the axis command to ensure that the graph looks circular.
14. Problem solving by the one dimensional and two dimensional array
15. Demonstrate some animation methods of the graphics in MATLAB.

## School of Engineering & Technology

### M.Tech. in Computer Science & Engineering (Information Security) Semester II

MCO 011A	Cloud Computing	4-0-0
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#### Course Objective:

- To familiarize the philosophy, power, practical use of cloud.
- To introduce fundamental principles, technology, and techniques of CC
- To Discuss common problems that can be best solved with/in cloud
- To Eliminate misconceptions about cloud computing

<b>UNIT 1:</b>	<b>Understanding cloud computing:</b> Introduction to Cloud Computing - Benefits and Drawbacks - Types of Cloud Service Development - Deployment models
<b>UNIT 2:</b>	<b>Cloud Architecture Technology and Architectural Requirements:</b> The Business Case for Clouds - Hardware and Infrastructure – Accessing the cloud – Cloud Storage – Standards- Software as a Service – Discovering Cloud Services Development tools. Three Layered Architectural Requirement - Provider Requirements
<b>UNIT 3:</b>	<b>Service Centric Issues</b> - Interoperability - QoS - Fault Tolerance - Data Management Storage and Processing - Virtualization Management - Scalability - Load Balancing - Cloud Deployment for Enterprises - User Requirement - Comparative Analysis of Requirement.
<b>UNIT 4:</b>	<b>Security Management in Cloud:</b> Security Management Standards - Security Management in the Cloud Availability Management - SaaS Availability Management - PaaS Availability Management - IaaS Availability Management - Access Control - Security Vulnerability, Patch, and Configuration Management – Privacy in Cloud- The Key Privacy Concerns in the Cloud - Security in Cloud Computing.
<b>UNIT 5:</b>	<b>Virtualization:</b> Objectives - Benefits - Virtualization Technologies - Data Storage Virtualization – Storage Virtualization – Improving Availability using Virtualization - Improving Performance using Virtualization- Improving Capacity using Virtualization.

#### **Outcomes:**

At the end of the course, the student should be able to:

- Understand the philosophy, power, practical use of cloud.
- Present fundamental principles, technology, and techniques of CC
- Discuss common problems that can be best solved with/in cloud
- Eliminate misconceptions about cloud computing

**Text books:**

1. David S Linthicum, “Cloud Computing and SOA Convergence in your Enterprise A Step by Step Guide”, Addison Wesley Information Technology Series.

**Reference books:**

1. Anthony T Velte, Toby J. Velte, Robert Elsenpeter, “Cloud computing A Practical Approach “, Tata McGraw Hill Publication
2. Tim Mather, SubraKumaraswamy, ShahedLatif, “Cloud Security and Privacy –
3. An Enterprise Perspective on Risks and Compliance” , O’Reilly Publications, First Edition
4. Michael Miller, “Cloud Computing – Web-Based Applications that Change the Way You Work and Collaborate Online”, Pearson Education, New Delhi, 2009.
5. Cloud Computing Specialist Certification Kit – Virtualization Study Guide.

## School of Engineering & Technology

### M.Tech. in Computer Science & Engineering (Information Security) Semester II

MCO 012A	Advanced Computer Network and Security	4-0-0
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#### Course Objective:

- To develop an in-depth understanding, in terms of architecture, protocols and applications, of major high-speed networking technologies.
- To Understand flow control and congestion control and handling mechanism.
- To Perform network design using the technologies to meet a given set of requirements
- To develop necessary background to be able to manage projects involving any of the high-speed networking technologies.

<b>UNIT 1:</b>	<b>HIGH SPEED NETWORKS</b> Frame Relay Networks - Asynchronous transfer mode - ATM Protocol Architecture, ATM logical Connection, ATM Cell - ATM Service Categories - AAL.High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel - Wireless LANs: applications, requirements - Architecture of 802.11
<b>UNIT 2:</b>	<b>PROTOCOLS FOR QOS SUPPORT</b> RSVP - Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms - Multiprotocol Label Switching - Operations, Label Stacking, Protocol details - RTP - Protocol Architecture, Data Transfer Protocol, RTCP
<b>UNIT 3:</b>	<b>SECURITY AT THE APPLICATION LAYER: PGP AND S/MIME</b> E Mail Architecture, E mail Security, PGP Scenarios ,Key Rings, PGP packets ,PGP messages, Applications of PGP S/MIME and MIME and their Applications
<b>UNIT 4:</b>	<b>SECURITY AT THE TRANSPORT LAYER: SSL AND TLS</b> SSL Architecture , key exchange algorithms ,encryption and decryption algorithm ,Four Protocols, SSL message formats. Transport layer Security: Generation of Cryptographic Secretes, Alert Protocols , handshake Protocols ,Record Protocols
<b>UNIT 5:</b>	<b>SECURITY AT NETWORK LAYER/INTERNET :IPSec SSUFLS, PGP, VPN, and Firewalls, Two Modes, Comparison, Two Security Protocols, Authentication header ( AH), Encapsulating Security Payloads( ESP ),AH versus ESP.</b> IPv4 and IPv6 ,Security Association ,Security Policies ,Internet Key Exchange (IKE), ISAKMP

#### **Outcomes:**

At the end of the course, the student should be able to:

- Develop an in-depth understanding, in terms of architecture, protocols and applications, of major high-speed networking technologies.
- Understand flow control and congestion control and Security issues in Application layer , Network Layer and Transport layer.
- Perform network design using the technologies to meet a given set of requirements keeping in mind of Security at various layers.
- Develop necessary background to be able to manage projects involving any of the high-speed secure networking technologies

**TEXT BOOKS:**

1. William Stallings, "HIGH SPEED NETWORKS AND INTERNET", Pearson Education, Second Edition, 2002.

**REFERENCES:**

1. Warland & Pravin Varaiya, "HIGH PERFORMANCE COMMUNICATION NETWORKS", Jean Hardcourt Asia Pvt. Ltd., II Edition, 2001.



## School of Engineering & Technology

### M.Tech. in Computer Science & Engineering (Information Security) Semester II

	<b>Research Methodology</b>	<b>3-0-0</b>
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#### Course Objective:

- To gain insights into how scientific research is conducted.
- To help in critical review of literature and assessing the research trends, quality and extension potential of research and equip students to undertake research.
- To learn and understand the basic statistics involved in data presentation.
- To identify the influencing factor or determinants of research parameters.

<b>UNIT 1:</b>	<b>Research Methodology-Introduction</b> Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India
<b>UNIT 2:</b>	<b>Defining the Research Problem</b> What is a Research Problem?, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem <b>Research Design</b> 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
<b>UNIT 3:</b>	<b>Sampling Design</b> Census and Sample Survey, Implications of a Sample Design, Steps in Sampling Design, Criteria of Selecting a Sampling Procedure, Characteristics of a Good Sample Design, Different Types of Sample Designs, How to Select a Random Sample?, Random Sample from an Infinite Universe, Complex Random Sampling Designs <b>Measurement and Scaling Techniques</b> Measurement in Research, Measurement Scales, Sources of Error in Measurement, Tests of Sound Measurement, Technique of Developing Measurement Tools, Scaling, Meaning of Scaling, Scale Classification Bases, Important Scaling Techniques, Scale Construction Techniques

<p><b>UNIT 4:</b></p>	<p><b>Methods of Data Collection</b> Collection of Primary Data, Observation Method, Interview Method, Collection of Data through Questionnaires, Collection of Data through Schedules, Difference between Questionnaires and Schedules, Some Other Methods of Data Collection, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method</p> <p><b>Processing and Analysis of Data</b> Processing Operations, Some Problems in Processing, Elements/Types of Analysis, Statistics in Research, Measures of Central Tendency, Measures of Dispersion, Measures of Asymmetry (Skewness), Measures of Relationship, Simple Regression Analysis, Multiple Correlation and Regression, Partial Correlation, Association in Case of Attributes</p>
<p><b>UNIT 5:</b></p>	<p><b>Sampling Fundamentals</b> Need for Sampling, Some Fundamental Definitions, Important Sampling Distributions, Central Limit Theorem, Sampling Theory, Sandler's A-test, Concept of Standard Error, Estimation, Estimating the Population Mean (<math>\mu</math>), Estimating Population Proportion, Sample Size and its Determination, Determination of Sample Size through the Approach Based on Precision Rate and Confidence Level, Determination of Sample Size through the Approach Based on Bayesian Statics</p>

**Outcome:**

At the end of the course, the student should be able to:

- Gain insights into how scientific research is conducted.
- Help in critical review of literature and assessing the research trends, quality and extension potential of research and equip students to undertake research.
- Learn and understand the basic statistics involved in data presentation.
- Identify the influencing factor or determinants of research parameters.

*Text Book: Research Methodology – Methods & Techniques by C. R. Kothari, New age International Publisher*

**Notes for Examiner / Paper Setter:**

1. 1<sup>st</sup> Question shall be of 20 marks and compulsory for all. It may consist of Multiple Choice Questions (MCQ) of one mark each and short answer questions of one or two marks.
2. One question of 10 marks shall be set from each Unit which may have parts including numericals. Paper setter may give internal choice, if required.
3. Students will be required to attempt all questions compulsorily.

**School of Engineering & Technology**

**M.Tech. in Computer Science & Engineering (Information Security) Semester II**

	<b>Quantitative Techniques &amp; Computer Applications Lab</b>	<b>0-0-1</b>
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**Various Methods and Uses of Advance Excel Formulas:** Vlookup, Hlookup, Sumif, Sumifs, Sumproduct, Dsum, Countif, Countifs, If, Iferror, Iserror, Isna, Isnumber, Isnontext, Isblank, Istext, Getpivotdata, Dcount, Dcounta, Or, And, Search, Index, Match Etc

**Various Methods and Uses of IF Conditions:** When should use the "IF" Conditions?, Creation of Multiple IF Conditions in One Cell, Use the IF Conditions with the Other Advance Functions, How to use nested IF statements in Excel with AND, OR Functions

**ADVANCED EXCEL OPTIONS :** Various Methods of Filter and Advance Filter options, Creating and Updating Subtotals, Various Methods of Text to Column options, Uses of Data Grouping and Consolidation options, Uses of Goal Seek and Scenarios Manager, Various Method of Sorting Data, Creating, Formatting and Modifying Chart, Data Validation, Creating drop down lists using different data sources, Linking Workbooks and Uses of Edit Link options, Excel Options, Customizing the Quick Access Tool Bar, Formula Auditing features and Trace formula error

**Pivot Tables & Charts :** Various Methods and Options of Pivot Table, Using the Pivot Table Wizard, Changing the Pivot Table Layout, Subtotal and Grand total Options, Formatting, Grouping Items, Inserting Calculated Fields, Pivot Table Options, Calculation in Pivot Table, Display and Hide Data in Field, Select, Move & Clear Pivot Data, Creating and Modifying Pivot Chart

**Advance Use of Function:** Mixing Function to get Various MIS Outputs, Creating Data Table, Advance Data Validation, Using conditional formatting with Formulas and Function, Using Name Manager, Array Formulas

**Importing Data from External Sources: Macros, What is a Macro?, Creating Excel Macro, Running Macros and Editing, Automating Tasks with Macro**

**(A) SPSS Package**

**An Overview of SPSS :** Mouse and keyboard processing, frequently –used dialog boxes, Editing output, Printing results, Creating and editing a data file

**Managing Data:** Listing cases, replacing missing values, computing new variables, recording variables, exploring data ,selecting cases, sorting cases, merging files

**Graphs:** Creating and editing graphs and charts

**Frequencies:** Frequencies, bar charts, histograms, percentiles

**Descriptive Statistics:** measures of central tendency, variability, deviation from normality, size and stability, Cross Tabulation and chi-square analyses, The means Procedure

**Bivariate Correlation:** Bivariate Correlation, Partial, Correlations and the correlation matrix

**The T-test procedure:** Independent –samples, paired samples, and one sample tests

**The one way ANOVA procedure:** One way analysis of variance

**General Linear model:** Two –way analysis of variance

**General Linear model:** three –way analysis of variance and the influence of covariates, Simple Linear Regression, Multiple regression analysis, Multidimensional scaling, Factor analysis, Cluster analysis

*Text Book: Research Methodology – Methods & Techniques by C. R. Kothari, New age International Publisher*

***Notes for Examiner / Paper Setter:***

1. 1<sup>st</sup> Question shall be of 16 marks and compulsory for all. It may consist of Multiple Choice Questions (MCQ) of one mark each and short answer questions of one or two marks.
2. One question of 14 marks shall be set from each Unit which may have parts including numericals. Paper setter may give internal choice, if required.
3. Students will be required to attempt all questions compulsorily.

## M.Tech. in Computer Science & Engineering (Information Security) Semester II

MCO 017A	Cloud Computing lab	0-0-2
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### Basic Exercises

1. Create a simulation showing how to create a datacenter with one host and run one cloudlet on it.
2. Create a simulation showing how to create two datacenters with one host and a network topology each and run two cloudlets on them.
3. Create a simulation showing how to create two datacenters with one host each and run cloudlets of two users with network topology on them.
4. Create a simulation showing how to create two datacenters with one host each and run two cloudlets on them.
5. Create a simulation showing how to create two datacenters with one host each and run cloudlets of two users on them.
6. An example showing how to create scalable simulations.
7. An example showing how to pause and resume the simulation, and create simulation entities (a Datacenter Broker in this example) dynamically.
8. An example showing how to create simulation entities (a DatacenterBroker in this example) in run-time using a global manager entity (GlobalBroker).

### Network Exercises

1. Create a simulation showing how to create a datacenter with one host and a network topology and and run one cloudlet on it.
2. Create a simulation showing how to create two datacenters with one host and a network topology each and run two cloudlets on them.
3. Create a simulation showing how to create two datacenters with one host each and run cloudlets of two users with network topology on them.
4. Create a simulation showing how to create a datacenter with one host and a network topology and and run one cloudlet on it. Here, instead of using a BRIE file describing the links, links are inserted in the code.

### Power Exercises

1. A simulation of a heterogeneous non-power aware data center: all hosts consume maximum power all the time.
2. A simulation of a heterogeneous power aware data center that only applied DVFS, but no dynamic optimization of the VM allocation. The adjustment of the hosts' power consumption according to their CPU utilization is happening in the PowerDatacenter class.
3. A simulation of a heterogeneous power aware data center that applies the Static Threshold (THR) VM allocation policy and Random Selection (RS) VM selection policy.

**M.Tech. in Computer Science & Engineering (Information Security) Semester II**

<b>MCO 018A</b>	<b>Network Security lab</b>	<b>0-0-2</b>
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1. Implementation of Substitution and Transposition ciphers
2. Implementation of Data Encryption Standard
3. Implementation of International Data Encryption Algorithm
4. Implementation of Advanced Encryption Standard
5. Implementation of RSA Algorithm
6. Implementation of Diffie-Hellman Key Exchange
7. Implementation of Message Authentication Codes
8. Implementation of Hash functions
9. Implementation of Digital Signature Standard
10. Hiding of confidential information within Image

## School of Engineering & Technology

### M.Tech. in Computer Science & Engineering (Information Security) Semester III

MCO 020A	IPR and Cyber Laws	4-0-0
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#### Course Objective:

- Enhance the understanding of Intellectual Property Rights and Cyber laws.
- Secure both clean and corrupted systems, protecting personal data, securing simple computer networks, and safe Internet usage
- Understand key terms and concepts in cyber law, intellectual property and cyber crimes, trademarks and domain theft.
- Determine computer technologies, digital evidence collection, and evidentiary reporting in forensic acquisition.
- Incorporate approaches to secure networks, firewalls, intrusion detection systems, and intrusion prevention systems.

<b>UNIT 1:</b>	<b>Intellectual Property rights:</b> Introduction to IP, Copyright, Related Rights, Trademarks, Geographical Indications, Industrial Design, Patents, WIPO Treaties, Unfair Competition, Protection of New Varieties of Plants, Summary and Discussion on IP Rights.
<b>UNIT 2:</b>	<b>Cyber laws:</b> Introduction to the Cyber World and Cyber Law, Information Technology Act, 2000 – Digital Signature; E-Governance; Regulation of Certifying Authorities; Duties of subscribers; Penalties and Adjudications; Offences under the Act; Making of Rules and Regulations etc.
<b>UNIT 3:</b>	<b>Cyber Crimes</b> Introduction – computer crime and cyber crimes; Classification of cyber crimes. Cyber forensic, Cyber criminals and their objectives Kinds of cyber crimes – cyber stalking; cyber pornography; forgery and fraud; crime related to IPRs; Cyber terrorism; computer vandalism etc.
<b>UNIT 4:</b>	<b>Concept of Copyright and Patent in Cyberspace</b> Copyright in the Digital Medium Copyright in Computer Programmes Copyright and WIPO Treaties Concept of Patent Right Relevant Provisions of Patent Act 1970
<b>UNIT 5:</b>	<b>International Organizations and Their Roles:</b> ICANN ,URDP, WTO and TRIPS, UNICITRAL Model LAW

#### **Books:**

1. Peter Weil, Jeanne Ross "IT Governance: How Top Performers Manage IT Decision Rights for Superior Results"
2. www.wipo.org
3. IT Act 2000 with amendments in 2008

School of Engineering & Technology

**M.Tech. in Computer Science & Engineering (Information Security) Semester III**

<b>MCO 021A</b>	<b>Digital Image Processing</b>	<b>4-0-0</b>
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**Course Objective:**

- Cover the basic theory and algorithms that are widely used in digital image processing
- Expose the current technologies and issues that are specific to image processing system.
- Develop hands-on experience in using computers to process images
- Familiarize with MATLAB Image Processing Toolbox
- Develop critical thinking about shortcomings of the state of the art in image processing

<b>UNIT 1:</b>	<b><i>Fundamentals Of Image Processing</i></b> <i>Introduction, Elements of visual perception, Steps in Image Processing Systems, Image Acquisition, Sampling and Quantization, Pixel Relationships, Colour Fundamentals and Models, File Formats. Introduction to the Mathematical tools.</i>
<b>UNIT 2:</b>	<b><i>Image Enhancement and Restoration</i></b> <i>Spatial Domain Gray level Transformations Histogram Processing Spatial Filtering, Smoothing and Sharpening. Frequency Domain: Filtering in Frequency Domain, DFT, FFT, DCT, Smoothing and Sharpening filters, Homomorphic Filtering., Noise models, Constrained and Unconstrained restoration models.</i>
<b>UNIT 3:</b>	<b><i>Image Segmentation and Feature Analysis</i></b> <i>Detection of Discontinuities, Edge Operators, Edge Linking and Boundary Detection, Thresholding, Region Based Segmentation, Motion Segmentation, Feature Analysis and Extraction.</i>
<b>UNIT 4:</b>	<b><i>Multi Resolution Analysis and Compressions</i></b> <i>Multi Resolution Analysis: Image Pyramids – Multi resolution expansion – Wavelet Transforms, Fast Wavelet transforms, Wavelet Packets. Image Compression: Fundamentals, Models, Elements of Information Theory, Error Free Compression, Lossy Compression, Compression Standards JPEG/MPEG.</i>
<b>UNIT 5:</b>	<b><i>Applications of Image Processing</i></b> <i>Representation and Description, Image Recognition, Image Understanding, Image Classification, Video Motion Analysis, Image Fusion, Steganography, Colour Image Processing.</i>

Suggested Books:

1. Digital Image Processing - Dr. S.Sridhar Oxford University Press



## Elective for First Semester

### M.Tech. in Computer Science & Engineering (Software Engineering) Semester I

MCO 005A	Advance Topics in Software Project Management	4-0-0
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#### Course Objective

- To discuss the various aspects of project management
- To understand the tasks in Advance Topics in Software Project Management
- To describe the project titles and estimate economy.
- To describe the requirements of a project plan

<b>UNIT 1:</b>	<b>Introduction to Project Management:</b> Definition of the Project, Project Specification and parameters, Principles of Project Management, Project Management Life Cycle
<b>UNIT 2:</b>	<b>Software Project Planning,</b> Project Activities and Work Breakdown Structure, Activity Resource Requirements, Project Management Plan , PERT & CPM \
<b>UNIT 3:</b>	<b>Project Scheduling and Tracking Techniques:</b> Why projects are delayed? Effort Estimation Techniques, Task Network and Scheduling Methods, Monitoring and Control Progress, Graphical Reporting Tools
<b>UNIT 4:</b>	<b>Project Economics:</b> Project Costing, Empirical Project Estimation Techniques, Decomposition Techniques, BEP, Automated Estimation Tools
<b>UNIT 5:</b>	<b>Risk Analysis and Management:</b> Risk Mitigation and Management, Software Metrics and Project Management <b>Project Control and Closure,</b> Project Management Issues with regard to New Technologies

#### Outcomes:

At the end of the course, the student should be able to:

- Discuss the various aspects of project management
- Understand the tasks in Advance Topics in Software Project Management
- Describe the project titles and estimate economy.
- Describe the requirements of a project plan

#### Text Book:

1 Clements and Gido, Effective Project Management, Thomson India Edition

#### Reference Books:

1 Bob Hughes and Mike Cotterell, “ Advance Topics in Software Project Management”, Third Edition,  
McGraw-Hill

2 PankajJalote, “ Advance Topics in Software Project Management in Practice”, Pearson Education Asia.

3 Robert T. Futrell, Donald F. Shafer, and Linda I. Shafer, “Quality Software Project Management”, Pearson Education Asia.

4Ramesh Gopaldaswamy, “Managing Global Software Projects”, Tata McGraw-Hill

**M.Tech. in Computer Science & Engineering (Software Engineering) Semester I**

MCO 006A	Client Server Programming	4-0-0
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**Course Objective:**

- To aware of the characteristics of client-server computing,
- To understand the issues associated with client-server computing,
- To know the basic approaches for implementing client-server computations via the TCP/IP suite.

<b>UNIT 1:</b>	<p><b>1. Concurrent Processing in Client-Server software:</b> Introduction, Concurrency in Networks, Concurrency in Servers, Terminology and Concepts, An example of Concurrent Process Creation, Executing New Code, Context Switching and Protocol Software Design, Concurrency and Asynchronous I/O.</p> <p><b>2. Program Interface to Protocols:</b> Introduction, Loosely Specified Protocol Software Interface, Interface Functionality, Conceptual Interface Specification, System Calls, Two Basic Approaches to Network Communication, The Basic I/O Functions available in UNIX, Using UNIX I/O with TCP/IP.</p>
<b>UNIT 2:</b>	<p><b>The Socket Interface:</b> Introduction, Berkley Sockets, Specifying a Protocol Interface, The Socket Abstraction, Specifying an End Point Address, A Generic Address Structure, Major System Calls used with Sockets, Utility Routines for Integer Conversion, Using Socket Calls in a Program, Symbolic Constants for Socket Call Parameters.</p> <p><b>Algorithms and Issues in Client Software Design:</b> Introduction, Learning Algorithms instead of Details, Client Architecture, Identifying the Location of a Server, Parsing an Address Argument, Looking up a Domain Name, Looking up a well-known Port by Name, Port Numbers and Network Byte Order, Looking up a Protocol by Name, The TCP Client Algorithm, Allocating a Socket, Choosing a Local Protocol Port Number, A fundamental Problem in choosing a Local IP Address, Connecting a TCP Socket to a Server, Communicating with the Server using TCP, Reading a response from a TCP Connection, Closing a TCP Connection, Programming a UDP Client, Connected and Unconnected UDP Socket, Using Connect with UDP, Communicating with a Server using UDP, Closing a Socket that uses UDP, Partial Close for UDP, A Warning about UDP Unreliability.</p>
<b>UNIT 3:</b>	<p><b>Algorithms and Issues in Server Software Design:</b> Introduction, The Conceptual Server Algorithm, Concurrent Vs Iterative Servers, Connection-Oriented Vs Connectionless Access, Connection-Oriented Servers, Connectionless Servers, Failure, Reliability and Statelessness, Optimizing Stateless Servers, Four Basic Types of Servers, Request Processing Time, Iterative Server Algorithms, An Iterative Connection-Oriented Server Algorithm, Binding to a Well Known Address using INADDR_ANY, Placing the Socket in Passive Mode, Accepting Connections and using them. An Iterative Connectionless Server Algorithm, Forming a Reply Address in a Connectionless Server, Concurrent Server Algorithms, Master and Slave</p>

	Processes, A Concurrent Connectionless Server Algorithm, A concurrent Connection-Oriented Server Algorithm, Using separate Programs as Slaves, Apparent Concurrency using a Single Process, When to use each Server Types, The Important Problem of Server Deadlock, Alternative Implementations.
<b>UNIT 4:</b>	<b>Iterative, Connectionless Servers (UDP):</b> Introduction, Creating a Passive Socket, Process Structure, An example TIME Server.  <b>Iterative, Connection-Oriented Servers (TCP):</b> Introduction, Allocating a Passive TCP Socket, A Server for the DAYTIME Service, Process Structure, An Example DAYTIME Server, Closing Connections, Connection Termination and Server Vulnerability
<b>UNIT 5:</b>	<b>Concurrent, Connection-Oriented Servers (TCP):</b> Introduction, Concurrent ECHO, Iterative Vs Concurrent Implementations, Process Structure, An example Concurrent ECHO Server, Cleaning up Errant Processes

**Outcomes:**

At the end of the course, the student should be able to:

- Aware of the characteristics of client-server computing,
- Understand the issues associated with client-server computing,
- Know the basic approaches for implementing client-server computations via the TCP/IP suite

**TEXT BOOK:**

1. Douglas E.Comer, David L. Stevens: Internetworking with TCP/IP – Vol. 3, Client-Server Programming and Applications, BSD Socket Version with ANSI C, 2nd Edition, Pearson, 2001.
- liam Stallings, “Operating Systems”, Pearson Education

## School of Engineering & Technology

### M.Tech. in Computer Science & Engineering (Network Engineering) Semester I

<b>MCO 007A</b>	<b>Advanced Data Communication Network</b>	<b>4-0-0</b>
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#### Course Objective

- To provide a good conceptual understanding of advance computer networking
- To understand various models and their functions
- To have an advance understanding of performance evaluation
- To understand network economics

<b>UNIT 1:</b>	The Motivation for Internetworking; Need for Speed and Quality of Service; History of Networking and Internet; TCP/IP and ATM Networks; Internet Services; TCP Services; TCP format and connection management; Encapsulation in IP; UDP Services, Format and Encapsulation in IP; IP Services; Header format and addressing; Fragmentation and reassembly; classless and subnet address extensions; sub netting and super netting; CIDR; IPv6;
<b>UNIT 2:</b>	Congestion Control and Quality of Service: Data traffic; Network performance; Effects of Congestion; Congestion Control; Congestion control in TCP and Frame Relay; Link-Level Flow and Error Control; TCP flow control; Quality of Service: Flow Characteristics, Flow Classes; Techniques to improve QoS; Traffic Engineering; Integrated Services;
<b>UNIT 3:</b>	High Speed Networks: Packet Switching Networks; Frame Relay Networks; Asynchronous Transfer Mode (ATM); ATM protocol Architecture; ATM logical connections; ATM cells; ATM Service categories; ATM Adaptation Layer;  Optical Networks: SONET networks; SONET architecture;  Wireless WANs: Cellular Telephony; Generations; Cellular Technologies in different generations; Satellite Networks;
<b>UNIT 4:</b>	Internet Routing: Interior and Exterior gateway Routing Protocols; Routers and core routers; RIP; OSPF; BGP; IDRP; Multicasting; IGMP; MOSPF; Routing in Ad Hoc Networks; Routing in ATM: Private Network-Network Interface;
<b>UNIT 5:</b>	Error and Control Messages: ICMP; Error reporting vs Error Correction; ICMP message format and Delivery; Types of messages;  Address Resolution (ARP); BOOTP; DHCP; Remote Logging; File Transfer and Access; Network Management and SNMP; Comparison of SMTP and HTTP; Proxy Server; The Socket Interface;

**Outcomes:**

At the end of the course, the student should be able to:

- Provide a good conceptual understanding of advance computer networking
- Understand various models and their functions
- Advance understanding of performance evaluation
- Understand network economics

**Text Books:**

1. William Stallings, “High-Speed Networks and Internets, Performance and Quality of Service”, Pearson Education;
2. Douglas E. Comer, “Internetworking with TCP/IP Volume – I, Principles, Protocols, and Architectures”, Fourth Edition, Pearson Education.

**Reference Books:**

1. B. Muthukumaran, “Introduction to High Performance Networks”, Vijay Nicole Imprints.
2. Wayne Tomasi, “Introduction to Data Communications and Networking”, Pearson Education.
3. James F. Kurose, Keith W. Ross, “Computer Networking, A Top-Down Approach Featuring the Internet”, Pearson Education.
4. Andrew S. Tanenbaum, “Computer Networks”, Pearson Education.
5. Behrouz A. Forouzan, “Data Communications and Networking”, Fourth Edition, McGraw Hill.
6. Mahbub Hassan, Raj Jain, “High Performance TCP/IP Networking, Concepts, Issues, and Solutions”, Pearson Education.

## School of Engineering & Technology

### M.Tech. in Computer Science & Engineering (Information Security) Semester I

MCO 016A	Information System Security	3-0-0
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#### Course Objective:

- To perform a risk assessment of an information system.
- To identify the security requirements for an information system.
- To use available government information system security resources when designing systems.

UNIT 1:	<b>Introduction to Securities:</b> Introduction to security attacks, services and mechanism, Classical encryption techniques substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers. Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, feistel structure, Data encryption standard (DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES
UNIT 2:	<b>Modular Arithmetic:</b> Introduction to group, field, finite field of the form $GF(p)$ , modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm, Advanced Encryption Standard (AES) encryption and decryption Fermat's and Euler's theorem, Primality testing, Chinese Remainder theorem, Discrete Logarithmic Problem, Principals of public key crypto systems, RSA algorithm, security of RSA
UNIT 3:	<b>Message Authentication Codes:</b> Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Securehash algorithm (SHA) <b>Digital Signatures:</b> Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm
UNIT 4:	<b>Key Management and distribution:</b> Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure. <b>Authentication Applications:</b> Kerberos <b>Electronic mail security:</b> pretty good privacy (PGP), S/MIME.
UNIT 5:	<b>IP Security:</b> Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Introduction to Secure Socket Layer, Secure electronic, transaction (SET). <b>System Security:</b> Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls.

#### **Outcomes:**

At the end of the course, students should be able to:

- Perform a risk assessment of an information system.
- Identify the security requirements for an information system.
- Use available government information system security resources when designing systems.

**Suggested Books:**

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



## Elective for Second Semester

### M.Tech. in Computer Science & Engineering (Information Security) Semester II

MCO 013A	Secure E-Commerce	3-0-0
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#### Course Objective:

- Understand the importance and scope of the security of information systems for EC.
- Describe the major concepts and terminology of EC security.
- Learn about the major EC security threats, vulnerabilities, and risks.
- Understand phishing and its relationship to financial crimes.
- Describe the information assurance security principles.

UNIT 1:	The importance of e-commerce security to the business enterprise. Current threats facing organizations that conduct business online and how to mitigate these challenges.
UNIT 2:	Cryptography review public key certificates and infrastructures, authentication and authorization certificates secure credential services and role-based authorization
UNIT 3:	Mobile code security, security of agent-based systems
UNIT 4:	Secure electronic transactions, electronic payment systems
UNIT 5:	Intellectual property protection, Law and Regulation

#### **Outcomes:**

At the end of the course, students should be able to:

- Understand the importance and scope of the security of information systems for EC.
- Describe the major concepts and terminology of EC security.
- Learn about the major EC security threats, vulnerabilities, and risks.
- Understand phishing and its relationship to financial crimes.
- Describe the information assurance security principles

#### **Text Books:**

1. Gary Schneider, Electronic Commerce, Sixth Edition, Course Technologies,2006, ISBN: 0-619-21704-9

#### **Reference Books:**

1. Awad, E., *Electronic Commerce: From Vision to Fulfillment*, 3/E, Prentice Hall, 2006, ISBN: 0-13-173521-7
2. Davis, W., Benamati, J., *E-Commerce Basics: Technology Foundations and E-Business Applications*, Prentice Hall, 2003, ISBN: 0-201-74840-1
3. Ford, W., Baum, M., *Secure Electronic Commerce: Building the Infrastructure for Digital Signatures and Encryption*, 2/E, Prentice Hall, 2001, ISBN: 0-13-027276-0
4. Mostafa Hashem Sherif, *Protocols for Secure Electronic Commerce*, Second Edition, CRC Press, 2004, ISBN: 0849315093.
6. National Institutes of Standards and Technology (NIST) Special Publications

## School of Engineering & Technology

### M.Tech. in Computer Science & Engineering (Information Security) Semester II

MCO 014A	Advance Topics in Data Mining and Warehousing	3-0-0
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#### Course Objective:

- To compare and contrast different conceptions of data mining as evidenced in both research and application.
- To explain the role of finding associations in commercial market basket data.
- To characterize the kinds of patterns that can be discovered by association rule mining.
- To describe how to extend a relational system to find patterns using association rules.

UNIT 1:	<b>Overview:</b> Concept of data mining and warehousing, data warehouse roles and structures, cost of warehousing data, roots of data mining, approaches to data exploration and data mining, foundations of data mining, web warehousing, web warehousing for business applications and consumers, introduction to knowledge management, data warehouses and knowledge bases.
UNIT 2:	<b>Data Warehouse:</b> Theory of data warehousing, barriers to successful data warehousing, bad data warehousing approaches, stores, warehouse and marts, data warehouse architecture, metadata, metadata extraction, implementing the data warehouse and data warehouse technologies.
UNIT 3:	<b>Data Mining and Data Visualisation:</b> Data mining, OLAP, techniques used to mine the data, market basket analysis, current limitations and challenges to DM, data visualization. <b>Designing and Building the Data Warehouse:</b> The enterprise model approach of data mining design, data warehouse project plan, analysis and design tools, data warehouse architecture, specification and development.
UNIT 4:	<b>Web-Based Query and Reporting:</b> Delivering information over the web, query and reporting tools and business value, architectural approaches to delivering query capabilities over the web. <b>Web Based Statistical Analysis and Data Mining:</b> Analytical tools, business value from analytical tools, humble spreadsheet, determining the business value that analytical tools will deliver, statistical products overview – statistical analysis applications, correlation analysis, regression analysis, data discovery tools overview, data discovery applications, comparison of the products, architectural approaches for statistical and data discovery tools.
UNIT 5:	<b>Search Engines and Facilities:</b> Search engines and the web, search engine architecture, variations in the way the search facilities work and variations in indexing schemes. <b>Future of Data Mining and Data Warehousing:</b> Future of data warehousing, trends in data warehousing, future of data mining, using data mining to protect privacy, trends affecting the future of data mining and future of data visualization.

**Outcomes:**

At the end of the course, students should be able to:

- Compare and contrast different conceptions of data mining as evidenced in both research and application.
- Explain the role of finding associations in commercial market basket data.
- Characterize the kinds of patterns that can be discovered by association rule mining.
- Describe how to extend a relational system to find patterns using association rules.
- Evaluate methodological issues underlying the effective application of data mining.

**Text Books**

1. Jiwei Han, MichelenKamber, “Data Mining Concepts and Techniques”, Morgan Kaufmann Publishers an Imprint of Elsevier, 2001.

**Reference Books:**

1. ArunK.Pujari, Data Mining Techniques, Universities Press (India) Limited, 2001.
2. George M. Marakas, Modern Data warehousing, Mining and Visualization: core concepts, Printice Hall, First Edition,2002.

**School of Engineering & Technology**

**M.Tech. in Computer Science & Engineering (Information Security) Semester II**

<b>MCO 015A</b>	<b>Pattern Recognition</b>	<b>3-0-0</b>
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**Course Objective:**

- To understand the nature and inherent difficulties of the pattern recognition problems.
- To understand concepts, trade-offs, and appropriateness of the different feature types and classification techniques such as Bayesian, maximum-likelihood, etc.
- To select a suitable classification process, features, and proper classifier to address a desired pattern recognition problem.
- To demonstrate algorithm implementation skills using available resources and be able to properly interpret and communicate the results clearly and concisely using pattern recognition terminology.

<b>UNIT 1:</b>	Introduction and mathematical preliminaries - What is pattern recognition?, Clustering vs. Classification; Applications; Linear Algebra, vector spaces, probability theory, estimation techniques.
<b>UNIT 2:</b>	Classification: Bayes decision rule, Error probability, Error rate, Minimum distance classifier, Mahalanobis distance; K-NN Classifier, Linear discriminant functions and Non-linear decision boundaries.
<b>UNIT 3:</b>	Fisher's LDA, Single and Multilayer perceptron, training set and test sets, standardization and normalization.
<b>UNIT 4:</b>	Clustering: Different distance functions and similarity measures, Minimum within cluster distance criterion, K-means clustering, single linkage and complete linkage clustering, MST, medoids, DBSCAN, Visualization of datasets, existence of unique clusters or no clusters. Feature selection: Problem statement and Uses, Probabilistic separability based criterion functions, interclass distance based criterion functions, Branch and bound algorithm, sequential forward/backward selection algorithms, (l,r) algorithm.
<b>UNIT 5:</b>	Feature Extraction: PCA, Kernel PCA. Recent advances in PR: Structural PR, SVMs, FCM, Soft-computing and Neuro-fuzzy.

**Outcomes:**

At the end of the course, students should be able to:

- Understand the nature and inherent difficulties of the pattern recognition problems.
- Understand concepts, trade-offs, and appropriateness of the different feature types and classification techniques such as Bayesian, maximum-likelihood, etc.
- Select a suitable classification process, features, and proper classifier to address a desired pattern recognition problem.
- Demonstrate algorithm implementation skills using available resources and be able to properly interpret and communicate the results clearly and concisely using pattern recognition terminology.

**Books & References:****PREREQUISITES**

Vector spaces and Linear Algebra; Algorithms.

Probability theory; Statistics.

**Text Books:**

1. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001.

**Reference Books:**

1. Statistical pattern Recognition; K. Fukunaga; Academic Press, 2000.
2. S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009.
3. C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006.

## Elective for Third Semester

School of Engineering & Technology

M.Tech. in Computer Science & Engineering (Information Security) Semester III

MCO 022A	Mobile Communication	4-0-0
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### Course Objective

- To introduce the concept of Mobile Communication and architecture of mobile communication.
- To teach the concepts of mobile communications to the transactions and transaction management.
- To familiarize the students with concepts of Mobile Communication and conventional wired network and simulate it on the simulator.
- To understand the working of heterogeneous networks.

<b>UNIT 1:</b>	<b>Overview of Mobile Communication:</b> Its applications, Radio Communication, Mobile Communication Architecture, Mobile System Networks, Data Dissemination, Mobility Management, <b>Introduction to Cellular network:</b> components, Architecture, Call set-up, Frequency Reuse and Co-channel cell, Cell Design, Interference, Channel assignment, Hand Off;
<b>UNIT 2:</b>	<b>Cellular Network Standards:</b> Digital cellular communication, Multiple Access Techniques: FDMA, TDMA, CDMA. GSM: System Architecture, Mobile services & features, Protocols, Radio interface, Handover, GSM Channels, Localization and calling, User validation; General Packet Radio Service; Introduction to CDMA based systems; Spread spectrum in CDMA systems; coding methods in CDMA; IS-95
<b>UNIT 3:</b>	<b>Wireless LAN:</b> Wireless LAN (Wi-Fi) Architecture and protocol layers; WAP Architecture; Bluetooth Architecture: Layers, Security in Bluetooth;
<b>UNIT 4:</b>	<b>Mobile Ad-hoc and Sensor Networks:</b> Introduction, MANET, Routing in MANET's Wireless Sensor Networks, Applications; Mobile Devices: Mobile Agent, Application Server, Gateways, Portals, Service Discovery, Device Management,
<b>UNIT 5:</b>	<b>Support for Mobility:</b> Mobile IP: Architecture, Packet delivery and Hand over Management, Location Management, Registration, Tunneling and Encapsulation, Route optimization, DHCP. Mobile Transport Layer: Conventional TCP/IP transport protocols, Indirect TCP, Snooping TCP, Mobile TCP

### **Outcomes:**

At the end of this course the student should be able to

- Understand the concept of Mobile Communication and architecture of mobile communication.

- Apply the concepts of mobile communications to the transactions and transaction management.
- Apply the concepts of Mobile Communication and conventional wired network and simulate it on the simulator.
- Understand the working of heterogeneous networks.

**Text Books**

1 Jochen Schiller, “Mobile Communications”, Second Edition, Pearson Education, 2004.

**Reference Books:**

2. Raj Kamal, “Mobile Communication”, Oxford Higher Education, 2008.

3. SipraDasBit, Biplab K. Sikdar, “Mobile Communication”, PHI, 2009.

4. William C.Y.Lee, “Mobile Cellular Telecommunications”, Second Edition, (Tata McGraw-Hill), 2006.



**School of Engineering & Technology**

**M.Tech. in Computer Science & Engineering (Information Security) Semester III**

<b>MCO 023A</b>	<b>Secure Communication and VPN</b>	<b>4-0-0</b>
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**Course Objective:**

- To understand about the communication security.
- To understand about window security.

<b>UNIT 1:</b>	<b>Introduction to Communication Security</b> Threats and Solutions, Technical Threats to Communication Security, Authentication, Confidentiality, Integrity, Biometric Access Tools, Foot Printing, Internet Foot Printing, Port Scanning.
<b>UNIT 2:</b>	<b>Windows Security</b> Windows Security Features, Windows Firewalls, Remote Connectivity and VoIP Hacking, PBX Hacking, Voice Mail Hacking.
<b>UNIT 3:</b>	<b>VPN</b> Introduction to VPN, Types of VPN: Access VPN, Intranet VPN, Extranet VPN, VPN Protocols, Layer 2 Tunneling Protocol, Internet Protocol Security, Internet Key Exchange (IKE) Protocol, VPN Hacking, Voice over IP Attack.
<b>UNIT 4:</b>	<b>VPN &amp; Firewalls</b> Secure VPN Technologies, Trusted VPN Technologies, VPN/Firewall Architecture, VPN/Firewall security Policy.
<b>UNIT 5:</b>	Advanced Security Policy and System Management Hybrid VPN Technologies, Site-to-Site VPN Design, Remote Access VPN Design.

**Outcomes:**

At the end of the course, students should be able to:

- Understand about the communication security.
- Understand about window security.

**Text Books:**

1. Ruixi Yuan and Timothy Strayer W., “Virtual Private Networks: Technologies and Solutions”, Addison-Wesley, 2001.

**Reference Books:**

1. Thaddeus Fortenberry, "Windows 2000 Virtual Private Networking", MacmillanTechnical Pub, 2007.
2. Roger J. Sutton, "Secure Communications: Applications and Management", WILEY, 2002.

## School of Engineering & Technology

### M.Tech. in Computer Science & Engineering (Information Security) Semester III

MCO 024A	Grid Computing	4-0-0
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#### Course Objective:

- To understand the grid computing concepts.
- To understand the roles of Grid computing.
- To explain Grid architecture.
- To understand the Grid related technologies

UNIT 1:	<b>Grid Computing:</b> values and risks – History of Grid computing, Grid computing model and protocols, Overview and types of Grids.
UNIT 2:	<b>Desktop Grids :</b> Background, Definition, Challenges, Technology, Suitability, Grid server and practical uses, Clusters and Cluster Grids, HPC Grids, Scientific in sight, Application and Architecture, HPC application, Development Environment and HPC Grids, Data Grids, Alternatives to Data Grid, Data Grid architecture.
UNIT 3:	<b>The open Grid services Architecture,</b> Analogy, Evolution, Overview, Building on the OGSA platform, Implementing OGSA based Grids, Creating and Managing services, Services and the Grid, Service Discovery, Tools and Toolkits, Universal Description Discovery and Integration
UNIT 4:	<b>Desktop Supercomputing,</b> Parallel Computing, Parallel Programming Paradigms, Problems of Current parallel Programming Paradigms, Desktop Supercomputing Programming Paradigms, Parallelizing Existing Applications, Grid Enabling Software Applications, Needs of the Grid users, methods of Grid Deployment, Requirements for Grid enabling Software, Grid Enabling Software Applications.
UNIT 5:	Application integration, Application classification, Grid requirements, Integrating applications with Middleware platforms, Grid enabling Network services, Managing Grid environments, Managing Grids, Management reporting, Monitoring, Data catalogs and replica management, Portals, Different application areas of Grid computing.

#### *Outcomes*

At the end of the course, students should be able to:

- Understand the grid computing concepts.
- Understand the roles of Grid computing.
- Explain Grid architecture.
- Understand the Grid related technologies

**Text Books:**

1. Ahmar Abbas, "Grid Computing: A Practical Guide to Technology and Applications", Firewall Media, 2004.

**Reference Books:**

1. Joshy Joseph and Craig Fellenstein, "Grid Computing", Pearson Education, 2001.
2. Ian Foster and Carl Kesselman, "Grid Blue Print for New Computing Infrastructure", Morgan Kaufmann, 2000.
3. Fran Berman, Geoffrey Fox and Anthony J. G. Hey, "Grid Computing: Making the Global Infrastructure a Reality", Wiley Publisher, 2001

## School of Engineering & Technology

### M.Tech. in Computer Science & Engineering (Information Security) Semester III

MCO 025A	Natural Language Processing	4-0-0
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#### Course Objective:

- Develop familiarity with lexical, syntactic, semantic and pragmatic aspects of NLP.
- Develop an understanding of NLP Models and Algorithms.
- Develop background in statistical and machine learning approaches to NLP.

<b>UNIT 1:</b>	Sound : Biology of Speech Processing; Place and Manner of Articulation; Word Boundary Detection; Argmax based computations; HMM and Speech Recognition.
<b>UNIT 2:</b>	Words and Word Forms : Morphology fundamentals; Morphological Diversity of Indian Languages; Morphology Paradigms; Finite State Machine Based Morphology; Automatic Morphology Learning; Shallow Parsing; Named Entities; Maximum Entropy Models; Random Fields.
<b>UNIT 3:</b>	Structures : Theories of Parsing, Parsing Algorithms; Robust and Scalable Parsing on Noisy Text as in Web documents; Hybrid of Rule Based and Probabilistic Parsing; Scope Ambiguity and Attachment Ambiguity resolution.
<b>UNIT 4:</b>	Meaning : Lexical Knowledge Networks, Wordnet Theory; Indian Language Wordnets and Multilingual Dictionaries; Semantic Roles; Word Sense Disambiguation; WSD and Multilinguality; Metaphors; Coreferences.
<b>UNIT 5:</b>	Web 2.0 Applications : Sentiment Analysis; Text Entailment; Robust and Scalable Machine Translation; Question Answering in Multilingual Setting; Cross Lingual Information Retrieval (CLIR).

#### *Outcomes:*

At the end of the course, students should be able to:

- Develop familiarity with lexical, syntactic, semantic and pragmatic aspects of NLP.
- Develop an understanding of NLP Models and Algorithms.
- Develop background in statistical and machine learning approaches to NLP.

#### **Books & References:**

##### PREREQUISITES

1. A previous course on Artificial Intelligence will help.
2. Courses of Data Structures and Algorithms should have been done.
3. Exposure to Linguistics is useful, though not mandatory.

## **REFERENCES**

1. Allen, James, Natural Language Understanding, Second Edition, Benjamin/Cumming, 1995.
2. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.
3. Jurafsky, Dan and Martin, James, Speech and Language Processing, Second Edition, Prentice Hall, 2008.
4. Manning, Christopher and Heinrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.

## **ADDITIONAL READINGS**

1. Radford, Andrew et. al., Linguistics, An Introduction, Cambridge University Press, 1999.
2. Journals : Computational Linguistics, Natural Language Engineering, Machine Learning, Machine Translation, Artificial Intelligence.

**School of Engineering & Technology**

**M.Tech. in Computer Science & Engineering (Information Security) Semester III**

<b>MCO 026A</b>	<b>Biometric Security</b>	<b>4-0-0</b>
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**Course Objective:**

- To explain different biometrics parameters
- To design a basic biometric facility
- To participate in Bidding process and Equipment installation of Biometric Equipment
- To Administrate a Biometric Facility

<b>UNIT 1:</b>	Explain the errors generated in biometric measurements cs: Need
<b>UNIT 2:</b>	Conventional techniques of authentication, challenges – legal and privacy issues
<b>UNIT 3:</b>	Biometrics in use: DNA, fingerprint, Iris, Retinal scan, Face, hand geometry
<b>UNIT 4:</b>	Human gait, speech, ear. Handwriting, Keystroke dynamics
<b>UNIT 5:</b>	Signature Multimodal biometrics: Combining biometrics, scaling issues. Biometric template security

***Outcomes***

At the end of this course Students will be able to:

- Explain different biometrics parameters
- Design a basic biometric facility
- Participate in Bidding process and Equipment installation of Biometric Equipment
- Administrate a Biometric Facility
- Understand the privacy challenges of Biometrics

**Texts/References:**

1. Julian D. M. Ashbourn, Biometrics: Advanced Identify Verification: The Complete Guide

**Reference Books:**

1. Davide Maltoni (Editor), et al, Handbook of Fingerprint Recognition
2. L.C. Jain (Editor) et al, Intelligent Biometric Techniques in Fingerprint and Face Recognition
3. John Chirillo, Scott Blaul, Implementing Biometric Security



## School of Engineering & Technology

### M.Tech. in Computer Science & Engineering (Information Security) Semester III

MCO 027A	Storage System	4-0-0
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#### Course Objective:

At the end of this course Students will be able to:

- To understand the various types of storage system.
- To understand the various types of technology used in storage system.
- To understand the management of the storage system.

<b>UNIT 1:</b>	<b>Introduction</b> : History: computing, networking, storage, Need for storage networking , SAN, NAS, SAN/NAS Convergence, Distributed Storage Systems, Mainframe/proprietary vs. open storage, Storage Industry Organizations and Major Vendors Market, Storage networking strategy (SAN/NAS)
<b>UNIT 2:</b>	<b>Technology:</b> Storage components, Data organization: File vs. Block, Object; Data store; Searchable models; Storage Devices (including fixed content storage devices), File Systems, Volume Managers, RAID systems, Caches, Prefetching.
<b>UNIT 3:</b>	<b>Network Components:</b> Connectivity: switches, directors, highly available systems, Fibre Channel, 1GE/10GE, Metro-ethernet, Aggregation, Infiniband <b>Error management:</b> Disk Error Mgmt, RAID Error Mgmt, Distributed Systems Error Mgmt
<b>UNIT 4:</b>	<b>Highly available and Disaster-tolerant designs:</b> Ordered writes, Soft updates and Transactions, 2 phase, 3 phase, Paxos commit protocols, Impossibility Results from Distributed Systems, Choose 2 of 3: Availability, Consistency and Partition Tolerance Layering and Interfaces in Storage Protocols (eg. SCSI 1/2/3SNIA model) SAN Components: Fibre Channel, IP-based Storage (iSCSI, FCIP, etc.), Examples NAS: NFS, CIFS, DAFS
<b>UNIT 5:</b>	<b>Large Storage Systems:</b> Google FS/BigTable, Cloud/Web-based systems (Amazon S3), FS+DB convergence, Programming models: Hadoop <b>Archival Systems:</b> Content addressable storage, Backup: serverless, LAN free, LAN Replication issues, Storage Security, Storage Management, Device Management, NAS Management, Virtualization, Virtualization solutions, SAN Management: Storage Provisioning, Storage Migration, SRM

At the end of this course Students will be able to:

- Understand the various types of storage system.
- Understand the various types of technology used in storage system.
- Understand the management of the storage system.

**School of Engineering & Technology**

**M.Tech. in Computer Science & Engineering (Information Security) Semester III**

<b>MCO 028A</b>	<b>PKI and Trust Management</b>	<b>4-0-0</b>
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**Course Objective:**

At the end of this course Students will be able to:

- Understand trust in a Digital World.
- Understand the foundations of Cryptography and elements of PKI.
- Learn about the various trust models.
- Understand the legal aspects.

<b>UNIT 1:</b>	Public Key Cryptography: Symmetric v/s Asymmetric ciphers, Secret key, New Directions: Public key, public/private key pair, Services of public key cryptography
<b>UNIT 2:</b>	Algorithms: Diffie Hellman key exchange algorithm, RSA algorithm. Digital certificate and Public Key Infrastructure: Digital Certificates, private key management,
<b>UNIT 3:</b>	the PKIX model, public key cryptography standards, Certification authority, certificate repository, certificate revocation, cross certification. Hierarchical PKI, Mesh PKI, What does PKI offer, Simple Public Key Infrastructure
<b>UNIT 4:</b>	Pretty Good Privacy, X509 Version 3 Public Key Certificate, Secure Electronic Transaction Certificate, Attribute Certificate, Certificate Policies
<b>UNIT 5:</b>	Trust Model: Strict hierarchy of certification authority, Loose hierarchy of certification authority, Four-Corner Model

**Outcomes:**

At the end of this course Students will be able to:

- Understand trust in a Digital World.
- Understand the foundations of Cryptography and elements of PKI.
- Learn about the various trust models.
- Understand the legal aspects.

**Text Books:**

1. AtulKahate, "Cryptography and Network Security", TMH
2. Understanding PKI: Concepts, Standards and Deployment, Considerations, Second Edition by Crlisle Adams, Steve Loyd, Addison-Wesely Professional

