Course Structure And Syllabus for

Master of Science (M.Sc.) in Computer Science

(Four Semester Course)

Proposed for 2012 batch onwards

Department of Computer Science
Faculty of Science
St. Joseph's College (Autonomous)

SEMESTER WISE COURSE STRUCTURE

FIRST SEMESTER

THEORY				
SL.NO.	**CODE**	**COURSE TITLE**	**Hrs / Week**	**Credits**
1	CS7112	Theory of Computation	4	4
2	CS7212	Design Methods and Analysis of Algorithm	4	4
3	CS7312	Data Communication and Computer Network	4	4
4	CS7412	Object Oriented Programming	4	4
PRACTICALS				
1	MCS1P1	Design Methods and Analysis of Algorithm Lab	6	3
2	MCS1P2	Object Oriented Programming Lab	6	3

SECOND SEMESTER

THEORY				
SL.NO.	**CODE**	**COURSE TITLE**	**Hrs / Week**	**Credits**
1	CS8112	Artificial Intelligence	4	4
2	CS8212	Computer Graphics And Multimedia	4	4
3	CS8312	Advanced Course in DBMS	4	4
4	CS8412	Software Project Management	4	4
PRACTICALS				
1	MCS2P1	Artificial Intelligence Lab	6	3
2	MCS2P2	Computer Graphics And Multimedia Lab	6	3

THIRD SEMESTER

THEORY				
SL.NO.	**CODE**	**COURSE TITLE**	**Hrs / Week**	**Credits**
1	CS9112	Data mining and knowledge discovery	4	4
2	CS9212	Data storage technologies	4	4
3	CS9312	Network Security	4	4
4	CS9412	Advanced Computer Architecture	4	4
PRACTICALS				
1	MCS3P1	Mini Project Lab	6	3
2	MCS3P2	Web Designing Lab	6	3

FOURTH SEMESTER

THEORY				
SL.NO.	**CODE**	**COURSE TITLE**	**Hrs / Week**	**Credits**
1	**CS0112**	**Distributed Computing Systems**	**4**	**4**
2	**CS0212**	**Advanced operating system**	**4**	**4**
3	**CS0312**	**Wireless communication**	**4**	**4**
PRACTICALS				
1	**MCS4P1**	**Major Project Lab**	**6**	**2**

THEORY QUESTION PAPER FORMAT

The question papers of the theory examinations should follow the pattern specified below:

Section	**Marks for each question**	**Number Of Questions**		**Total Marks**
		Total	**Should Answer**	
A	20	8	5	100

Total Marks 100

While selecting the questions importance should be given to all major units.

PRACTICAL QUESTION PAPER FORMAT

Scheme of valuation:

1. Writing two programs one from each section 10 marks
2. Execution of one program 20 marks
3. Formatting the program and output 10 marks
3. Record verification 05 marks
4. Viva voce related to practical topics only 05 marks

Total 50 marks

PROJECT EVALUATION FORMAT

Scheme of valuation:

1.	Demonstration and presentation	25 marks
2.	Documentation	25 marks
	Total	50 marks

INTERNAL ASSESSMENT FORMAT

THEORY:

1.	CIA test	30 marks
2.	First Activity	10 marks
3.	Second Activity	10 marks
	Total	50 marks

PRACTICALS:

Every practical class the student should be assessed.

1.	Writing the observation book	3 marks
2.	Executing the programs	5 marks
3.	Record writing	2 marks
	Total	10 marks

Internal marks for the final semester project work can be awarded by the guide by evaluating the performance of the student during the course of the project work.

DETAILED SYLLABUS

FIRST SEMESTER

TITLE: Theory of Computation
CODE: CS7112
Hrs / Week : 4 Hrs
CREDITS: 4

Finite Automata and Regular Expressions:
Introduction to Finite Automata,DFA, Notations of DFA, DFA Design Techniques, Applications of Finite Automata, NFA, conversion from NFA to DFA. FA with Epsilon Transitions, Extended Transition function of ϵ-NFA to Strings, Conversions from ϵ-NFA to DFA, Difference between NFA, DFA and NFA, Regular Expressions, Finite Automata and Regular Expressions. **20 Hrs**

Regular Languages and Properties of Regular Languages:
Proving languages not to be regular, Pumping lemma for Regular Languages, Properties of Regular Languages, Applications of Pumping lemma Equivalence and Minimization of Finite Automata. **10 Hrs**

Context free Grammars and Languages
Grammar, Chomsky Hierarchy, Grammar from Finite Automata, Derivations, Leftmost Derivation, Rightmost Derivation, Derivation Tree, Ambiguous Grammar, **Properties of Context free Languages:**
Substitution, Left Recursion, Simplification of CFG, Eliminating ϵ-productions, Eliminating Unit Productions, Chomsky Normal Form, Greiback Normal Form. **20 Hrs**

Pushdown Automata and Turing Machines:
Transitions, Graphical Representation of PDA, Instantaneous Description, Acceptance of a language by PDA, Construction of PDA, Turing Machine Model, Instantaneous Description, Construction of Turing Machine. **10 Hrs**

BOOKS:

1. J.E.Hopcraft, R. Motwani and J.D. Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education
2. Cohen, "Introduction to Computer Theory", John Wiley.
3. M. Sipser, Introduction to Theory of Computation, PWS Publishing Corporation, 1997.
4. J.E. Hopcroft, J.D. Ullman, Introduction to Automata Theory, Languages and Computation, Addison-Wisley, 1979.
5. T.C. Martin, Theory of Computation, Tata McGraw-Hill
6. H.R. Lewis, C.H. Papadimitrou, Elements of the Theory of Computation, PHI.

TITLE: Design Methods and Analysis of Algorithm
CODE: CS7212
Hrs / Week : 4 Hrs
CREDITS: 4

Elementary Data Structures:
Arrays, stacks, queue, linked list, Basic Computational Models.
Simple Algorithms. Analyzing Algorithms, Asymptotic Notation, Recurrence relations.
Design Methods:
General Consideration, Algorithm design paradigms and representative problems.
12 Hrs

Divide and Conquer:
Binary search, Merge Sort, Quick Sort, Arithmetic with Large integers. **12 Hrs**

Greedy Method:
Minimal Spanning Tree, Shortest Paths, Knapsack. Dynamic Programming, Chained Matrix Multiplication, Optimal Storage on Tapes, Shortest Paths, Optimal Search Trees. **12 Hrs**

Backtracking Method:
8-queens problem, Graph Colouring, Hamiltonian Cycles, Branch and Bound 0/1 Knapsack problem, Travelling Salesperson, Approximation Graph Colouring, Task Scheduling, Bin Packing. **12 Hrs**

Graph Algorithms:
BFS, DFS and its applications. Polynomial Evaluation , Intractable Problems : Basic Concepts, Nondeterministic Algorithms, NP Completeness, Cook's Theorem, Examples of NP-Hard and NP-Complete problems. **12 Hrs**

BOOKS:

1. A.Aho, J. Hopcroft and J.Ullman, The Design and Analysis of Computer Algorithms, Addison Wesley.
2. E. Horowitz and S. Sahani, Fundamentals of Computer Algorithms, Galgotia, New Delhi.
3. S.E.Goodman and S.T.Hedetniemi, Introduction to the Design and Analysis of Algorithms, McGraw Hill.
4. G.Brassard and P.Bratley, Algorithmics, PHI.
5. S.K.Basu, Design Methods and Analysis of Algorithms, PHI, 2005.

TITLE: Data Communication and Computer Network
CODE: CS7312
Hrs / Week : 4 Hrs
CREDITS: 4

Elements of data communication:
Concepts and terminology, analog and digital data transmission, signals, attenuation, delay distortion, noise, channel capacity, transmission media, data encoding, asynchronous and synchronous transmission, multiplexing.

Communication network, Circuit Switching, Message Switching and Packet Switching, Radio and Satellite Networks, Local Area Network topology, medium access control protocols. **15 Hrs**

Design and Setting a practical Network:
Network Adaptors, Repeaters, Hubs, Bridges, Switches and Routers, Cables. **15 Hrs**

Network Architecture and Distributed Processing:
OSI reference model, layered and hierarchical approaches, network interface, internet protocols and standards. Network services, electronic mail, Digital Signature, and Firewalls. **15 Hrs**

Introduction to high-speed networks:
Routing, Scheduling and Congestion Control issues and algorithms. **15 Hrs**

BOOKS:

1. B. A. Forouzan, Data Communications and Networking, TMH, 2003.
2. W.Stallings, Data and Computer Communication, McMillan.
3. A.S.Tanenbaum, Computer Networks, PHI.
4. J. Martin, Computer Network and Distributed Data Processing, Prentice Hall.
5. W.Stallings, Local Networks, McMillan.
6. M.Schwertz, Computer Communication Network Design and Analysis, Prentice Hall
7. Keshav, An Engineering Approach to Computer Networks, Addison-Wisley, 1998.
8. Peterson and Davie, Computer Networks, Morgan and Kaufmann, 2000.

TITLE: Object Oriented Programming
CODE: CS7412
Hrs / Week : 4 Hrs
CREDITS: 4

Introduction:
OOAD and OOP, Object Oriented Programming paradigm and design; General Concepts: Object, Class, Data Abstraction and Encapsulation, Inheritance, Polymorphism, Dynamic Binding, Message Passing; Benefits of OOP, Object-oriented Languages. **12 Hrs**

Objects and Classes:
Object oriented Programming using C++: Data Types, Operators, Classes and Objects, Constructors and Destructors. **12 Hrs**

Operator Overloading:
Operator Overloading, Type Conversions, Inheritance, Pointers, Virtual Functions, Polymorphism. **12 Hrs**

Streams:
Stream I/O in C++, File Processing, Templates, Standard Template Library, Program defined exceptions, Events; Introduction to Class Wizard, Application Wizard and MFC. **12 Hrs**

OOAD:
Use of OOAD and OOP concepts in different areas: - Object-oriented Software Engineering, Object-oriented OS. **12 Hrs**

BOOKS:

1. B. Stroustrup, The C++ Programming Language, Addison-Wesley.
2. E. Balagurusamy, Object oriented Programming with C++, 2/ed, TMH.
3. G. Booch, Object Oriented Analysis and Design, Addison-Wesley.
4. Rumbagh et. Al., Object Oriented Modeling, PHI.
5. R. S. Pressman, Software Engineering – A Practitioner's Approach, McGraw Hill.

TITLE: Design Methods and Analysis of Algorithm Lab
CODE: MCS1P1
Hrs / Week : 6 Hrs
CREDITS: 3

1. A list of programs should be prepared by the lab in-charge and displayed at the beginning of the semester with the approval of the HOD.

2. The list should include at least 20 programs (more can be considered) covering all units equally.
3. The students should write the algorithm and the flow charts for the problems solved in the labs itself, this should be evaluated by the lab in-charge.
4. The questions can be designed with real time application in mind, the programs should not be conventional type.
5. All the students should execute the same set of problems.

TITLE: Object Oriented Programming Lab
CODE: MCS1P2
Hrs / Week : 6 Hrs
CREDITS: 3

1. A list of programs should be prepared by the lab in-charge and displayed at the beginning of the semester with the approval of the HOD.
2. The list should include at least 20 programs (more can be considered) covering all units equally.
3. The students should write the algorithm and the flow charts for the problems solved in the labs itself, this should be evaluated by the lab in-charge.
4. The questions can be designed with real time application in mind, the programs should not be conventional type.
5. All the students should execute the same set of problems.

SECOND SEMESTER

TITLE: Artificial Intelligence
CODE: CS8112
Hrs / Week : 4 Hrs
CREDITS: 4

Introduction:
Definitions and approaches, Foundations of A.I., History of AI, Areas and state of the art in A.I., A.I. Programming languages, Concept of Intelligent Agents. **15 Hrs**

Problem Solving:
Problem solving as state space search, production system, control strategies and problem characteristics; Search techniques: Breadth First and Depth-first, Hill-climbing, Heuristics, Best-First Search, A* algorithm, Problem reduction and AO* algorithm, Constraints satisfaction, Means Ends Analysis, Game Playing. **15 Hrs**

Knowledge Representation and Reasoning:
Syntactic and Semantic representations, Predicate and prepositional logic, Resolution, Unification, Deduction and theorem proving, Question answering, Overview of PROLOG; Forward versus backward reasoning, Matching, Indexing;
Ontological Engineering, Formal Theory of Beliefs, Semantic Net, Frames, Conceptual Dependencies and Scripts, Truth Maintenance Systems. **15 Hrs**

Selected Topics and Applications:
Philosophical issues, Introduction to Natural Language Processing, Expert Systems and Multi-agent Systems. **15 Hrs**

BOOKS:

1. S. Russel, P. Norvig, Artificial Intelligence: A Modern Approach, Pearson Education.
2. E. Rich and K. Knight, Artificial Intelligence, Tata McGraw Hill.
3. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann.
4. Manual of Turbo PROLOG.

TITLE: Computer Graphics And Multimedia
CODE: CS8212
Hrs / Week : 4 Hrs
CREDITS: 4

Introduction:
Introduction to Computer Graphics, Display Technologies, Random and Raster Scan, frame buffer, bit plane, Input Devices, Graphics Standards, Graphics Hardware. **10 Hrs**

Line and Circle drawing:
Line and Circle Drawing Algorithms, Scan Conversion, filling algorithms, clipping, Two and Three Dimensional transformations, Homogeneous Coordinates, Rigid Body and Affine transformations, Parallel and perspective projections, vanishing points, viewing transformation, Hidden line removal method, Curve and Surface: Cubic Spline, Bezier curve, B-Spline Curves, Parametric Surface, Surface of revolution, Sweep surface, Fractal Curves and surfaces. **30 Hrs**

Introduction to Multi-media technology:
Introduction to Multi-media Technology, Audio System, Image Compression, Data Compression, Digital Motion Video, Authoring tools, Multimedia Applications, Multimedia DBMS. **20 Hrs**

BOOKS:

1. R. Steinmetz and K. Nahrstedt, Multimedia: Computing, Communications and Applications, Prentice Hall P T R, 1995.
2. Computer Graphics (Principles and Practice) by Foley, van Dam, Feiner and Hughes, Addisen Wesley (Indian Edition)
3. Computer Graphics by D Hearn and P M Baker, Printice Hall of India (Indian Edition).
4. Mathematical Elements for Computer Graphics by D F Rogers

TITLE: Advanced Course in DBMS
CODE: CS8312
Hrs / Week : 4 Hrs
CREDITS: 4

Functional Dependencies:
Basic definitions, Trivial and non trivial dependencies, closure of a set of dependencies, closure of a set of attributes, irreducible set of dependencies.
Normalization techniques : Normal forms, First normal form, second normal form, third normal form, BCNF, fourth normal form, Fifth normal form. **12 Hrs**

Query Optimization:
Introduction, General Optimization Strategies, Algebraic Manipulation, Optimization of Selections in System R optimizer. **12 Hrs**

Database Protection and recovery:
Integrity, Constraints in Query-by-Example, Security, Security in query-by-Example, Security in Statistical Databases, Transactions, properties of transactions, recovery(System recovery, Media recovery). **12 Hrs**

Concurrent Operations on the Database:
Basic Concepts, A simple Transaction Model, Model with Read- and Write-Locks, Read-only, Write-only Model, Protection against Crashes, Optimistic Concurrency Control. **12 Hrs**

Principles of Distributed Data Bases:
Framework for distribution. Query optimization and management of distributed transaction. Concurrency control and reliability in distributed databases. Administration of Distributed Data Bases. **12 Hrs**

BOOKS:

1. J.D.Ullman, Principles of Database Systems, Galgotia, New Delhi.
2. Database Systems , C .J Date
3. Fundamentals of Database Management Systems, Alexis Leon and Mathews Leon
4. S.Ceri and G. Relagatti, Distributed Databases, McGraw-Hill.
5. C.Papadimitriou , The Theory of Database concurrency Control, Computer Science Press.
6. T. Ozsu and P. Valduriez, Principles of Distributed Database Systems, Prentice-Hall.

TITLE: Software Project Management
CODE: CS8412
Hrs / Week : 4 Hrs
CREDITS: 4

Introduction to Software Project Management:
Introduction, Software project versus other types of projects, contract management and technical project management, activities covered by Software Project Management, plans methods and Methodologies, Categorizing Software Projects, setting objectives stakeholders, business case, requirement specification, Management control. **6 Hrs**

Project planning:
Introduction and various steps in project planning. **6 Hrs**

Project evaluation:
Strategic assessment, technical assessment, cost-benefit analysis, cash flow forecasting, cost-benefit evaluation techniques, risk evaluation. **6 Hrs**

Selection of appropriate Project approach:
Choosing technologies, technical plan contents list, choice of process models, (structure versus speed of delivery), waterfall model, V-process model, spiral model, software prototyping, other ways of categorizing prototypes, controlling changes during prototyping, incremental delivery,(dynamic systems development method, extreme programming, Managing iterative processes), selecting more appropriate process model. **6 Hrs**

Software Effort Estimation:
Estimation Techniques – COCOMO Model. **4 Hrs**

Activity planning:
Objectives, When to plan, project schedules, projects and activities, sequencing and scheduling the activities, network planning models, formulating a network model, adding time dimension, forward pass, backward pass, identifying critical path, activity float, shortening project duration, identifying critical activities, activity-on-arrow networks.

Risk Management:
Nature of risk, types of risk, managing risk, hazard identification, hazard analysis, risk planning and control, evaluating risks to the schedule. **8 Hrs**

Resource allocation:
Nature of resources, identifying resource requirements, scheduling resources, creating critical paths, counting the cost, publishing resource schedule. **6 Hrs**

Monitoring and control:
Creating framework, collecting data, visualizing progress, cost monitoring, earned value, prioritizing monitoring, getting the project back to target, change control. **6 Hrs**

Managing people and organizing teams:
Understanding behavior, organizational behavior: a background, selecting the right person for the job, instruction in the best methods, motivation, working in groups, becoming a team, decision making, leadership, organizational structures, stress, health and safety. **6 Hrs**

Software quality:
Place of software quality in project planning, importance of project quality, defining software quality, ISO 9126, practical software quality measures, product versus process quality management, external standards, techniques to help enhance software quality, quality plans. **6 Hrs**

BOOKS:

1. Hughes, Bob and Cotterell, Mike, *Software project Management*, 3rd OR 4th Edition, TMH, 2005
2. Kathy Schwalbe, *Information Technology Project Management,* Vikas Publishing House, 2004
3. Kieron Conway, *Software Project Management – From Concept to Deployment,* Dreamtech Press, 1st Reprint Edition, 2002
4. Kelkar S. A,*Information Technology Project Management, A concise study*, PHI, 2005
5. Royce, Walker, *Software project Management A unified Framework*, Pearson

TITLE: Artificial Intelligence Lab
CODE: MCS2P1
Hrs / Week : 6 Hrs
CREDITS: 3

1. A list of programs should be prepared by the lab in-charge and displayed at the beginning of the semester with the approval of the HOD.
2. The list should include at least 20 programs (more can be considered) covering all units equally.
3. The students should write the algorithm and the flow charts for the problems solved in the labs itself, this should be evaluated by the lab in-charge.

4. The questions can be designed with real time application in mind, the programs should not be conventional type.
5. All the students should execute the same set of problems.

TITLE: Computer Graphics Lab
CODE: MCS2P2
Hrs / Week: 6 Hrs
CREDITS: 3

1. A list of programs should be prepared by the lab in-charge and displayed at the beginning of the semester with the approval of the HOD.
2. The list should include at least 20 programs (more can be considered) covering all units equally.
3. The students should write the algorithm and the flow charts for the problems solved in the labs itself, this should be evaluated by the lab in-charge.
4. The questions can be designed with real time application in mind, the programs should not be conventional type.
5. All the students should execute the same set of problems.

THIRD SEMESTER

TITLE: Data mining and knowledge discovery
CODE: CS9112
Hrs / Week : 4 Hrs
CREDITS: 4

Introduction:
Motivations, Data Mining Databases-Relational Data Bases, Data warehouse, Transactional Databases, Advanced Database systems and advanced Database applications. Data Mining Functionalities- Concept/Class Discrimination; characterizations and Discrimination, Association Analysis, Classification and Prediction, Cluster Analysis, Outlier Analysis and Evolution Analysis. Classifications of Data Mining Systems, Major issues in Data Mining.

Data Pre-processing:
Introduction, Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation Discretization. **15 Hrs**

Data Warehouse and OLAP Technology:
An Overview, Introduction to Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data Mining.

Data Cube Computation and Data Generalization:
Data Cube Computation and Data Generalization: Efficient Method for Data Cube Computations. **15 Hrs**

Mining Frequent Patterns, Associations, and Correlations:
Basic Concepts and a Road Map, Efficient and Scalable Frequent Itemset Mining Methods, Mining Various Kinds of Association Rules.

Classification and Prediction:
Introduction, Issues regarding classification and prediction, classification by decision tree Induction, Bayesian classification, Rule based Classification, Classification by back propagation and advanced classification methods, prediction, classification accuracy.
15 Hrs

Cluster Analysis:
Introduction, Types of data in cluster analysis, A categorization of major cluster Methods, Partitioning methods, Hierarchical methods, Density-Base Methods, Grid-based methods, Model based Methods, Clustering High Dimensional Data, Outlier analysis. Introduction to Advanced Data Mining and their applications. **15 Hrs**

BOOKS:

1. Jaiawei Han and Micheline Kamber, Data Mining Concepts and Techniques, Morgan Kaufmann/Elsevier Science publisher, 2nd Edition. Reprint published by Harcourt (INDIA) Private Limited.
2. Ian H. Writte, Eibe Frank and Mark A. Hall, Data Mining Practical Machine Learning Tools and Techniques, Elsewher Pubication, Third Edition.
3. Arun K Pujari, Data Mining Techniques, University Press (INDIA) Pvt., 2003.
4. Krzysztof J Cios; Witold Pedrycz and Roman Swiniarski, Data Mining Methods For Knowledge Discovery, Publisher: Boston : Kluwer Academic, 1998.

TITLE: Data storage technologies
CODE: CS9212
Hrs / Week : 4 Hrs
CREDITS: 4

Introduction to Storage Technology:
Data proliferation and the varying value of data with time & usage, sources of data and states of data creation, Data center requirements and evolution to accommodate storage needs, Overview of basic storage management skills and activities, The five pillars of technology, Overview of storage infrastructure components, Evolution of storage, Information Lifecycle Management concept, Data categorization within an enterprise, Storage and Regulations. **12 Hrs**

Storage Systems Architecture:
Intelligent disk subsystems overview, Contrast of integrated vs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, Logical partitioning of disks, RAID & parity algorithms, hot sparing, Physical vs. logical disk organization, protection, and back end management, Array caching properties and algorithms, Front end connectivity and queuing properties, Front end to host storage provisioning, mapping, and operation, Interaction of file systems with storage, Storage system connectivity protocols. **12 Hrs**

Introduction to Networked Storage:
JBOD, DAS, SAN, NAS, & CAS evolution, Direct Attached Storage (DAS) environments: elements, connectivity, & management, Storage Area Networks (SAN): elements & connectivity, Fiber Channel principles, standards, & network management principles, SAN management principles, Network Attached Storage (NAS): elements, connectivity options, connectivity protocols (NFS, CIFS, ftp), & management principles, IP SAN elements, standards (iSCSI, FCIP, iFCP), connectivity principles, security, and management principles, Content Addressable Storage (CAS): elements, connectivity options, standards, and

management principles, Hybrid Storage solutions overview including technologies like virtualization & appliances. **12 Hrs**

Introductions to Information Availability:
Business Continuity and Disaster Recovery Basics, Local business continuity techniques, Remote business continuity techniques, Disaster Recovery principles & techniques Managing & Monitoring Management philosophies (holistic vs. system & component), Industry management standards (SNMP, SMI-S, CIM), Standard framework applications, Key management metrics (thresholds, availability, capacity, security, performance), Metric analysis methodologies & trend analysis, Reactive and proactive management best practices, Provisioning & configuration change planning, Problem reporting, prioritization, and handling techniques. **12 Hrs**

Securing Storage and Storage Virtualization:
Define storage security. , List the critical security attributes for information systems, describe the elements of a shared storage model and security extensions, Define storage security domains, List and analyze the common threats in each domain, Identify different virtualization technologies, describe block-level and file level virtualization technologies and processes. **12 Hrs**

BOOKS:

1. Marc Farley Osborne, "Building Storage Networks", Tata Mcgraw Hill,2006
2. Robert Spalding, "Storage Networks: The Complete Reference", Tata Mcgraw Hill,2002
3. Meeta Gupta, Storage Area Network Fundamentals, Pearson Education Limited,2006
4. Gerald J Kowalski / Mark T Maybury ,Information Storage & Retrieval Systems Theory & Implementation, , BS Publications,2006
5. Thejendra BS ,Disaster Recovery & Business Continuity -, Shroff Publishers & Distributors,2008
6. Barb Goldworm / Anne Skamarock, Blade Servers & Virtualization, Wiley India

TITLE: Network Security
CODE: CS9312
Hrs / Week : 4 Hrs
CREDITS: 4

Introduction:
Introduction to the concepts of security, the need for security, security approaches, principles of security, types of attacks.

Convention Encryption:
Conventional Encryption Model, Steganography, Classical Encryption Techniques, 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, Conventional Encryption algorithms. **12 Hrs**

Public Key Encryption And Hash Functions:
Public Key Cryptography, Principles of Public Key Cryptosystems, The RSA Algorithm, Key Management, Diffie Hellman Key Exchange, Elliptic Curve Cryptography Message Authentication and Hash Functions Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security of Hash Functions. **12 Hrs**

Hash and Mac Algorithms:

Introduction, Nifty things to do with a Hash, MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA-I), RIPEMD, HMAC, CMAC, Digital Signatures, Authentication Protocols - Digital Signature Standard. **12 Hrs**

Network Security Applications:
Authentication Applications, Kerberos, X.509 authentication service, public key Infrastructure (PKI), Electronic Mail Security, Pretty Good Privacy, S/MIME, IP Security, IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating payload, combining security association, Key Management, Web Security, Web Security Considerations, Secure Socket Layer & Transport Layer Security, Secure Electronic Transaction, Introduction to Wireless security. **12 Hrs**

Intruders, Viruses and Worms:
Intruders, Intrusion detection, password management, Viruses and Related Threats, Distributed Denial of service attacks, Firewall Design Principles, Trusted Systems, virtual private network(VPN). **12 Hrs**

BOOKS:

1. William Stallings, "Cryptography and Network Security", Fourth edition, Prentice Hall, 2007.
2. Atul Kahate, "Cryptography and Network Security," Tata McGraw-Hills, 2006.
3. Neal Krawetz, "Introduction to Network Security", Thomson Business Press, 2007.
4. Eric Maiwald, "Information Security Series", "Fundamental of Network security", Dreamtech press, 2004.
5. Charlie Kaufman, Radia Perlman, Mike Speciner, "Network Security: Private Communication in public world", Prentice Hall, India, 2002.

TITLE: Advanced Computer Architecture
CODE: CS9412
Hrs / Week : 4 Hrs
CREDITS: 4

Introduction::
Architectural Abstraction, Classification schemes, Parallelism: Pipelining, Multiprocessing. Issues in Branch performance, Synchronization in Multiprocessing, High Performance Processor Design Issues: Pipeline design, Memory system design, I/O design. **12 Hrs**

Parallelism:
Instruction level parallelism, Thread and process level parallelism, Data parallelism. **10 Hrs**

Vector Machines:
Vector machines, Dependency Analysis, Vectorization, Optimization in Vector Processing, Vector Chaining , Example systems. Associative Processors and Algorithms. **10 Hrs**

Processors:
Super-scalar and VLIW processors, Example systems and main issues in design. **10 Hrs**

Multiprocessors:
Multiprocessors: Shared Memory, Distributed Memory Architectures; Multiprocessor Interconnections. **10 Hrs**

Memories:

Memory systems for Multiprocessors, Example systems; cache memory, coherence issues, protocols.

Multiprocessor Simulation and Measurement. **8 Hrs**

BOOKS:

1. D. Sima, T. Fountain, P. Kacsuk, "Advanced Computer Architectures: A Design Space Approach", Addison Wesley, 1997.
2. .J. Flynn, "Computer Architecture: Pipelined and Parallel Processor Design", Narosa Publishing House/ Jones
3. K. Hwang, "Advanced Computer Architecture: Parallelism, Scalability, Programmability", McGraw-Hill, Inc
4. Hwang and Briggs, "Computer Architecture and Parallel Processing, McGraw Hill.
5. B. Barnes, Modeling and Performance Measurement of Computer Systems, MIT Press.

TITLE: Mini Project Lab
CODE: MCS3P1
Hrs / Week : 6 Hrs
CREDITS: 3

Students will be required to pursue a project work allotted to them. This work generally involves solving some practical problem, developing computer programs using the knowledge acquired in the theory and laboratory courses. They will have to submit a report of the work done by them.

TITLE: Web Designing Lab
CODE: MCS3P2
Hrs / Week : 6 Hrs
CREDITS: 3

Students will be required to pursue a project work allotted to them. This work generally involves solving some practical problem, developing computer programs using the knowledge acquired in the theory and laboratory courses. They will have to submit a report of the work done by them.

FOURTH SEMESTER

TITLE: Distributed Computing Systems
CODE: CS0112
Hrs / Week : 4 Hrs
CREDITS: 4

Introduction to Distributed Systems:
Introduction -- What is a Distributed System? – Goals – (Advantages of Distributed Systems over Centralized Systems, Advantages of Distributed System over Independent PCs, Disadvantages of Distributed Systems) – Hardware Concepts – (Bus-Based Multiprocessors, Switched Multiprocessors, Bus-Based Multicomputers, Switched Multicomputers) – Software

Concepts – (Network Operating Systems, True Distributed Systems, Multiprocessor Timesharing Systems) – Design Issues – (Transparency, Flexibility, Reliability, Performance, Scalability) **12 Hrs**

Communication in Distributed Systems:
Introduction Asynchronous Transfer Mode Network – (What is Asynchronous Transfer Mode? ATM Physical Layer, ATM Layer, ATN Adaptation Layer, ATM Switching) – The Client-Server Model – (Client and Servers, Addressing, Block versus Nonblocking Primitives, Buffered versus Unreliable Primitives) – Remote Procedure Call – (Basic RPC Operation, Parameter Passing, Dynamic Binding, RPC Semantics in the Presence of Failures) Distributed objects and remote invocation : Introduction, Communication between distributed objects, Java RMI case study **12 Hrs**

Synchronization in Distributed Systems:
Introduction -- Clock Synchronization – (Logical Clocks, Physical Clocks, Clock Synchronization Algorithms) – Mutual Exclusion – (A Centralized Algorithm, A Distributed Algorithm, A Token Ring Algorithm) – Election Algorithms – (The Bully Algorithm, A Ring Algorithm) – Atomic Transactions – (Introduction to Atomic Transactions, The Transaction Model. Implementation, Concurrency Control) – Deadlocks in Distributed Systems – (Distributed Deadlock Detection & Prevention) **12 Hrs**

Processes and Processors in Distributed Systems:
Introduction – Threads – (Introduction to Threads, Threads Usage, Design Issues for Threads Packages,) – System Models – (The Workstation Model, Using Idle Workstations, The Processor Pool Model, A hybrid Model) – Processor Allocation –
(Allocation Models, Design Issues for Processor Allocation Algorithms, Implementation Issues for Processor Allocation Algorithms, Example Processor Allocation Algorithms) – Scheduling in Distributed Systems – Fault Tolerance – (Component Fault, System Failures, Synchronous versus Asynchronous Systems, Use of Redundancy, Fault Tolerance Using Active Replication, Agreement in Fault Systems) **12 Hrs**

Distributed File Systems:
Introduction – Distributed File System Design – (The File Service Interface, The Directory Server Interface, Semantics of File Sharing) -- Distributed File System Implementation – (File Usage, System Structure, Caching, Replication, An Example:
Sun's Network File System).

Distributed Shared Memory:
Introduction, What is Shared Memory? , Consistency Models, Page-Based Distributed Shared Memory. **12 Hrs**

BOOKS:

1. Tanenbaum S Andrew, Distributed Operating Systems, Pearson Eduction Asia, 2001
2. Singhal Mukesh, Shivaratri G Niranjan, Advanced Concepts In Operating Systems Distributed Data Base, And Multiprocessor Operating Systems, McGraw-Hill, Inc., 2002
3. George Colulouris , Jean Dollimore, Tim Kindberg, Distributed systems-Concepts and Design, Second edition, Addison_Wesely
2. Sinha K Pradeep, Distributed Operating Systems Concepts and Design, Eastern

TITLE: Advanced operating system
CODE: CS0212
Hrs / Week : 4 Hrs
CREDITS: 4

Distributed Operating System:
Architecture of Distributed System:
Introduction, System Architecture Types, Distributed Operating System, Issues in DOS, Communication Network and Primitives. **Theoretical Foundations-** Introduction, Inherent Limitations of DS, Lamport's Logical Clocks, Vector Clocks, Termination Detection.

Distributed Mutual Exclusion:
Classification of Mutual Exclusion Algorithm, Preliminaries, Non-Token Based Algorithm, Lamport's Clock, Token based algorithm, Performance Analysis.

Distributed Deadlock Detection:
Deadlock Handling, Issues in Deadlocks, Control organizations for Distributed Deadlock Detection, Centralized Deadlock Detection Algorithms.

Agreement Protocols:
System model, Classification of Agreement Protocols. **12 Hrs**

Distributed Resource Management:
Distributed File System:
Introduction, Architecture, Mechanism for building Distributed file system, Design Issues. **Distributed Shared Memory-**Introduction, Architecture and Motivation, Algorithm for Implementing DSM, Memory Coherence.

Distributed Scheduling:
Introduction and Motivation, Issues in Load Distribution, Components of Load Distribution Algorithm, Stability, Load Distribution Algorithm. **12 Hrs**

Failure Recovery and Fault Tolerance:
Recovery:
Introduction, Classifications of Failure, Backward and Forward Error Recovery, Recovery in concurrent systems, Synchronous checkpoint and recovery, Asynchronous checkpoint and recovery.

Fault Tolerance:
Introductions, Issues, Atomic actions and Commiting, Commit protocol, Voting protocols, Dynamic Voting protocol, Dynamic Vote Reassignment protocol. **12 Hrs**

Protection and Security:
Resource Security and Protection:
Access and Flow Control, Preliminaries, The Access Matrix Model, Implementation of Access Matrix. **12 Hrs**

Multiproccessor Operating System and Database Operating System
Multiprocessor System Architecture:
Introduction, Motivation, Basic Multiprocessor System Architecture, Interconnection Network for Multiprocessor Systems.

Multiprocessor Operating Systems:
Introduction, Structure, Operating System Design Issues, Threads.
Database Operating System
Introduction.
Concurrency Control Algorithm
Introduction, Basic Synchronization primitives. **12 Hrs**

BOOKS

1. A.S. Tanenbaum, Distributed Operating System, Prentice-Hall, 1995.
2. A.S. Tanenbaum, Modern Operating Systems, Pearson Education Asia, 2001.
3. M. Singhal and N. G. Shivaratri, , Advance Concepts in Operating Systems, McGraw-Hill, 1994.
4. J. W. S. Liu, Real-Time Systems, Pearson Education, 2000.

TITLE: Wireless communication
CODE: CS0312
Hrs / Week : 4 Hrs
CREDITS: 4

Services and technical:
Types of Services, Requirements for the services, Multipath propagation, Spectrum Limitations, Noise and Interference limited systems, Principles of Cellular networks, Multiple Access Schemes. **12 Hrs**

Wireless propagation:
Propagation Mechanisms (Qualitative treatment), Propagation effects with mobile radio, Channel Classification, Link calculations, Narrowband and Wideband models. **12 Hrs**
Wireless transceivers:
Structure of a wireless communication link, Modulation and demodulation – Quadrature /4-Differential Quadrature Phase Shift Keying, Offset-QuadratureπPhase Shift Keying, Phase Shift Keying, Binary Frequency Shift Keying, Minimum Shift Keying, Gaussian Minimum Shift Keying, Power spectrum and Error performance in fading channels. **12 Hrs**

Signal processing in wireless systems:
Principle of Diversity, Macrodiversity, Microdiversity, Signal Combining Techniques, Transmit diversity, Equalisers- Linear and Decision Feedback equalisers, Review of Channel coding and Speech coding techniques. **12 Hrs**

Advanced transceiver schemes:
Spread Spectrum Systems- Cellular Code Division Multiple Access Systems- Principle, Power control, Effects of multipath propagation on Code Division Multiple Access, Orthogonal Frequency Division Multiplexing – Principle, Cyclic Prefix, Transceiver implementation, Second Generation(GSM, IS–95) and Third Generation Wireless Networks and Standards

BOOKS:

1. Andreas.F. Molisch, "Wireless Communications", John Wiley – India, 2006.
2. Simon Haykin & Michael Moher, "Modern Wireless Communications", Pearson Education, 2007.
3. Rappaport. T.S., "Wireless communications", Pearson Education, 2003.
4. Gordon L. Stuber, "Principles of Mobile Communication", Springer International Ltd.,

TITLE: Major Project Lab
CODE: MCS4P1
Hrs / Week : 6 Hrs
CREDITS: 2

Students will be required to pursue a project work in an organization of their choice with the permission of the HOD. This work generally involves solving and implementing some problem of the organization, developing computer programs using the knowledge acquired in the theory and laboratory courses. They will have to submit a report of the work done by them. Finally a demonstration of the work with the help of a presentation has to be done.