MASTER OF PHILOSOPHY IN COMPUTER SCIENCE

SYLLABUS - 2007-09

ST. JOSEPH'S COLLEGE (AUTONOMOUS)

(Nationally Reaccredited with A+ Grade / College with Potential for Excellence)

TIRUCHIRAPPALLI - 620 002

TAMIL NADU, INDIA

ST. JOSEPH'S COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI - 620 002
DEGREE OF MASTER OF PHILOSOPHY (M. PHIL.)
FULL TIME - AUTONOMOUS REGULATIONS

GUIDELINES

1. ELIGIBILITY

- ✧ A Candidate who has qualified for the Master's Degree in any Faculty of this University or of any other University recognized by the University as equivalent there to (including old Regulations of any University) subject to such conditions as may be prescribed therefore shall be eligible to register for the Degree of Master of Philosophy (M.Phil.) and undergo the prescribed course of study in a Department concerned.
- ✧ A candidate who has qualified for Master's degree (through regular study / Distance Education mode / Open University System) with not less than 55% of marks in the concerned subject in any faculty of this university or any other university recognized by Bharathidasan University, shall be eligible to register for M.Phil. SC / ST candidates are exempted by 5% from the prescribed minimum marks.

2. DURATION

The duration of the M.Phil. course shall be of one year consisting of two semesters for the full-time programme.

3. COURSE OF STUDY

The course of study shall consist of

Part - I : 3 Written Papers
Part - II : 1 Written Paper and Dissertation.

The three papers under Part I shall be :

Paper I : Research Methodology
Paper II : Advanced / General Paper in the Subject
Paper III : Advanced Paper in the subject

Paper I to III shall be common to all candidates in a course. Paper I, II, III & IV shall consist of 5 units each covering the subject requirements of the course offered. The Board of Studies shall approve the Syllabi for Papers. The syllabus for paper IV shall be prescribed by each Research Advisor, which is also to be approved by the Board of Studies. The number of specialized papers by the research advisor can be more than one.

Question papers for Papers I to III shall be set externally and valued by two examiners, one internal and one external. The concerned HOD will be in the Board of Examiners to pass the results. Paper IV shall be set and valued by the Research Adviser. The Controller of Examinations shall conduct the examinations for all papers and dissertation.

4. SCHEME OF EXAMINATION

4.1 Part-I (First Semester)

Paper I : Research Methodology
Paper II : Advanced / General paper in the subject
Paper III : Advanced paper in the subject

Part-II (Second Semester)

Paper IV : Field of specialization
Paper V : Dissertation

4.2 Written Examination

The examinations for Papers-I, II and III shall be taken at the end of the first semester and Paper-IV at the end of the second semester. Each paper shall have 100 marks for the semester examination (written) and 100 marks for Continuous Internal Assessment.

The CIA components are:

Seminar-I	:	15 marks
Mid semester	:	35 marks
Seminar-II	:	15 marks
End semester	:	35 marks
Total	:	100 marks

Both the CIA marks and the external marks should be mentioned separately in the mark sheets. The duration for each semester examination shall be 3 hours. A candidate shall be declared to have passed Part-I & II examinations if he/she secures not less than 50 of the marks each in the CIA and the semester examination respectively. The aggregate of the marks secured in the semester examinations and CIA marks taken together must be 50% in each of the Papers I to IV and Dissertation.

4.3 Credits for Papers I to IV

Paper	Name	Contact Hours	Library Hours	Total Hours	Credits	CIA Marks
I	Research Methodology	6	6	12	10	100
II	Core Subject	6	6	12	10	100
III	Core Subject	6	6	12	10	100
IV	Optional Subject	2	4	6	5	100
	Total			42	35	400

Credits for Dissertation

Internal Examination (the split up for CIA)

Project	Credits	Marks	Total Marks
Seminar on review of related literature	3	30	200
Seminar on Data Analysis / Results	2	20	
Dissertation Evaluation	15	150	
Viva - voce	5	100	100
Total	**25**	**300**	**300**

External Examination

	Credits	Marks
Dissertation Evaluation	20	200
Viva-voce	5	100
Total	**25**	**300**

4.4 Dissertation

For carrying out the dissertation the mandatory requirement is strictly adhering to the rules of the college as given below:

4.4.1a Requirement

Every student is expected to give two seminars one concerning Review of Related Literature within the four weeks from the beginning of the second semester and the other on Data Analysis / Result just before the submission of the final draft of the dissertation

4.4.1b Submission

Candidates shall submit the Dissertations to the Controller of Examination not earlier than five months but within six months in the full time programme. The above said time limit shall start from 1st of the month which follows after the month in which Part-I examinations are conducted. If a candidate is not able to submit his/her Dissertation within the period stated above, he/she shall be given an extension time of three months in the first instance and another three months in the second instance with penalty fees. If a candidate does not submit his Dissertation even after the two extensions, his registration shall be treated as cancelled and he has to re-register for the course subject to the discretion of the Principal. However the candidate need not write once again the theory papers if he / she has already passed these papers.

4.4.1c Requirement

For the valuation of dissertation the mandatory requirement is a pass in papers I to IV. One external examiner and the Research Adviser shall value the Dissertation. The external examiner should be selected only from outside the college and shall be within the colleges affiliated to Bharathidasan University. In case of non-availability, the panel can include examiners from the other university / colleges in Tamil Nadu. The external examiner shall be selected from a panel of 3 experts suggested by the Research Adviser. However, the Controller of Examination may ask for another panel if he deems it necessary. Both the internal and external examiner will evaluate the Dissertation and allot the marks separately. However the viva-voce will be done by both of them. The average marks will be considered.

4.4.2 Viva-voce

The external examiner who valued the Dissertation and the Research Adviser shall conduct the Viva-Voce for the candidate for a maximum of 100 marks. A Candidate shall be declared to have passed in viva-voce if he secures not less than 50% of the marks prescribed for Dissertation and 50% of the marks in the aggregate of the marks secured in viva-voce test and Dissertation valuation. A student can undertake project in the second semester whether or not he /she has passed the first semester.

5. QUESTION PAPER PATTERN

5.1 Internal (Mid & End)

5.1a For Science

There are two sections A and B:

Section A contains 8 short answer Questions	8 × 4	= 32
Section B contains 4 Essay Question	4 × 17	= 68
		100

5.1b For Arts

Only one section of Essay type questions 5 × 20 = 100

5.2 External Exam (Semester)

5.2a For Science

Section A - 10 short answer Questions	10 × 3	= 30
Section B - 5 Essay type Questions either or	5 ×14	= 70
		100

5.2b For Arts

Only one section of Essay type questions 5 out of 8 (5 × 20 = 100)

5.2c For the Paper-IV (Optional/Research Adviser's paper)

The Question paper pattern for Paper IV is common for both Science and Arts. The pattern is only one section with Essay type Questions 5 out of 8 (5 × 20 = 100)

There may be two separate mark sheets for the first and second semester respectively. The marks allotted by the guide and that by the External Examiner must be shown in separate columns of the 2nd Semester mark sheet.

6. CLASSIFICATION OF SUCCESSFUL CANDIDATES

6.1 The candidates who pass the Part - I and Part - II examinations in their first attempt shall be classified as follows:

No.	Total Marks secured in Part - I and Part - II Examinations	Classification
1.	80% and above in the case of Science Subjects & 75% and above in the case of Arts and Social Science Subjects	I Class with Distinction
2.	60% to 79% in the case of Science Subjects & 60% to 74% in the case of Arts and Social Science Subjects	I Class
3.	50% to 59% in all the subjects (Mathematics, Statistics and Computer Science / Applications shall be treated as Science Subjects)	II Class

6.2 Candidates who pass the course in more than one attempt shall be declared to have completed the programme under II Class.

7. QUALIFICATIONS OF RESEARCH ADVISER FOR THE M.Phil. COURSE

7.1 A person eligible to be a Research Adviser shall be required to possess a Ph.D. Degree or two years of Post-Graduate teaching experience after qualifying for M.Phil. / M.Litt. degree. He / She should have obtained recognition from the University.

7.2 In view of the paucity of guides in the newly emerging subjects like Biotechnology, Microbiology, Remote Sensing the research guides in the related areas may be permitted to guide students provided these guides satisfy the qualification requirements.

7.3 Normally a person shall be allowed to guide not more than three candidates.

7.4 Change of guide may be permitted by the Principal based on the merit of the individual cases.

8. ATTENDANCE

- ✧ Daily attendance for 90 working days should be enforced for the students.
- ✧ Periodical report of a student to the guide concerned should be recorded in the register kept by the guide.

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M.PHIL. COMPUTER SCIENCE - COURSE PATTERN - 2007

Sem	*Code*	Course	Title of the paper
I	07 MCS 101	I	Research Methodology
	07 MCS 102	II	Concepts in Computer Science
	07 MCS 103	III	Computer Architecture and Security
II	07 MCS 204	IV	Artificial Intelligence & Expert Systems
	07 MCS 205	IV	Simulation and Modeling
	07 MCS 206	IV	Grid Computing
	07 MCS 207	IV	Data Mining
	07 MCS 208	IV	Network Security
	07 MCS 209	IV	Artificial Neural Networks
	07 MCS 210	IV	Software Metrics
	07 MCS 211	IV	Parallel Processing
	07 MCS 212	IV	Security in Computing
	07 MCS 213	IV	Artificial Neural Networks
	07 MCS 214	IV	Data Structures and Algorithms
	07 MCS 215	IV	Soft Computing
	07 MCS 216	IV	Object Oriented Technology
	07 MCS 217	IV	Psychology of Computer Programming
	07 MCS 218	IV	Data Representation and Processing With XML
	07 MCS 219	IV	3-D Modeling and Virtual Reality
	07 MCS 220	IV	Distributed Database Systems
	07 MCS 221	IV	Dissertation

Sem I | Hours/ Week: 12
07MCS101 | Credit: 10

Paper - I: RESEARCH METHODOLOGY

Objectives

✧ To impart the basic concepts on formal languages and Automata, which are required for research and to give knowledge on research types and thesis writing.

Units

1. **Thesis Writing**: Research types - objectives and approaches - Literature Collection: Web browsing - Software tools - Writing review and journal articles - manuscript publication..
2. **Thesis Writing**: Planning a thesis - general format - page and chapter format - footnotes -tables and figures - references and appendices .
3. **Analysis of algorithms**: The role of algorithm in computing - Insertion sort - Analyzing and designing algorithms - growth of functions - Introduction to NP -Completeness.
4. **Formal Languages:** Contextfree grammars - Derivation trees - Simplification of Context Free Grammars - Chomsky normal form - Greiback normal form - The pumping lemma for Context Free Languages.
5. **Finite Automata:** Finite state systems - Basic definitions - Non deterministic finite automata - Finite automata with epsilon moves - Regular expressions - Applications of finite Automata.

Books for study

1. Kothari, C. R., Research Methodology -methods and techniques, 2nd Edition,Wishwa Prakashjan, Newdelhi. 1999.
2. Berny, H. Durston, M. Poole, “Thesis and Assignment writing”, Wiley Eastern Ltd, ND, 1970.
3. Misra, R P, Research Methodology - A Hand Book , Concept publishing Company, New Delhi, 1988.
4. Ellis Horowitz and Sartaj Sahni , “Fundamentals of Computer algorithms “, Galgotia Publications , New Delhi, 2000
5. Thomas. H. Cormen, Charles. E. Leiserson, Ronald, L. Rivest “Introduction to Algorithms”, Prentice Hall of India, 1998.
6. John E. Hopcroft, Jeffery D. Ullman, “Introduction to Automata Theory Language and Computation”, Narosa Publishing House, 1979.

Sem I | Hours/ Week: 12
07MCS102 | Credit: 10

Paper-II: CONCEPTS IN COMPUTER SCIENCE

Objectives

- ✧ To impart the knowledge on some of the advance topics in Computer Science such as logics, relation and functions, distributed databases , web technology and Probability and Statistics for data analysis.

1. **Probability and Statistical Analysis** : Probability - Failtime data analysis - Hazard models - Conditional probability - Bayes rule - System reliability - Stochastic process.
2. **Logics**: Propositions - Precedence rules for operators - Laws of equivalence - Natural deduction system : - Developing natural deduction system proofs
3. **Relations and Functions**: Relation properties -Matrix and Graph - Graph Notations for relations - Partition and covering - Equivalence relation - Compatibility relations—Partial ordering - Functions - components - Composition of function - Inverse functions -Binary and n - ary operations.
4. **Distributed Databases**: Introduction - Distributed Database Architecture - Distributed Database Design - Distributed Transaction Management - Concurrency control - Distributed database management systems.
5. **Web Technology** - Introduction - Dynamic web pages - Active web pages - User sessions - On line security and payment processing mechanism - Middle ware and component based architectures - EDI - XML

Books for Study

1. L. S. Srinath, “Reliability engineering”, Third Edition, Affliated East. West Press Pvt Ltd, New Delhi, 2005.
2. E. BalaGurusamy , “Reliability Engineering”, Tata McGraw Hill Publishing Ltd, New Delhi, 2003
3. David Gries, “The Science of Programming”, Narosa Publishing House, 1981.
4. Leon S. Levy, “Discrete Structures of Computer Science”, Wiley Eastern Ltd.,1980.
5. M.Tamer OZ Su and Patrick Valduriez, “ Principles of Distributed Systems”, 2nd Edition,Prentice Hall International Inc. 1999.
6. Achyut S.Godbole, Atul Kahate, “Web Technologies” , Tata McGraw Hill publishing Company, New Delhi, 2003.

Sem I Hours/ Week: 12
07MCS103 Credit: 10

Paper-III: COMPUTER ARCHITECTURE AND SECURITY

Objectives

✧ To impart knowledge about Computer architecture, Open systems, Communication Protocol and Network security, which further can be used to develop the research skills among students.

Units

1. **Computer Architecture**: Fundamentals of Computer design - Instruction set principles and Examples - Pipelining - Vector processors.
2. **Open System**: Overview - Processes: The Principal Model of Execution - Memory Management. - Input/Output - File systems - Scheduling and Kernel Synchronization.
3. **Communication Protocols**: Overview - Protocols and architecture - Internet protocols - Inter-network operations - Transport protocols.
4. **Network Security**: Cryptography - Introduction -Submission Ciphers - Transposition Ciphers - One time pads - Cryptographic Principles - Symmetric Key Algorithms: DES - AES - Cipher Modes -Cryptanalysis -Public Key Algorithms

   Digital Signatures: Symmetric Key Signatures - Public Key Signatures - Message Digests - The Birth Day Attack - Management of public keys: Certificates - X 509 - Public Key Infrastructure.
5. **Communication Security**: IPSec - Firewalls - Virtual Private Networks - Wireless Security - Authentication protocols : Shared Sacred key - The Diffe- HellMan Algorithm - Key Distribution Centre - Kerbros - Public key cryptography - Mail Security : PGP -PEM - S/MIME - Web Security: Threats - Secure Naming - SSL - Mobile code security - privacy -Freedom of speech -copyright

Books for Study

1. John L. Hennessy and David A Patterson, “Computer Architecture - A Quantitative Approach”, Harcourt Asia and Morgan Kaufmann publishers, 2nd Edition, New Delhi, 1995.
2. Claudia Salzberg Rodriguez, Gordon Fischer, Steven Smolski, “The Linux Kernel Primer: A Top-Down Approach for x86 and PowerPC Architectures“, Pearson Education, 1st Edition, 2006.
3. William Stallings, “Cryptography and Network Security”, Pearson Education, New Delhi, 2006 .
4. Andrew S Tanenbaum “Computer Networks”, Pearson Education, 4th Edition, New Delhi, 2003 .
5. http://plg.uwaterloo.ca/~itbowman/CS746G/a1/ - Conceptual Architecture of the Linux Kernel.
6. http://se.uwaterloo.ca/~mctanuan/cs746g/LinuxCA.html -An Introduction to the Linux Operating System Architecture
7. http://www.oopweb.com/OS/Documents/tlk/VolumeFrames.html - The Linux Kernel

Sem II | Hours/ Week: 6
07MCS204 | Credit: 5

ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS

Prof. D S Ravi

1. Artificial Intelligence:

AI problem - AI technique - level of the model - defining the problem - production systems - production system characteristics - Heuristic search techniques.

2. Knowledge Representation:

Representations and Mappings - issues in knowledge representation - predicate logic - representing knowledge using rules - symbolic reasoning under uncertainity.

3. Natural language processing :

Syntactic processing - semantic analysis - parallel and distributed AI - learning - learning in problem solving - explanation - based learning - discovery - analogy - formal learning theory.

4. Expert Systems

Introduction - architecture of expert systems - knowledge representation - decomposition / Hierarchy of knowledge - augmented transition networks - semantic analysis of knowledge.

5. Knowledge Base and chaining functions:

Modeling of uncertain reasoning - coherence of knowledge base - reductions of sets of rules - syntactic semantic analysis discursive grammar - the semiotic square - analyse achantieue narrative grammar - applications of semiotic theory of artificial intelligence.

Books for study

1. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata Mc - Graw Hill Edition, 2nd Edition,1995
2. Eugene charniat and Drew McDermot, “Introduction to Artificial Intelligence”, Addison Wesley, 1985.
3. Jean - Louis Ermine, “Expert Systems Theory and Practice”, Prentice - Hall of India Pvt Ltd, 2001.

Sem II | Hours/ Week: 6
07MCS205 | Credit: 5

SIMULATION AND MODELING

Prof. D S Ravi

1. Introduction to Simulation

Advantages and Disadvantages of Simulation - Types of Models - Simulation of Queuing Systems - Other Examples of Simulation - Concepts in Discrete - Event Simulation - List Processing - History of Simulation Software - Simulation Packages - Trends in Simulation Software.

2. Statistical Models in Simulation

Continuous Distributions - Empirical Distributions - Characteristics of Queueing Systems - Long - Run Measures of Performance of Queueing Systems - Steady - State Behaviour of finite - Population Models - Networks of Queues.

3. Random - Number Generation

Properties of Random Numbers - Techniques for Generating Random Numbers - Tests for Random Numbers - Inverse Transform Technique - Direct Transformation for the Normal and Lognormal Distributions - Convolution Method - Acceptance - Rejection Technique.

4. Input Modeling : Data Collection

Parameter Estimation - Goodness - of - Fit Tests - Selecting Input Models without Data - Multivariate and Time - Series Input Models - Model Building, Verification and Validation - Calibration and Validation of Models - Types of Simulations with Respect to Output Analysis - Output Analysis for Terminating Simulations - Output Analysis for Steady - State Simulations.

5. Comparison of Two System Designs

Metamodeling - Optimization via Simulation - Manufacturing and Material Handling Simulations - Issues in Manufacturing and Material Handling Simulations - Simulation Tools - Model Input - High - Level Computer - System Simulation - CPU Simulation - Memory Simulation.

Books for study

1. Jerry Banks, John S. Carson, II, Barry L. Nelson, David M. Nicol, “Discrete - Event System Simulation”. Third Edition, Pearson Education International Series in Industrial and Systems Engineering, 2001.
2. Robert E. Shannon, “Systems Simulation, The Art and Science”, Prentice Hall Inc., 1975.
3. Narsing Deo, “System Simulation with Digital Computer”, Prentice Hall of India Inc., New Delhi, 1996.
4. Geoffery Gordon, “System Simulations”, Second Edition, Prentice Hall of India Inc., New Delhi, 1992.
5. Avriell M. Law, W.David Kelton, “Simulation Modeling Analysis”, Second Edition, McGraw - Hill International Editions, 1991.

Sem II | Hours/ Week: 6
07MCS206 | Credit: 5

GRID COMPUTING

Prof. DP Jeyapalan

1. Grid Computing: Early Grid Activities

Current Grid Activities - An Overview of Grid Business Areas - Grid Applications - Grid Infrastructure - Grid Computing Organization and Roles: Organization developing Grid Standards and best practice guidelines - Organization developing Grid Computing Toolkits and the Framework - Organization building and using Grid based solutions to solve Computing - Data and Network Requirements - Commercial Organization building and using Grid - Based solutions - The Grid Computing Anatomy: The Grid problem. The Grid Computing Road Map: Autonomic Computing, Business On Demand and Infrastructure Virtualization, Service - Oriented Architecture and Grid - Semantic Grids.

2. Merging the Grid Services Architecture with the Web Services Architecture

Service - Oriented Architecture - Web Service Architecture - XML Related Technologies and their relevance to Web Services - XML Messages and Enveloping - Service Message Description Mechanisms - Relationship between Web Services and Grid Services - Web Service Interoperability and the role of WS - I Organization - Open Grid Service Architecture (OGSA) - OGSA Architecture and Goal - Some Sample Use Cases that Drive the OGSA - Commercial Data Center (CDC) - National Fusion collaboratory (NFS) - Online Media and Entertainment - The OGSA Platform Components - Native Platform Services and Transport Mechanisms - OGSI Hosting Environment - Core Networking Services Transport and Security - OGSA Infrastructure - OGSA Basic Services.

3. Open Grid Services Infrastructure (OGSI)

Introduction - Grid Services - A High - level Introduction to OGSI - technical details of OGSI specification - Introduction to Service Data Concepts - Grid Services: Naming and Change Management Recommendations - OGSA Basic Services: Common Management model (CMM) - Service Domains - Policy Architecture - Securtiy Architecture - Metering and Accounting - Common Distributed Logging - Distributed Data Access and Replication

4. The Grid Computing Tool Kits: GLOBUS GT3 Toolkit

Architecture - GT3 Architecture Model - GLOBUS GT3 Toolkit: Programming Model: Introduction - Service Programming Model

5. LOBUS GT3 Toolkit

A sample implementation: Acme search implementation in a top - Down approach. GLOBUS GT3 Toolkit: High - level services: Introduction - resource discovery and monitoring - resource allocation - Data Management - commercial Services - index services - resource information services - resource management services - data management services. OGSI.NET Middleware Solutions: OGSI.NET framework implementation.

Books for study

1. Joshy Joseph and Craig Fellenstein, “Grid Computing”, Pearson Education Pvt Ltd. Indian Branch, 482, F.I.E. Patparaganj, New Delhi - 110 092, India, 2004.
2. Ahmar Abbas, “Grid Computing: A practical guide to technology and applications (Programming series)”, Firewall media, New Delhi, 2004
3. Graham G. Carey, “Computational Grids: Generations, Adaptations and Solutions strategies”, John Benjamin Publishing Co., 1997.

Sem II | Hours/ Week: 6
07MCS207 | Credit: 5

DATA MINING

Prof. D P Jeyapalan

1. Introduction to Data Mining:

Functionalities - Classification of data mining systems - Data warehouse and OLAP technology for Data Mining - Data models - Warehousing architecture, implementation - Data Cube Technology

2. Data Processing: Cleaning:

Integration and transformation - reduction - descretization and concept hierarchy generation - Data Mining primitives, languages and system architectures - query language.

3. Concept description:

Characterization and comparison - Analytical characterization - mining class comparison - Descriptive statistical measures in large databases - Association rule mining - Mining single level and multilevel association rules from transaction databases and relational databases - moving to correlation analysis - constraint based mining.

4. Classification and prediction:

Decision tree induction - Bayesian classification - classification by backpropagation - other classification methods - classifier accuracy - cluster analysis - partitioning methods - hierarchical methods - density - based methods - grid - based methods - outlier analysis

5. Multidimensional analysis and descriptive mining of complex data objects:

Mining spatial databases, multimedia databases, time - series and sequence data, text databases and www - data mining applications - products and research prototypes - social impacts and trends in data mining

Book for study

1. Jiawei Han and Micheline Kamber, “Data Mining: Concepts and Techniques”, Morgan Kaufman Publishers (Elsevier Science) , 2001, (ISBN: 81 - 7867 - 023 - 2)

Sem II | Hours/ Week: 6
07MCS208 | Credit: 5

NETWORK SECURITY

Dr S Albert Rabara

1. Introduction - Security Trends - The OSI Architecture - Security Attacks - Security Services - Security Mechanisms - A model for Network Security - Classic Encryption Techniques - Symmetric Cipher Model - Substitution Techniques - Transposition techniques - Rotor Machines - Stegnography.
2. Block Ciphers and Data Encryption Standards - Block Cipher-Principles - Data Encryption Standard - The strength of DES - Differentila and Linear Cryptanalysis - Block Cipher design principles - Advanced encryption Standard - The AES Cipher
3. Public Key Encryption and Hash functions - Principles of Public Key Crypto Systems - The RSA algorithm - Message Authentication - Authentication Requirements - Authentication Functions - Message Authentication codes - Hash Functions - Security of Hash Functions and MAC- Whirlpool - HMAC - CMAC - Digital Signatures - Authentication Protocols - Digital Signature standard
4. Authentication Applications - Kerberos - X.509 Authentication Service - PKI - Electronic Mail Security - Pretty Good Piracy - S/MIME - IP Security - IP Security Overview - IP Security Architecture - Authentication Header - Key Management - Web Security - Web Security Considerations- - SSL and Transport Layer Security
5. System Security - Intruders - Intrusion Detection - Password Management - Viruses - DOS and DDOS Attacks - Firewalls - Firewall Design Principles - Trusted Systems - IT Security Evaluation

Book for Study:

1. William Stallings, “Cryptography and network Security - Principles and Practices”, Prentice Hall (Pearson Education), Fourth Edition, 2006

Book for Reference

1. Atul Kahate, Cryptography and Network Security, Tata McGraw Hill Publications, New Delhi

Sem II Hours/ Week: 6
07MCS209 Credit: 5

ARTIFICIAL NEURAL NETWORKS

Prof. A Charles

1. Characteristics Of Biological Neuron:

Models of neuron - Terminology - Training of ANN - Preceptron - Preceptron learning - Training algorithms.

2. Back Propagation Network:

Training algorithms - Applications Caveats - XOR function - Delta learning rule - Counter Propagation Networks - Normal operation of CPN - Training of Kohonen and Gross berg layers - data compression.

3. Statistical Methods:

Training applications - general non - linear optimization problems - Boltzmann and Cauchy Training. Recurrent networks - Hop field net - applications.

4. Bi Directional Associative Memory (BAM)

Structure - retrieving a stored association - encoding the associations - memory capacity - continuous, adaptive and competitive BAM. Adaptive Resonance Theory - architecture - characteristics - implementation - training example.

5. Optical Neural Networks:

Vector - matrix multipliers - Holographic correlators - Cognition and neocognition.

Books for study

1. Philip D. Wassermann “Neural Computing: Theory and Practice”, Van Nastrand Reinhold.
2. James A. Freeman and David M. Skpura, “ Neural networks : Algorithms Applications and programming Techniques”, Addison - Wesley Publishing Company.

Books for Reference

1. Beale and Jackson, “T - Neural - an Introduction”, Adam Hilger, 1990.
2. Robert J. Schalkoff, “ Artificial Neural Networks.” McGraw Hill International Ed, 1997

Sem II | Hours/ Week: 6
07MCS210 | Credit: 5

SOFTWARE METRICS

Prof. L Arockiam

1. Introduction

Measurement in Software Engineering - The scope of software Metrics - The representational theory of measurement and models - Scales - Classification of software measures - Applying the frame work - Validation.

2. Principles of Investigation

Planning formal experiments - Data collection - Storing and extracting. Analyzing the results of experiments - Simple analysis technique - Advanced methods - Statistical tests.

3. Measuring Internal Product Attributes

Aspects of Software size - reuse, functionality and complexity - types of structural measures - control flow structure - modularity and information flow. Difficulties in general complexity measures. Software quality models and measuring aspects.

4. Reliability Theory And Problems

Parametric models - predictive accuracy - the importance of operational environments - Software reliability. Resources measurements - productivity - Making process predictions - Cost estimations - Effort and cost models - Current estimation methods - implication for process prediction.

5. Object - Oriented Product Metrics

Module metrics - size and logic metrics - Cognitive complexity model - Contingency model of programmer task - Application to Object - oriented systems.

Books for study

1. Noman E. Fenton and Shari Lawrence Pfleeger, “Software Metrics”, PWS publishing Company, USA, Second edition 1996.
2. Brian Henderson - Sellers, “ Object - oriented metrics - Measures of Complexity”, Prentice Hall, New Jersy, 1996.

Books for Reference

1. Lem O. Ejiogu,”Software Engineering with formal metrics”, QED technical publishing group, Boston, 1991.
2. Daniel Hoffman and Paul Strooper, “Software Design, Automated Testing and Maintenance”, International Thomson Computer Press, Boston,1995.
3. Stephen H. Kan, “Metrics and models in Software Engineering”, 2nd edition, Pearson Education(Singapore), Pvt. Ltd., 2004.

Sem II | Hours/ Week: 6
07MCS211 | Credit: 5

PARALLEL PROCESSING

Prof. S Charles

Objectives

- ✧ Parallel Computing is a complete end - to - end source of information on almost all aspects of parallel computing from introduction to architectures to programming paradigms to algorithms to programming standards. It deals the traditional Computer Science algorithms, scientific computing algorithms and data intensive algorithms.

Units

1. Parallel Programming Platforms

Motivating Parallelism - Implicit Parallelism: Trends in Microprocessor Architectures - Limitations of Memory System Performance Dichotomy of Parallel Computing Platforms - Communication Model of Parallel Platforms - Physical Organization of Parallel Platforms - Communication Costs in Parallel Machines. Principles of Parallel Algorithm Design: Introduction to Parallel Algorithm Design - Decomposition Techniques - Characteristics of Tasks and Interactions - Mapping Techniques for Load Balancing - Methods for Containing Interaction Overheads - Parallel Algorithm Models Analytical Modeling of Parallel Programs : Performance Metrics for Parallel Systems - Effect of Granularity and Data Mapping on Performance - Scalability of Parallel Systems - Minimum Execution Time and Minimum Cost - Optimal Execution Time

2. Parallel Programming

Programming Shared Address Space Platforms . Thread Basics - Why Threads - The POSIX Thread Application Programmer Interface - Synchronization Primitives in POSIX - Controlling Thread and Synchronization Attributes - Composite Synchronization Constructs - Tips for Designing Asynchronous Programs - Open MP: A Standard for Directive Based Parallel - Programming

3. Programming Message Passing Platforms

Message Passing Interface (MPI) Basics - Topologies and Embedding - Overlapping Communication with Computation - Collective Communication and Computation Operations - Groups and Communicators - Parallel Algorithms And Applications : Dense Matrix Algorithms - Mapping Matrices onto Processors - Matrix Transposition - Matrix - Vector Multiplication - Matrix Multiplication - Solving a System of Linear Equations

4. Sorting

Issues in Sorting on Parallel Computers - Sorting Networks - Bubble Sort and its Variants - Quicksort - Other Sorting Algorithms. Graph Algorithms: Definitions and Representation - Minimum Spanning Tree: Prim's Algorithm Single - Source Shortest Paths: Dijkstra's Algorithm - All - Pairs Shortest Paths Transitive Closure - Connected Components - Algorithms for Sparse Graphs

5. Discrete Optimization Problems

Sequential Search Algorithms - Search Overhead Factor - Parallel Depth - First Search - Parallel Best - First Search - Speedup Anomalies in Parallel Search Algorithms. Dynamic Programming: Serial Monadic DP Formulations - Nonserial Monadic DP Formulations - Serial Polyadic DP Formulations Nonserial Polyadic DP Formulations

Book for study

1. Ananth Grama, George Karypis, Vipin Kumar, Anshul Gupta, “Introduction to Parallel Computing”2nd edition, Addison Wesley , Pearson Education, 2003.

Book for Reference

1. Michael J Quinn, “Parallel Computing, Theory and Practice”, McGraw Hill International Edn. Singapore, 1994

Sem II | Hours/ Week: 6
07MCS212 | Credit: 5

SECURITY IN COMPUTING

Prof. A Aloysius

Objectives

- ✧ To give overall security aspects of database, network and operating system with various protection mechanism.

Units

1. Security problem in Computing

Protecting variables - Characteristics of computer intrusion - Attacks - Security goals - Vulnerabilities - Computer criminals - methods of defense - Elements of cryptography : Terminology and background - Substitution ciphers - Transpositions - Encryption algorithms - Data encryption standard - AES encryption algorithm - uses of encryption

2. Program security

Secure program - Non Malicious program errors - Virus and other malicious code - controls against program threads - - Protection in general purpose operating system: protected objects and methods of protection - Memory and address protection - control of access to general objects - file protection mechanism - user authentications

3. Designing Trusted operating System

Security policy - Models of security - Trusted OS Design - Assurance in trusted OS - implementation - Database security

4. Security in networks

NT concepts - Threads in NT - Network Security controls - firewalls - Intrusion detection system - Secure Email - Administering security: Security planning - Risk analysis - Organisation security policies - Physical security

5. Legal, Privacy and Ethical issues in computer security

Protecting programs and data - Information of Computer objects - Rights of employees and Employers - Software failure - Computer crime - Privacy - Ethical issues in Computer Security - Cryptography: Mathematics for Cryptography - Symmetric encryption - Public key encryption system - Quantum Cryptographic results.

Books for study

1. Charles P. Pfleeger and Shari Lawrence Pfleeger, “Security in Computing”, Second Edition, Pearson Education (Singapore) Pvt Ltd., 2004.
2. Eric Maiwald, “Network Security A Beginner’s Guide”, , Second Edition, Tata - McGraw Hill Pub. Ltd., New Delhi, 2003.
3. Atul Kahate ,“Cryptography and Network Security”, Tata - McGraw Hill Pub. Ltd., New Delhi, 2003.

Sem II | Hours/ Week: 6
07MCS213 | Credit: 5

ARTIFICIAL NEURAL NETWORKS

Rev. Fr. Francis Thamburaj

Objectives

- ✧ To introduce some of the fundamental techniques and principles of neural network systems and investigate some common models and their applications.

Units

1. Introduction

Definition, fundamental concepts, applications, advantages and disadvantages, classifications, biological neural network, Artificial neural structure, activation function, adding bias, perceptron, MLP.

2. Feed forward ANNs

Structure, delta rule, architecture and training, radial basis function, cognitron, neocognitron

3. Attractor ANNs

Associative learning, Attractor NN, Linear associative memory, hopfield network, content addressable memory, simulated annealing, Boltzman machine, Bidirectional associative memory.

4. Unsupervised ANNs

Clustering procedures, c - means algorithm, learning vector quantization, maxnet, self - organizing feature maps, Adaptive resonance architecture, ART1, ART2.

5. Soft Computing:

Spiking Neuron model, linguistic processing, Uncertainty, Fuzzy sets, membership functions, geometry of fuzzy sets, fuzzy operations, fuzzy rules for approximate reasoning, genetic algorithm, neural network and fuzzy logic

Books for study

1. Robert J. Schalkoff, Artificial neural networks, McGraw - Hill, New Delhi, 1997.
2. Satish Kumar, Neural Networks
2. Haykin Simon, Neural Networks: A Comprehensive Foundation, 2nd edition, Addison Wesley, Singapore, 2001.
3. Freeman A. James and Skapura M. David, Neural Networks: Algorithms, Applications, and programming techniques, Addison - Wesley Longman, California, 1999.

Sem II | Hours/ Week: 6
07MCS214 | Credit: 5

DATA STRUCTURES AND ALGORITHMS

Prof. V. S. Joe Irudhayaraj

Units

1. Trees

Operations on binary trees - tree search and insertion - tree deletion - Analysis of tree search and insertion - balanced tree insertion - balanced tree deletion - optimal search trees

2. Multi way trees and hashing

B - trees - binary B - trees - choice of a transformation function - collision handling - analysis of key transformation.

3. Greedy Methods

The general method - Knapsack problem - job sequencing with deadlines - minimum cost spanning tree - Optimal storage on tapes - optimal merge patterns.

4. Dynamic Programming

The general method - All - pairs shortest paths - single source shortest paths - optimal binary search trees - The traveling salesman problem - Flow shop scheduling

5. Back tracking

The general method - the 8 - queen problem - sum of subsets - graph coloring - Hamiltonian cycles.

Books for study

1. Niklaus Wirth, “Algorithms+Data structures=Programs”,Prentice Hall of India Limited, New Delhi 2002.(units I and II)
2. Ellis Horowitz and Sartaj Sahani, “Fundamentals of Computer Algorithms”, Galgotia publications, New Delhi, 1985. (units III,IV and V)

Sem I | Hours/ Week: 6
07MCS215 | Credit: 5

SOFT COMPUTING

Prof. A. Charles

1. Artificial Neural Networks

Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning - Back propagation networks - Kohnen's self organizing networks - Hopfield network.

2. Fuzzy Systems

Fuzzy sets and Fuzzy reasoning - Fuzzy matrices - Fuzzy functions - Decomposition - Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.

3. Neuro - Fuzzy Modeling

Adaptive networks based Fuzzy interface systems - Classification and Regression Trees - Data clustering algorithms - Rule based structure identification - Neuro - Fuzzy controls - Simulated annealing.

4. Genetic Algorithms

Evolutionary computation. Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction - Rank method - Rank space method.

5. Soft Computing And Conventional AI

AI search algorithm - Predicate calculus - Rules of inference - Semantic networks - Frames - Objects - Hybrid models - Applications.

Books for study

1. Jang J.S.R., Sun C.T. and Mizutani E, "Neuro - Fuzzy and Soft computing", Prentice Hall 1998.
2. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill, 1997.
3. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall, 1994.
4. George J. Klir and Bo Yuan, "Fuzzy sets and Fuzzy Logic", Prentice Hall, USA 1995.
5. Nih J.Nelsson, "Artificial Intelligence - A New Synthesis", Harcourt Asia Ltd., 1998.
6. D.E . Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y, 1989.

Sem II | Hours/ Week: 6
07MCS216 | Credit: 5

OBJECT ORIENTED TECHNOLOGY

Prof . B. Gerlad Marvin

Objectives

- ✧ To provide the fundamental concepts on object modeling and to give a deep knowledge on object oriented analysis and design

Units

1. Introduction

Introduction to object oriented development - Modeling as a design technique: Modeling - Object Modeling Techniques - Object Modeling: Objects and Classes - Links and Association - Advanced Link and Association Concepts - Generalization and Inheritance - Grouping Constructs - a sample Object Model - Advanced Object Modeling: Aggregation - Abstract Classes - Generalization as extension and restriction - Multiple Inheritance - Meta data - Candidate Keys and Constraints.

2. Dynamic Modeling

Events and States - Operations - Nested state diagrams - Concurrency - Advanced dynamic modeling concepts - A sample Dynamic model - Relation of object and Dynamic models - Functional Modeling : Functional Models - Data flow diagrams - Specifying operation - Constraints - A sample functional model - Relation of functional to Object and Dynamic Models.

3. Analysis

Overview of Analysis Problem statement - Automated Teller Machine example - Object modeling - Dynamic Modeling - Functional Modeling - Adding Operations - Iterating the analysis.

4. System Design

Overview of System Design - Breaking a System into Subsystems - Identifying Concurrency - Allocating subsystems to processes and tasks - Management of Data stores - Handling Boundary conditions - Setting Trade - off priorities - Common Architectural frameworks - Architecture of the ATM System.

5. Object Design

Overview of Object Design - Combining the three models - Designing algorithms - Design Optimization - Implementation of Control - Adjustment of Inheritance - Design of associations - Object Representations - Physical packaging - Documenting Design Decisions.

Books for study

1. James Rumbaugh, Michael Blaha, William Premerlani, Fredrick Eddy, William Lorensen, “Object - Oriented Modelling and Design”, Prentice Hall of India, New Delhi, 2001.
2. Grady Booch, “Object Oriented Analysis and Design with Applications”, Addison - Wesley Publishing Company, New York, 2000.

Sem II Hours/ Week: 6
07MCS217 Credit: 5

PSYCHOLOGY OF COMPUTER PROGRAMMING

Prof. A. Aloysius

Objectives

- ✧ To introduce the basic Psychology of computer programming and the various programming Tools.

Units

1. Programming as Human Performance

Reading Programs: An example - Machine Limitations - Language Limitations - Programmer Limitations - Historical Traces - Specifications - Making a Good Program: Specifications - Schedule - Adaptability - Efficiency - Study of Programming: Introspection - Observation - Experiment - Psychological Measurement - Using Behavioral Science Data.

2. Programming as a Social Activity

The Programming Group: Formal and Informal Organization - Physical Environment and Social Organization - Error and Ego - Ego less Programming - Creating and Maintaining the Programming Environment - The Programming Team: Team Forms - Establishing and Accepting Goals - Team Leadership and Team Leaders - The team in Crisis - The Programming Project: Stability through Change - Measuring Performance - Project Structure - Common Social Problems of Large Projects.

3. Programming as an Individual Activity

Variations in the Programming Task: Professional Versus Amateur Programming - The programmer is trying to do - Stages of programming work - Personality Factors: Personality Changes - Personality Invariants - Critical Personality traits - Personality Testing - Personality Testing of Programmers.

4. Intelligence, or Problem - Solving Ability

Psychological Set - Some Dimensions of Problem Solving - Facets of Programming Intelligences - Aptitude Tests - Aptitude Tests for Programming - Motivation, Training, and Experience: Motivation - Training, Schooling, and Education - Forces against Learning - Learning Program.

5. Programming Tools

Programming Languages: Programming Language and Natural Language - Programming Language Design - Some Principles for Programming Language Design: Uniformly - Compactness - Locality and Linearity - Tradition and Innovation - Special - Purpose, Multipurpose, and Toy Languages - Other Programming Tools: Program Testing Tools - Operating Systems - Time Sharing Versus Batch - Documentation.

Book for study

1. Gerald M. Weinberg, “The Psychology of Computer Programming“, Dorest House Publishing, New York.

Sem II | Hours/ Week: 6
07MCS218 | Credit: 5

DATA REPRESENTATION AND PROCESSING WITH XML

Prof. D. Ravindran

Objectives

✧ To understand the XML related technologies, xml processing with SAX, DOM and JDOM, comparison of these parsers and web services

Units

1. XML

syntax - data representation - well - formed document - style sheets - XSL - Xlinks - Xpointers - XMLSchema

2. XML

validity - DTD - XML protocols: XML - RPC and SOAP - writing XML with Java - AJAX features.

3. Reading XML

SAX - SAX Filters - XML Reader Interface

4. DOM

Trees - DOM parser for java - creating XML documents with DOM - JDOM - XSLT

5. Web Services

SOAP and WSDL - UDDI, Discovery and Web Services Registries - Java Web Services: A Conceptual Overview - Web Services Security

Books for study

1. Elliotte Rusty Harold , “XML Bible”,
2. Elliotte Rusty Harold , “Processing XML with Java”, Pearson Education, Nov 2002.
3. http://www.cafeconleche.org/books/xmljava/
4. Nikola Ozu, Jon Duckett,” Professional Xml” ,Wrox publications, 2nd Edition
5. Harvey M. Deitel ,Paul J. Deitel , B. DuWaldt , L. K. Trees ,” Web services A Technical Introduction”, Deital Development series,
6. Christian Heilmann, “Beginning JavaScript with DOM Scripting and Ajax”

Sem II | Hours/ Week: 6
07MCS219 | Credit: 5

3-D MODELING AND VIRTUAL REALITY

Prof. D. Ravindran

Objectives

- ✧ To understand the 3d modeling concepts, to know the VRML features and to study the design of interactive, multiuser, multiserver systems

Units

1. 3D modeling

Modeling techniques - advantages

2. VRML

Concepts - building a scene - complex objects - object appearance - lights - viewpoints - sound - softwares

3. Events and routing

Behaviour - VRML Scripting - animated view points - special effects - limitations - issues

4. Performance

Estimation and System Tuning - Sensors and Input Processing - 3D Multimodal Interaction Design

5. XVRML

Core - object orientation - database interaction - Dynamic module - advantages

Books for study

1. Chris Marin, Bruce Campbell, “Teach yourself VRML2 in 21 days”, Techmedia, New Delhi
2. Grigore C. Burdea, Philippe Coiffet, “ Virtual Reality Technology”, Second Edition
3. Gerard Kim, “Designing Virtual Reality Systems: The Structured Approach”, Springer
4. http://xvrml.kti.ae.poznan.pl/

Sem II Hours/ Week: 6
07MCS220 Credit: 5

DISTRIBUTED DATABASE SYSTEMS

Prof. C. Balakrishnan

Units

1. Overview of Database systems

Levels of abstraction - Data models - Relational Data models - Relational algebra - Relational calculus - Normalizations - Relational DBMS - Network fundamentals

2. Distributed data processing

Promises - complicating areas - problem areas - Architectural models for Distributed databases - Distributed database architecture - global directory issues - alternative design strategies - Distribution design issues - Fragmentation - allocation - semantic data control

3. Query processing

Objectives - complexity in relational models - characterization - layers of query processing - query decomposition - localization - optimization of distributed queries

4. Overview of Transactions

Properties - Types of Transactions - Concurrency - Serializability theory - Loc - based and Timestamp based concurrency control protocols - Deadlock management - Reliability concepts - Failures in Distributed DBMS - Local and Distributed reliability protocols - Dealing site failures - network partitioning

5. Overview of parallel databases

Distributed object databases - Database interoperability - current issues

Books for study

1. A Silberschatz, Henry F. Korth and S. Sudarshan, “Database System Concepts”, 5th Edition, Tata McGraw Hill, 2006
2. Tamer Ozsu and Patrick Valduriez, “ Principles of Distributed Database Systems”, 2nd Edition, Pearson Education Asia, 2002.
3. S K Singh, “Database Systems Concepts, Design and Applications”, Pearson Education
4. Andrew S Tanenbaum, “Computer Networks” Prentice Hall of India, New Delhi, 1999.

Sem II Credit: 50 (25+25)
07MCS221

DISSERTATION
