COMPUTER SCIENCE AND ENGINEERING

M.TECH (COMPUTER SCIENCE AND ENGINEERING)

(NON-CBCS)

REGULATIONS,CURRICULUM AND SYLLABUS

(With effect from the Academic Year 2011 – 12)

PONDICHERRY UNIVERSITY
PUDUCHERRY – 605 014.

PONDICHERRY UNIVERSITY

PUDUCHERRY -605 014.

REGULATIONS FOR POST GRADUATE (M.Tech.) PROGRAMMES IN THE DISCIPLINE OF COMPUTER SCIENCE AND ENGINEERING (**NON-CBCS**)

(WITH EFFECT FROM JULY 2011)

M.Tech (Computer Science and Engineering)

1.0 ELIGIBILITY

Candidates for admission to the first semester of four semester M.Tech (Computer Science and Engineering) should have passed B.E / B.Tech in Computer Science and Engineering / Information Technology or M.C.A through regular course of study from an AICTE approved institution or an examination of any University or authority accepted by the Pondicherry University as equivalent thereto, with at least 55% marks in the degree examination or equivalent CGPA.

Note:

1. Candidates belonging to SC/ST who have a mere pass in the qualifying examination are eligible.
2. There is no age limit for M.Tech. programmes.

2.0 ADMISSION

The admission policy for various M.Tech. programmes shall be decided by the respective institutes offering M.Tech. programmes subject to conforming to the relevant regulations of the Pondicherry University.

3.0 STRUCTURE OF M.Tech. PROGRAMME

3.1 General

3.1.1. The M.Tech. Programmes are of semester pattern with 16 weeks of instruction in a semester.

3.1.2 The programme of instruction for each stream of specialization will consist of :

(i) Core courses (Compulsory)
(ii) Electives
(iii) Laboratory
(iv) Seminar
(v) Project work

3.1.3 The M.Tech. Programmes are of 4 semester duration.

3.1.4. Credits will be assigned to the courses based on the following general pattern:

(i) One credit for each lecture period
(ii) One credit for each tutorial period
(iii) Two credits for practical course
(iv) Two credits for seminar
(v) Twenty three credits for Project work divided into 9 credits for Phase-I and 14 credits for Phase – II.
(vi) One teaching period shall be of 60 minutes duration including 10 minutes for discussion and movement.

3.1.5 Regulations, curriculum and syllabus of the M.Tech. programme shall have the approval of Board of Studies and other Boards/ Committees/ Councils, prescribed by the Pondicherry University. The curriculum should be so drawn up that the minimum number of credits and other requirements for the successful completion of the programme will be as given in Table – 1.

Table 1: Minimum credits and other requirements

Sl.No.	**Description**	**Requirements**
		M.Tech (Full-Time)
1	Number of Semesters	4
2	Min. number of credits of the programme	72
3	Max. number of credits of the programme	75
4	Min. Cumulative Grade Point Average for pass	5
5	Min. successful credits needed for registering in the next semester	Sem. I: 10
		Sem. II: 25
		Sem. III: 40
6	Min. period of completion of programme (consecutive semesters)	4

7	Max. period of completion of programme(consecutive semesters)	8
8	Number of core and elective courses	13
9	Seminar	1
10	Laboratory	1
11	Project work (semesters)	2

3.1.6 A core course is a course that a student admitted to the M.Tech. programme must successfully complete to receive the degree. A student shall register for all the core courses listed in the curriculum.

3.1.7 Elective courses are required to be chosen from the courses offered by the department(s) in that particular semester from among the approved courses. A core course of one department may be chosen as an elective by a student from other department.

3.1.8 Each student is required to make a seminar presentation on any chosen topic connected with the field of specialisation. Preparation and presentation of a seminar is intended to investigate an in-depth review of literature, prepare a critical review and develop confidence to present the material by the student. The seminar shall be evaluated by a Department Committee constituted for this purpose, based on a report submitted by the candidate and a viva-voce conducted at the end of the semester.

3.1.9 Project work is envisaged to train a student to analyze independently any problem posed to him/her. The work may be analytical, experimental, design or a combination of both. The project report is expected to exhibit clarity of thought and expression. The evaluation of project work will be a continuous internal assessment based on two reviews, an internal viva-voce and an external viva-voce examination.

3.1.10 The medium of instruction, examination, seminar, directed study and project work will be in English.

4.0 REQUIREMENTS TO APPEAR FOR UNIVERSITY EXAMINATION

4.1 A candidate shall be permitted to appear for university examinations at the end of any semester only if he / she secures not less than 75% overall attendance arrived at by taking into account the total number of periods in all subjects put together offered by the institution for the semester under consideration. Candidates who secure overall attendance greater than 60% and less than 75% have to pay a condonation fee as prescribed by the University along with a medical certificate obtained from a medical officer not below the rank of Assistant Director to become eligible to appear for the examinations.

4.2 A candidate to secure eligibility towards continuing the Programme, he/she must have earned the minimum number of credits at the end of each semester as given in Table – 1. If he /she fail to satisfy this criterion in any semester, he/she shall be placed on scholastic probation in the succeeding semester.

4.3 His / Her conduct shall be satisfactory as certified by the Head of the institution.

5.0 EVALUATION

5.1 Evaluation of theory courses shall be based on 40% continuous internal assessment and 60% University examination. Evaluation of laboratory course shall be based on 50% internal assessment and 50% University examination. In each course, there shall be a 3 hour University examination.

5.2 The seminar will be evaluated internally for 100 marks. The total marks for the project work for M.Tech. programmes will be 300 marks for phase-I and 400 marks for phase-II. The allotment of marks for external valuation and internal valuation shall be as detailed below:

Seminar(Internal valuation only) : **100 Marks**

First review		30 marks
Second review		30 marks
Report and Viva voce		40 marks
	Total	**100 marks**

Project work – (Phase – I): 300 Marks

Internal valuation			
	Guide		50 marks
	First Evaluation		50 marks
	Second Evaluation		50 marks
		Total	**150 marks**
External valuation			
	Evaluation (External Examiner Only)		50 marks
	Viva voce (50 for Ext.+ 50 for Int.)		100 marks
		Total	**150 marks**

Project work – (Phase – II): 400 Marks

Internal valuation			
	Guide		100 marks
	First Evaluation		50 marks
	Second Evaluation		50 marks
		Total	**200 marks**
External valuation			
	Evaluation (External Examiner Only)		50 marks
	Viva voce (75 for Ext. + 75 for Int.)		150 marks
		Total	**200 marks**

Internal valuation should be done by a committee comprising of not less than 3 faculty members appointed by the Head of the Department and approved by the Head of the Institution.

5.3 The end-semester examination shall be conducted by the Pondicherry University for all the courses offered by the department. A model question paper, as approved by the Chairperson, BOS (ECE), Pondicherry University, for each course offered under the curriculum should be submitted to the University. The University examination shall cover the entire syllabus of the course.

5.4 The University shall adopt the double valuation procedure for evaluating the end-semester examinations, grading and publication of the results. Each answer script shall be evaluated by two experts. If the difference between the total marks awarded by the two examiners is not more than 15% of end-semester examination maximum marks, then the average of the total marks awarded by the two examiners will be reckoned as the mark secured by the candidate; otherwise, a third examiner is to be invited to evaluate the answer scripts and his/her assessment shall be declared final.

5.5 Continuous assessment of students for theory courses shall be based on two tests (15 marks each) and one assignment (10 marks). A laboratory course carries an internal assessment mark of 50 distributed as follows: (i) Regular laboratory exercises and records – 20 marks (ii) Internal laboratory test– 20 marks and (iii) Internal viva-voce – 10 marks.

5.6 All eligible students shall appear for the University examination.

6.0 Grading

6.1 The assessment of a course will be done on absolute marks basis. However, for the purpose of reporting the performance of a candidate, letter grades, each carrying stipulated points, will be awarded as per the range of total marks (out of 100) obtained by the candidate, as detailed below in Table – 2.

TABLE 2: Letter Grade and the Corresponding Grade Point

Range of Total Marks	Letter Grade	Grade	Description
90 to 100	S	10	EXCELLENT
80 to 89	A	9	VERY GOOD
70 to 79	B	8	GOOD

60 to 69	C	7	ABOVE AVERAGE
55 to 59	D	6	AVERAGE
50 to 54	E	5	SATISFACTORY
0 to 49	F	0	FAILURE
Incomplete	FA	-	FAILURE DUE TO LACK OF ATTENDANCE/ FAILURE BY ABSENCE

6.2 A student is deemed to have completed a course successfully and earned the appropriate credit if and only if, he /she receives a grade of E and above. The student should obtain 40% of marks in the University examination in a subject to earn a successful grade.

6.3 A candidate who has been declared "Failed" in a course may reappear for that subject during the subsequent semesters and secure a pass. However, there is a provision for revaluation of failed or passed subjects provided he/she fulfills the following norms for revaluation.

(i) Applications for revaluation should be filed within 4 weeks from the date of declaration of results or 15 days from the date of receipt of marks card whichever is earlier.

(ii) The candidate should have attended all the university examinations.

(iii) The candidate should not have failed in more than two papers in the current university examination.

(iv) The request for revaluation must be made in the format prescribed and duly recommended by the Head of the Institution along with the revaluation fee prescribed by the University.

(v) Revaluation is not permitted for practical courses, seminar and project work.

6.4 The internal assessment marks secured by a student in a theory course shall be considered only during the first appearance. For the subsequent attempts, the marks secured by the student in the University examination shall be scaled up to the total marks. Further, the marks secured by the student in the University examination in the latest attempt shall alone remain valid in total suppression of the University examination marks secured by the student in earlier attempts.

7.0 DECLARATION OF RESULTS, RANK AND ISSUE OF GRADE CARD

7.1 The results will be declared and the grade cards will be issued to the students after completing the valuation process.

7.2 The grade cards will contain the following details:

(i) The college in which the candidate is studying/has studied.

(ii) The list of courses enrolled during the semester and the grades scored.

(iii) The Grade Point Average (GPA) for the semester and the Cumulative Grade Point Average (CGPA) of all enrolled subjects from first semester onwards.

7.3 GPA is the ratio of the sum of the products of the number of credits (C) of courses registered and the corresponding grades points (GP) scored in those courses, taken for all the courses and the sum of number of credits of all the courses

$$GPA = (\text{Sum of } (C \times GP) / \text{ Sum of } C)$$

The sum will cover all the courses the student has taken in that semester, including those in which he/she has secured F.

7.4 CGPA will be calculated in a similar manner, considering all the courses enrolled from first semester. FA grades are to be excluded for calculating GPA and CGPA. If a student has passed in a course after failing in earlier attempts, the grade secured by the student in the successful attempt only will be taken into account for computing CGPA.

7.5 To convert CGPA into percentage marks, the following formula shall be used:

$$\% \text{ Mark} = (CGPA - 0.5) \times 10$$

7.6 A candidate who satisfies the course requirements for all semesters and passes all the examinations prescribed for all the four semesters within a maximum period of 10 semesters reckoned from the commencement of the first semester to which the candidate was admitted, shall be declared to have qualified for the award of degree.

7.7 A candidate who qualifies for the award of the degree shall be declared to have passed the examination in **FIRST CLASS** with **DISTINCTION** upon fulfilling the following requirements:

(i) Should have passed all the subjects pertaining to semesters 1 to 4 in his/her first appearance in 4 consecutive semesters starting from first semester to which the candidate was admitted.

(ii) Should not have been prevented from writing examinations due to lack of attendance.

(iii) Should have secured a CGPA of 8.50 and above for the semesters 1 to 4.

7.8 A candidate who qualifies for the award of the degree by passing all the subjects relating to semesters 1 to 4 within a maximum period of 6 consecutive semesters after his/her commencement of study in the first semester and in addition secures CGPA not less than 6.5 shall be declared to have passed the examination in **FIRST CLASS**.

7.9 All other candidates who qualify for the award of degree shall be declared to have passed the examination in **SECOND CLASS**.

7.10 A student with CGPA less than 5.0 is not eligible for the award of degree.

7.11 For the award of University rank and gold medal, the CGPA secured from 1st to 4th semester should be considered and it is mandatory that the candidate should have passed all the subjects from 1st to 4th semester in the first appearance and he/she should not have been prevented from writing the examination due to lack of attendance and should not have withdrawn from writing the University examinations.

8.0 PROVISION FOR WITHDRAWAL

A candidate may, for valid reasons, and on the recommendation of the Head of the Institution be granted permission by the University to withdraw from writing the entire semester examination as one unit. The withdrawal application shall be valid only if it is made earlier than the commencement of the last theory examination pertaining to that semester. Withdrawal shall be permitted only once during the entire programme. Other conditions being satisfactory, candidates who withdraw are also eligible to be awarded DISTINCTION whereas they are not eligible to be awarded a rank/gold medal.

9.0 DISCONTINUATION FROM THE PROGRAMME

If a candidate wishes to temporarily discontinue the programme for valid reasons, he/she shall apply through the Head of the Institution in advance and obtain a written order from the University permitting discontinuance. A candidate after temporary discontinuance may rejoin the programme only at the commencement of the semester at which he/she discontinued, provided he/she pays the prescribed fees to the University. The total period of completion of the programme reckoned from the commencement of the first semester to which the candidate was admitted shall not in any case exceed 4 years, including the period of discontinuance.

10.0 REVISION OF REGULATIONS AND CURRICULUM

The University may from time to time revise, amend or change the regulations of curriculum and syllabus as and when requirement for the same arises.

11.0 POWER TO MODIFY

11.1 Notwithstanding anything contained in the foregoing, the Pondicherry University shall have the power to issue directions/ orders to remove any difficulty.

11.2 Nothing in the foregoing may be construed as limiting the power of the Pondicherry University to amend, modify or repeal any or all of the above.

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M.TECH (COMPUTER SCIENCE AND ENGINEERING) –NON-CBCS

CURRICULUM AND SCHEME OF EXAMINATION

(Total number of credits required for the completion of the programme: 72)

SEMESTER – I

Sl. No.	Code	Subject	Hours / Week			Credits	Evaluation (marks)		
			L	T	P		Internal	External	Total
1.	CS 901	Advanced Data Structures and Algorithms	3	1	0	4	40	60	100
2.	CS 902	Design of Distributed Systems	3	1	0	4	40	60	100
3.	CS 903	Advanced Computer Architecture	3	1	0	4	40	60	100
4.		Elective – I	3	0	0	3	40	60	100
5.		Elective – II	3	0	0	3	40	60	100
6.		Elective – III	3	0	0	3	40	60	100
7.	CS 908	Seminar	-	-	3	2	100	-	100
						23	340	360	700

SEMESTER – II

Sl. No.	Code	Subject	Hours / Week			Credits	Evaluation (marks)		
			L	T	P		Internal	External	Total
1.	CS 904	High Performance Networks	3	1	0	4	40	60	100
2.	CS 905	Advances in Database Systems	3	1	0	4	40	60	100

3.	CS 906	Advanced Software Engineering	3	1	0	4	40	60	100
4.		Elective – IV	3	0	0	3	40	60	100
5.		Elective –V	3	0	0	3	40	60	100
6.		Elective – VI	3	0	0	3	40	60	100
7.	CS 907	Advanced Software Laboratory	-	-	3	2	50	50	100
						23	290	410	700

SEMESTER – III

Sl. No.	Code	Subject	Hours / Week			Credits	Evaluation (marks)		
			L	T	P		Internal	External	Total
1.	CS 909	Project Phase-I	-	-	16	9	150	150	300
2.		Elective – VII	3	0	0	3	40	60	100
						12	190	210	400

SEMESTER – IV

Sl. No.	Code	Subject	Hours / Week			Credits	Evaluation (marks)		
			L	T	P		Internal	External	Total
1.	CS 910	Project Phase II	-	-	24	14	200	200	400
						14	200	200	400

LIST OF ELECTIVE SUBJECTS

SL.NO.	Code	SUBJECT
1	CS 921	Soft Computing
2	CS 922	Data warehousing and Data Mining
3	CS 923	Semantic Web and Knowledge Management
4	CS 924	Knowledge Management
5	CS 925	Real-Time Systems
6	CS 926	Web Services and Internet Engineering
7	CS 927	Service Oriented Architecture
8	CS 928	Data Compression
9	CS 929	Agent Technology
10	CS 930	Advanced Java Programming
11	CS 931	Software Architecture
12	CS 932	Ad Hoc and Sensor Networks
13	CS 933	Design of Embedded Systems
14	CS 934	Trusted Internet
15	CS 935	Internals of Operating Systems
16	CS 936	Cryptography
17	CS 937	Cloud and Utility Computing
18	CS 938	Mobile and Pervasive Computing

CS952 ADVANCED DATA STRUCTURES AND ALGORITHMS

UNIT I

Mathematical Induction - Asymptotic Notations – Algorithm Analysis - NP-Hard and NP-Completeness – Recurrence Equations – Solving Recurrence Equations – Memory Representation of Multi-dimensional Arrays – Time-Space Tradeoff.

UNIT II

Heapsort – Quicksort – Topological sort - Sorting in Linear Time – Elementary Data Structures – Hash Tables – Binary Search Trees – AVL Trees – Red-Black trees – Multi-way Search Trees – B-Trees- Fibonacci Heaps – van Emde Boas Trees – Data Structures for Disjoint Sets.

UNIT III

Algorithm Design Techniques: Divide-and-Conquer – Greedy – Dynamic Programming – Amortized Analysis - Backtracking – Branch-and-Bound techniques.

UNIT IV

Elementary graph Algorithms – Minimum Spanning Trees – Single-Source Shortest Paths- All-Pairs Shortest Paths – Maximum Flow - Multithreaded Algorithms – Matrix Operations.

UNIT V

Linear programming – Polynomials and FFT – Number-Theoretic Algorithms – Computational Geometry –NP-Completeness – Approximation Algorithms.

REFERENCES

1. Thomas H. Coreman, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, “Introduction to Algorithms”, PHI, Third Edition, 2010.
2. G. Brassard and P. Bratley, “Algorithmics: Theory and Practice”, Printice –Hall, 1997.
3. E. Horowitz, S.Sahni and Dinesh Mehta, “Fundamentals of Data structures in C++”, Uiversity Press, 2007.
4. E. Horowitz, S. Sahni and S. Rajasekaran, “Computer Algorithms/C++”, Second Edition, University Press, 2007.
5. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, “Data Structures and Algorithms”, Addison Wesley.

CS 902 DESIGN OF DISTRIBUTED SYSTEMS

UNIT - I

Introduction – Examples of Distributed Systems – Resource Sharing and the Web – Challenges- System Models - Introduction – Architectural Models – Functional Models- Characterization of Distributed Systems – Client-Server Communication – Distributed Objects and Remote Invocation – Communication Between Distributed Objects – Remote Procedure Call – Events and Notifications.

UNIT - II

Distributed Operating Systems - Introduction – Issues – Communication Primitives – Inherent Limitations - Lamport's Logical Clock; Vector Clock; Causal Ordering; Global State; Cuts; Termination Detection. Distributed Mutual Exclusion – Non-Token Based Algorithms – Lamport's Algorithm - Token-Based Algorithms – Suzuki-Kasami's Broadcast Algorithm – Distributed Deadlock Detection – Issues – Centralized Deadlock-Detection Algorithms - Distributed Deadlock-Detection Algorithms. Agreement Protocols – Classification - Solutions – Applications.

UNIT- III

Distributed Resource Management - Distributed File systems – Architecture – Mechanisms – Design Issues – Distributed Shared Memory – Architecture – Algorithm – Protocols - Design Issues. Distributed Scheduling – Issues – Components – Algorithms.

UNIT- IV

Introduction to Distributed Algorithms, Kinds of Distributed Algorithm, Timing Models. Synchronous Network Algorithms: Synchronous Network Model, Leader Election in a synchronous Ring, Algorithms in a General Synchronous Networks, Distributed Consensus with Link Failures, Distributed Consensus with Process failures, More Consensus problems.

UNIT-V

Resource Security and Protection - Introduction – The Access Matrix Model – Implementation of Access Matrix Model – Safety in the Access Matrix Model – Advanced Models of protection – Data Security.

REFERENCES

1. George Coulouris, Jean Dellimore and Tim Kindberg, "Distributed Systems Concepts and Design", Pearson Education, 4th Edition, 2005 [Unit-I]
2. Mukesh Singhal and N. G. Shivaratri, "Advanced Concepts in Operating Systems", McGraw-Hill, 2001 [Units II - IV]
3. Joshy Joseph and Craig Fellenstein, "Grid Computing", IBM Press, 2004. [Unit –V]
4. Ajay D. Kshemkalyani and Mukesh Singhal, " Distributed Computing – Principles, Algorithms and Systems", Cambridge University Press, 2008.
5. Pradeep K. Sinha, "Distributed Operating Systems", PHI, 2005.
6. Nancy A. Lynch, "Distributed Algorithms", Morgan Kaufmann Publishers, 2000.

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CS 903 ADVANCED COMPUTER ARCHITECTURE

UNIT – I

Parallel Computer Models - The State of Computing, Multiprocessors and Multicomputer, Multivector and SIMD Computers, PRAM and VLSI Models, Architectural Development Tracks. Program and Network properties - Conditions of Parallelism, Program Partitioning and Scheduling, Program Flow mechanisms, System Interconnection Architectures.

UNIT – II

Principles of Scalable Performance - Performance Metrics and Measures, Parallel Processing Applications, Speedup Performance Laws, Scalability Analysis and Approaches. Processor and Memory Hierarchy - Advanced Processor Technology, Superscalar and Vector Processors, Memory Hierarchy Technology, Virtual Memory Technology.

UNIT – III

Bus, Cache, and Shared Memory - Backplane Bus Systems, Cache Memory Organizations, Shared-Memory Organizations, Sequential and Weak Consistency Models. Pipelining and Superscalar Techniques - Linear Pipeline Processors, Nonlinear Pipeline Processors, Instruction Pipeline Design, Arithmetic Pipeline Design, superscalar and Superpipeline Design.

UNIT – IV

Multiprocessors and Multicomputers - Multiprocessor System Interconnects, Cache Coherence and Synchronization mechanisms, Three Generations of Multicomputers, Message-Passing Mechanisms. Multivector and SIMD Computers - Vector Processing Principles, Multivector Multiprocessors, Compound Vector Processing, SIMD Computer organizations, The Connection Machine CM-5. Scalable, Multithreaded, and Dataflow Architect architectures - latency-Hiding Techniqies, Principles of Multithreading, Fine-Grain Multicomputers. Scalable and Multithreaded Architectures, Dataflow and Hybrid Architectures.

UNIT – V

Parallel Models, Languages and Compilers - Parallel Programming Models, Parallel Languages and Compilers. Dependence Analysis of Data Arrays, Code Optimization and Scheduling, Loop Parallellization and Pipelining. Parallel Program Development and Environments - Parallel programming Environments, Synchronization and Multiprocessing Models, Shared-Variable Program Structures, Message-Passing program Development, Mapping Programs onto Multicomputers.

REFERENCES

1. Kai Hwang, “Advanced Computer Architecture: Parallelism, Scalability, Programmability”, Tata McGraw-Hill, 2003.
2. Kai Hwang and Faye A. Briggs, “Computer Architecture and Parallel Processing”, McGraw-Hill International Editions, 1985.

CS 904 HIGH PERFORMANCE NETWORKS

UNIT- I

Introduction to computer networks - Review of OSI/ISO model – Introduction to high speed networks - High speed LANs – Fast Ethernet - Switched Fast Ethernet - Gigabit Ethernet – ISDN, FDDI, Frame relay - operations and layers.

UNIT- II

Introduction to SONET – SONET/SDH Layers – SONET Frame Structure – Sonet Physical Layer. Introduction ATM – Cell format and Switching Principles – Protocol Architecture – Service categories. TCP/IP protocol Suite – IP Packet Header – TCP packet header – User services – Protocol Operation – Connection Establishment – UDP.

UNIT- III

Congestion control in Data Networks and Internets – Effects of Congestion – Congestion Control in Packet Switched Networks. Frame relay Congestion Control – Traffic rate Management – Congestion Avoidance. ATM Traffic and Congestion Control – Attributes – Traffic Management Framework – Traffic Control – ABR Traffic Management. TCP Traffic Control – Flow Control – TCP Congestion Control – Timer Management – Window Management.

UNIT-IV

Introduction to Quality of Service - Integrated Services – Differentiated Services – Protocols for QoS support - Resource Reservation (RSVP) – Multiprotocol Label Switching (MPLS) – Real-Time Transport Protocol (RTP).

UNIT- V

Introduction to Optical networks – Wavelength division multiplexing (WDM) – Introduction to broadcast-and-select networks - Switch architectures - channel accessing – Wavelength routed networks – Switch architectures - Routing and wavelength assignment – virtual topology design– IP over SONET over ATM over WDM – IP over ATM over WDM – IP over WDM.

REFERENCES

1. William Stallings, “High-Speed Networks and Internets”, Pearson Education, 2nd Edition, 2002. (Unit I, II, III, and IV)
2. Fred Halsall, “Multimedia Communications: Applications, Protocols, and Standards”, Pearson Education Asia, 2001. (Unit I and II)
3. Rajiv Ramaswami and Kumar N. Sivarajan, “Optical Networks: A Practical Perspective”, Morgan Kaufmann (Elsevier Indian Edition), 2nd Edition, 2004. (Unit II and V).
4. C. Siva Ram Murthy and Mohan Gurusamy, “WDM Optical Networks: Concepts, Design and Algorithms”, PHI, 2002. (Unit V)
5. Laon-Garcia and Widjaja, “Communication Networks: Fundamental Concepts and key Architectures”, Tata McGrawHill, 2000.
6. Behrouz A. Forouzan, “Data Communications and Networking”, Tata McGraw-Hill, 2nd edition, 2000.

CS 905 ADVANCES IN DATABASE SYSTEMS

UNIT – I

Overview of Existing DBMS Models - Introduction to commercial and open source database systems- Need for Special databases like multimedia, embedded, web, spatial, temporal databases-JDBC-ODBC.

UNIT – II

Query Processing basics and optimization – Heuristic Optimization – Cost, Size Estimation - Models of Transactions – Properties of Transactions – Concurrency Control – Recovery – Security and Authorization – Storage – Indexing and Hashing – ISAM – B-Trees – Kd Trees – X Trees – Dynamic Hashing.

UNIT – III

Distributed Databases – Principles – Design – Queries – Translation of Queries – Optimization Access Strategies – Management of Distributed Transactions – Concurrency Control – Reliability

UNIT – IV

Object Oriented Concepts – Data Object Models – Object Based Databases – Object Oriented Databases – Persistence – Issues in OODBMS - Object Oriented Relational Databases – Object Definition Languages – Object Query Languages – SQL3 - Concurrency in OODBs – Storage and Access – Data Access Interface Technologies – ADO – RDO - CORBA.

UNIT – V

Enhanced data models for Advanced applications - Multimedia Databases – Parallel Databases – Data Mining – Data warehousing – Spatial Database Concepts – Temporal Database Concepts – Active Databases -.Embedded databases-Web databases – The Web as a database application platform – Scripting Language: PHP and Ruby

REFERENCES

1. Abraham Silberchatz, Henry F. Korth and S.Sudarsan, “Database System Concepts”, 5th Edition, McGraw-Hill, 2006.
2. Ramez Elmasri and Shamkant B. Navethe, “Fundamentals of Database Systems”, 4th Edition, Pearson Education, 2004.
3. Thomas M. Connolly and Carolyn E. Begg, “Database Systems – A Practical Approach to Design, Implementation and Management”, 3rd edition, Pearson Education, 2003.
4. Jefrey D. Ullman and Jenifer Widom, “A First Course in Database Systems”, Pearson Education Asia, 2001.
5. Stefano Ceri and Giuseppe Pelagatti, “Distributed Databases Principles and Systems”, McGraw-Hill International Editions, 1985.
6. Rajesh Narang, “Object Oriented Interfaces and Databases”, Prentice Hall of India, 2002.

CS 906 ADVANCED SOFTWARE ENGINEERING

UNIT – I

Software Engineering Process Paradigms Project management Process and Project Metrics Software estimation Empirical estimation models planning Risk analysis Software project scheduling and Tracking.

UNIT – II

System, Process and Product Engineering Hierarchies Requirement Engineering and its phases, Building the Analysis Models: Concepts, Data Flow Model, Control Flow Model, State Charts and Transition Models, Quality Function Deployment, Language and Tools, Requirements Validation Metrics.

UNIT – III

Software Architecture: Introduction - Architecture Styles- Architecture for distributed applications - Case study for Instrumentation Software, Mobile Robotics, and Crusise control. Software Design Concepts and Principles, Data Design: Architectural Design Metrics, Design Structure Quality Index Estimation, User interface design models and process Interface Design Activities, Component Level Design and Notations, Component Level Design Metrics.

UNIT – IV

Principles of Software Testing White-Box Testing Techniques and its Variants, Black- Box Testing Techniques and its Variants, Integration, Validation and System Testing, Debugging. Agile and Iterative Development: Introduction-Iterative and Evolutionary-agile-motivation-Scrum-Extreme Programming-Unified Process.

UNIT – V

Software Quality Assurance Quality Metrics and Models, Software Reliability Theory Software Maintenance Software Configuration Management - Reverse Engineering and Re-engineering-Process Capability Maturity Models

REFERENCES

1. Roger Pressman.S, “Software Engineering: A Practitioner s Approach”, McGraw Hill, 4th Edition 1997.
2. Sommerville, “Software Engineering”, Adison Wesley, 8th Edition, 2008
3. Pfleeger, “Software Engineering”, Prentice Hall, 1999.
4. Carlo Ghezzi, Mehdi Jazayari and Dino Mandrioli, “Fundamentals of Software Engineering”, Prentice Hall of India, 1991.
5. Craig Larman, “Agile and Iterative Development: A Manager’s Guide”, Pearson Education, 2009.
6. M.Shaw and D. Garlan, “Software Architecture: Perspectives on an Emerging Discipline”, Prentice Hall of India Private Limited , New Delhi 2010

CS 921 SOFT COMPUTING

UNIT – I

Evolution of Computing - Soft Computing Constituents – From Conventional AI to Computational Intelligence - Machine Learning Basics

UNIT – II

Introduction to Genetic Algorithms (GA) – Applications of GA in Machine Learning - Machine Learning Approach to Knowledge Acquisition.

UNIT – III

Machine Learning Using Neural Network, Adaptive Networks – Feed forward Networks – Supervised Learning Neural Networks – Radial Basis Function Networks - Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance architectures – Advances in Neural networks.

UNIT – IV

Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions-Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making.

UNIT – V

Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification and Regression Trees – Data Clustering Algorithms – Rulebase Structure Identification – Neuro-Fuzzy Control – Case studies.

REFERENCES

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun and Eiji Mizutani, “Neuro-Fuzzy and Soft Computing”, Prentice-Hall of India, 2003.
2. George J. Klir and Bo Yuan, “Fuzzy Sets and Fuzzy Logic-Theory and Applications”, Prentice Hall, 1995.
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7. S.N.Sivanandam · S.N.Deepa, “Introduction to Genetic Algorithms”, Springer, 2007.
8. Jacek M. Zurada, “Introduction to Artificial Neural Systems”, PWS Publishers, 1992.

CS 922 DATA WAREHOUSING AND DATA MINING

UNIT – I

Data Warehousing and Business Analysis: - Data warehousing Components –Building a Data warehouse – Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.

UNIT – II

Data Mining: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation. Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.

UNIT – III

Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

UNIT – IV

Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

UNIT – V

Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.

REFERENCES

1. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Elsevier, 2nd Edition, 2008.
2. Alex Berson and Stephen J. Smith, “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill, 10th Reprint 2007.
3. K.P. Soman, Shyam Diwakar and V. Ajay, “Insight into Data mining Theory and Practice”, Prentice Hall of India, Easter Economy Edition, 2006.
4. G. K. Gupta, “Introduction to Data Mining with Case Studies”, Prentice Hall of India, Easter Economy Edition, 2006.
5. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “Introduction to Data Mining”, Pearson Education, 2007.

CS 923 SEMANTIC WEB AND KNOWLEDGE MANAGEMENT

UNIT - I

Introduction: Semantic web and Knowledge Management -roles of ontologies- Architecture for semantic web-based Knowledge Management- Tools for semantic web-based Knowledge Management

UNIT - II

Ontology Languages for the Semantic Web: Introduction- OIL and DAML+OIL Semantic web pyramid of languages- design rationale for OIL- OIL language constructs- Different syntactic forms- language layering- semantics- From OIL to DAML+OIL

UNIT - III

Ontology based Knowledge Management: Introduction- Feasibility Study- Kick off phase- Refinement phase- Evaluation phase- Maintenance and Evolution phase- Related WorkOntology Management- Storing, Aligning and Maintaining ontologies: The Requirement for Ontology Management- Aligning Ontologies- Supporting ontology change- organizing ontologies

UNIT - IV

Resource Description Framework: what is RDF- distinction between RDF model and syntax- RDF features- RDF and XML- non-contextual modeling data modeling using RDF schema- Need for an RDFS query language Ontologies for semantic web: introduction- reading the web- information extraction knowledge generation from natural language documents.

UNIT - V

Ontology based knowledge management- case studies - Semantic web tools

REFERENCES

1. J. Davies, “Towards the Semantic Web: Ontology-driven Knowledge Management”, John Wiley & Sons Ltd., 2003.
2. Tim Berners-Lee, “Spinning the Semantic Web: Bringing the World Wide Web to Its Full Potential”, The MIT Press, 2005.
3. Shelley Powers, “Practical RDF”, O'Reilly Media, Inc, 1st Edition, 2003.
4. John Davies, “Semantic Web Technologies: Trends and Research in Ontology based Systems”, Wiley, 2006.
5. Thomas B. Passin, “Explorer's Guide to the Semantic Web”, Manning Publications, 2004.
6. Lee W. Lacy, “Owl: Representing Information Using the Web Ontology Language”, Trafford Publishing, 2005.
7. Grigoris Antoniou and Frank van Harmelen, “A Semantic Web Primer-Cooperative Information Systems”, The MIT Press, 2004.

CS 924 KNOWLEDGE MANAGEMENT

UNIT - I

The value of Knowledge – Knowledge Engineering Basics – Knowledge Economy – The Task and Organizational Content – Knowledge Management – Knowledge Management Ontology.

UNIT - II

Knowledge Model Components – Template Knowledge Models –Reflective Knowledge Models– Knowledge Model Construction – Types of Knowledge Models.

UNIT - III

Knowledge Elicitation Techniques – Modeling Communication Aspects – Knowledge Management and Organizational Learning.

UNIT - IV

Case Studies – Designing Knowledge Systems – Knowledge Codification – Testing and Deployment – Knowledge Transfer and Knowledge Sharing – Knowledge System Implementation.

UNIT - V

Advanced Knowledge Modeling – Value Networks – Business Models for Knowledge Economy – UML Notations – Project Management.

REFERENCES

1. Guus Schreiber, Hans Akkermans, Anjo Anjewierden, Robert de Hoog, Nigel Shadbolt, Walter Van de Velde and Bob Wielinga, "Knowledge Engineering and Management", Universities Press, 2001.
2. Elias M.Awad and Hassan M. Ghaziri, "Knowledge Management", Pearson Education, 2003.
3. C.W. Holsapple, "Handbooks on Knowledge Management", International Handbooks on Information Systems, Vol 1 and 2, 2003.
4. Kurt Schneider, "Experience And Knowledge Management In Software Engineering" Springer, 2009

CS 925 REAL-TIME SYSTEMS

UNIT - I

Introduction to Real-Time system – Characteristics – Types of Real-Time tasks – Timing constraints –Real-Time Scheduling:- Basic concepts and classification of Algorithms – Clock-Driven Scheduling – Event-Driven Scheduling – Hybrid schedulers – EDF Scheduling – RM Scheduling and its Issues.

UNIT - II

Resource Sharing and Dependencies among Real-Time tasks:- Resource sharing in Real Time tasks, Priority Inversion, Priority Inheritance Protocol, Highest Locker Protocol, Priority Ceiling Protocol, Handling Task dependencies – Scheduling Real-Time Tasks in Multiprocessor and Distributed Systems – Resource Reclaiming in Multiprocessor Real- Time Systems – Fault-Tolerant Task Scheduling in Multiprocessor Real-Time Systems.

UNIT - III

Real-Time Operating System (RTOS):– Features of RTOS, Commercial Real-Time Operating Systems, Real-Time Databases:- Applications, Design issues, Characteristics of Temporal Data, Concurrency control, Commercial Real-Time Databases.

UNIT - IV

Real-Time Communication in Wide Area Networks:- Introduction, Service and Traffic Models and Performance Requirements, Resource Management, Switching Subsystem, Route Selection in Real-Time Wide Area Networks:- Basic Routing Algorithms, Routing during Real-Time Channel Establishment, Route Selection Approaches, Dependable Real-Time Channels.

UNIT - V

Real-Time Communication in a LAN – Soft Real-Time Communication in a LAN – Hard Real-Time Communication in a LAN – Bounded Access Protocols for LANs – Real-Time Communications over Packet Switched Networks – QoS requirements – Routing and Multicasting.

REFERENCES

1. Rajib Mall, “Real-Time Systems Theory and Practice”, Pearson Education, India, 2007.
2. C. Siva Ram Murthy and G. Manimaran, “Resource Management in Real-Time Systems and Networks”, Prentice-Hall of India, 2005.
3. Jane W.S. Liu, “Real-Time Systems”, Prentice Hall, USA, 2000.

CS 926 WEB SERVICES AND INTERNET ENGINEERING

UNIT – I

Web Technology - Web 2.0 technologies, Introduction to Ajax, Ajax Design Basics, Introduction to WWW, TCP/IP, HTTP, ARP, ICMP FTP, UDP, routing protocols (RIP, OSPF, BGP), Network Management Protocols (SNMP), and Application-level protocols (FTP, TELNET, SMTP), URL, Web Browsers, Web Servers.

UNIT – II

Web services, Evolution and differences with Distributed computing, XML - Name Spaces - Structuring With Schemas and DTD - Transformation - XML Infrastructure WSDL, SOAP, UDDI, ebXML - SOAP And Web Services in E-Com - Overview Of .NET And J2EE.

UNIT - III

Platform for Web Services Development, MVC Design Pattern, Web services - EJB, .NET, J2EE Architecture, J2EE Components & Containers, Specification, Application servers, Struts, Introduction to JSON.

UNIT - IV

Web Transactions, Coordination, Orchestration, and Choreography – tools BPEL, WS- CDL- Overview of Web service standards -BPEL4WS. WS-Security and the Web services security specifications, WSReliable Messaging, WS-Policy, WS-Attachments.

UNIT - V

Web Service Case Study - Web Service Search Engine, Web Service Discovery, WebService Composition. Web Service – SOAP vs Web Service – REST.

REFERENCES

1. Deitel, and Nieto, “Internet and World Wide Web – How to program”, Pearson Education Publishers, 2000.
2. Elliotte Rusty Harold, “Java Network Programming”, O’Reilly Publishers, 2002.
3. Ramesh Nagappan , Robert Skoczylas and Rima Patel Sriganesh, " Developing Java Web Services", Wiley Publishing Inc., 2004.
4. R. Krishnamoorthy & S. Prabhu, “Internet and Java Programming”, New Age International Publishers, 2004.
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7. McGovern, et al., "Java Web Services Architecture", Morgan Kaufmann Publishers, 2005.

CS 927 SERVICE ORIENTED ARCHITECTURE

UNIT - I

Software Architecture – Types of IT Architecture – SOA – Evolution – Key components – Patterns for SOA – Architectural Patterns – The Unified Process: Use Case Driven, Architecture Centric, Iterative, and Incremental – SOA programming models

UNIT - II

Service-oriented Analysis and Design – Design of Activity, Data, Client and business process services – Technologies of SOA – SOAP – WSDL – JAX – WS – XML WS for .NET – Service integration with ESB – Scenario – Business case for SOA – stakeholder objectives – benefits of SPA – Cost Savings

UNIT - III

SOA implementation and Governance – strategy – SOA development – SOA governance – trends in SOA – event-driven architecture – software s a service – SOA technologies – proof-of-concept – process orchestration – SOA best practices

UNIT - IV

Meta data management – XML security – XML signature – XML Encryption – SAML – XACML – XKMS – WS-Security – Security in web service framework - advanced messaging

UNIT - V

Transaction processing – paradigm – protocols and coordination – transaction specifications – SOA in mobile – research issues

REFERENCES

1. Shankar Kambhampaly, “Service –Oriented Architecture for Enterprise Applications”, Wiley India Pvt Ltd, 2008.
2. Eric Newcomer and Greg Lomow, “Understanding SOA with Web Services”, Pearson Education. 2006
3. Mark O’ Neill, et al., “Web Services Security”, Tata McGraw-Hill Edition, 2003.
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5. Ivar Jacobson, Grady Booch, and James Rumbaugh, “The Unified Software Development Process”, Addison Wesley Longman, 2002.

CS928 DATA COMPRESSION

UNIT – I

Compression - Definition – lossless compression - lossy compression - modeling and coding – compression measure - Shannon's source coding and channel coding theorems – Types of redundancy - transform coding – predictive coding – simple applications.

UNIT – II

Text Compression - Information theory concepts – entropy - Shannon-Fano coding – Huffman coding – arithmetic coding – dictionary-based coding – LZ77 – LZ78 – LZW – BWT - context-based coding.

UNIT – III

Audio Compression - Basics of digital audio – audio file formats (WAV, MIDI) - ADPCM in speech coding – vocoders – LPC – CELP – MELP – scalar quantization – vector quantization – Linde-Buzo-Gray algorithm - DPCM – MPEG audio compression.

UNIT – IV

Image Compression - Basics of digital image – image file formats (BMP, GIF, TIFF) – Color models in images - Discrete Fourier Transform – Discrete Cosine Transform – Discrete Wavelet Transform – Sub band coding - EZW – SPIHT – EBCOT - Image compression standards: JBIG, JPEG and JPEG 2000.

UNIT – V

Video Compression - Basics of digital video – video file formats (AVI, YUV) – color models in video – motion estimation and compensation - Video compression standards: MPEG-1, MPEG-2, MPEG-4, H.261, H.263 and H.264/AVC.

REFERENCES

1. David Salomon, "Data Compression: The Complete Reference", Springer International Edition, 3rd Edition New Delhi, 2005.
2. Khalid Sayood , "Introduction to Data Compression", Harcourt India Private Ltd., 2nd edition New Delhi, 2000.
3. Ze-Nian Li and Mark S. Drew, "Fundamentals of Multimedia" Pearson Education, New Delhi, 2004.
4. Mark Nelson and Jean-Loup Gailly, "The Data Compression Book", M&T Books, 2nd Edition, New York, 1996.
5. K. R. Rao and J. J. Hwang, "Techniques and standards for image, video and audio coding", Prentice Hall Inc., New Jersey, 1996.

CS 929 AGENT TECHNOLOGY

UNIT - I

Agent – Definition and Introduction – Abstract architectures for intelligent agents – Concrete architecture for intelligent agents – Agent Programming languages Multi-agent Systems and societies of Agents – Agent Communications – Agent Interaction Protocols.

UNIT - II

Distributed Problem Solving and Planning – Introduction – Task Sharing – Result Sharing – Distributed Planning – Distributed Planning and Execution. Search Algorithm for Agents – Constraint satisfaction – Path finding problem – two player games.

UNIT - III

Distributed Relation Decision making – Introduction Evaluation Criteria – Voting – Auctions – Bargaining – General Equilibrium market mechanisms – Contract nets – coalition formation Learning in multi-agent system – Learning and activity coordination – Learning about and from other agents – Learning and Communication.

UNIT - IV

Computational Organization Theory – Introduction Organizational Concepts useful in modeling organizations Formal Methods in DAI – Logic based representation and reasoning.

UNIT - V

Agents Development frameworks and languages – Development tools – applications of agents. Agent Oriented methodologies – Agent oriented analysis and design, Gaia methodology, MASE, OPEN process framework, Tropos, Agent UML.

REFERENCES

1. Gerhard Weiss, “Multi-agent system – A modern approach to Distributed Artificial Intelligent”, MIT press.
2. Michael Wooldridge, “Introduction to Multi-agent system”, John Wiley & Sons, 2002.
3. Walter Brenner et al, “Intelligent Software agents”, Springer.

CS 930 ADVANCED JAVA PROGRAMMING

UNIT - I

JAVA Basics - **Java** streaming - Networking - Event handling - Multithreading - Byte code Interpretation - Customizing application - Data Structures - Collection classes.

UNIT - II

Distributes Computing: Custom sockets - Remote Method Invocation - Activation - Object serialization -Distributed garbage collection - RMI - IIOP - Interface definition language - CORBA - JINI overview.

UNIT - III

JAVA Beans and Swing - Bean concepts - Events in bean box - Bean customization - Persistence - Application - deployment using swing - Advanced swing techniques - JAR file handling.

UNIT - IV

JAVA e-Applications - JNI - Servlets - Java Server Pages - JDBC - Session beans - Entity beans - Programming and deploying enterprise Java Beans - Java transactions.

UNIT - V

Related JAVA Techniques - Java Media Frame work - 3D graphics - Internationalization - Case study - Deploying n-tier application, E- commerce applications.

REFERENCES

1. Deitel & Dieter, "Java How to program", Prentice Hall, 8th Edition, 2009.
2. Gary Cornell and Cay S. Horstmann, "Core Java", Vol 1 and Vol 2, Sun Microsystems Press, 1999.
3. Stephen Asbury and Scott R. Weiner, "Developing Java Enterprise Applications", Wiley, 1998.

CS 931 SOFTWARE ARCHITECTURE

UNIT - I

Software Architecture - Bridging Software Requirement and Software Implementation-Architectural Styles-Quality Attributes-Guidelines for Software Architectural Design. Software Architecture Design Space - Types of Software Structures-Software Elements-Software Connectors-An Agile Approach to Software Architecture Design. Models for Software Architecture - UML for Software Architecture-Architecture Views-Architectural Description Languages (ADL).

UNIT - II

Object Oriented Paradigm - Introducing Object Oriented Paradigm -OO Analysis-OO Design-Design Principles. Data Flow Architecture - Batch Sequential-Pipe & Filter Architecture-Process-Control Architecture. Data Centered Software Architecture - Repository Architecture Style-Blackboard Architecture Style.

UNIT - III

Hierarchy Architecture - Main/Subroutine-Master/Slave-Layered-Virtual Machine. Implicit Asynchronous Communication Software Architecture - Non-Buffered Event-Based Implicit Invocations-Buffered Message-Based Software Architecture. Interaction Oriented Software Architecture - Model-View-Controller (MVC)-Presentation-Abstraction-Control (PAC).

UNIT - IV

Distributed Architecture - Introduction-Client/Server-Multi-tiers-Broker Architectural Style-Service-Oriented Architecture (SOA). Component-Based Software Architecture - Component-Principles of Component-Based Design. Heterogeneous Architecture - Methodology of Architecture Decision-Quality Attributes-Selection of Architectural Styles-Evaluation of Architecture Designs-Case Study: Online Computer Vendor.

UNIT - V

Architecture of Graphical User Interfaces - Evolution of User Interfaces -Look-and-Feel (Syntax) of User Interfaces-Usability (Semantics) of User Interfaces-Design Considerations of User Interfaces-Enabling Technology-Direct Manipulation-Evaluation of User Interfaces. Product Line Architectures - Introduction and Motivation-Domain Engineering: Institutionalizing Software Reuse-Product Line Architectures (PLA)-A Product Line Analysis Example.

REFERENCES

1. Kai Qian, Xiang Fu, Lixin Tao, Chomg-Wei Xu and Jorge L. Diaz-Herrera, “Software Architecture and Design Illuminated”, Jones & Bartlett Publishers, 2010.
2. Mary Shaw and David Garlan, “Software Architecture: Perspectives on an emerging discipline”, Prentice Hall of India, 2010.

CS 932 AD HOC AND SENSOR NETWORKS

UNIT - I

Introduction to Wireless Networks – Evolution of 3G Mobile Systems – Wireless LANs – Bluetooth – Scatternet – Piconet - Ad hoc Networks – Heterogeneity in Mobile Devices – Types of Ad hoc Mobile Communications – Types of Mobility – Challenges in Ad hoc Mobile Networks – Energy Management - Scalability – Addressing and Service Discovery - Deployment Considerations.

UNIT - II

MAC protocols for Ad hoc Networks: Design issues – Classifications – Contention based protocols – MACAW – FAMA – BTMA – DBTMA - MACABI – Real-Time MAC protocol – Multichannel protocols – Power aware MAC – Routing protocols: Design issues – Table-driven protocols – DSDV – WRP – CGSR – On-Demand protocols – DSR – AODV – TORA – LAR – ABR – Zone Routing Protocol – Power Aware Routing protocols.

UNIT - III

Multicast Routing – Preferred Link based Multicast – Mesh-based protocols – Core-Assisted Mesh protocol - Issues in Transport layer protocols – TCP over Ad hoc Networks – TCP Reno – Tahoe – Vegas – TCP SACK – Indirect TCP – Snooping TCP - Split-TCP – TCP-BuS – Quality of Service issues – MAC layer solutions – Network layer solutions – QoS framework for Ad hoc networks – INSIGNIA – INORA – SWAN.

UNIT - IV

Wireless Sensor Networks – Unique constraints and challenges - Applications – Collaborative processing – Architecture – Data Dissemination – MAC protocols – S-MAC – IEEE 802.15.4 and ZigBee – Geographic, Energy-Aware Routing – Attribute-based routing – Directed Diffusion – Rumor Routing - Geographic Hash Tables -GHT – Data Gathering – PEGASIS – Location Discovery – Localization – Communication and Sensing Coverage.

UNIT - V

Topology Control – Time Synchronization - Sensor Taking and Control – Sensor Selection – IDSQ – Cluster Leader-based Protocol – Joint Routing and Information Aggregation – Sensor Network Databases – Challenges – In-Network Aggregation – TinyDB query processing – Data-Centric Storage – Data Indices and Range Queries – Distributed Hierarchical Aggregation – Temporal Data – Platforms and Tools – Berkeley Motes – Programming Challenges – TinyOS – nesC – TinyGALS – ns2 extensions – TOSSIM – Actuators.

REFERENCES

1. C. Siva Ram Murthy and B. S. Manoj, “Ad Hoc Wireless Networks: Architectures and Protocols”, Pearson Education, 2007.
2. C. K. Toh, “Ad Hoc Mobile Wireless Networks: Protocols and Systems”, Pearson Education, 2007.
3. Feng Zhao and Leonidas Guibas, “Wireless Sensor Networks: An Information Processing Approach”, Morgan Kaufman Publishers, 2007.
4. Jochen Schiller, “Mobile Communications”, Pearson Education, 2009.

CS 933 DESIGN OF EMBEDDED SYSTEMS

UNIT - I

Embedded Computing - Challenges of Embedded Systems – Embedded system design process. Embedded processors – ARM processor – Architecture, ARM and Thumb Instruction sets

UNIT - II

Embedded C Programming - C-looping structures – Register allocation – Function calls – Pointer aliasing – structure arrangement – bit fields – unaligned data and endianness – inline functions and inline assembly – portability issues.

UNIT - III

Optimizing Assembly Code - Profiling and cycle counting – instruction scheduling – Register allocation – conditional execution – looping constructs – bit manipulation – efficient switches – optimized primitives.

UNIT - IV

Processes and Operating systems - Multiple tasks and processes – Context switching – Scheduling policies – Interprocess communication mechanisms – Exception and interrupt handling - Performance issues.

UNIT - V

Embedded System Development - Meeting real time constraints – Multi-state systems and function sequences. Embedded software development tools – Emulators and debuggers. Design methodologies – Case studies – Windows CE – Linux 2.6x and RTLinux – Coding and sending application layer byte stream on a TCP/IP network using RTOS Vxworks – Embedded system for a smart card.

REFERENCES

1. Andrew N Sloss, D. Symes and C. Wright, “ARM System Developers Guide”, Morgan Kaufmann / Elsevier, 2006.
2. Michael J. Pont, “Embedded C”, Pearson Education, 2007.
3. Wayne Wolf, “Computers as Component: Principles of Embedded Computer System Design”, Morgan Kaufmann / Elsevier, 2nd Edition, 2008.
4. Steve Heath, “Embedded System Design”, Elsevier, 2nd Edition, 2003.
5. Raj Kamal, “Embedded Systems – Architecture, Programming and Design”, 2nd Edition, McGraw-Hill companies, 2008

CS 934 TRUSTED INTERNET

UNIT - I

Introduction: Understanding the Internet's underlying architecture, connecting to the internet, Internet Service Providers (ISP), TCP/IP Suite and Internet Stack Protocols, Web Client Server Architecture, Internet Security Evolution.

UNIT - II

Internet Security: Security Issues, Real Threats that Impact Security, Securing the Web Client - Protecting Your Web Browser, Enhancing Web server security - Controlling Access, Extended Web Site Security Functionality, Securing Web Communications with SSL, VPNS.

UNIT - III

Trusted Systems and Security Policies: Trusted System Design, Trusted OS, Secure System Models, Security in Networks: Network Security Controls, IDS, Firewalls, Secure E-Mail. Internet Security Policies: Web Server and Web Browser policies.

UNIT - IV

E-Commerce Security: SET for E-Commerce Transactions, Business requirements for SET, SET System Participants, Dual Signature and Signature, Authentication and Message Integrity, Payment Processing.

UNIT - V

Secure Internet Programming, Security development life cycle, Internet Security Standards and Internet Security Products, Trusted Internet Security services.

REFERENCES

1. Charles Pfleeger and Shari Lawrence Pfleeger, "Security in Computing", Pearson Education Pvt Ltd, 4th Edition, 2006.
2. Man Young Rhee, "Internet Security Cryptographic Principles, Algorithms and Protocols", John Wiley & Sons Ltd, 2003.
3. John R. Vacca, "Practical Internet Security", Springer, 2007.
4. Preston Gralla and Michael Troller, "How the Internet Works", Que Publishers, 8th Edition.

CS 935 INTERNALS OF OPERATING SYSTEMS

UNIT I

Introduction to Kernel - Architecture of the UNIX operating system, System concepts, Data structures. Buffer Cache: Buffer header, Structure of Buffer pool, Reading and writing disk blocks. Files INODES, Structure of a regular file, Directories, Super block, Inode assignment.

UNIT II

System calls - OPEN, Read, Close, Write, Create, CHMOD, CHOWN, Pipes, Mounting and Unmounting. Process - Layout the system memory, Context, Process control, process creation, signals, Process scheduling, time, clock.

UNIT III

Inter-Process Communications - Process tracing, System V IPC, Shared Memory, Semaphores. Network Communications - Socket programming: Sockets, descriptors, Connections, Socket elements, Stream and Datagram Sockets.

UNIT IV

Windows Operating system - versions, Concepts and tools, Windows internals, System Architecture, Requirements and design goals, Operating system model, Architecture overview, Key system components. System mechanisms - Trap dispatching, object manager, Synchronization, System worker threads, Windows global flags, Local procedural calls, Kernel event tracing.

UNIT V

Windows Management Mechanisms - The registry, Registry usage, Registry data types, Local structure, Trouble shooting Registry problems, Registry Internals, Services, Applications, Accounts, Service control Manager, Windows Management Instrumentation, Processes, Threads, and Jobs: Process Internals, Flow of create process, Thread Internals, Examining Thread creation, Thread Scheduling, Job Objects.

REFERENCES

1. Maurice J. Bach, “The Design of the Unix Operating System”, Prentice Hall of India, 1991.
2. Mark E. Russinovich and David A. Solomon, “Microsoft® Windows® Internals”, 4th Edition, Microsoft Press, 2004.
3. William Stallings, “Operating Systems: Internals and Design Principles”, 5th Edition, Prentice Hall, 2005.

CS 936 CRYPTOGRAPHY

UNIT I

Introduction – Beginning with a simple communication game – Wrestling between safeguard and attack – Encryption symmetric techniques.

UNIT II

Encryption – Asymmetric techniques –Bit security of the basic public key cryptographic functions

UNIT III

Data Integrity Techniques –Authentication framework for public key cryptography.

UNIT IV

Formal and strong security definitions for public-key crypto systems – Provably secure and efficient public-key cryptosystems – Introduction – The optimal asymmetric encryption padding.

UNIT V

The Cramer–Shoup Public-key crypto systems – An overview of provably secure hybrid cryptosystems – Literature notes on practical and provably secure public-key cryptosystems – Strong and provable security for digital signatures.

REFERENCES

1. Wenbo Mao, "Modern Cryptography Theory and Practice", Pearson Education, 2004.
2. Atvl Kahate, "Cryptography and Network Security", Tata McGrew Hill, 2003.
3. William Stallings, "Cryptography and Network Security", 3rd Edition, Pearson Education, 2003.

CS 937 CLOUD AND UTILITY COMPUTING

UNIT-I

Introduction to Cloud Computing- The Evolution of Cloud Computing – Hardware Evolution – Internet Software Evolution – Server Virtualization - Web Services Deliver from the Cloud – Communication-as-a-Service – Infrastructure-as-a-Service – Monitoring-as-a-Service – Platform-as-a-Service – Software-as-a-Service – Building Cloud Network

UNIT-II

Federation in the Cloud - Presence in the Cloud - Privacy and its Relation to Cloud-Based Information Systems – Security in the Cloud - Common Standards in the Cloud – End-User Access to the Cloud Computing

UNIT –III

Introduction - Advancing towards a Utility Model – Evolving IT infrastructure – Evolving Software Applications – Continuum of Utilities- Standards and Working Groups - Standards Bodies and Working Groups – Service Oriented Architecture – Business Process Execution Language – Interoperability Standards for Data Center Management - Utility Computing Technology – Virtualization – Hyper Threading – Blade Servers - Automated Provisioning - Policy Based Automation – Application Management – Evaluating Utility Management Technology - Virtual Test and development Environment - Data Center Challenges and Solutions - Automating the Data Center

UNIT-IV

Software Utility Application Architecture - Characteristics of an SaaS - Software Utility Applications - Cost Versus Value - Software Application Services Framework - Common Enablers – Conceptual view to Reality – Business Profits - Implementing Database Systems for Multitenant Architecture

UNIT-V

Other Design Considerations - Design of a Web Services Metering Interface - Application Monitoring Implementation - A Design for an Update and Notification Policy - Transforming to Software as a Service - Application Transformation Program - Business Model Scenarios - Virtual Services for Organizations - The Future.

REFERENCES

1. John W. Rittinghouse and james F. Ransome, “Cloud Computing Implementation, Management and Security”, 2010, CRC Press, Taylor & Francis Group, Boca Raton London New York. [Unit -11 and Unit II]
2. Alfredo Mendoza, “Utility Computing Technologies, Standards, and Strategies”, Artech House INC, 2007. [Unit -11I to Unit V]
3. Bunker and Darren Thomson, “Delivering Utility Computing”, 2006, John Wiley & Sons Ltd.
4. George Reese, “Cloud Application Architectures”, O’reilly Publications, 2009.

CS 938 MOBILE AND PERVASIVE COMPUTING

UNIT I

Wireless networks- emerging technologies- Blue tooth, WiFi, WiMAX, 3G ,WATM.-Mobile IP protocols -WAP push architecture-Wml scripts and applications.

UNIT II

Mobile computing environment—functions-architecture-design considerations, content architecture -CC/PP exchange protocol, context manager. Data management in WAE-Coda file system- caching schemes- Mobility QOS. Security in mobile computing.

UNIT III

Handoff in wireless mobile networks-reference model-handoff schemes. Location management in cellular networks - Mobility models- location and tracking management schemes- time, movement, profile and distance based update strategies. ALI technologies.

UNIT IV

Pervasive Computing- Principles, Characteristics- interaction transparency, context aware, automated experience capture. Architecture for pervasive computing- Pervasive devices- embedded controls.- smart sensors and actuators -Context communication and access services

UNIT V

Open protocols- Service discovery technologies- SDP, Jini, SLP, UpnP protocols–data synchronization- SyncML framework - Context aware mobile services -Context aware sensor networks, addressing and communications. Context aware security.

REFERENCES

1. Ivan Stojmenovic, “Handbook of Wireless Networks and Mobile Computing”, John Wiley & sons Inc, Canada, 2002.
2. Asoke K Taukder and Roopa R Yavagal, “Mobile Computing”, Tata McGraw Hill Pub Co. , New Delhi, 2005.
3. Seng Loke, “Context-Aware Computing Pervasive Systems”, Auerbach Pub., New York, 2007.
4. Uwe Hansmann etl , “Pervasive Computing”, Springer, New York, 2001.

Infrastructure and Faculty requirements for M.Tech(CSE)

Faculty–student ratio: **1:12** (As per AICTE norms for intake of 18: 1 Professor, 1 Associate Professor, 1 Assistant Professors)

Class room Equipment: Multimedia Projector, Black Board

Teacher qualification Specilzation : M.Tech. in Computer Science and Engineering

Class Room: **2, with the area of 30 sq.m**

Laboratory: 1

Resources	**Batch size of 25 students**
Computer System : Server	1 No.
Computer systems: node	18 No connected in LAN
UPS	Minimum of 5 KVA
Printer	2 No.
User License required for software (proprietary)	Minimum 18 No.
Software	1. Microsoft Server OS/ Linux Server OS/ UNIX Server OS/Any open source server OS / any Proprietary Server OS software 2. Proprietary/ open source clients 3. Borland C Compiler / Microsoft C compiler/ any open source C compiler/ any Proprietary C compiler 4. Java development Kit (Latest Version) 5. Microsoft Visual Studio With .Net Framework 6. DB2 Server / ORACLE server/ SQL Server/ Open source DBMS server software 7. Network simulator 8. Open MP