

SCHEME AND SYALLABUS
M. Tech. Computer Science & Engineering
Evaluation Schemes form I Year to IV Year
w.e.f. 2017-2018



G. B. PANT ENGINEERING COLLEGE
GHURDAURI, PAURI GARHWAL, Uttarakhand-246194
(An Autonomous Institution of the Government of Uttarakhand)

EVALUATION SCHEME

M.TECH. 1ST Year 1ST Semester (Computer Science & Engineering)
Effective from session 2017-18

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME				
						SESSIONAL EXAM			ESE	Subject Total
			L	T	P	CT	TA	Total		
THEORY										
1.	TCS 511	Advanced Computer Networks	3	1	-	30	20	50	100	150
2.	TCS 512	Advanced Operating Systems	3	1	-	30	20	50	100	150
3.	TCS 513	Mathematical Concepts for Computer Science	3	1	-	30	20	50	100	150
4.	ECS 51X	Elective-1	3	1	-	30	20	50	100	150
5.	ECS 51Y	Elective-2	3	1	-	30	20	50	100	150
PRACTICAL										
6.	PCS 511	Computer Networks (Pr)	-	-	3	-	-	50	50	100
7.	PCS 512	Operating Systems (Pr)	-	-	3	-	-	50	50	100
8.	GPP 511	General Proficiency	-	-	-	-	50	50	-	50
SEMESTER TOTAL			15	5	6	150	150	400	600	1000

List of Elective I		List of Elective II	
ECS 510	Theoretical Foundations of Computer Science	ECS 515	Advanced Software Engineering
ECS 511	Advanced Programming Language	ECS 516	Advanced Computer Architecture
ECS 512	Digital Image Processing	ECS 517	Advanced Data Structures & Algorithms
ECS 513	Advanced Microprocessor	ECS 518	Internet Technology
ECS 514	Research Methodology	ECS 519	Cryptography and Computer Security

Note: Minimum five students are required to run an elective subject.

EVALUATION SCHEME

M.TECH. 1ST Year 2ND Semester (Computer Science & Engineering)
Effective from session 2017-18

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME			ESE	Subject Total
						SESSIONAL EXAM				
			L	T	P	CT	TA	Total		
THEORY										
9.	TCS 521	Advances in Database Technology	3	1	-	30	20	50	100	150
10.	TCS 522	Mobile Computing Networks	3	1	-	30	20	50	100	150
11.	TCS 523	Information Security	3	1	-	30	20	50	100	150
12.	ECS 52X	Elective-III	3	1	-	30	20	50	100	150
13.	ECS 52Y	Elective-IV	3	1	-	30	20	50	100	150
PRACTICAL										
14.	PCS 521	Advances in Database Technology(Pr)	-	-	3	-	-	50	50	100
15.	PCS 522	Mobile Computing Networks (Pr)	-	-	3	-	-	50	50	100
16.	GPP 521	General Proficiency	-	-	-	-	50	50	-	50
SEMESTER TOTAL			15	5	6	150	150	400	600	1000

List of Elective III		List of Elective IV	
ECS 520	VLSI System Design	ECS 525	Artificial Intelligence and Expert Systems
ECS 521	Embedded System Design	ECS 526	Data Warehousing and Mining
ECS 522	Advanced JAVA Programming	ECS 527	Modeling and Simulation
ECS 523	Neural Networks	ECS 528	Software Verification, Validation & Testing
ECS 524	Genetic Algorithms	ECS 529	Distributed Computing

Note : Minimum five students are required to run an elective subject.

EVALUATION SCHEME

M.TECH. 2nd Year 3rd Semester (Computer Science & Engineering)
Effective from session 2017-18

S. No.	COURSE CODE	SUBJECT	PERIODS			SESSIONAL EXAM			ESE	Subject Total
			L	T	P	CT	TA	Total		
			THEORY							
17.	ECS 63X	Elective –V	3	1	-	30	20	50	100	150
18.	ECS 63Y	Elective –VI	3	1	-	30	20	50	100	150
PRACTICAL										
19.	PCS 631	Dissertation Phase-I	-	-	6	-	-	300	200	500
20.	PCS 632	Seminar	-	-	3	-	-	50	50	100
21.	PCS 633	Creative Problem Solving	-	-	3	-	25	25	25	50
22.	GPP 631	General Proficiency	-	-		-	50	50	-	50
SEMESTER TOTAL			6	2	9	60	115	525	475	1000

List of Elective V		List of Elective VI	
ECS 630	Advanced Data Modeling	ECS 635	Fault Tolerant Systems
ECS 631	Clouding Computing	ECS 636	Fuzzy Logic & Design
ECS 632	Web mining	ECS 637	Network Programming
ECS 633	Robotics	ECS 638	Cyber Law
ECS 634	Medical Imaging	ECS 639	Ad Hoc and Sensor Network

Note:- Minimum five students are required to run an elective subject.

EVALUATION SCHEME

M.TECH. 2nd Year 4th Semester (Computer Science & Engineering)
Effective from session 2017-18

S. No.	COURSE CODE	SUBJECT	EVALUATION SCHEME							
			PERIODS			SESSIONAL EXAM			ESE	Subject Total
			L	T	P	CT	TA	Total		
THEORY										
23.	PCS 641	Dissertation Phase - II	-	-	20	450	-	450	500	950
24.	GPP 641	General Proficiency	-	-	-	-	50	50	-	50
Total			-	-	20	450	50	500	500	1000

TCS 511: Advanced Computer Networks
M.Tech. Semester –I (Computer Science & Engg.)

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3 1 -

Class Work :50 Marks
Exam. :100 Marks
Total :150 Marks
Duration of Exam : 3 Hrs.

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.

TCS 512: Advanced Operating Systems
M.Tech. Semester –I (Computer Science & Engg.)

L **T** **P**
3 **1** **-**

Class Work **:50 Marks**
Exam. **:100 Marks**
Total **:150 Marks**
Duration of Exam **: 3 Hrs.**

UNIT- I

Operating System Introduction, Structures, Simple Batch, Multi programmed, time-shared, Personal Computer, Parallel, Distributed Systems ,Real-Time Systems , System components, Operating-System services, System Calls, Virtual Machines, System Design and Implementation.

UNIT- II

Process and CPU Scheduling , Process concepts and scheduling, Operation on processes, Cooperating Processes, Threads, and Interposes Communication Scheduling Criteria, Scheduling Algorithm, Multiple - Processor Scheduling, Real-Time Scheduling.

UNIT- III

Memory Management and Virtual Memory, Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging. Demand Paging , Performance of Demanding Paging , Page Replacement ,Page Replacement Algorithm, Allocation of Frames, Thrashing.

UNIT- IV

File System Interface and Implementation -Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management, Directory Management, Directory Implementation, Efficiency and Performance.

Deadlocks - System Model, Dead locks Characterization, Methods for Handling Dead locks Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock.

UNIT- V

Process Management and Synchronization - The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors

REFERENCES

1. Peterson, J.L. & Silbersehatz, A: Operating System Concepts, Addison, Wesley-Reading.
2. Brineh, Hansen: Operating System Principles, Prentice Hall of India.
3. Haberman, A.N: Introduction to Operating System Design Galgotia Publication, New Delhi.
4. Hansen, P.B: Architecture of Concurrent Programs, PHI.
5. Shaw, A.C: Logic Design of Operating Systems, PHI.
6. Mukesh Singhal & N.G. Shivaratri: Advanced concepts in operating systems, TMH 2001.
7. A S Tanenbaum : Modern Operating Systems, PHI.
8. A. Silberschatz, P. Galving, G. Gahne : Applied operating system concepts, Wiley.

TCS 513: Mathematical Concepts for Computer Science
M.Tech. Semester –I (Computer Science & Engg.)

L **T** **P**
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Class Work **:50 Marks**
Exam. **:100 Marks**
Total **:150 Marks**
Duration of Exam **: 3 Hrs.**

Unit - I

Finite state machines (FSM): FSM as models of physical systems, equivalent machines, FSM as language recognizers, finite state languages & type-3 languages.

Unit - II

Recurrence relations: derivation of recurrence relations from the general behavior of Systems. Solutions of Recurrence relations. Groups, Subgroups, Cyclic Group, Rings, Integral domains, Isomorphism & Homeomorphisms.

Unit - III

Graphs & planar Graphs: Shortest path, Trees & Cut sets, Rooted Trees, Minimum Spanning Trees, and Transport Networks.

Unit - IV

Z- transform, inverse Z-transform, convolution theorem, Discrete Fourier Transform (DFT), Fast Fourier Transform (FFT), linearity, symmetry, time and frequency shifting, convolution and correlation of FFT and DFT,

Unit - V

Random Variables: Stochastic Processes, Discrete parameter Markov Chains, Limiting state probabilities, State classification, Irreducible Markov Chains, Birth-Death processes.

REFERENCES

1. C. L. Liu, Elements of Discrete Mathematics, 1985, McGraw-Hill.
2. Kishore.S.Trivedi, Statistical Models for Computer Science Applications, PHI.
3. Ronald Graham, Donald Knuth and Oren Patashik, Concrete Mathematics: A foundation for Computer Science, 1989, Addison-Wesley.
4. Judith L. Gersting, Mathematical structures for Computer Science, 1993, Computer Science Press.
5. Doerr and Lefasseur, Applied discrete structures for Computer Science, (Chicago: 1985, SRA)
6. A. Chetwynd and P. Diggle, Discrete Mathematics, (Modular Mathematics series), 1995, Edward Arnold, London.
7. S. Lipschutz, Schaums Outline series: Theory and Problems of Probability 1982, McGraw-Hill Singapore.
8. B. Kolman and R. C. Busby, Discrete Mathematical Structures, 1996, PHI.
9. Trembley & Manohar, Discrete Mathematical Structures with Applications to Computers, 1995, McGraw-Hill.

ECS 510: Theoretical Foundations of Computing Science
M.Tech. Semester –I (Computer Science & Engg.)

L **T** **P**
3 **1** **-**

Class Work **:50 Marks**
Exam. **:100 Marks**
Total **:150 Marks**
Duration of Exam **: 3 Hrs.**

Unit - I

Type and compositions of relations, Pictorial representation of relations, Equivalence relations, Partial ordering relation. Function: Types, Composition of function, Recursively defined function Mathematical Induction: Piano's axioms, Mathematical Induction, Discrete Numeric Functions and Generating functions, Simple Recurrence relation with constant coefficients, linear recurrence relation without constant coefficients, Asymptotic Behavior of functions, Algebraic Structures: Properties, Semi group, monoid, Group, Abelian group, properties of group, Subgroup, Cyclic group, Cosets, Permutation groups, Homomorphism, Isomorphism and Automorphism of groups.

Unit - II

Propositional Logic: Preposition, First order logic, Basic logical operations, Tautologies, Contradictions, Algebra of Proposition, Logical implication, Logical equivalence, Normal forms, Inference Theory, Predicates and quantifiers, Posets, Hasse Diagram,

Unit - III

Lattices: Introduction, Ordered set, Hasse diagram of partially ordered set, Consistent enumeration, Isomorphic ordered set, Well ordered set, Lattices, Properties of lattices, Bounded lattices, Distributive lattices, and Complemented lattices.

Unit - IV

Introduction to defining language, Kleene Closure, Arithmetic expressions, Chomsky Hierarchy, Regular expressions, Generalized Transition graph. finite Boolean algebra, functions of Boolean algebra.

Unit - V

Conversion of regular expression to Finite Automata, NFA, DFA, Conversion of NFA to DFA, Optimizing DFA, FA with our Moore machine, Mealy machine, Conversions.

REFERENCES

1. Kenneth H. **Rosen**, "Discrete Mathematics and Its Applications", Sixth Edition, 2008, Tata McGraw-Hill (TMH) Publications Pvt. Ltd., New Delhi.
2. D. S. **Malik** & M. K. Sen, "Discrete Mathematical Structures", First Edition, 2005, CENGAGE Learning India Pvt. Ltd., New Delhi.
3. Judith L. **Gersting**, "Mathematical Structures for Computer Science: A Modern treatment to Discrete Mathematics", Fifth / Sixth Edition (Asian Student Editions), 2008, W. H. Freeman & Company, New Delhi.

**ECS 511: Advanced Programming Language
M.Tech. Semester –I (Computer Science & Engg.)**

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Class Work **:50 Marks**
Exam. **:100 Marks**
Total **:150 Marks**
Duration of Exam **: 3 Hrs.**

Unit - I

Introduction Brief history of Programming Language, Characteristics of programming language, The structure and operation of a computer, Hardware and firmware computers, Translator and simulator computers, Syntax, semantics and virtual computers, hierarchies of computers, binding and binding time

Elementary Data Types, Data object, variable and constants, data types, specification of elementary data types, declarations, type checking and type conversion, assignment and initialization, numeric data types, enumerations, Boolean, characters

Structured Data Types, Structured data object and data types, specification of data structure types, implementation of data structure types, declarations and type checking for data structures, vector and arrays, record, character strings, variable sized data structures, pointers and programmer-constructed data objects, sets, file and input/output

Unit - II

Subprogram and Programmer-Defined Data Types, Evolution of the data type concept, Abstraction, encapsulation, and information hiding, subprogram, type definitions, abstract data types

Sequence Control, Implicit and explicit sequence control, sequence control within expression, sequence control between statements, subprogram sequence control, recursive subprogram, exceptions and exception handlers, Co-routines, scheduled subprograms, tasks and concurrent execution, data structures and sequence control.

Data Control, names and referencing environments, static and dynamic scope, block structure, local data and local referencing environments, shared data, task and shared data.

Unit - III

Storage Management, Major Runtime elements requiring storage, programmer and system controlled storage management, storage management phases, static storage management, stack based storage management, heap storage management

Unit - IV

Syntax And Translation: General syntactic criteria, syntactic elements of language, stages in translation, formal definition of syntax.

Unit - V

Operating and Programming Environment: Batch processing environment, interactive environments, embedded system environments, programming environments

Theoretical Models: Problem in syntax and translation, problem in semantic

REFERENCES

1. Programming Languages, design and implementation second edition by Terrence W. Pratt Prentice Hall of India pvt.ltd. New Delhi

ECS 512: Digital Image Processing
M.Tech. Semester –I (Computer Science & Engg.)

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Class Work **:50 Marks**
Exam. **:100 Marks**
Total **:150 Marks**
Duration of Exam **: 3 Hrs.**

Unit - I

Introduction and Digital Image Fundamentals, Elements of a Digital Image Processing system, Structure of the Human eye, sampling and Quantization, Neighbours of a pixel, Distance measures. Image Transform: Fourier transform, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, KL transform, Wavelet transform.

Unit -II

Image Enhancement, Spatial domain enhancement, gray level transformations, histogram processing, smoothing spatial filters, sharpening spatial filters, combining spatial enhancement methods. Frequency domain enhancement, filtering in frequency domain, smoothing frequency domain filters, sharpening frequency domain filters, homomorphic filtering.

Unit –III

Image Restoration, Image degradation/restoration process model, Noise models, and properties of noise, probability density function, periodic noise, and estimation of noise parameters, Restoration by spatial filtering: mean filters, order statistics filters. Periodic noise reduction by frequency domain filtering: band reject, band pass, and notch filters, Inverse filtering, Wiener filtering, Geometric mean filter.

.Unit –IV

Image Compression, Image compression models: source encoder and decoder, channel encoder and decoder, Elements of information theory: measuring information, information channel, fundamental coding theorems. Errorfree compression: variable length coding, LZW coding, bit-plane coding, loss-less predictive coding, Lossy compression: lossy predictive coding, transform coding, wavelet coding, JPEG compression, MPEG standards

Unit –V

Image Segmentation, Detection of discontinuities: point, line and edge detection, Edge linking and boundary detection. Thresholding: global thresholding, optimal thresholding, local thresholding, thresholds based on several variables. Region based segmentation, Case Study: Applications of segmentation in industry, medicine, and defense related images.

REFERENCES

1. Rafael C. Conzalez & Richard E. Woods, Digital Image Processing , AWL.
2. A.K. Jain, Fundamental of Digital Image Processing , PHI.
3. Rosefield Kak, Digital Picture Processing, W.K. Pratt, Digital Image Processing

ECS 513: Advanced Microprocessors
M.Tech. Semester –I (Computer Science & Engg.)

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Class Work	:50 Marks
Exam.	:100 Marks
Total	:150 Marks
Duration of Exam	: 3 Hrs.

Unit -I

Processor Design, The evolution of microprocessors, instruction set processor design, principles of processor performance, instruction-level parallel processing, conventional CISC & RISC architecture.

Pipelined Processors Design, Pipelining fundamentals, Pipeline hazards & pipelined processor design using hazard resolution techniques.

Super Scalar Processor, Limitation of scalar pipelining, from scalar to super scalar pipelines, super scalar pipeline overview, super scalar techniques: instruction flow techniques, register data flow techniques, memory data flow techniques.

Unit- II

The Power PC 620, Introduction, instruction fetching, instruction dispatching, instruction execution, instruction completion. Intel's P6 Micro-architecture: Introduction, pipelining, the in-order front end, the out-of-order core, retirement, memory subsystem

Unit -III

The VLIW Architecture, Basic principles, overview of proposed and commercial VLIW architecture, case study: the trace 200 family.

Advanced Instruction flow techniques, Static Branch prediction, Dynamic Branch prediction, Hybrid Branch prediction,

Advanced Register Data flow techniques, Value locality & Redundant execution, Value locality without speculation, Value locality with speculation.

Unit-IV

Execution of multiple threads, Synchronizing Shared memory threads, Explicitly multithreaded processors, Implicitly multithreaded processors.

Unit-V

Advanced Memory Technology: SRAM, SDRAM, flash memory, dual port memory, cache memory, interleaved memory.

Microprocessor Based Applications: Case studies.

REFERENCES

1. Modern Processor Design – Shen & Lipasti [TMH]
2. Advance Microprocessor - Rafiquzzaman [PHI]
3. The Pentium Microprocessor – Antonakos [Pearson]
4. An Introduction to Intel Family of Microprocessors - Antonakos [Pearson]
5. Microprocessor: Principles and Applications - Gillmore [TMH]

ECS 514: Research Methodology
M.Tech. Semester –I (Computer Science & Engg.)

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Class Work **:50 Marks**
Exam. **:100 Marks**
Total **:150 Marks**
Duration of Exam **: 3 Hrs.**

UNIT-I

Research: Meaning, Purpose, Types of research, significance of research in science, engineering, and technology.

Steps in Research: Identification, selection and formulation of research problem, Research questions, Research design, Formulation of hypothesis, Review of literature.

UNIT-II

Sampling Technique: Sampling theory, Types of sampling, Steps in sampling, Sampling and Non-sampling error, Sample size, Advantages and limitations of sampling.

Data for Research: Primary data, Meaning, Collection methods, Observation, Interview, Questionnaire, Schedule, Pretest, Pilot study, Experimental and case studies, Secondary data, Meaning, Relevance, limitations and cautions.

Processing Data: Checking, Editing, Coding, Transcriptions and Tabulation, Data analysis, Meaning and methods, Quantitative and Qualitative analysis.

UNIT-III

Analysis and Interpretation of Data: Central Tendency of Data, Average, Median, Mode, Skewness, Frequency, Distribution Dispersion, Standard Deviation, Kurtosis

Meaning of relationship, Correlation, Procedure for assigning Ranks, Testing of correlation, Partial correlation, Regression analysis, Relationship Between correlation, Coefficient and regression coefficient
Multiply Regression Analysis

UNIT-IV

Testing, Measurement and Scaling: Hypothesis Testing, Null Hypothesis & Alternate Hypothesis, Test of Hypothesis, Parametric Test, 'F' test, 'Z' test, 't' test.

Parametric Test, Fundamental of Hypothesis Testing, Test Procedure.

ANOVA & Chi-square Tests, Analysis of Variance, χ^2 Test and Goodness of Fit.

Measurement and scaling Techniques, Ordinal Measurement, Internal Measurement, Ratio Measurement, Reliability, validity scale.

UNIT-V

Structuring the Report: Chapter format, Pagination, Identification, Using quotations, Presenting footnotes, abbreviations, Presentation of tables and figures, Referencing, Documentation, Use and format of appendices, Indexing.

Research Report: Types of reports, Contents, Styles of reporting, Steps in drafting reports, Editing the final draft, Evaluating the final draft.

REFERENCES

1. C.R. Kothari, Research Methodology Methods and Techniques, 2/e, Vishwa Prakashan, 2006.
2. Donald H. McBurney, Research Methods, 5/e, Thomson Learning, 2006.
3. Donald R. Cooper, Pamela S. Schindler, Business Research Methods, 8/e, Tata McGraw-Hill Co Ltd, 2006.

ECS 515: Advanced Software Engineering
M.Tech. Semester –I (Computer Science & Engg.)

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Class Work :50 Marks
Exam. :100 Marks
Total :150 Marks
Duration of Exam : 3 Hrs.

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 Cruise 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”, Addison 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.

**ECS 516: Advanced Computer Architecture
M.Tech. Semester –I (Computer Science & Engg.)**

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Class Work	:50 Marks
Exam.	:100 Marks
Total	:150 Marks
Duration of Exam	: 3 Hrs.

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 Techniques, 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 Parallelization 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.

ECS 517: Advanced Data Structures And Algorithms
M.Tech. Semester –I (Computer Science & Engg.)

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Class Work	:50 Marks
Exam.	:100 Marks
Total	:150 Marks
Duration of Exam	: 3 Hrs.

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.

ECS 518: Internet Technology
M.Tech. Semester –I (Computer Science & Engg.)

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Class Work **:50 Marks**
Exam. **:100 Marks**
Total **:150 Marks**
Duration of Exam **: 3 Hrs.**

Unit I

Basic Principles: Evolution of Internet, Internet services, Internet protocols and standardization, TCP/IP, Review of Network technologies. Architectural model, Application level, Network level, Properties of the Internet, Interconnection through IP Gateways or routers, Internet and Intranet.

Unit II

Addressing Schemes: Introduction, Universal identifiers, Three primary classes of IP addresses, Classless IP address, Network and Broadcast addresses, Mapping internet addresses to physical addresses (ARP), ARP protocol format, Transport Gateways and subnet addressing, Multicast addressing.

Protocols : Reliable and unreliable delivery, Connectionless delivery system, Routing direct and indirect delivery, Table driven IP routing, Protocol layering, Reliable stream transport, TCP performance, Bootstrap protocol (BOOTP).

Unit III

Routing : The origin of Gateway routing tables, Original Internet Architecture and Cores, Core Gateways, Automatic route propagation, Vector distance (Bellman-Ford), routing, Gateway to Gateway Protocol (GGP), Autonomous system concept, Exterior Gateway Protocol (EGP), Interior Gateway Protocol (RIP, OSPF, HELLO), Routing Information Protocol (RIP), Combining RIP, HELLO, and EGP, Routing with partial information.

Unit IV

Enterprise Networking : Corporate networking, Broadband at the Metropolitan area level, High speed dedicated WAN services and switched WAN services, ISDN, BISDN and ATM services, Frame relay technology and services, Virtual private network concepts PPTP protocol.

Unit V

Internet Servers: DNS, DHCP Servers, FTP, TELNET, E-Mail

Firewall & Networking : Introduction, Implementation of Firewall, Activities of Firewall, Configuration of firewall, Firewalls & SSL, SSL implementation, Bit implementation of SSL, Use of SSL.

REFERENCES

1. Computer Networks and Internets - Douglas E. Comer; PE.
2. Communication Networks - Leon-Garcia-Widjaja; TMH.
3. Internetworking with TCP / IP - Douglas E .Comer; PE.
4. TCP/IP protocol suite - Forouzan Behrouz A; TMH.
5. Computer Networks – Andrew S. Tannenbaum; PHI.
6. Data and Computer Communication - William Stallings; PHI.
7. The Complete reference of Networking - Craig Zacker; TMH.

ECS 519: Cryptography and Network Security
M.Tech. Semester –I (Computer Science & Engg.)

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Class Work	:50 Marks
Exam.	:100 Marks
Total	:150 Marks
Duration of Exam	: 3 Hrs.

Unit -I

Introduction and Mathematical Tools : Ciphers and Secret Messages, Security Attacks and Services, Substitutions and Permutations, Modular Arithmetic, Euclid's Algorithm, Finite Fields, Polynomial Arithmetic, Discrete Logarithms

Unit -II

Symmetric Encryption Algorithms: Theory of Block Cipher Design, Feistel Cipher Network Structures, DES and Triple DES, Modes of Operation (ECB,CBC, OFB,CFB), Strength (or Not) of DES, IDEA, CAST, Blowfish, Twofish, RC2, RC5, Rijndael (AES), Key Distribution, Pseudo random sequences, Linear Congruential Generators, Cryptographic Generators, Design of Stream Cipher, One Time Pad

Unit -III

Asymmetric Key Cryptography: Prime Numbers and Testing for Primality, Factoring Large Number, RSA, Diffie-Hellman, ElGamal, Key Exchange Algorithms, Public-Key Cryptography Standards, Message Authentication, MD5, SHA, RIPEMD, HMAC, Digital Signatures, Certificates, User Authentication, Digital Signature Standard (DSS and DSA), Security Handshake Pitfalls, Elliptic Curve Cryptosystems

Unit -IV

Authentication, e-mail and web security: Kerberos V4 and V5, X.509 Authentication Service, Pretty Good Privacy (PGP), S/MIME, X.400, IPsec and Virtual Private Networks, Secure Sockets and Transport Layer (SSL and TLS), Electronic Payment Systems, Secure Electronic Transaction (SET), CyberCash, iKey Protocols, eCash (DigiCash)

Unit -V

Digital Watermarking and Steganography

REFERENCES

1. Wenbo Mao, Modern Cryptography: Theory and Practice, Prentice Hall, 2004
2. William Stallings, Cryptography and Network Security, 3Ed, Prentice Hall PTR, 2003
3. Richard A. Mollin, An Introduction to Cryptography, Chapman and Hall/CRC, 2001.
4. B. Schneier, Applied Cryptography, John Wiley and Sons, NY, 1996.
5. A. Menezes, P. Oorschot, and S. Vanstone, Handbook of Applied Cryptography, CRC Press, Boca Raton, FL, 1997.
6. Thomas H. Barr, Invitation to Cryptography, Prentice Hall, 2002.
7. Richard J. Spillman, Classical and Contemporary Cryptology, Prentice Hall, 2005.
8. D.Stinson, Cryptography: Theory and Practice, Second Edition (ISBN: 1584882069) Chapman & Hall; 2002.
9. Dorothy E. Denning Information Warfare and Security , Addison Wesley 1999

PCS 511: Computer networks (Pr)
M.Tech. Semester –I (Computer Science & Engg.)

L	T	P
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Class Work	:50 Marks
Exam.	:50 Marks
Total	:100 Marks
Duration of Exam	: 3 Hrs

Prerequisites: Knowledge of C/C++ Programming and basic data structures is essential.

The experiments will be based on the following Paper- TCS 511 **Advanced Computer network**

PCS 512: Operating Systems (Pr)
M.Tech. Semester –I (Computer Science & Engg.)

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Class Work	:50 Marks
Exam.	:50 Marks
Total	:100 Marks
Duration of Exam	: 3 Hrs

Prerequisites : Knowledge of C/C++ Programming is essential.

The experiments will be based on the following paper: TCS 512 **Advanced Operating Systems**

TCS 521: Advances in Database Technology
M.Tech. Semester –II (Computer Science & Engg.)

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Class Work	:50 Marks
Exam.	:100 Marks
Total	:150 Marks
Duration of Exam	: 3 Hrs

Unit -I

Relational Data Base Design and Architecture: DBMS Architecture, Data base models, Normal Forms Based on Primary Keys, (1NF, 2NF, 3NF & BCNF), Lossless Join and Dependency Preserving Decomposition. Multivalued and Join Dependencies, Template Dependency, Inclusion and Generalized Functional Dependency.

Unit -II

SQL–A Relational Database Language, Data Definition in SQL, View and Queries in SQL, Specifying Constraints ,Indexes, Triggers in SQL.

Unit -III

Concurrency control & Recovery: Transaction Concept and State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, **Concurrency Control Techniques**, Lock-Based Protocols, Timestamp-based Protocols, Validation – based Protocols, Multiversion Schemes, Deadlock Handling, **Recovery System**, Failure Classification, Storage Structure, Recovery and Atomicity, Log-based Recovery, Shadow Paging, Recovery with Concurrent Transactions.

Unit -IV

Distributed Data Bases: Distributed database concept, An over view of Client/Server Architecture, Database security, issues, GIS, Mobile databases, overview of Object oriented database & temporal databases.

Unit -V

Data Warehousing & Data mining: The Evolution of Data Warehousing, Today's Development Environment, Types of Data and their Uses, Conceptual Data Architecture, Design Techniques, Logical Architecture. Data Mining: Introduction, data mining, kind of data, Functionalities, interesting patterns, Classification of data mining systems, Major issues. Data Warehouse and OLAP Technology for Data Mining: data warehouse, operational database systems and data warehouses, Architecture, Implementation, development of data cube technology.

REFERENCES

1. Korth, Silberschatz, Database System Concepts , 4th Ed., TMH, 2000.
2. Date C. J., An Introduction to Database Systems , 7th Ed., Narosa Publishing, 2004
3. Data Mining, Adriaans, Addison-Wesley Longman.
4. Alex Berson, Stephen Smith, Korth Theorling, Data Mining, TMH.
5. Anahory, Addison-Wesley Longman, Data Warehousing in the Real World.
6. Chanchal Singh, Wiley, Data Mining and Warehousing.

TCS 522: Mobile Computing Networks
M.Tech. Semester –II (Computer Science & Engg.)

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3 **1** **-**

Class Work :50 Marks
Exam. :100 Marks
Total :150 Marks
Duration of Exam : 3 Hrs

Unit -I

Overview of Ad Hoc Networks: Why Ad Hoc Networks?, Challenges, and benefits of Mobile Computing, Breakthrough Technology, Wireless Computing, Nomadic Computing, Mobile Computing, Ubiquitous Computing, Pervasive Computing, Invisible Computing, Applications of mobile computing, Wireless and Mobile Computing Models, LAN Protocols: IEEE 802.11/a/g/n & Bluetooth, Data Management Issues. Sensor Networks- Challenges, Architecture, and Applications.

Unit -II

Routing: Taxonomy, Applications, Challenges in Mobile Environments, Hidden and exposed terminal problems, Routing Protocols- Proactive, Reactive, and Hybrid protocols, Dynamic State Routing (DSR), Ad hoc On-Demand Distance Vector (AODV), Destination Sequenced Distance – Vector Routing (DSDV), and Cluster Based Routing Protocol (CBRP), and Temporally Ordered Routing algorithm (TORA).

Unit -III

Distributed location Management: Pointer forwarding strategies, Process communication techniques, socket programming, Remote Procedure Call (RPC), Remote Method Invocation (RMI), client/server programming.

Unit -IV

Mobile IP- Problem with Mobility, Terminology, Operation, Tunneling, Data transfer to the mobile system, Transport Control Protocol (TCP) Over wireless- Indirect TCP (I-TCP), Snoop TCP, Mobile TCP (M-TCP), Case Study of Client/Server architecture.

Unit -V

Fault tolerance and Security: Mobile Agents Computing, Security- Issues and Mechanisms, Certificate, Secure Agent Transfer, Timestamp Tamper-proofing, Secure Agent Reception, Host Protection, Providing Security and Integrity to Agent Data and State, Securing Agent Itineraries, Security Architecture, fault tolerance- Issues and Mechanisms, Agent Failure Scenarios, Node (host) Failure Detection and Recovery, Agent Failure Detection and Recovery, Communication Failure Detection and Recovery, Fault Tolerant System-3-Layered Monitor System, transaction processing in Mobile computing environment. Mobile Agent Systems: Aglets, PMADE and Case Study.

REFERENCES

1. Charles E. Perkins, Ad hoc Networks, Addison Wesley, 2008.
2. Kazem Sohraby, Daniel Minoli, Taieb Znati, Wireless Sensor Networks: Technology, Protocols, and Applications, Wiley, 2007.
3. Mazliza Othman, Principles of mobile computing and communications, Auerbach Publications, 2007.
4. Uwe Hansmann, Lothar Merk, Martin Nicklous, Thomas Stober, Principles of Mobile computing, 2nd Ed., Wiley, 2006.
5. Daniel Minoli, A Networking Approach to Grid Computing, Wiley, 2004.
6. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff UNIX Network Programming: The Sockets Networking API, Volume 1, Third Edition: Addison Wesley, 2003.
7. Lange, D.B. and Oshima, M., Programming and Deploying Java Mobile Agents with Aglets, 1st Ed., Addison Wesley, 2001.
8. William T. Cockayne, Michal Zyda, Mobile agents, Manning Publication, 2000.
9. Milojcic, D., Douglis, F. and Wheeler R., (ed.), Mobility Processes, Computers and Agents, Addison Wesley, 1999.

TCS 523: Information Security
M.Tech. Semester –II (Computer Science & Engg.)

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Class Work	:50 Marks
Exam.	:100 Marks
Total	:150 Marks
Duration of Exam	: 3 Hrs

Unit-I

History of Information Systems and its Importance, basics, Changing Nature of Information Systems, Need of Distributed Information Systems, Role of Internet and Web Services, Information System Threats and attacks, Classification of Threats and Assessing Damages, Security in Mobile and Wireless Computing- Security Challenges in Mobile Devices, authentication Service Security, Security Implication for organizations, Laptops Security, Basic Principles of Information Security, Confidentiality, Integrity Availability and other terms in Information Security, Information Classification and their Roles.

Unit-II

Security Threats to E Commerce, Virtual Organization, Business Transactions on Web, E-Governance and EDI, Concepts in Electronics payment systems, E Cash, Credit/Debit Cards, Physical Security- Needs, Disaster and Controls, Basic Tenets of Physical Security and Physical, Entry Controls, Access Control- Biometrics, Factors in Biometrics Systems, Benefits, Criteria for selection of biometrics, Design Issues in Biometric Systems, Interoperability Issues, Economic and Social Aspects, Legal Challenges

Unit-III

Model of Cryptographic Systems, Issues in Documents Security, System of Keys, Public Key Cryptography, Digital Signature, Requirement of Digital Signature System, Finger Prints, Firewalls, Design and Implementation Issues, Policies

Unit-IV

Network Security- Basic Concepts, Dimensions, Perimeter for Network Protection, Network Attacks, Need of Intrusion Monitoring and Detection, Intrusion Detection Virtual Private Networks- Need, Use of Tunneling with VPN, Authentication Mechanisms, Types of VPNs and their Usage, Security Concerns in VPN

Unit-V

Security metrics- Classification and their benefits, Information Security & Law, IPR, Patent Law, Copyright Law, Legal Issues in Data mining, Security, Building Security into Software Life Cycle Ethics- Ethical Issues, Issues in Data and Software Privacy, Cyber Crime Types & overview of Cyber Crimes

REFERENCES

1. Schou, Shoemaker, " Information Assurance for the Enterprise", Tata McGraw Hill
2. Furnell, "Computer Insecurity", Springer

ECS 520: VLSI System Design
M.Tech. Semester –II (Computer Science & Engg.)

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Class Work	:50 Marks
Exam.	:100 Marks
Total	:150 Marks
Duration of Exam	: 3 Hrs

Unit -I

Introduction To MOS Circuits: MOS Transistors, MOS Transistor Switches, CMOS Logic, Circuit and System Representations, MOS Transistor Theory - Introduction MOS Device Design Equations, The Complementary CMOS Inverter-DC Characteristics, Static Load MOS Inverters, The Differential Inverter, The Transmission Gate, The Tri State Inverter, Bipolar Devices.

Unit -II

Circuit Characterization and Performance Estimation: Introduction, Resistance Estimation, Capacitance Estimation, Inductance, Switching Characteristics CMOS-Gate Transistor Sizing, Power Dissipation, Sizing Routing Conductors, Charge Sharing, Design Margining, and Reliability.

Unit -III

CMOS Circuit And Logic Design: CMOS Logic Gate Design, Basic Physical Design of Simple Gate, CMOS Logic Structures, Clocking Strategies, I/O Structures, Low Power Design.

Unit -IV

Systems Design And Design Method: Design Strategies CMOS Chip Design Options, Design Methods, Design Capture Tools, Design Verification Tools, Design Economics, Data Sheets, CMOS Testing - Manufacturing Test Principles, Design Strategies for Test, Chip Level Test Techniques, System Level Test Techniques, Layout Design for Improved Testability.

Unit -V

CMOS Sub System Design: Data Path Operations-Addition/Subtraction, Parity Generators, Comparators, Zero/One Detectors, Binary Counters, ALUs, Multiplication, Shifters, Memory Elements, Control-FSM, Control Logic Implementation.

REFERENCES

1. N. Weste and K. Eshraghian, "Principles of CMOS VLSI Design", Addison Wesley, 1998.
2. Jacob Backer, Harry W. Li and David E. Boyce, " CMOS Circuit Design, Layout and Simulation ", Prentice Hall of India, 1998.
3. L.Glaser and D. Dobberpuhl, "The Design and Analysis of VLSI, Circuits", Addison Wesley 1993.
4. C.Mead and L. Conway, "Introduction to VLSI Systems", Addison Wesley, 1979.
5. Randel & Geiger, "VLSI Analog and Digital Circuit Design Techniques" McGraw-Hill,1990.
6. Sahib H.Gerez, "Algorithms for VLSI design automation ",1998.
7. William M. Penny, Lillian Lau, " MOS Integrated Circuits- Theory, Fabrication, Design and System Applications of MOS LSI", Van Nostrand Reihold Company.
8. Sung Ms Kang, Yusuf Lablebici, "CMOS Digital Integrated Circuits Analysis & Design", Tata Mc-Graw Hill.

ECS 521: Embedded System Design
M.Tech. Semester –II (Computer Science & Engg.)

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Class Work :50 Marks
Exam. :100 Marks
Total :150 Marks
Duration of Exam : 3 Hrs

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, and 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

ECS 522: Advanced Java Programming
M.Tech. Semester –II (Computer Science & Engg.)

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Class Work	:50 Marks
Exam.	:100 Marks
Total	:150 Marks
Duration of Exam	: 3 Hrs

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.

ECS 523 : Neural Networks
M.Tech. Semester –II (Computer Science & Engg.)

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Class Work	:50 Marks
Exam.	:100 Marks
Total	:150 Marks
Duration of Exam	: 3 Hrs

UNIT -I

INTRODUCTION - what is a neural network? Human Brain, Models of a Neuron, Neural networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks

LEARNING PROCESS – Error Correction learning, Memory based learning, Hebbian learning, Competitive, Boltzmann learning, Credit Assignment Problem, Memory, Adaption, Statistical nature of the learning process,

UNIT -II

SINGLE LAYER PERCEPTRONS – Adaptive filtering problem, Unconstrained Organization Techniques, Linear least square filters, least mean square algorithm, learning curves, Learning rate annealing techniques, perceptron convergence theorem, Relation between perceptron and Bayes classifier for a Gaussian Environment

MULTILAYER PERCEPTRON – Back propagation algorithm XOR problem, Heuristics, Output representation and decision rule, Computer experiment, feature detection,

UNIT -III

BACK PROPAGATION - back propagation and differentiation, Hessian matrix, Generalization, Cross validation, Network pruning Techniques, Virtues and limitations of back propagation learning, Accelerated convergence, supervised learning.

UNIT -IV

SELF ORGANIZATION MAPS – Two basic feature mapping models, Self organization map, SOM algorithm, properties of feature map, computer simulations, learning vector quantization, Adaptive pattern classification

UNIT- V

NEURO DYNAMICS – Dynamical systems, stability of equilibrium states, attractors, neurodynamical models, manipulation of attractors as a recurrent network paradigm

HOPFIELD MODELS – Hopfield models, computer experiment I

REFERENCES

1. Neural networks A comprehensive foundations, Simon Haykin, Pearson Education 2nd edition 2004
2. Artificial neural networks - B.Vegnarayana Prentice Hall of India P Ltd 2005
3. Neural networks in Computer intelligence, Li Min Fu TMH 2003
4. Neural networks James A Freeman David M S Kapura Pearson Education 2004.

ECS 524: Genetic Algorithms
M.Tech. Semester –II (Computer Science & Engg.)

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Class Work **:50 Marks**
Exam. **:100 Marks**
Total **:150 Marks**
Duration of Exam **: 3 Hrs**

Unit -I

Introduction

A brief history of evolutionary computation, Elements of Genetic Algorithms, A simple genetic algorithm, Applications of genetic algorithms
Evolving computer programs, data analysis & prediction, evolving neural networks, Modeling interaction between learning & evolution, modeling sexual selection, measuring evolutionary activity.

Unit -II

Theoretical Foundation of genetic algorithm

Schemas & Two-Armed and k-armed problem, royal roads, exact mathematical models of simple genetic algorithms, Statistical- Mechanics Approaches.

Unit -III

Computer Implementation of Genetic Algorithm

Data structures, Reproduction, crossover & mutation, mapping objective functions to fitness form, fitness scaling, coding, a multiparameter, mapped, fixed point coding, discretization and constraints.

Unit -IV

Applications of genetic algorithms

The risk of genetic algorithms, De Jong & function optimization, Improvement in basic techniques, current application of genetic algorithms.

Unit -V

Advanced operators & techniques in genetic search

Dominance, duplicity, & abeyance, inversion & other reordering operators. Other micro operators, Niche & speciation, multiobjective optimization, knowledge based techniques, genetic algorithms & parallel processors.

REFERENCES

1. David E. Goldberg, "Genetic algorithms in search, optimization & Machine Learning" Pearson Education, 2006
2. Melanle Mitchell, "An introduction to genetic algorithms", Prentice Hall India, 2002.
3. Michael D. Vose, "The simple genetic algorithm foundations and theory, Prentice Hall India, 1999
4. Masatoshi Sakawa, "Genetic Algorithms & Fuzzy Multiobjective Optimization", Kluwer Academic Publisher, 2001
5. D. Quagliarella, J Periaux, C Poloni & G Winter, "Genetic Algorithms in Engineering & Computer science", John Wiley & Sons, First edition, 1997
6. Pinaki Mzumder, Elizabeth M. Raudnick, "Genetic Algorithms for VLSI design, layout and test automation", Pearson Education, 2006

ECS 525 Artificial Intelligence and Expert Systems
M.Tech. Semester –II (Computer Science & Engg.)

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Class Work	:50 Marks
Exam.	:100 Marks
Total	:150 Marks
Duration of Exam	: 3 Hrs

UNIT – I

Overview Of A.I.: Definition Of AI, The Importance Of AI, Previous Works In The History Of AI, AI And Related Fields, Problems, Problem Spaces and Search.

UNIT II

Knowledge: General Concepts –Definition and Importance of Knowledge, Knowledge-Based Systems, Representation of Knowledge, Knowledge Organization, Knowledge Manipulation, Acquisition Of Knowledge.

UNIT – III

Formalized Symbolic Logics – Syntax And Semantics For Propositional Logic, Properties of Wffs, Conversion To Clausal Form, Inference Rules, Resolution. Dealing With Inconsistencies - Truth Maintenance Systems, Symbolic Reasoning under Uncertainty, Statistical Reasoning. Structural Knowledge – Graph, Frames and Related Structures.

UNIT – IV

Natural Language Processing: Overview of Linguistics, Grammer and Languages, Syntactic Processing, Semantic Analysis, Morphological, Discourse and Pragmatic Processing, Natural Language Generation, Natural Language Systems.

UNIT – V

Pattern Recognition: Introduction, Recognition and Classification Process, Learning Classification Pattern, Recognizing and Understanding Speech. Expert Systems: Definition, Rule Based System Architecture, NonProduction System Architecture, Basic Components of E.S.

REFERENCES

1. Dan W. Patterson, —Introduction to Artificial Intelligence and Expert Systems. II Prentice-Hall, India.
2. A.Rich and K. Knight, —Artificial Intelligencell, Tate McGraw Hill.
3. E. Charnaik and D.Mcdermott, —Introduction to Artificial Intelligencell, Addison-Wesley Publishing Company.

ECS 526: Data Warehousing And Data Mining

M.Tech. Semester –II (Computer Science & Engg.)

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Class Work :50 Marks
Exam. :100 Marks
Total :150 Marks
Duration of Exam : 3 Hrs.

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 Selection.

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.

ECS 527 Modeling and Simulation
M.Tech. Semester –II (Computer Science & Engg.)

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Class Work	:50 Marks
Exam.	:100 Marks
Total	:150 Marks
Duration of Exam	: 3 Hrs

Unit -I

Introduction: System models and role of simulation. Entities, Attributes, States and Activities.

Unit -II

Types of Systems: Deterministic, Stochastic, Continuous and Discrete systems. Steps in simulation studies.

Unit -III

Statistical Tools and Techniques: generation of pseudorandom numbers, random variate generation for uniform, Poisson and normal distributions, sampling and estimation, maximum likelihood estimation, confidence intervals and hypothesis testing, stochastic processes and Markov models.

Unit -IV

Simulation of Inventory and Queuing Systems: single and multiserver queues, network of queues. Modeling and performance evaluation of computers and computer communication networks.

Unit -V

Biological and Sociological System Simulation: Verification and validation of simulation models - input/output validation, sensitivity analysis, performance measures and their estimation. Length of simulation run, Variance reduction Techniques.

REFERENCES

1. Russell Schwartz, Biological Modeling and Simulation: A Survey of Practical Models, Algorithms and Numerical Methods, PHI Learning Pvt. Ltd. New Delhi, 2009.
2. Karian, Z.A., and Dudewicz, E. J., Modern Statistical Systems and GPSS Simulation, 2nd Ed., CRC Press.
3. Banks, J., Carson, L.S, Nelson, B.L and Nicol, D.M., Discrete Event System Simulation, 3rd Ed., Pearson Education.
4. Law, A.M. and Kelton, W.D., Simulation, Modeling and Analysis, 3rd Ed., Tata McGraw-Hill.

ECS 528: Software Verification, Validation & Testing
M.Tech. Semester –II (Computer Science & Engg.)

L	T	P
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Class Work	:50 Marks
Exam.	:100 Marks
Total	:150 Marks
Duration of Exam	: 3 Hrs.

Unit -I

Introduction: What is software testing and why it is so hard?, Error, Fault, Failure, Incident, Test Cases, Testing Process, Limitations of Testing, No absolute proof of correctness, Overview of Graph Theory.

Unit -II

Functional Testing: Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique.

Unit -III

Structural Testing: Path testing, DD-Paths, Cyclomatic Complexity, Graph Metrics, Data Flow Testing, Mutation testing. Testing Activities: Unit Testing, Levels of Testing, Integration Testing, System Testing, Debugging, Domain Testing. Reducing the number of test cases: Prioritization guidelines, Priority category, Scheme, Risk Analysis, Regression Testing, and Slice based testing

Unit -IV

Object Oriented Testing: Issues in Object Oriented Testing, Class Testing, GUI Testing, Object Oriented Integration and System Testing.

Unit -V

Testing Tools: Static Testing Tools, Dynamic Testing Tools, and Characteristics of Modern Tools and Implementation with example. Advanced topics in software testing: web based testing, Client/Server testing, Automated test cases generation, Regular expression and FSM based testing.

REFERENCES

1. William Perry, Effective Methods for Software Testing , John Wiley & Sons, New York, 1995.
2. Cem Kaner, Jack Falk, Nguyen Quoc, Testing Computer Software , Second Edition, Van Nostrand Reinhold, New York, 1993.
3. Boris Beizer, Software Testing Techniques , Second Volume, Second Edition, Van Nostrand Reinhold, New York, 1990.
4. Louise Tamres, Software Testing , Pearson Education Asia, 2002
5. Roger S. Pressman, Software Engineering – A Practitioner’s Approach , Fifth Edition, McGraw-Hill International Edition, New Delhi, 2001.
6. Boris Beizer, Black-Box Testing – Techniques for Functional Testing of Software and Systems , John Wiley & Sons Inc., New York, 1995.
7. K.K. Aggarwal & Yogesh Singh, Software Engineering , New Age International Publishers, New Delhi, 2003.
8. Marc Roper, Software Testing , McGraw-Hill Book Co., London, 1994.
9. Gordon Schulmeyer, Zero Defect Software , McGraw-Hill, New York, 1990.
10. Watts Humphrey, Managing the Software Process , Addison Wesley Pub. Co. Inc., Massachusetts, 1989.

ECS 529: Distributed Computing
M.Tech. Semester –II (Computer Science & Engg.)

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Class Work :50 Marks
Exam. :100 Marks
Total :150 Marks
Duration of Exam : 3 Hrs.

Unit- I

Fundamentals of Distributed Computing: Architectural models for distributed and mobile computing systems. Basic concepts in distributed computing such as clocks, message ordering, consistent global states, and consensus. Basic Algorithms in Message: Passing Systems, Leader Election in Rings, and Mutual Exclusion in Shared Memory, Fault-Tolerant Consensus, Causality and Time. Message Passing: PVM and MPI.

Unit -II

Distributed Operating Systems and network operating systems: Distributed File systems. Client/server model for computing, common layer application protocols (RPC, RMI, streams), distributed processes, network naming, Group Communication, distributed synchronization and distributed object-based systems.

Unit- III

Simulation: A Formal Model for Simulations, Broadcast and Multicast, Distributed Shared Memory, Fault-Tolerant Simulations of Read/Write Objects Simulating Synchrony, Improving the Fault Tolerance of Algorithms, Fault-Tolerant Clock Synchronization.

Unit -IV

Advanced Topics: Randomization, Wait-Free Simulations of Arbitrary Objects, and Problems Solvable in Asynchronous Systems, Solving Consensus in Eventually Stable Systems, High Performance Computing-HPF, Distributed and mobile multimedia systems. Adaptability in Mobile Computing, Grid Computing and applications.

Unit -V

Distributed Environments: Current systems and developments (DCE, CORBA, JAVA).
Case study- Distributed information searching on the network- Mobile Agent Approach.

REFERENCES

1. Hagit Attiya, Jennifer Welch, Distributed Computing: Fundamentals, Simulations, and Advanced Topics, 2nd Edition, March 2004.
2. Mullendar S. Distributed Systems, 2nd Ed. Addison, Wesley 1994.
3. Tannenbaum, A. Distributed Operating Systems, Prentice Hall 1995.
4. Helal, Abdelsalam A. et al. Anytime, Anywhere Computing: Mobile Computing Concepts and Technology, Kluwer Academic Publishers 1999.
5. George Coulouris, Jean Dollimore and Tim Kindberg, Distributed Systems: Concepts and Design Third Edition Addison-Wesley, Pearson Education, 2001.
6. Cay S Horstmann and Gary Cornell, Java 2 Vol I and II-Sun Micro Systems-2001

PCS 521: Advances in Databases Technology (Pr)
M.Tech. Semester –II (Computer Science & Engg.)

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Class Work	:50 Marks
Exam.	:50 Marks
Total	:100 Marks
Duration of Exam	: 3 Hrs

The experiments will be based on the following paper: TCS 521 **Advances in Databases Technology**

PCS 522: Mobile Computing Networks (Pr)
M.Tech. Semester –II (Computer Science & Engg.)

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Class Work	:50 Marks
Exam.	:50 Marks
Total	:100 Marks
Duration of Exam	: 3 Hrs

The experiments will be based on the following paper: TCS 522 **Mobile Computing Networks**

ECS 630: Advance Data Modeling
M.Tech. Semester –III (Computer Science & Engg.)

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Class Work :50 Marks
Exam. :100 Marks
Total :150 Marks
Duration of Exam : 3 Hrs.

Unit -I

Introduction to Systems Analysis and Design Information: Systems Building Block, Systems Development Life Cycle & Methodology ,Project Management ,Systems Analysis & Requirements discovery, Feasibility Analysis and System Proposal, requirements definition using Use Case Modelling Systems, Relational Database Concepts & Basic Data Modelling , Data Modelling Using CASE Tools

Unit -II

Process Modelling: Data Flow Diagram, Activity Diagram ,Object-Oriented analysis Using UML , Application Architecture and Modelling, Output Design and Prototyping ,Input Design and Prototyping ,Prototyping Tool, Systems Construction and Implementation .

Unit -III

Conceptual Object Data Model: XML and Web Data, XML Schema, Distributed Data bases, OLAP and Data Mining, ROLAP and MOLAP

Unit -IV

Enhanced Data Model for Advanced Applications: Database Operating System, Introduction toTemporal Database Concepts, Spatial and Multimedia Databases,

Unit -V

Data Mining Techniques: Data Mining, Active Database System, Deductive Databases, Database Machines, Web Databases, Advanced Transaction Models, Issues in Real Time Database Design.

REFERENCES

1. Jeffrey Whitten and Lonnie Bentley Systems Analysis and Design Methods, 7th edition, McGrawHill, 2007
2. R.Elmasri and S.B. Navathe, "Fundamentals of Database Systems", ,Addison Wesley,
3. Abraham Silberschatz, Henry F. Korth, S. Sudharsan, "Database System Concepts",Tata McGraw Hill

ECS 631: Cloud Computing
M.Tech. Semester –III (Computer Science & Engg.)

L	T	P
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Class Work	:50 Marks
Exam.	:100 Marks
Total	:150 Marks
Duration of Exam	: 3 Hrs

UNIT - I

Foundations: Introduction to Cloud Computing, Migrating into a Cloud Enriching the 'Integration as a Service' Paradigm for the Cloud Era, Cloud Computing for Enterprise Applications

UNIT – II

Infrastructure as a Service (IaaS): Virtual Machines Provisioning and Migration Services, On the Management of Virtual Machines for Cloud Infrastructures, Enhancing Cloud Computing Environments using a Cluster as a Service, Secure Distributed Data Storage in Cloud Computing

UNIT - III

Platform and Software as a Service (PaaS/IaaS): Aneka – Integration of Private and Public Clouds, CometCloud: An Autonomic Cloud Engine, T-Systems' Cloud-Based Solutions for Business Applications, Workflow Engine for Clouds, Understanding Scientific Applications for Cloud Environments, The MapReduce Programming Model and Implementations

UNIT – IV

Monitoring and Management: An Architecture for Federated Cloud Computing, SLA Management in Cloud Computing: A Service Provider's Perspective, Performance Prediction for HPC on Clouds

UNIT - V

Applications: Architecting Applications for the Amazon Cloud, Massively Multiplayer Online Game Hosting on Cloud Resources, Building Content Delivery Networks Using Clouds, Resource Cloud Mashups

REFERENCES

1. "Cloud Computing: Principles and Paradigms", Rajkumar Buyya, James Broberg, Andrzej Goscinski, Wiley, New York, USA

ECS 632: Web Mining
M.Tech. Semester –III (Computer Science & Engg.)

L	T	P
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Class Work	:50 Marks
Exam.	:100 Marks
Total	:150 Marks
Duration of Exam	: 3 Hrs

Unit -I

Basic Search Engines and information retrieval, Architecture of a Search Engine, Basic Building Blocks(Text Acquisition, Text Transformation, Index Creation, User Interaction, Ranking Evaluation). Crawls and Feeds, Deciding what to search, Crawling the Web, Directory Crawling, Document Feeds, Storing the Documents, Detecting Duplicates, Removing Noise.

Unit -II

Processing Text, From Words to Terms, Text Statistics, Vocabulary Growth, Estimating Database and Result Set Sizes, Document Parsing, Overview, Tokenizing, Stopping, Stemming, Phrases and N-grams, Document Structure and Markup, Link Analysis, Anchor Text, PageRank, Link Quality, Information Extraction, Internationalization

Unit -III

Ranking with Indexes, Abstract Model of Ranking, Inverted indexes, Documents, Counts, Positions, Fields and Extents, Scores, Ordering, Compression, Entropy and Ambiguity, Delta Encoding, Bit-aligned codes, Byte-aligned codes, Looking ahead

Unit -IV

Evaluating Search Engines, Why Evaluate? The Evaluation Corpus, Logging, Effectiveness Metrics, Recall and Precision, Averaging and Interpolation, Focusing On the Top Documents, Using Preferences, Efficiency Metrics, Training, Testing, and Statistics, Significance Tests, Setting Parameter Values, Bottom Line

Unit -V

Classification and Clustering, Classification and Categorization, Naïve Bayes, Support Vector Machines, Evaluation, Classifier and Feature Selection, Spam, Sentiment, and Online Advertising, Clustering, Hierarchical and *K*-Means Clustering, *K* Nearest Neighbor Clustering, Evaluation

REFERENCES

1. Mining The Web, Soumen Chakraborty.
2. Modern Information Retrieval, Cristofer Manning, Pravakar Raghavan.

ECS 633: Robotics
M.Tech. Semester –III (Computer Science & Engg.)

L	T	P
3	1	-

Class Work	:50 Marks
Exam.	:100 Marks
Total	:150 Marks
Duration of Exam	: 3 Hrs

Unit -I

Introduction: Classification of robots, basic robot components, manipulator end effectors, controller, power unit, sensing devices, specification of robot systems, accuracy precision and repeatability.

Robot Motion Analysis: Manipulator Kinematics, Inverse Manipulator Kinematics, Manipulator Dynamics newton-Euler and Lagrange formulation, Trajectory generation.

Unit -II

Robotic sensing devices:

Position, velocity and acceleration sensors, proximity and range sensors, touch and slip sensors, tactile sensors, force and torque sensors.

Unit -III

Robotic vision system: imaging components, picture coding, object recognition , training and vision systems, review of existing vision systems.

Unit -IV

Robotics programming:

Methods of robot programming, types of programming, robotics programming languages, artificial intelligence.

Unit -V

Robot applications: material transfer and machine loading /unloading, processing applications, welding and painting assembly and inspection, future robotic applications and related technologies developments.

Economics analysis of robotics: Robotics project analysis, life cycle costs, data required for economic analysis, methods of economics analysis.

REFERENCES

1. Fundamentals of Robotics Analysis and control : Robert J. Schilling
2. Industrial robotics : Groover, weiss nagel and odrey, Mc Graw Hill
3. Robotics engineering : klatfer, Chmielwski and nagirn,Prentice hill.
4. Robotics for engineering : Yorem Korem, Mc Graw Hill.
5. Robotics:control,sensing vision and intelligence: K.S. Fu, R.C.Gonzalez, C.S.g Lee, McGraw Hill

ECS 634: Medical Imaging
M.Tech. Semester –III (Computer Science & Engg.)

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Class Work :50 Marks
Exam. :100 Marks
Total :150 Marks
Duration of Exam : 3 Hrs.

UNIT I: BASIC CONCEPTS

Introduction to Medical Imaging: The Modalities and Image Properties - Image Quality: Spatial Resolution- Convolution-Frequency Domain-Contrast-Physical mechanisms of Blurring- Medical Imaging Informatics.

UNIT II: DIAGNOSTIC RADIOLOGY

X-Ray Computed Tomography: Introduction, Ray's detectors in CT, Imaging, Cardiac CT, Dual energy CT, Biological affects and safety. Ultrasound Imaging: Introduction- Physics of Acoustic waves- Generation and Detection of Ultrasound- Doppler Imaging-Biological effects and safety.

UNIT III: MAGNETIC RESONANCE IMAGING (MRI) & NUCLEAR IMAGING

MRI: Advanced Image Acquisition Methods, Artifacts-Spectroscopy- Quality Control- Siting- Bioeffects and Safety. Nuclear Imaging: Positron Emission Tomography and Dual Modality Imaging- SPECT/CT, PET/CT.

UNIT IV: MEDICAL IMAGE ANALYSIS AND VISUALIZATION

Introduction- Manual Analysis- Automated Analysis- Computational strategies for Automated Medical Image Analysis-Pixel Classification- Geometric model matching using a Transformation Matrix- Flexible Geometric Model Matching. Visualizaion for Diagnosis and Therapy: Introduction- 2D Visualization, User Interaction, Intraoperative Navigation.

UNIT V: RADIATION BIOLOGY AND PROTECTION

Radiation Biology: Overview-Interaction of radiation with tissue, Whole body response to radiation: The acute radiation syndrome, Hereditary Effects of Radiation Exposure, Radiation Protection: Sources of exposure to ionizing radiation, Radiation detection equipment in radiation safety, Medical emergencies involving ionizing radiation.

REFERENCES

1. Paul Suetens, "Fundamentals of Medical Imaging", 2nd Edition, Cambridge University Press, UK, 2009.
2. Jerrold T.Bushberg, J.Anthony Seibert, Edwin M.Leidholdt, Jr.John M.Boone, "Essential Physics of Medical imaging", 3rd Edition, Lippincott Williams & Wilkins, USA, 2012.
3. Steve Webb, "The Physics of Medical Imaging", Adam Hilger, Philadelphia, 2012.
4. Jerry L.Prince, Jnathan M.Links,"Medical Imaging Signals and Systems", Pearson EI, 2006.

ECS 635: Fault Tolerant Systems
M.Tech. Semester –III (Computer Science & Engg.)

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Class Work	:50 Marks
Exam.	:100 Marks
Total	:150 Marks
Duration of Exam	: 3 Hrs

Unit- I

Fundamental concepts in the theory of reliable computer systems design.

Unit -II

Introduction to redundancy theory, limit theorems; decision theory in redundant systems.

Unit -III

Hardware fault tolerance, redundancy techniques, detection of faults, replication and compression techniques, self-repairing techniques, concentrated and distributed voters, models of fault tolerant computing systems, Case studies.

Unit -IV

Software fault tolerance: fault tolerance versus fault intolerance, errors and their management strategies. Implementation techniques: software defense, protective redundancy, architectural support.

Unit -V

Fault recovery techniques & Coding theory: application to fault tolerant system design. Fault-tolerance and reliability of multicomputer networks (direct and indirect) including fault-tolerant routing and sparing techniques. Yield and reliability enhancement techniques for VLSI/WSI array processors.

REFERENCES

1. Israel Koren, C. Mani Krishna Fault Tolerant Systems. Course developed by professor

ECS 636: Fuzzy Logic & Design
M.Tech. Semester –III (Computer Science & Engg.)

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Class Work	:50 Marks
Exam.	:100 Marks
Total	:150 Marks
Duration of Exam	: 3 Hrs

Unit -I

Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, α -cuts, Properties of α -cuts, Decomposition Theorems, Extension Principle.

Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations.

Unit -II

Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations.

Unit -III

Fuzzy Relations: Crisp & Fuzzy Relations, Projections & Cylindric Extensions, Binary Fuzzy Relations, Binary Relations on single set, Equivalence, Compatibility & Ordering Relations, Morphisms, Fuzzy Relation Equations.

Unit -IV

Possibility Theory: Fuzzy Measures, Evidence & Possibility Theory, Possibility versus Probability Theory. Fuzzy Logic: Classical Logic, Multivalued Logics, Fuzzy Propositions, Fuzzy Qualifiers, Linguistic Hedges. Uncertainty based Information: Information & Uncertainty, Nonspecificity of Fuzzy & Crisp sets, Fuzziness of Fuzzy Sets.

Unit -V

Applications of Fuzzy Logic:

REFERENCES

1. G.J.Klir , Yuan, "Fuzzy Sets and fuzzy logic, Theory and applications", Prentice Hall India, 1995.
2. John Yen, Reza Langari, "Fuzzy Logic Intelligence, Control and Information", Pearson Education, 2006.
3. Ross, "Fuzzy Logic with Engineering Applications", 2nd Edition, John Wiley, 2004.
4. H. Zimmermann, "Fuzzy Set Theory and its applications", 2nd Edition, Allied Publishers, 1996.

ECS 637: Network Programming
M.Tech. Semester –III (Computer Science & Engg.)

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Class Work **:50 Marks**
Exam. **:100 Marks**
Total **:150 Marks**
Duration of Exam **: 3 Hrs**

Unit -I

Socket Programming: Creating sockets, Postfix data type, Socket addresses, Assigning address to a socket, Java socket programming, Thread programming, Berkeley Sockets: Overview, socket address structures, byte manipulation & address conversion functions, elementary socket system calls – socket, connect, bind, listen, accept, fork, exec, close, TCP ports (ephemeral, reserved), Berkeley Sockets: I/O asynchronous & multiplexing models, select & poll functions, signal & fcntl functions, socket implementation (client & server programs), UNIX domain protocols

Unit -II

APIs & Winsock Programming: Windows socket API, window socket & blocking I/O model, blocking sockets, blocking functions, timeouts for blocking I/O, API overview, Different APIs & their programming technique, DLL & new API's, DLL issues, Java Beans.

Unit -III

Web Programming: Java network programming, packages, RMI, Overview of Javascript, WAP architecture & WAP services, Web databases, Component technology, CORBA concept, CORBA architecture, CGI programming.

Unit -IV

Firewall & security techniques, Cryptography, Digital Signature.

Unit -V

Client/Server Programming: Client side programming: Creating sockets, Implementing generic network client, Parsing data using string Tokenizer, Retrieving file from an HTTP server, Retrieving web documents by using the URL class. Server side programming: Steps for creating server, Accepting connection from browsers, creating an HTTP server, Adding multithreading to an HTTP server.

REFERENCES

1. Steven.W.R: UNIX Network Programming, PHI (VOL I& II)
2. Window Socket Programming by Bobb Quinn and Dave Schutes
3. Davis.R: Windows Network Programming, Addison Wesley
4. NETWORK PROGRAMMING With Windows Socket By Baner .P., PH New Jersey

ECS 638: Cyber Law
B.Tech. Semester –III (Computer Science & Engg.)

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Class Work	:50 Marks
Exam.	:100 Marks
Total	:150 Marks
Duration of Exam	: 3 Hrs.

UNIT – I

Cyber Law: Introduction, Definition, nature & Scope of Cyber Laws. Sociolegal Implications of Computer Science, Cyber Laws.

UNIT – II

Cyber Crimes: Definition & Kinds of Cyber Crimes. International and Foreign Developments. Common Cyber Offences: Phreaking, Internet Frauds, Hackers, Stalking, E-Mail, Security Invasion, Money Laundering, Data Diddling, Theft of Information

Contractual Aspects: Hardware Contracts: User Requirement Specification, Negotiation, Sales & Leases, Delivery & Payment, Seller's Obligations, Buyer's Remedies.

UNIT III

Software Contract: Selecting Software, Types of Software, What is Software, Software License, Principal Commercial Terms, Warranties, Software Maintenance. Liability: Contractual Liability, Strict Liability, Negligence, Criminal. Miscellaneous (Briefly); Copyright & Patent Protection, Evidence, Protecting Confidential Information.

UNIT – IV

The Information Technology Act, 2000: Introduction: Definition, A Brief Summary of the Act. Digital Signature & Electronic Governance (Sections 3 to 10) Secure Electronic Records & Secure Digital Signatures (Sections 14 to 16).

UNIT – V

Regulation of Certifying Authorities (Sections 17 to 34). Digital Signature Certificates (Sections 35 to 39). Duties of Subscribers (Sections 40 to 42). Penalties, Adjudication Offences (Sections 45 to 47 & Sections 65 to 78). Cyber Regulations Appellate Tribunal (Sections 48 to 64).

REFERENCES

1. The Information Technology Act, 2000.
2. Chris Reed (Ed.), Computer Law, 1996: Universal Law Publishing Co. Pvt. Ltd.
3. Mittal D.P., Law of Information Technology (2000): Taxmann's.

ECS 639: AD HOC and Sensor Networks
B.Tech. Semester –III (Computer Science & Engg.)

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Class Work :50 Marks
Exam. :100 Marks
Total :150 Marks
Duration of Exam : 3 Hrs.

UNIT - I

Introduction to Wireless Networks: Wireless LANs, Bluetooth, Scatternet, Piconet , Ad hoc Networks: Types of Ad hoc Networks, Mobility, Challenges in Ad hoc Mobile Networks, Energy Management, Scalability, Addressing and Service Discovery, Deployment Considerations.

UNIT – II

ROUTING PROTOCOLS

Classifications, Table Driven DSDV, WRP, On-Demand DSR, AODV, Hybrid ZRP and Routing Protocols with efficient Flooding mechanism, Power aware Routing Protocols. Operation of Multicast Routing Protocols

UNIT - III

WIRELESS SENSOR NETWORKS

Wireless Sensor Networks :Challenges for wireless sensor networks, Comparison of sensor network with ad hoc network, Single node architecture, Hardware components, energy consumption of sensor nodes, Network architecture, Sensor network scenarios, types of sources and sinks, single hop versus multi-hop networks, multiple sinks and sources.

UNIT-IV

QUALITY OF SERVICES (QOS)

Introduction, Issues and Challenges, Classifications of QoS Solutions, QoS Frameworks for Ad Hoc Wireless Networks QoS Models, Quality of Sensor Network-Coverage and Exposure.

UNIT-V

ENERGY MANAGEMENT

Introduction, Need for Energy Management, Classification of Energy Management Schemes, Battery Management Schemes, Transmission Power Management Schemes, System Power Management Schemes

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.

PCS 631: Dissertation Phase-I
M.Tech. Semester –III (Computer Science & Engg.)

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Class Work	:300 Marks
Exam.	:200 Marks
Total	:500 Marks
Duration of Exam	: 3 Hrs

The student will submit a synopsis at the beginning of the semester for approval to Dissertation evaluation committee in a specified format. The student will have to present the progress of the work through seminars and progress report. A report must be submitted to the committee for evaluation purpose at the end of the semester in a specified format.

Distribution of Credits for Dissertation shall be as follows.

- 1) Selection of Topic and Work-Plan - 100 Marks
- 2) Mid-Semester presentation - 100 Marks
- 3) Pre- Submission Presentation - 100 Marks
- 4) Final Viva- Voce Examination -200 Marks

PCS 632: Seminar
M.Tech. Semester –III (Computer Science & Engg.)

L	T	P	Class Work	:100 Marks
-	-	4	Exam	: 50 Marks
			Total	:150 Marks

Concerned Teachers/Experts in the selected area must be identified by a student for approval of the topic. A student is required to submit **Three** copies of bound report of the seminar **One** week before the presentation to office of Head/Concerned faculty (examiner) appointed by the Head.

PCS 633: Creative Problem Solving
M.Tech. Semester –III (Computer Science & Engg.)

L	T	P
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Class Work	:100 Marks
Exam	: 50 Marks
Total	:150 Marks

Concerned Teachers/Experts in the selected area must be identified by a student for approval of the problem. A student is required to submit **Three** copies of bound report **One** week before the presentation to office of Head/Concerned faculty (examiner) appointed by the Head.

PCS 641: Dissertation
M.Tech. Semester –IV (Computer Science & Engg.)

L	T	P	Class Work	:450 Marks
-	-	20	Exam.	:500 Marks
			Total	:950 Marks

Distribution of Credits for Dissertation shall be as follows.

- 1) Mid-Semester presentation - 150 Marks
- 2) Pre- Submission Presentation - 300 Marks
- 3) Final Viva- Voce Examination - 500 Marks

A student is required to submit **Three** copies of bound report of the dissertation after pre-submission presentation to office of Head duly signed by his/her supervisor.