SIR PADAMPAT SINGHANIA UNIVERSITY

Udaipur

SCHOOL OF ENGINEERING

Course Curriculum of 2-Year M. Tech. Degree Programme in Computer Science & Engineering (Specialization in Computer Networks) (Batch- 2020-22)

Credit Structure

M. Tech. Core	
Category	**Credits**
Departmental Core Subjects	60
Total	60

Distribution of Total Credits & Contact Hours in all Semesters

S. No.	Semester Number	Credits/Semester	Contact hours/week
1	I	17	19
2	II	16	17
3	III	15	21
4	IV	12	18
	Total	60	--

Course Structure: M. Tech. 2020-2022

Semester - I

S. No.	Course Code	Course Title	L	T	P	Credit(s)
1	CS-551	Advanced Algorithms	3	0	1	4
2	CS-552	Probability & Statistics for Computer Science	3	0	0	3
3	CS-553	Cryptography & Network Security	3	0	1	4
4	CS-554	Database Engineering	3	0	0	3
5	CS-555	Advanced Computer Architecture	3	0	0	3
					Total Credits	17
					Total Contact hours/week	19

Semester - II

S. No.	Course Code	Course Title	L	T	P	Credit(s)
1	CS-556	Machine Learning: Theory & Methods	3	0	0	3
2	CS-557	Advances in Operating System Design	3	0	0	3
3	CS-558	Digital Image Processing	3	0	1	4
4	CS-561	Advanced Computer Networks	3	0	0	3
5	CS-562	Mobile Computing	3	0	0	3
					Total Credits	16
					Total Contact hours/week	17

Semester - III

S. No.	Course Code	Course Title	L	T	P	Credit(s)
1	CS-563	Advanced Wireless Networks	3	0	1	4
2	CS-564	Quality of Service in Networks	3	0	0	3
3	CS-565	High Speed Networks	3	0	0	3
4	CS-580A	Dissertation - I	0	0	5	5
					Total Credits	15
					Total Contact hours/week	21

Semester - IV

S. No.	Course Code	Course Title	L	T	P	Credit(s)
1	CS-580B	Dissertation - II	0	0	9	9
2	CS-580C	Dissertation Viva Voce	-	-	-	3
					Total Credits	12
					Total Contact hours/week	18

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Semester - I

(Departmental Core Subject)

CS-551 L-T-P-C
Advanced Algorithms 3-0-1-4

Objective: *The goal of this course is to develop the appropriate background, foundation & experience for advanced study in Computer Science. Students will develop the necessary skills from both a theoretical perspective as well as applying their knowledge on various problem sets.*

Course Content

NP-completeness; Advanced complexity classes; Incremental & Decremental Algorithms; Geometric algorithms: Point location, Convex hulls & closest pair; Graph algorithms: Matching & Flows; Approximation algorithms: local search heuristics; Randomized algorithms; Online algorithms; Parameterized algorithms; Internet search algorithms.

List of Experiments

1. Experiments related to various types of graphs
2. Experiments related to various algorithms on graphs
3. Experiments related to geometric algorithms
4. Experiments related to randomized algorithms
5. Experiments related to online algorithms
6. Experiments related to parameterized algorithms
7. Experiments related to approximation algorithms

Text/Reference Books

1. Introduction to Algorithms. Cormen T. H., Lieserson C. E., Rivest R. L. & Stein C. 3rd Ed. MIT Press/McGraw-Hill. 2011.
2. Algorithm Design. Kleinberg J. & Tardos E. Pearson. 2005.
3. Computational Complexity: A Modern Approach. Arora S. & Barak B. 1st Ed. Cambridge University Press. 2009.
4. Randomized Algorithms. Motwani R. & Raghavan O. Cambridge University Press. 1995.

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Semester - I

(Departmental Core Subject)

CS-552 L-T-P-C
Probability & Statistics for Computer Science 3-0-0-3

Objective: *Probability theory is the branch of mathematics that deals with modelling uncertainty. It is important because of its direct application in areas such as genetics, finance & telecommunications. It also forms the fundamental basis for many other areas in the mathematical sciences including statistics, modern optimization methods & risk modelling.*

Course Content

Review of probability basics. Discrete & continuous distributions, common distributions (Poisson, exponential, Gaussian, etc.), functions of random variables. Multivariate Distributions, joint & marginal distributions, covariance & correlation, sums of random variables, sampling theory. Estimators, confidence intervals, hypothesis testing & P-values, design of experiments. Miscellaneous topics: Markov Chains, Queuing Theory.

Text/Reference Books

1. Probability and Statistics for Computer Scientists. Baron M. 1st Ed. Chapman & Hall Publication. 2006.
2. A First Course in Probability and Statistics. Rao N. D. V. P. Cambridge University Press. 2013.
3. Probability Statistics and Reliability for Engineers and Scientists. McCuen H. R. & Ayyub B. M. 3rd Ed. CRC Press. 2011.

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Semester - I

(Departmental Core Subject)

CS-553 L-T-P-C
Cryptography & Network Security 3-0-1-4

Objective: *The course provides an extensive coverage of the techniques & methods needed for the proper functioning of the ciphers, one way functions & trap-door functions, cryptanalysis of public key ciphers, namely RSA, key exchange problem & solutions using the Diffie-Hellman algorithm, Message Authentication Codes (MAC) & signature schemes, elliptic & hyper-elliptic curve cryptography.*

Course Content

Introduction: Basic objectives of cryptography, secret-key & public-key cryptography, one-way & trapdoor one-way functions, cryptanalysis, attack models, classical cryptography. Block ciphers: Modes of operation, DES & its variants, RCS, IDEA, SAFER, FEAL, Blowfish, AES, linear & differential cryptanalysis. Stream ciphers: Stream ciphers based on linear feedback shift registers, SEAL, unconditional security. Message digest: Properties of hash functions, MD2, MD5 & SHA-1, keyed hash functions, attacks on hash functions. Public-key parameters: Modular arithmetic, gcd, Chinese remainder theorem, modular square roots, finite fields. Intractable problems: Integer factorization problem, RSA problem, modular square root problem, discrete logarithm problem, Diffie-Hellman problem, known algorithms for solving the intractable problems. Public-key encryption: RSA, Rabin & El Gamal schemes, side channel attacks. Key exchange: Diffie-Hellman & MQV algorithms. Digital signatures: RSA, DAS & NR signature schemes, blind & undeniable signatures. Entity authentication: Passwords, challenge-response algorithms, zero-knowledge protocols. Standards: IEEE, RSA & ISO standards. Network issues:

Certification, public-key infrastructure (PKI), secured socket layer (SSL), Kerberos. Advanced topics: Elliptic & hyper-elliptic curve cryptography, number field sieve, lattices & their applications in cryptography, hidden monomial cryptosystems, cryptographically secure random number generators.

List of Experiments

1. Implementation of Ceaser, Hill & Playfair cipher
2. Implementation of simplified DES
3. Implementation of AES
4. Implementation of Diffie-Hellman Kay exchange algorithm
5. Implementation of RSA algorithm
6. Implementation of MD5 & SHA
7. Implementation of Kerberos
8. Implementation of Elliptic & hyper-elliptic curve cryptography
9. Implementation of hidden monomial cryptosystems
10. Implementation of random number generators

Text/Reference Books

1. Cryptography and Network Security. Forouzan B. A. 2nd Ed. Tata McGraw-Hill. 2010.
2. Cryptography and Network Security. Stalling W. 4th Ed. Pearson.2006.
3. Cryptography and Network Security. Kahate A. 3rd Ed. Tata McGraw-Hill. 2003.

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Semester - I

(Departmental Core Subject)

CS-554 L-T-P-C
Database Engineering 3-0-0-3

Objective: *The course offers some advance database topics in depth which are useful for working with database in real world. The topics cover introductory concepts as well as advance topics in database like Parallel and Distributed Databases, Scheduling & Concurrency Control & Web database.*

Course Content

Relational Databases: Integrity Constraints revisited: Functional, Multi-valued & Join Dependency, Template Algebraic, Inclusion & Generalized Functional Dependency, Chase Algorithms & Synthesis of Relational Schemes. Query Processing & Optimization: Evaluation of Relational Operations, Transformation of Relational Expressions, Indexing & Query Optimization, Limitations of Relational Data Model, Null Values & Partial Information. Deductive Databases: Data log & Recursion, Evaluation of Data log program, Recursive queries with negation. Objected Oriented & Object Relational Databases: Modeling Complex Data Semantics, Specialization, Generalization, Aggregation & Association, Objects, Object Identity, Equality & Object Reference, Architecture of Object Oriented & Object Relational Databases. Case Studies: Gemstone, O2, Object Store, SQL3, Oracle xxi, DB2.

Parallel & Distributed Databases: Distributed Data Storage: Fragmentation & Replication, Location & Fragment Transparency, Distributed Query Processing & Optimization, Distributed Transaction Modeling & Concurrency Control, Distributed Deadlock, Commit Protocols, Design of Parallel Databases, Parallel Query Evaluation. Advanced

Transaction Processing: Nested & Multilevel Transactions, Compensating Transactions & Saga, Long Duration Transactions, Weak Levels of Consistency, Transaction Work Flows, & Transaction Processing Monitors. Active Databases: Triggers in SQL, Event Constraint & Action: ECA Rules, Query Processing & Concurrency Control, Compensation & Databases Recovery. Real Time Databases: Temporal Constraints: Soft & Hard Constraints, Transaction Scheduling & Concurrency Control. Image & Multimedia Databases: Modeling & Storage of Image & Multimedia Data, Data Structures - R-tree, k-d tree, Quad trees, Content Based Retrieval: Color Histograms, Textures etc., Image Features, Spatial & Topological Relationships, Multimedia Data Formats, Video Data Model, Audio & Handwritten Data, Geographic Information Systems (GIS). WEB Databases.

Text/Reference Books

1. Database System Concepts. Silberschatz A., Korth H. F. & Sudarshan S. 6th Ed. Tata McGraw-Hill. 2010.
2. Database Management System. Pakhira M. K. PHI. 2012.
3. Database Systems: Models, Languages, Design and Application Programming. Ramez E. & ShamKant B. N. 6th Ed. Pearson. 2013.

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Semester - I

(Departmental Core Subject)

CS-555 L-T-P-C
Advanced Computer Architecture 3-0-0-3

Objective: *The course entails some of the design concepts, subsystems, & new & specialized architectures (especially parallel architectures). The principal objective is to gain an understanding of selected architectural structures as they are likely to be encountered in real systems. The course also highlights some aspects of neuro-computing architecture.*

Course Content

Introduction to High Performance Computing: Overview, Pipeline vs. Parallel Processing Parallel Architectures: Classification & Performance. Pipeline Processing: Pipeline Performance, design of arithmetic pipelines, concept of reservation table, collision vector & hazards. Instruction Processing Pipes: Instruction & data hazard, hazard detection & resolution, delayed jumps, delayed execution. RISC Philosophy. Pipeline scheduling Theory: Greedy pipeline scheduling algorithm, state diagram, modified state diagram, Latency cycles, optimal cycles, scheduling of static & dynamic Pipelines. Implementation of pipeline schedulers Interconnection Networks: Interconnection network classification, Single stage/ Multistage Networks, crossbars, clos Networks, Benes Networks, Routing algorithms. Omega, Cub-connected & other networks. Introduction to Neurocomputing Architectures.

Text/Reference Books

1. Computer Architecture: A Quantitative Approach. Hennessy J. L. & Patterson D. A. 3rd Ed. Morgan Kaufmann. 2002.

2. Advanced Computer Architecture. Hwang K. & Jotwani N. 2nd Ed. Tata McGraw-Hill. 2011.
3. Computer Organization and Architecture. Stallings W. Macmillan Publishing Company. 1990.

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Semester - II

(Departmental Core Subject)

CS-556 L-T-P-C
Machine Learning: Theory & Methods 3-0-0-3

Objective: *Upon successful completion of the course, the students will acquire the basic knowledge of Machine Learning, identify algorithms as well as machine learning problems & apply the knowledge of computing & mathematics appropriate to the discipline. The course also includes concepts of decision tree, artificial neural networks, Bayesian learning, genetic algorithms, clustering & classification algorithms etc. & their applications.*

Course Content

Introduction Theoretical Approaches: Inductive Inference, Grammatical Inference PAC Learning. Complexity of Learning, polynomial learnability, VC-dimension. Methodologies: parametric learning, language learning, explanation based learning, learning using exemplars, algorithms, learning in neural nets, multistrategy learning. Automatic program construction from example computations, inference of LISP & logic programs, inference of decision trees & finite automata. Architecture of machine learning programs, ID5, C4.5 etc. Applications of Machine Learning to Data Mining & Knowledge Discovery.

Text/Reference Books

1. Machine Learning: The Art and Science of Algorithms that Make Sense of Data. Flach P. Cambridge University Press. 2012.
2. Machine Learning. Mitchell T. M. 1st Ed. Tata McGraw-Hill. 2013.
3. Introduction to Machine Learning. Alpaydin E. PHI. 2015.

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Semester - II

(Departmental Core Subject)

CS-557 L-T-P-C
Advances in Operating System Design 3-0-0-3

Objective: *The course entails the distributed operating systems & provides theoretical foundation for distributed systems. The student will also be able to implement project Case Studies in distributed OS & Security in Distributed OS, Distributed databases etc. & analyze the requirements, make critiques & create design of secured operating systems.*

Course Content

Theory & implementation aspects of distributed operating systems. Process synchronization in multiprocessing/multiprogramming systems. Inter-process communication & co-ordination in large distributed systems. Distributed resource management. Fundamentals of real time operating systems. Case studies. Information management in distributed systems: security, integrity & concurrency problems. Fault tolerance issues. OS issues related to the Internet, intranets, pervasive computing, embedded systems, mobile systems & wireless networks. Case studies of contemporary operating systems.

Text/Reference Books

1. Advance Concepts in Operating Systems. Singhal M. & Shivaratri N. 1st Ed. Tata McGraw-Hill. 2001.
2. Distribution System Modeling & Analysis. Kersting W. H. 3rd Ed. CRC Press. 2012.
3. Distributed Operating Systems. Tanenbaum A. S. 1st Ed. Pearson. 1995.

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Semester - II

(Departmental Core Subject)

CS-558 L-T-P-C
Digital Image Processing 3-0-1-4

Objective: *The course will cover techniques & tools for digital image processing, & image analysis techniques in the form of image segmentation. The topics cover image enhancement, image filters, image transforms, Fourier transforms & Fast Fourier transforms, Edge detection, Image Segmentation & color imaging.*

Course Content

Digital Image Fundamentals; Sensor & Imaging: Imaging Optics, Radiometry of Imaging, Illumination sources & techniques, Camera Principles, Image Enhancement in Spatial Domain: histogram equalization & specification, contrast modification, neighborhood filtering, image smoothing & image sharpening; Gray Level Transformation, Histogram Processing, Spatial Filters; Image Transforms; Fourier transforms & their properties, Fast Fourier Transform, Other Transforms; Frequency domain processing: Sampling theorem, applications in image filtering, Edge detection, Image Restoration, Image segmentation, Hough transform, region based segmentation; Representation & Description; Color Imaging.

List of Experiments

1. The basic built-in functions available for image processing in Scilab to read, write & manipulate, understanding various image formats & conversion to gray scale & other formats
2. Programs related to the concept of image transforms through singular value decomposition, Haar, Walsh & Hadamaard transforms, DFT etc

3. Programs related to the statistical description of digital image through random fields, Karhunen-Loeve transform, independent component analysis
4. Programs related to image enhancement through histogram manipulation, reducing high frequency noise
5. Programs related to linear, non-linear filtering techniques like convolution, derivative, wiener & dithering
6. Programs related to image segmentation & edge detection through Sobel filters
7. Programs related to morphological image processing
8. Programs related to basic color image processing
9. Programs related to the basics of 3D image representation
10. Programs related to the concept of image compression
11. Case Study: Human face detection system & Signature verification system

Text/Reference Books

1. Digital Image Processing Pratt. William K. 4th Ed. Willey Publisher. 2007.
2. Fundamentals of Digital Image Processing. Jain A. K. 2nd Ed. PHI. 1989.

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Semester - II

(Departmental Core Subject)

CS-561 L-T-P-C
Advanced Computer Networks 3-0-0-3

Objective: *The course is offered to identify & discuss the concepts underlying protocols for communications, & their main characteristics & functionality; to understand the principles & functionality of mobile IP, explaining its concretization in IPv6, handover latency & requirements from terminals & the QoS support challenges in future networks.*

Course Content

Introduction: Networking basics, OSI Model, LAN & WAN Technologies, Internet & Intranets. Network protocols, Overview of computer networks, seven-layer architecture, TCP/IP suite of protocols, etc. MAC protocols for high-speed LANS, MANs, & wireless LANs. (For example, FDDI, DQDB, HIPPI, Gigabit Ethernet, Wireless Ethernet, etc.) Medium access control, TCP/IP Network programming, Client-Server architecture, Sockets, Remote Procedure Calls. Distributed applications, File-servers, three-tier applications, Distributed object systems. Synchronization issues in distributed systems. Network security & management; Fast access technologies. (For example, ADSL, Cable Modem, etc.); IPv6: Why IPv6, basic protocol, extensions & options, support for QoS, security, etc., neighbor discovery, auto-configuration, routing. Changes to other protocols. Application Programming Interface for IPv6; IP Multicasting. Multicast routing protocols, address assignments, session discovery, etc.; TCP extensions for high-speed networks, transaction-oriented applications. Other new options in TCP; Network security at various layers. Secure-HTTP, SSL, ESP, Authentication header, Key distribution protocols. Digital signatures, digital certificates.

Text/Reference Books

1. Computer Networks: A Systems Approach. Peterson L. L. & Davie B. S. 5th Ed. Morgan Kaufmann. 2011.

2. Computer Networking – A top-down approach featuring the Internet. Kurose J. F. & Ross K. Addison-Wesley Publishing Co. 2003.
3. Data Communications, Computer Networks and Open Systems. Halsall F. 4th Ed. Addison-Wesley Publishing Co. 1996.

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Semester - II

(Departmental Core Subject)

CS-562 L-T-P-C
Mobile Computing 3-0-0-3

Objective: *The objective of this course is to impart fundamental concepts in the area of mobile computing, provide a computer systems perspective on the converging areas of wireless networking, embedded systems, & software, & to introduce selected topics of current research interest in the field.*

Course Content

Overview of wireless technologies: wireless LANs, cellular systems, sensor networks etc. Wireless physical layer designs. Wireless multiple access protocols. Wireless broadcast techniques. Multihop routing protocols. Mobility management at the IP & higher layers. Impact of mobility on algorithms & applications. TCP performance over wireless. Localization, energy efficiency, & security in mobile systems. Smartphone based mobile computing & applications. Future directions of mobile communications. Mobility in networks. Mobile IP. Security related issues.

Text/Reference Books

1. Mobile Communications. Schiller J. H. Addison-Wesley Publishing Co. 2000.
2. Mobile Computing-Technology, Applications and Service Creation. Talukder A. K. & Yavagal R. Tata McGraw-Hill. 2006.
3. Mobile Computing. Imielinski T. & Korth H. F. Springer. 1996.

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Semester - III

(Departmental Core Subject)

CS-563 L-T-P-C
Advanced Wireless Networks 3-0-1-4

Objective: *The course provides a broad coverage of challenges and latest research results related to the design & management of wireless sensor networks & understanding of network architectures, node discovery & localization, deployment strategies, node coverage, routing protocols, medium access arbitration, fault-tolerance.*

Course Content

Fundamentals of wireless communication & computer networking : Electromagnetic spectrum; Characteristics of wireless channel; Modulation techniques; Multiple access techniques; Voice coding; Computer network architectures (reference models).

Fundamentals of wireless LANs, PANs, WANs, MANs & Wireless Internet : IEEE 802.11 & ETSI, HIPER-LAN standards; Bluetooth; HomeRF; Cellular concept & architecture; First, second, & third generation cellular networks; Wireless in local loop systems, standards, & future trends; Wireless ATM networks; IEEE 802.16 & ETSI HIPERACCESS standards; Issues & challenges in extending internet services over wireless networks; Mobile IP; TCP over wireless; Wireless application protocol; Optimizing Web over wireless.

Ad hoc wireless networks : Issues & challenges in infrastructure-less networks; MAC protocols; Routing protocols; Multicast routing protocols; Transport & security protocols; Quality of service provisioning; Energy management.

Hybrid wireless networks & wireless sensor networks : Architectures & routing protocols for hybrid wireless networks; Load balancing schemes; Pricing schemes for multihop wireless networks; Issues & challenges in wireless sensor networks: Architectures &

routing protocols; MAC protocols; Data dissemination, data gathering, & data fusion; Quality of a sensor network; Real-time traffic support & security protocols.

Recent advances in wireless networks Wide Band (UWB) communication; Issues & challenges in UWB communication; Applications of UWB communication; Wireless Fidelity (Wi-Fi) systems; Issues in Wi-Fi Systems; Pricing/billing in Wi-Fi systems; Multimode 802.11; Optical wireless communications; Optical Wireless Wavelength Division Multiplexing (OWWDM).

List of Experiments

1. Introduction to cognitive wireless networking
2. Designing of scalable wireless networks
3. Improvement of bandwidth efficiency & fairness
4. Utilization of network assets via the re-arrangability of network connectivity
5. Quality-of-Service (QoS) routing to support networked applications requiring different qualities of service
6. Routing for WSN
7. AODV, DSDV, DSR in WSN
8. Link state updating to expedite the exchange of network state information
9. Active queue management to control congestion & to reduce the occurrence of overflows of packet buffers associated with network routers
10. Traffic modeling & scheduling to improve the ability to engineer & operate networks with predictable qualities of service
11. Broadband access to provide end users at network edges with sufficient bandwidth & QoS
12. Network coding to improve network performance by mixing/coding information received from multiple links at intermediate network nodes

Text/Reference Books

1. Ad Hoc and Sensor Networks – Theory and Applications. Corderio C. & Aggarwal D. P. World Scientific Publications. 2006.
2. Wireless Sensor Networks: An Information Processing Approach. Zhao F. & Guibas L. Morgan Kauffman. 2004.

3. A High-Throughput Path Metric for Multi-Hop Wireless Routing. Douglas S.J., Aguayo D., Bicket J. & Morris R. ACM Mobicom. 2003.

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Semester - III

(Departmental Core Subject)

CS-564 L-T-P-C
Quality of Service in Networks 3-0-0-3

Objective: *The course includes the fundamentals of quality of service & optimization in networks, Management & service-oriented architectures. This course provides the foundation for understanding the QoS & networks management mechanisms.*

Course Content

Integrated Services architecture, guaranteed service, controlled load service. RSVP signaling, packet scheduling mechanisms, GPS, Weighted fair queuing, & Weighted Round Robin. Differentiated Service Architecture, Per Hop Behaviours, Diff serv fields, AF & EF PHB. IntServ over DiffServ, Congestion Control. MPLS Architecture, Label Distribution Protocols, Traffic Engineering, Constraint Based Routing. QoS based routing. QoS in Wireless Networks. Traffic Description methods, worst case delay calculations for ATM, FDDI & heterogeneous networks.

Text/Reference Books

1. Internet QoS - Architecture and Mechanisms for Quality of Service. Wang Z. 1st Ed. Morgan Kauffman. 2001.
2. MPLS: Technology and Applications. Davie B. S. & Rekhter Y. 1st Ed. Morgan Kauffman. 2000.
3. An Engineering Approach to Computer Networking: ATM Networks, the Internet, and the Telephone Network. Keshav S. 1st Ed. Addison-Wesley Publishing Co.1997.

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Semester - III

(Departmental Core Subject)

CS-565 L-T-P-C
High Speed Networks 3-0-0-3

Objective: *The objective of the course is to develop an in-depth understanding, in terms of architecture, protocols & applications, of major high-speed networking technologies, solve numerical or analytical problems pertaining to the high-speed networking technologies, evaluate various technologies & identify the most suitable one to meet a given set of requirements for a hypothetical corporate network.*

Course Content

High Speed Networks: Frame Relay Networks, Asynchronous transfer mode: ATM Protocol Architecture, ATM logical Connection, ATM Cell: ATM Service Categories, AAL. High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel: Wireless LANs: applications, requirements: Architecture of 802.11.

Congestion & Traffic Management: Queuing Analysis, Queuing Models, Single Server Queues, Effects of Congestion, Congestion Control, Traffic Management, Congestion Control in Packet Switching Networks, Frame Relay Congestion Control. TCP & ATM Congestion Control: TCP Flow control, TCP Congestion Control, Retransmission, Timer Management, Exponential RTO back off, KARN's Algorithm, Window management, Performance of TCP over ATM. Traffic & Congestion control in ATM, Requirements, Attributes, Traffic Management Frame work, Traffic Control, ABR traffic Management, ABR rate control, RM cell formats, ABR Capacity allocations, GFR traffic management. Integrated & Differentiated Services: Integrated Services Architecture, Approach,

Components, Services, Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ, Random Early Detection, Differentiated Services.

Protocols for Qos Support: RSVP, Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms, Multiprotocol Label Switching, Operations, Label Stacking, Protocol details, RTP, Protocol Architecture, Data Transfer Protocol, RTCP.

Text/Reference Books

1. High Speed Networks and Internet. Stallings W. 2nd Ed. Pearson Education. 2002.
2. High Performance Communication Networks. Warland & Varaiya P. 2nd Ed. Jean Harcourt Asia Pvt. Ltd. 2001.

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Semester - III

(Departmental Core Subject)

CS-580A L-T-P-C
Dissertation - I 0-0-5-5

The Dissertation for M.Tech programme consists of two parts: Dissertation-I & Dissertation-II. Dissertation-I is undertaken during the III Semester.

The Dissertation is by far the most important single piece of work in the post-graduate programme. It provides the opportunity for student to demonstrate independence & originality, to plan & organize a large Dissertation over a long period & to put into practice some of the techniques students have been taught in the course. Students will choose a dissertation, in consultation with a faculty member, who will act as the Supervisor. Dissertation involves a combination of sound background research, a solid implementation, or piece of theoretical work, & a thorough evaluation of the dissertation's output in both absolute & relative terms. The very best dissertations invariably covers some new ground, e.g. by developing a complex application which does not already exit, or by enhancing some existing application or method to improve its functionality, performance etc.

The student will prepare the Dissertation report as per the prescribed format/guidelines, & present the same as a seminar at the end of the semester.

The Dissertation will be evaluated continuously over the span of the III Semesters, as per the approved procedure.

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Semester - IV

(Departmental Core Subject)

CS-580B	L-T-P-C
Dissertation - II	0-0-9-9

After completion of Dissertation-I, students will undertake the Dissertation-II in the IV Semester. The idea conceived & progress made in the Dissertation-I shall be extended as Dissertation-II under the supervision of a faculty member. Students shall complete the theoretical & practical aspect of the project. Thereafter they will prepare a report, as per the prescribed format/ guidelines, incorporating the results, their analysis & interpretation. The report, duly certified by the Supervisor, should be submitted to the Head of the Department. The report should also be presented as a seminar at the end of the semester. Progress made by the student will be continuously monitored throughout the semester & evaluated as per the approved procedure.

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Semester - IV

(Departmental Core Subject)

CS-580C	L-T-P-C
Dissertation Viva Voce	0-0-0-3

Dissertation Viva Voce is the verbal defence of the dissertation carried out by the student in front of a panel of examiners. The objective of Viva Voce examination is to confirm that the piece of work submitted as a dissertation is student's own work, he/she has a sound understanding of the subject of the dissertation, aware of the recent works in the area of dissertation, methodology adopted, and importance/relevance/merits of the output in relation with the existing results in the area.