Syllabus for B.Tech. (CSE) 2014 onward

First Year												
Course No.	**Course Name**	**L**	**T**	**P**	**C**		**Course No.**	**Course Name**	**L**	**T**	**P**	**C**
Semester – 1 Group I							**Semester – 1 Group II**					
CH101	Chemistry	3	0	0	6		CS101	Introduction to Computing	3	0	0	6
ME101	Engineering Mechanics	3	1	0	8		EE101	Basic Electrical & Electronics Sciences	3	1	0	8
MA101	Mathematics - I	3	0	0	6		MA101	Mathematics - I	3	0	0	6
PH101	Physics - I	3	0	0	6		PH101	Physics - I	3	0	0	6
HS101	Communication Skills	2	0	0	4		CE101	Environmental Studies	2	0	0	4
CH111	Chemistry Laboratory	0	0	2	2		CS111	Computing Laboratory	0	0	4	4
ME111/PH111	Workshop/Physics Laboratory	0	0	3	3		PH111/ME111	Physics Laboratory/Workshop	0	0	3	3
ME112	Engineering Drawing	1	0	3	5		EE111	Basic Electrical & Electronics Sciences laboratory	0	0	3	3
SA101	NCC/NSS/NSO1	0	0	2	0		SA 101	NCC/NSS/NSO1	0	0	2	0
		15	**1**	**10**	**40**				**14**	**1**	**12**	**40**

First Year												
Course No.	**Course Name**	**L**	**T**	**P**	**C**		**Course No.**	**Course Name**	**L**	**T**	**P**	**C**
Semester – II Group II							**Semester – II Group I**					
CH101	Chemistry	3	0	0	6		CS101	Introduction to Computing	3	0	0	6
ME101	Engineering Mechanics	3	1	0	8		EE101	Basic Electrical & Electronics Sciences	3	1	0	8
MA102	Mathematics - II	3	0	0	6		MA102	Mathematics - II	3	0	0	6
PH102	Physics - II	3	0	0	6		PH102	Physics - II	3	0	0	6
HS101	Communication Skills	2	0	0	4		CE101	Environmental Studies	2	0	0	4
CH111	Chemistry Laboratory	0	0	2	2		CS111	Computing Laboratory	0	0	4	4
ME111/PH111	Workshop/Physics Laboratory	0	0	3	3		PH111/ME111	Physics Laboratory/Workshop	0	0	3	3
ME112	Engineering Drawing	1	0	3	5		EE111	Basic Electrical & Electronics Sciences Laboratory	0	0	3	3
SA102	NCC/NSS/NSO II	0	0	2	0		SA102	NCC/NSS/NSO II	0	0	2	0
		15	**1**	**10**	**40**				**13**	**1**	**12**	**40**

Syllabus for B.Tech. (CSE) 2014 onward

Second Year												
Course No.	**Course Name**	**L**	**T**	**P**	**C**		**Course No.**	**Course Name**	**L**	**T**	**P**	**C**
Semester – 3							**Semester – 4**					
MA201	Mathematics III	3	0	0	6		CS202	Formal Languages and Automata Theory	3	1	0	8
CS201	Data Structures	3	0	0	6		CS204	Algorithms	3	0	0	6
CS203	Discrete Mathematics	3	1	0	8		CS206	Computer Organization and Architecture	3	0	0	6
CS205	Digital Design	3	0	0	6		CS208	Object Oriented Programming	3	0	0	6
HS201	Engineering Economics & Accountancy	2	0	0	4		MA202	Probability and Random Processes	3	0	0	6
CS231	Data Structures Lab	0	0	3	3		CS242	Algorithms Lab	0	0	3	3
CS233	Digital Design Lab	0	0	3	3		CS244	Object Oriented Programming Lab	0	0	3	3
SA201	NCC/NSO/COS	0	0	2	0		CS246	Peripherals and Accessories Lab	0	0	3	3
							SA202	NCC/NSO/COS	0	0	2	0
		14	**1**	**8**	**36**				**15**	**1**	**11**	**41**

Third Year												
Course No.	**Course Name**	**L**	**T**	**P**	**C**		**Course No.**	**Course Name**	**L**	**T**	**P**	**C**
Semester – 5							**Semester – 6**					
MA301	Optimization	3	0	0	6		HS302	Management and Managerial Economics	2	0	0	4
CS301	Software Engineering	3	0	0	6		CS302	Databases	3	0	0	6
CS303	Operating Systems	3	0	0	6		CS304	Compilers	3	0	0	6
CS305	Data Communication	3	1	0	8		CS306	Computer Networks	3	0	0	6
CS307	Machine Learning	3	0	0	6		CS308	Information Storage and Retrieval	3	1	0	8
CS351	Software Engineering and System Software Lab	0	0	3	3		CS362	Databases Lab	0	0	3	3
CS353	Operating Systems Lab	0	0	3	3		CS364	Compilers and System Programming Lab	0	0	3	3
CS355	Machine Learning Lab	0	0	3	3		CS366	Computer Networks Lab	0	0	3	3
		15	**1**	**9**	**41**				**14**	**1**	**9**	**39**

Syllabus for B.Tech. (CSE) 2014 onward

Final Year												
Course No.	**Course Name**	**L**	**T**	**P**	**C**		**Course No.**	**Course Name**	**L**	**T**	**P**	**C**
Semester – 7							**Semester – 8**					
CS401	Computer Graphics	3	0	0	6		CS5XX	Department Elective - IV	3	0	0	6
MA203	Numerical Methods	3	0	0	6		CS5XX	Department Elective - V	3	0	0	6
CS5XX	Department Elective - I	3	0	0	6		CS5XX	Department Elective - VI	3	0	0	6
CS5XX	Department Elective - II	3	0	0	6		CS482	Project - II	0	0	9	9
CS5XX	Department Elective - III	3	0	0	6							
CS471	Computer Graphics Lab	0	0	3	3							
CS473	Project - I	0	0	6	6							
		15	**0**	**9**	**39**				**9**	**0**	**9**	**27**

Total Credits: **303**

CS201 DATA STRUCTURES 3-0-0-6

Syllabus : Performance of algorithms: space and time complexity, asymptotics; Fundamental Data structures: linked lists, arrays, matrices, stacks, queues, binary trees, tree traversals; Algorithms for sorting and searching: linear search, binary search, insertion-sort, selection sort, bubble-sort, quicksort, mergesort, heapsort, shellsort; Priority Queues: lists, heaps, binomial heaps, Fibonacci heaps; Graphs: representations, depth first search, breadth first search; Hashing: separate chaining, linear probing, quadratic probing; Search Trees: binary search trees, red-black trees, AVL trees, splay trees, B-trees; Strings: suffix arrays, tries; Randomized data structures: skip lists.

Texts :

1. T H Cormen, C E Leiserson, R L Rivest and C Stein, Introduction to Algorithms, MIT Press, 2001.
2. M A Weiss, Data Structures and Problem Solving Using Java, Addison-Wesley, 1997.

References :

1. A M Tannenbaum, Y Langsam and M J Augenstein, Data Structures Using C++, Prentice Hall India, 1996.
2. A H Aho, J E Hopcroft and J Ullman, Data Structures and Algorithms, Addison-Wesley, 1987.
3. Robert Sedgewick, Algorithms in C++ Parts 1-4, Pearson Education, Third Edition, 1998.
4. Robert Sedgewick, Algorithms in C++ Part 5, Pearson Education, Third Edition, 2002.

CS203 DISCRETE MATHEMATICS 3-1-0-8

Syllabus : Set theory: sets, relations, functions, countability; Logic: formulae, interpretations, methods of proof, soundness and completeness in propositional and predicate logic; Number theory: division algorithm, Euclid's algorithm, fundamental theorem of arithmetic, Chinese remainder theorem, special numbers like Catalan, Fibonacci, harmonic and Stirling; Combinatorics: permutations, combinations, partitions, recurrences, generating functions; Graph Theory: paths, connectivity, subgraphs, isomorphism, trees, complete graphs, bipartite graphs, matchings, colourability, planarity, digraphs; Algebraic Structures: semigroups, groups, subgroups, homomorphisms, rings, integral domains, fields, lattices and boolean algebras.

Texts :

1. C L Liu, Elements of Discrete Mathematics, 2/e, Tata McGraw-Hill, 2000
2. R C Penner, Discrete Mathematics: Proof Techniques and Mathematical Structures, World Scientific, 1999.

References :

1. R L Graham, D E Knuth, and O Patashnik, Concrete Mathematics, 2/e, Addison-Wesley, 1994.
2. K H Rosen, Discrete Mathematics & its Applications, 6/e, Tata McGraw-Hill, 2007.
3. J L Hein, Discrete Structures, Logic, and Computability, 3/e, Jones and Bartlett, 2010.
4. N Deo, Graph Theory, Prentice Hall of India, 1974.
5. S Lipschutz and M L Lipson, Schaum's Outline of Theory and Problems of Discrete Mathematics, 2/e, Tata McGraw-Hill, 1999.
6. J P Tremblay and R P Manohar, Discrete Mathematics with Applications to Computer Science, Tata McGraw-Hill, 1997.

CS205 DIGITAL DESIGN 3-0-0-6

Syllabus : Boolean Algebra and switching functions; Minimization and realization using logic gates, ROMs, PLAs, multiplexers; Circuits for code conversion; Flip-flops, registers, counters; Finite state model: State tables and diagrams; State minimization; Excitation functions of memory elements; Synthesis of synchronous sequential circuits; Representation and synthesis using ASM charts; Incompletely specified machines; Specification and synthesis of asynchronous sequential machines; Current trends in digital design: ASIC, FPGA, etc.; Number representation: fixed and floating point; Addition, subtraction, multiplication and division of numbers.

Texts :

1. M. Morris Mano and M. D. Ciletti, Digital Design, 4/e, Pearson Education, 2007.
2. R. H. Katz and G. Boriello, Contemporary Logic Design, 2/e, Prentice Hall of India, 2009.

References :

1. A. P. Malvino, D. P. Leach and G.Saha, Digital Principles and Applications, 7/e, McGraw Hill, 2010.
2. Z. Kohavi and N. Jha, Switching and Finite Automata Theory, 3/e, Cambridge University Press, 2010.
3. S. C. Lee, Digital Circuits and Logic Design, Prentice Hall of India, 2006.
4. J. F. Wakerly, Digital Design Principles and Practices, 4/e, Prentice Hall of India, 2008.

CS231 DATA STRUCTURES LABORATORY 0-0-3-3

Syllabus : Programming Laboratory will be set in consonance with the material covered in CS201. All programming assignments are to be in C/C++/Java.

Texts :

References :

1. J Gosling, B Joy, G L Steele and G Bracha, The Java Language Specification, 2/e, Addison-Wesley, 2000.
2. B Stroustrup, The C++ Programming Language, 3/e, Addison-Wesley Longman Reading MA,1997.
3. S B Lippman, C++ Primer, 2/e, Addison-Wesley, 1991.
4. T Budd, C++ for Java Programmers, Addison Wesley, 1999.
5. M C Daconta, Java for C/C++ programmers, John Wiley & Sons, 1996.

CS233 DIGITAL DESIGN LABORATORY 0-0-3-3

Syllabus : Experiments related to topics covered in CS221: Digital Design.

Texts :

References :

1. Relevant Analog and Digital IC and component manuals.

CS202 FORMAL LANGUAGES AND AUTOMATA THEORY 3-1-0-8

Syllabus : Alphabets, languages, grammars; Finite automata: regular languages, regular expressions; Context-free languages: pushdown automata, DCFLs; Context sensitive languages: linear bounded automata; Turing machines: recursively enumerable languages; Operations on formal languages and their properties; Chomsky hierarchy; Decision questions on languages.

Texts :

1. J. E. Hopcroft, R. Motwani and J. D. Ullman, Introduction to Automata Theory, Languages and Computation, 2/e, Pearson Education, 2000.

References :

1. M. Sipser, Introduction to the Theory of Computation, Thomson, 2004.
2. H. R. Lewis, C. H. Papadimitriou, Elements of the Theory of Computation, Pearson Education Asia, 2001.
3. D. C. Kozen, Automata and Computability, Springer-Verlag, 1997.

CS204 ALGORITHMS 3-0-0-6

Syllabus : Models of Computation: space and time complexity measures, lower and upper bounds; Design techniques: the greedy method, divide-and-conquer, dynamic programming, backtracking, branch and bound; Lower bound for sorting; Selection; Graph Algorithms: connectivity, strong connectivity, biconnectivity, topological sort, shortest paths, minimum spanning trees, network flow; The disjoint set union problem; String matching; NP-completeness; Introduction to approximate algorithms and Randomized algorithms.

Texts :

1. T H Cormen, C E Leiserson, R L Rivest and C Stein, Introduction to Algorithms, MIT Press, 2001.
2. Jon Kleinberg and Eva Tardos, Algorithm Design, Addison Wesley, 2005.

References :

1. A Aho, J E Hopcroft and J D Ullman, The Design and Analysis of Computer Algorithms, Addison-Wesley, 1974.
2. S Sahni, Data Structures, Algorithms and Applications in C++, McGraw-Hill, 2001.
3. M T Goodrich and R Tamassia, Algorithm Design: Foundations, Analysis and Internet Examples, John Wiley & Sons, 2001.

CS206 COMPUTER ORGANIZATION AND ARCHITECTURE 3-0-0-6

Syllabus : Arithmetic and Logic Unit; Memory Organization; Instruction sets; RISC and CISC paradigms; Various addressing modes; Assembly language programming; Instruction interpretation: micro-operations and their RTL specification; CPU design: Hardwired and Microprogrammed; I/O transfer techniques: Program controlled, Interrupt controlled and DMA; Introduction to computer buses, peripherals and current trends in architecture.

Texts :

1. William Stallings, Computer Organization and Architecture: Designing for Performance, 8/e, Pearson Education India. 2010.
2. D. A. Patterson and J. L. Hennessy, Computer Organization and Design, 4/e, Morgan Kaufmann, 2008.

References :

1. A. S. Tanenbaum, Structured Computer Organization, 5/e, Prentice Hall of India, 2009.
2. V. C. Hamacher, Z. G. Vranesic and S. G. Zaky, Computer Organization, 5/e, McGraw Hill, 2002.
3. J. L. Hennessy and D. A. Patterson, Computer Architecture: A Quantitative Approach, 4/e, Morgan Kaufmann, 2006.
4. D. V. Hall, Microprocessors and Interfacing, 2/e, McGraw Hall, 2006.

CS208 OBJECT ORIENTED PROGRAMMING 3-0-0-6

Syllabus : Principles of Object Oriented Programming; Tokens, expressions and control structures; Classes and objects; Object initialization and cleanup; Operator overloading and type conversion; Inheritance, extending classes; Pointers, virtual functions and polymorphism; Working with files; Generic programming with templates; Introduction to Object-Oriented analysis and design

Texts :

1. Object-Oriented Programming in C++ By Robert Lafore
2. Object Oriented Programming with C++ by Balaguruswamy, TMH

References :

1. Object Oriented Programming By- Budd, Addison Wesley.
2. Mastering C++ By K.R Venugopal , Rajkumar, TMH.
3. An Introduction to Object Oriented Programming with C++ by Timthy Budd, Addition-Wesley
4. C++ and Object-Oriented Programming By - Kip R. Irvine, Prentice Hall.

MA202 PROBABILITY AND RANDOM PROCESSES 3-0-0-6

Syllabus : Axiomatic construction of the theory of probability, independence, conditional probability, and basic formulae, random variables, probability distributions, functions of random variables; Standard univariate discrete and continuous distributions and their properties, mathematical expectations, moments, moment generating function, characteristic functions; Random vectors, multivariate distributions, marginal and conditional distributions, conditional expectations; Modes of convergence of sequences of random variables, laws of large numbers, central limit theorems.

Definition and classification of random processes, discrete-time Markov chains, Poisson process, continuous-time Markov chains, renewal and semi-Markov processes, stationary processes, Gaussian process, Brownian motion, filtrations and martingales, stopping times and optimal stopping.

Texts:

1. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2000.
2. J. Medhi, Stochastic Processes, 3rd Ed., New Age International, 2009.
3. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

References :

1. G.R. Grimmett and D. R. Stirzaker, Probability and Random Processes, Oxford University Press, 2001.
2. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
3. K.S. Trivedi, Probability and Statistics with Reliability, Queuing, and Computer Science Applications, Wiley India, 2008.
4. S.M. Ross, Stochastic Processes, 2nd Ed., Wiley, 1996.
5. C.M. Grinstead and J. L. Snell, Introduction to Probability, 2nd Ed., Universities Press India, 2009.

CS242 ALGORITHMS LABORATORY 0-0-3-3

Syllabus : Programming different algorithms studied in theory course (CS204: Algorithms); running on large data sets and observing change in time with input size.

Texts :

1. T H Cormen, C E Leiserson, R L Rivest and C Stein, Introduction to Algorithms, MIT Press, 2001.

References :

1. A Aho, J E Hopcroft and J D Ullman, The Design and Analysis of Computer Algorithms, Addison-Wesley, 1974.

CS244 OBJECT ORIENTED PROGRAMMING LABORATORY 0-0-3-3

Syllabus : Programs will be based on theoretical topics of the course (CS208: Object Oriented Programming) covered in the class.

Texts :

1. Object-Oriented Programming in C++ By Robert Lafore

References :

1. Object Oriented Programming with C++ by Balaguruswamy, TMH

CS246 PERIPHERALS AND ACCESSORIES LABORATORY 0-0-3-3

Syllabus : Microprocessor architecture, Microprocessor programming, Assembly Language of 8085 and 8086 microprocessors, Software controlled serial and parallel I/O in 8085, Use of programmable interrupt controller, programmable peripheral interface (8255), DMA controller, PIT (8253) and DMA. Experiments related to interfacing ADC, DAC, Motors, Timers, Serial and Parallel ports, etc. to such kits/boards.

Texts :

1. Ramesh Gaonkar, Microprocessor Architecture, Programming, and Applications with 8085, 5/e, Penram International Publishing, 2009.
2. D. V. Hall, Microprocessors and Interfacing, 2/e, McGraw Hall, 2006.
3. Relevant Analog and Digital IC and component manuals.

References :

MA301 OPTIMIZATION 3-0-0-6

Syllabus : Classification and general theory of optimization; Linear programming (LP): formulation and geometric ideas, simplex and revised simplex methods, duality and sensitivity, interior-point methods for LP problems, transportation, assignment, and integer programming problems; Nonlinear optimization, method of Lagrange multipliers, Karush-Kuhn-Tucker theory, numerical methods for nonlinear optimization, convex optimization, quadratic optimization; Dynamic programming; Optimization models and tools in finance.

Texts:

1. D. G. Luenberger and Y. Ye, Linear and Nonlinear Programming, 3rd Ed., Springer India, 2008.
2. N. S. Kambo, Mathematical Programming Techniques, East-West Press, 1997.

References:

1. E. K. P. Chong and S. H. Zak, An Introduction to Optimization, 2nd Ed., Wiley India, 2001.
2. M. S. Bazarra, H. D. Sherali and C. M. Shetty, Nonlinear Programming Theory and Algorithms, 3rd Ed., Wiley India, 2006.
3. S. A. Zenios (ed.), Financial Optimization, Cambridge University Press, 2002.
4. K. G. Murty, Linear Programming, Wiley, 1983.
5. D. Gale, The Theory of Linear Economic Models, The University of Chicago Press, 1989.

CS301 SOFTWARE ENGINEERING 3-0-0-6

Syllabus : Software and Software Engineering; The Software Process: Process models; Modeling: Requirements engineering, requirements modeling, UML, design concepts, etc.; Quality Management; Product metrics; Process and project metrics; Software estimation techniques; Software testing strategies; Project scheduling; Risk management; Maintenance.

Texts :

1. Pressman, R.S., Software Engineering: A Practioner's Approach, McGraw Hill, seventh edition, 2010.

References :

1. Sommerville, Ian, Software Engineering, Addison-Wesley, fifth edition, 2000.
2. Jalote, P., An Integrated Approach to Software Engineering, Narosa Publishing House, second edition, 2003.
3. Bennett S., McRobb S. & Farmer R., Object Oriented Systems Analysis and Design using UML, Tata McGraw-Hill, second edition, 2004.

CS303 OPERATING SYSTEMS 3-0-0-6

Syllabus : Process Management: process, thread, scheduling; Concurrency: mutual exclusion, synchronization, semaphores, deadlocks; Memory Management: allocation, protection, hardware support, paging, segmentation; Virtual Memory: demand paging, allocation, replacement, swapping, segmentation, TLBs; File Management: naming, file operations and their implementation; File Systems: allocation, free space management, directory management, mounting; I/O Management: device drivers, disk scheduling.

Texts :

1. Silberschatz, A. and Galvin, P. B. Operating System Concepts. 8/e. Wiley, 2008.

References :

1. Stalling, W. Operating Systems: Internals and Design Principles. 6/e. Pearson, 2008.
2. Tanenbaum, A. S. Modern Operating System. 3/e. Pearson, 2007.
3. Dhamdhere, D. M. Operating SystemsA Concept Based Approach, McGrawHill, 2008

CS305 DATA COMMUNICATION 3-1-0-8

Syllabus : Basics of Digital communications: Signals, noise, Nyquist rate, Shannon capacity; Analog transmission: modulation techniques, fundamentals of modems, FDM; Digital transmission: PCM, ADPCM, line coding, error handling techniques, TDM, xDSL, spread spectrum; Transmission media: Guided (twisted pair, coaxial, fiber optic) and unguided media; Balanced and unbalanced signalling, interfacing; Principles of switching; Local area networks: Ethernet, Fast Ethernet, introduction to Gigabit Ethernet and WLANs; Hubs, bridges and switches;

Texts :

1. W. Stallings, Data and Computer Communications, 8th Ed, Pearson India, 2007.
2. B. Forouzan, Data Communications and Networking, 4th Ed, Tata Mcgraw Hill, 2006.

References :

1. A. S. Tanenbaum, Computer Networks, 4th Ed, Pearson India, 2003.
2. J. Quinn, Digital Data Communications, 1st Ed, Prentice Hall Career and Technology, 1995.
3. P. C. Gupta, Data Communications and Computer Networks, 2nd Ed, Prentice Hall of India, 2009.
4. F. Halsall, Data Communications, Computer Networks and Open Systems, 4th Ed, Addison Wesley, 1996.

CS307 MACHINE LEARNING 3-0-0-6

Syllabus : **Introduction:** Basic concepts; **Supervised learning:** Supervised learning setup, LMS, Logistic regression, Perceptron, Exponential family, Generative learning algorithms, Gaussian discriminant analysis, Naive Bayes, Support vector machines, Model selection and feature selection, Ensemble methods: Bagging, boosting, Evaluating and debugging learning algorithms; **Learning theory:** Bias/variance tradeoff, Union and Chernoff/Hoeffding bounds, VC dimension, Worst case (online) learning; **Unsupervised learning:** Clustering K-means, EM. Mixture of Gaussians, Factor analysis, PCA (Principal components analysis), ICA (Independent components analysis); **Reinforcement learning and control:** MDPs. Bellman equations, Value iteration and policy iteration, Linear quadratic regulation (LQR), LQG, Q-learning. Value function approximation, Policy search. Reinforce. POMDPs.

Texts :

1. Ethem Alpaydin, Introduction to Machine Learning, Second Edition, PHI, 2010

2. P. Langley, Elements of Machine Learning, Morgan Kaufmann, 1995.

References :

CS351 SOFTWARE ENGINEERING AND SYSTEM SOFTWARE LABORATORY 0-0-3-3

Syllabus : Laboratory will be set in consonance with the material covered in CS301. The syllabus also includes Overview of Unix system, commands and utilities; Basic Linux administration and installation: grub, rpm, yum, disk partitioning; Basic Linux utilities, logging, backup, authentication; Internet mail system: send mail, elm, mail administration; Program Maintenance: make, sccs, debugging with gdb and ddd; Archiving: shar, tar; Shell use: redirection, .cshrc, environment variables; Regular Expression parsing: grep, egrep, sed, awk; Shell programming: bash; Scripting Languages like Perl, Python, Java Script; Database Driven Web Site: PHP and MySQL;

Texts :

References :

1. Bennett S., McRobb S. & Farmer R., Object Oriented Systems Analysis and Design using UML, Tata McGraw-Hill, second edition, 2004.
2. J. Greenspan and B. Bulger, MySQL/PHP Database Applications, M&T Books, 2008

3. E. Nemeth, G. Snyder and T. R. Hein, Linux Administration Handbook, Prentice Hall PTR, 2002.

4. D. Curry, UNIX Systems Programming for SVR4, OReilly, 1996.

5. S. Kochan and P. Wood, Unix Shell programming, 3rd Ed, SAMS, 2003.

6. D. Flanagan, Javascript: The Definitive Guide, Fifth Edition, O'REILLY, 2006.

7. D. Gosselin, PHP Programming with MySQL, Course Technology, 2006.

CS353 OPERATING SYSTEMS LABORATORY 0-0-3-3

Syllabus : Programs on the use of pthread library, process creation, shared memory, message queues, semaphores in Unix/Linux using simple examples, Development of user-level modules for memory management, file caching etc. Programming assignments to build parts of an OS kernel. Use of a teaching package such as Nachos, Pintos.

Texts :

1. Tanenbaum, A. S. Modern Operating System. 3/e. Pearson, 2007.
2. Dhamdhere, D. M. Operating SystemsA Concept Based Approach, McGrawHill, 2008
3. Reference manuals for Nachos and Pintos.

References :

CS355 MACHINE LEARNING LABORATORY 0-0-3-3

Syllabus : Programs will be based on theoretical topics of the course (CS307: Machine Learning) covered in the class.

Texts :

References :

CS302 DATABASES 3-0-0-6

Syllabus : Data models with emphasis on the relational model; Database design with E-R model; Relational algebra and calculus; query Languages (specifically SQL); RDBMS design; File & system structure: indexed sequential, hashed, dynamic hashed, B-trees; Query processing; Concurrency control; error recovery; security; Case studies like ORACLE, Mysql, etc.; Introduction to Open Database Connectivity, Client-Server environment etc.

Texts :

1. A. Silberschatz, H. F. Korth and S. Sudarshan, Database System Concepts, 5/e, McGraw Hill, 2006
2. R. Ramakrishnan and J. Gehrke, Database Management Systems, 3/e, McGraw Hill, 2003

References :

1. Elmasri R, Navathe S B, Fundamentals of Database Systems, Benjamin Cummings Publishing Company, 1994.
2. ONeil P., Database : Principles, Programming, Performance, Morgan Kaufmann, 1994.
3. Theorey T J, Database Modeling & Design, 2/e, Morgan Kaufmann Publishers, 1994.
4. Melton J, Simon A R, SQL: A Complete Guide, Morgan Kaufmann Publishers, 1993.
5. H. GarciaMolina, J. D. Ullman and J. Widom, Database Sytems The Complete Book,1/e, Pearson Education, 2007

CS304 COMPILERS 3-0-0-6

Syllabus : Overview of different phases of a compiler: front-end; back-end; Lexical analysis: specification of tokens, recognition of tokens, input buffering, automatic tools; Syntax analysis: context free grammars, top down and bottom up parsing techniques, construction of efficient parsers, syntax-directed translation, automatic tools; Semantic analysis: declaration processing, type checking, symbol tables, error recovery; Intermediate code generation: run-time environments, translation of language constructs; Code generation: flow-graphs, register allocation, code-generation algorithms; Introduction to code optimization techniques.

Texts :

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers: Principles, Techniques, and Tools, 2nd Edition, Prentice Hall, 2009.

References :

1. V. Raghavan, Principles of Compiler Design, McGrawHill, 2010.
2. C.N. Fischer, R.J. Le Blanc, Crafting a Compiler with C, Pearson Education, 2009.
3. K. D. Cooper, L. Torczon, Engineering a Compiler, Morgan Kaufmann Publishers, 2004.

CS306 COMPUTER NETWORKS 3-0-0-6

Syllabus : Evolution of computer networks; Data link layer: Framing, HDLC, PPP, sliding window protocols, medium access control, Token Ring, Wireless LAN; Virtual circuit switching: Frame relay, ATM; Network Layer: Internet addressing, IP, ARP, ICMP, CIDR, routing algorithms (RIP, OSPF, BGP); Transport Layer: UDP, TCP, flow control, congestion control; Introduction to quality of service; Application Layer: DNS, Web, email, authentication, encryption.

Texts :

1. L. L. Peterson and B. S. Davie, Computer Networks: A Systems Approach, 4th Ed, Elsevier India, 2007.
2. A. S. Tanenbaum, Computer Networks, 4th Ed, Pearson India, 2003.

References :

1. J. F. Kurose and K. W. Ross, Computer Networking: A Top Down Approach, 3rd Ed, Pearson India, 2005.
2. D. E. Comer, Internetworking with TCP/IP Vol. 1, 5th Ed, Prentice Hall of India, 2006.
3. S. Keshav, An Engineering Approach to Computer Networking, 1st Ed, Pearson India, 1999.
4. B. Forouzan, Data Communications and Networking, 4th Ed, Tata Mcgraw Hill, 2006.

CS308 INFORMATION STORAGE AND RETRIEVAL 3-1-0-8

Syllabus : Introduction: concepts and terminology of information retrieval systems, Significance of information retrieval and storage, Information Retrieval Vs Information Extraction; Indexing: inverted files, encoding, Zipf's Law, compression, boolean queries; Fundamental IR models: Boolean, Vector Space, probabilistic, TFIDF, Okapi, language modeling, latent semantic indexing, query processing and refinement techniques; Performance Evaluation: precision, recall, F-measure; Classification: Rocchio, Naive Bayes, k-nearest neighbors, support vector machine; Clustering: partitioning methods, k-means clustering, hierarchical; Introduction to advanced topics: search, relevance feedback, ranking, query expansion.

Texts :

1. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schtze, Introduction to Information Retrieval, Cambridge University Press. 2008
2. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, Modern Information Retrieval, Addison Wesley, 1st edition, 1999.

References :

1. Soumen Chakrabarti, Mining the Web, Morgan-Kaufmann Publishers, 2002.
2. Bing Liu, Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data, Springer, Corr. 2nd printing edition, 2009.
3. David A. Grossman, Ophir Frieder, Information Retrieval: Algorithms and Heuristics, Springer, 2nd edition, 2004.
4. William B. Frakes, Ricardo Baeza-Yates, Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
5. G. Salton, M. J. McGill, Introduction to Modern Information Retrieval, McGraw-Hill, 1986.
6. C. J. Van Rijsbergen, Information Retrieval, Butterworth-Heinemann; 2nd edition, 1979.

CS362 DATABASES LABORATORY 0-0-3-3

Syllabus : Familiarization with various databases packages like Microsoft Access, ORACLE, MySql, SQL Server, DB2 etc. Client-server and 3 tier web enabled database programming. Use of Application servers. Design and implementation of a Database application using a multi-user DBMS.

Texts :

1. J. Melton and A. R. Simon, SQL: A Complete Guide, Morgan Kaufmann, 1993
2. S. Feuerstein and B. Pribyl, Oracle PL/SQL Programming, 5/e, O'Reilly, 2009
3. J. Greenspan and B. Bulger, MySQL/PHP Database Applications, M&T Books, 2008

References :

CS364 COMPILERS AND SYSTEM PROGRAMMING LABORATORY 0-0-3-3

Syllabus : Programming assignments to build a compiler for a subset of a C-like programming language, using tools such as Lex / Flex / JLex and Yacc / Bison / CUP etc. C-Macro; Linker and Loader: Design of Linkers and Loaders in C-Compile and go loader, Absolute Loaders, Relocating Loaders, Direct Linking Loaders.
Documentation and Presentation: Document writing and Slides using LaTex;

Texts :

1. D. Brown, J. Levine, T. Mason, Lex and Yacc, 2nd Edition, O'REILLY Publications.
2. J. J. Donovan, Systems Programming, 45th Reprint, Tata Mc-Graw-Hill, 1991
3. D. M. Dhamdhere, Systems Programming And Operating Systems, Tata Mc-Graw-Hill, 2 Revised edition, 2008.

References :

1. J. Levine, Linkers and Loaders, MORGAN KAUFFMAN, 1999.
2. Leslie Lamport, LaTeX: A Document Preparation System, 2nd Edition, Addison-Wesley Series, 1994.

CS366 COMPUTER NETWORKS LABORATORY 0-0-3-3

Syllabus : Unix network measurement and analysis tools, Wireshark, Socket interface and programming, RPC, RMI, HTML, HTTP, CGI, XML, Client-server programming using TCP and UDP sockets, implementation of ARQ techniques, implementation of subset of TCP stack at user level, implementation of simplified versions of application layer protocols such as SMTP/HTTP/FTP etc., Assignments using Network Simulators.

Texts :

1. W. R. Stevens, UNIX Network Programming, Volume 1: Networking APIs: Sockets and XTI, 2nd Ed, Prentice Hall, 1998.
2. S. S. Panwar, S. Mao, J. Ryoo, and Y. Li, TCP/IP Essentials: A Lab-based Approach, Cambridge Press, 2004.

References :

CS401 COMPUTER GRAPHICS 3-0-0-6

Syllabus : Introduction and organization of an interactive graphics system; Scan conversion: line, circle, and ellipse; Filling: rectangle, polygon, ellipse, and arc; Clipping: line, circle, ellipse, and polygon; Antialiasing: unweighted and weighted area sampling, and Gupta-Sproull methods; Transformations: 2D and 3D, homogeneous coordinates, composite and window-to-viewport transformations; 3D View: projections, specification and implementation of 3D view; Curves and Surfaces: polygon meshes, parametric cubic curves and bicubic surfaces, Hermite, Bezier, and B-splines curves and surfaces; Quadric surfaces; Solid Modeling: Boolean set operations, spatial partitioning methods (occupancy enumeration, octree, and binary space partitioning tree); Hidden line and surface removal: z-buffer, list-priority, and scan line algorithms, algorithms for binary space partitioning trees and octrees, and ray tracing; Shading: illumination model, polygon shading (interpolated, Goursud, and Phong), texture mapping,

shadow determination (scan line and z-buffer algorithms), transparency, global illumination model; Introduction to GPU and animation.

Texts :

1. D. Hearn and M. P. Baker, Computer Graphics with OpenGL, 3/e, Pearson, 2009.

References :

1. E. Angel. Interactive Computer Graphics: A Top-Down Approach using OpenGL, 5/e, Pearson, 2009.
2. J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes. Computer Graphics: Principles and Practice in C, 2/e, Addison-Wesley, 1995.
3. P. Shirley and S. Marschner. Computer Graphics. India Edition, Cengage Learning, 2009.
4. F. S. Hill. Computer Graphics using OpenGL, 3/e, Pearson, 2009.

MA401 NUMERICAL METHODS 3-0-0-6

Syllabus : **Numerical Analysis:** Solution of algebraic and transcendental equations by bisection method, iteration method, Regular-Falsi (False position) method, Newton-Raphson method, Solution of Simultaneous linear equations by Gauss Elimination and Gauss-Seidal method; **Interpolation:** Concept of interpolation, difference operators, divided difference interpolation, Newton's forward, backward interpolation, Lagrange's interpolation, Starling and Bessel's interpolation, Numerical differentiation (1st and 2nd order), Numerical integration (Trapezoidal, Simpson's one-third, Weddle's rule); **Numerical Solution of Ordinary differential equation:** Taylor's method, Picard's method, Runge's method, Runge-Kutta's method, Euler's method and Euler's modified method, Predictor-corrector method.

Texts :

1. Jain, Iyengar and Jain : Numerical Methods for Engineers and Scientists, Wiley Eastern

References :

1. S. D. Cante and C. de Boor, Elementary Numerical Analysis, an algorithmic approach, McGraw-Hill.
2. Gerald and Wheatley : Applied Numerical Analysis, Addison- Wesley.

CS471 COMPUTER GRAPHICS LABORATORY 0-0-3-3

Syllabus : Programming assignments to learn and practice the concepts taught in the theory course CS461.

Texts :

1. OpenGL programming Guide (the Red Book). Online tutorial, available at http://fly.cc.fer.hr/~unreal/theredbook/
2. D. P. Mukherjee and D. Jana. Computer Graphics: Algorithms and Implementations. PHI Learning, 2010.

References :

CS473 PROJECT - I 0-0-6-6

Syllabus : Each student will undertake a sizeable project involving survey of literature, development of new techniques and/or implementation of systems, writing of reports etc. under the guidance of one or more faculty members.

Texts :

References :

CS482 **PROJECT - II** **0-0-9-9**

Syllabus : Each student will undertake a sizeable project involving survey of literature, development of new techniques and/or implementation of systems, writing of reports etc. under the guidance of one or more faculty members.

Texts :

References :