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DEPARTMENT OF COMPUTER SCIENCE

संगणक विभाग,

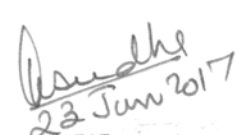
Appendix-XXXIV to XXXVII

E.C. dated 03.07.2017/14-15.07.2017

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UNIVERSITY OF DELHI, DELHI - 110 007 (INDIA)

दिल्ली विश्वविद्यालय, दिल्ली - 110 007 (भारत)

Existing	Proposed
MCS 101 Design and Analysis of Algorithms	
<p>Review of algorithm design techniques like Iterative Techniques and Divide & Conquer through Sorting, Searching and Selection problems. Review of Lower Bounding techniques: decision trees, adversary. String Processing: KMP, Boyre-Moore, Rabin Karp algorithms. Introduction to randomized algorithms: random numbers, randomized quick sort, randomly built binary search tree.</p> <p>Number Theoretic Algorithms: GCD, addition and multiplication of two large numbers, polynomial arithmetic, Fast-Fourier transforms. Advanced Techniques to analyze algorithms: Use and study advanced data structures unionfind (Disjoint Set Structure), Fibonacci heaps. Graph algorithms: Matching and Flows. Parallel algorithms: Basic techniques for sorting, searching and merging in parallel. Geometric algorithms: Point location, Convex hulls and Voronoi diagrams.</p> <p>Complexity Theory: Classes P, NP, NP-Hard, NP Complete. Approximation Algorithms: Introduction through examples.</p> <p>Readings:</p> <ol style="list-style-type: none"> 1. T.H. Cormen, C.E. Leiserson, R.L. Rivest, and C. Stein, Introduction to Algorithms, McGraw-Hill, 2002. 2. Sara Baase, Computer Algorithms: Introduction to Design and Analysis, Addison Wesley, 1999 3. R. Motwani and P. Raghavan, Randomized Algorithms, Cambridge University Press, 1995 4. Teofilo F. Gonzalez, Handbook of NP-Completeness: Theory and Applications Chapman & Hall, 2009. 5. Vijay V. Vazirani, Approximation Algorithms, Springer-Verlag, France, 2006. 6. S. Rajasekharan and John Reif, Handbook of Parallel Computing: Models, algorithms and applications, Chapman and Hall/CRC, 2007. 7. Gareth A. Jones and Josephine M. Jones, Elementary Number Theory, Springer, 1998. 8. F P Preparata and M I Shamos, Computational Geometry: An Introduction Springer, 1993. 	<p>Iterative Algorithms: review of elementary searching and sorting Techniques - Linear search, binary search, insertion sort including proof of correctness.</p> <p>Divide and Conquer: more sorting techniques- merge sort and quick sort.</p> <p>Lower bounding techniques: Decision Trees, Adversaries.</p> <p>Graphs: Graph Traversal algorithms- Depth-First Search and its applications, Breadth First Search and its applications.</p> <p>Greedy Algorithms: Scheduling, Minimum Spanning Trees, Shortest Path Problem.</p> <p>More on Divide and Conquer: Integer Multiplication, Convolution and Fast-Fourier Transform.</p> <p>Dynamic Programming: Weighted Interval Scheduling, Segmented Least Square problem, Knapsack problem, Shortest Paths</p> <p>String Processing: Finite Automata method, KMP.</p> <p>Introduction to randomized algorithms: Random numbers, randomized Qsort, randomly built BST</p> <p>Introduction to Complexity Theory: Class P, NP, NP-Hard, NP Completeness.</p> <p>Introduction to Approximation Algorithms</p> <p>Readings:</p> <ol style="list-style-type: none"> 1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, Introduction to Algorithms, Prentice-Hall of India, 3rd Edition, 2009. 2. J. Kleinberg and E. Tardos, Algorithms Design, Pearson Education, 2014. 3) S. Baase, Computer algorithms: Introduction to Design and Analysis, Pearson Education, 3rd Edition, 2002. 4) A.V. Levitin, Introduction to the Design and Analysis of algorithms, Pearson Education, 3rd Edition, 2012. <p style="text-align: right;">  अध्यक्ष/HEAD संगणक विज्ञान विभाग Department of Computer Science दिल्ली विश्वविद्यालय/University of Delhi दिल्ली/Delhi-110007 </p>



Existing	Proposed
MCA 301 Design and Analysis of Algorithms	
<p>Introduction: RAM model, $O(\log n)$ bit model.</p> <p>Review of data structures: Balanced trees, Mergeable sets.</p> <p>Algorithm Design Techniques: Iterative techniques, Divide and conquer, dynamic programming, greedy algorithms.</p> <p>Searching and Sorting Techniques: Review of elementary sorting techniques-selection sort, bubble sort, insertion sort; more sorting techniques-quick sort, heap sort, merge sort, shell sort; external sorting.</p> <p>Lower bounding techniques: Decision Trees, Adversaries.</p> <p>String Processing: KMP, Boyre-Moore, Robin Karp algorithms.</p> <p>Introduction to randomized algorithms: Random numbers, randomized Qsort, randomly Built BST</p> <p>Number Theoretic Algorithms: GCD, Addition and Multiplication of two large numbers, polynomial arithmetic, Fast-Fourier Transforms.</p> <p>Graphs: Analysis of Graph algorithms Depth-First Search and its applications, minimum Spanning Trees and Shortest Paths.</p> <p>Introduction to Complexity Theory: Class P, NP, NP-Hard, NP Completeness.</p> <p>Readings</p> <ol style="list-style-type: none"> 1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, Introduction to Algorithms, Prentice-Hall of India, 2006. 2. J. Kleinberg and E.Tardos, Algorithms Design, Pearson Education, 2006. 3. S.Baase, Computer algorithms: Introduction to Design and Analysis, Addison Wesley, 1999. 4. A.V. Levitin, Introduction to the Design and Analysis of algorithms, Pearson Education, 2006. 	<p>Iterative Algorithms: review of elementary searching and sorting Techniques - Linear search, binary search, insertion sort including proof of correctness.</p> <p>Divide and Conquer: more sorting techniques-merge sort and quick sort.</p> <p>Lower bounding techniques: Decision Trees, Adversaries.</p> <p>Graphs: Graph Traversal algorithms- Depth-First Search and its applications, Breadth First Search and its applications.</p> <p>Greedy Algorithms: Scheduling, Minimum Spanning Trees, Shortest Path Problem.</p> <p>More on Divide and Conquer: Integer Multiplication, Convolution and Fast-Fourier Transform.</p> <p>Dynamic Programming: Weighted Interval Scheduling, Segmented Least Square problem, Knapsack problem, Shortest Paths</p> <p>String Processing: Finite Automata method, KMP.</p> <p>Introduction to randomized algorithms: Random numbers, randomized Qsort, randomly built BST</p> <p>Introduction to Complexity Theory: Class P, NP, NP-Hard, NP Completeness.</p> <p>Introduction to Approximation Algorithms.</p> <p>Readings</p> <ol style="list-style-type: none"> 1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, Introduction to Algorithms, Prentice-Hall of India, 3rd Edition, 2009. 2. J. Kleinberg and E.Tardos, Algorithms Design, Pearson Education, 2014. 3) S.Baase, Computer algorithms: Introduction to Design and Analysis, Pearson Education, 3rd Edition, 2002. 4) A.V. Levitin, Introduction to the Design and Analysis of algorithms, Pearson Education, 3rd Edition, 2012.

Signature
23 Jun 2017

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Existing	Proposed
MCA 101: OBJECT ORIENTED PROGRAMMING	
<p>Programming Concepts: Algorithm and its characteristics, pseudo code / flowchart, program, identifiers, variables, constants, primitive data types, expressions, structured data types, arrays, compilers & interpreters</p> <p>Statements: Assignment statement, if then else statements, switch statement, looping Statements - while, do while, for, break, continue, input/output statements, functions/procedures</p> <p>Object Oriented Concepts: Abstraction, encapsulation, objects, classes, methods, constructors, inheritance, polymorphism, static and dynamic binding, overloading.</p> <p>Program Development: Object oriented analysis, design, unit testing & debugging, system testing & integration, maintenance.</p> <p>Readings</p> <ol style="list-style-type: none"> 1. Cay Horstmann, Computing Concepts with Java Essentials (5th ed.), John Wiley & Sons, 2006 2. Bruce Eckel, Thinking in Java, Pearson Education, 2006. 3. H. Schildt, Java 2: The Complete Reference (5th ed.), Tata McGraw Hill, 2002 4. Richard Johnson, An Introduction to Java Programming and Object-Oriented Application Development, Thomson Learning, 2006 5. Cay S. Horstmann & Gary Cornell, Core Java Volume I (7th ed.), Sun Microsystems Press Java Series, 2006 6. H.M. Deitel and P.J. Deitel, Java-How to Program (7th ed.), Prentice Hall, 2006 7. Daniel Liang, Introduction to Java Programming (5th ed.), Prentice Hall, 2005 8. J.A. Slack, Programming and Problem Solving with Java, Thomson Learning, 1999 9. B.Stroustrup : C++ Programming, The C++ Programming Language, Addison Wesley, 2004 	<p>Programming Concepts: Pseudo code and program development, identifiers, variables, keywords, constants, Input and Output statements, and scope.</p> <p>Data types: int, float, complex string, list, tuple, and dictionary, set, expressions, assignment statement, modularity, default arguments.</p> <p>Control Statements and Recursion: If then else, while, for, break, continue, pass, recursion.</p> <p>I/O and Error handling: file processing, errors, and exceptions.</p> <p>Object Oriented Concepts: Abstraction, encapsulation, objects, classes, methods, constructors, inheritance and polymorphism. testing and debugging</p> <p>Readings</p> <ol style="list-style-type: none"> 1. A. Downey, E. Jeffrey, and M. Chris. How to Think Like a Computer Scientist: Learning with Python. Dreamtech Press, 2015. 2. J.V. Gutttag, Introduction to Computation and Programming Using Python: With Application to Understanding Data. Mit Press, 2016. 3. S. Taneja, N. Kumar. Python Programming Pearson, 2017. 4. K. Arnold and G. James. The Java programming language. W. Addison, 2005. 5. C. S. Horstmann, Core Java- Volume I, Fundamentals. Pearson Education, 2016.

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MCS 326 Network Science (New Elective)

Introduction: Introduction to complex systems and network, modelling of complex systems, basic graph theory.

Network properties: clustering coefficient, centrality measures for directed and undirected networks.

Graph models: Random graph model, Small world graph model, Network evolution using preferential attachment

Community structure in networks: Communities and community detection in networks, Hierarchical algorithms for community detection, Modularity based community detection algorithms, Label Propagation algorithm

Spreading Processes: SI Model, SIS model, SIR model

Readings:

1. Mohammed J. Zaki, Wagner Meira Jr.; **Data Mining and Analysis: Fundamental Concepts and Algorithms**, Cambridge University Press, 2014.
2. Albert Barabasi, **Network Science**, Cambridge University Press, 2016.
3. M.E. J. Newman, **Networks: An Introduction**, Oxford University Press, 2010.
4. David Easley and Jon Kleinberg **Networks, Crowds, and Markets: Reasoning About a Highly Connected World**, Cambridge University Press, 2010.

Aswathi
23 Jun 2017

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