

Course structure of M. Tech. CSE (2016 Batch Onwards)

Semester-I

Course No.	Course Name	L-T-P-C
CS 512	<u>Design and Analysis of Algorithms</u>	3-0-0-6
CS 514	<u>Mathematics for Computer Science</u>	3-0-0-6
CS 513	Data Structures Lab	0-2-2-6
CS XXX	Elective 1	3-0-0-6*
CS XXX	Elective 2	3-0-0-6*
	Total	30*

Semester-II

Course No.	Course Name	L-T-P-C
CS 558	<u>Computer Systems Lab</u>	0-1-4-6
CS XXX	Elective 3	3-0-0-6*
CS XXX	Elective 4	3-0-0-6*
CS XXX	Elective 5	3-0-0-6*
	Total	24*

Semester-III

Course No.	Course Name	L-T-P-C
CS 698	Project-I	0-0-24-24
	Total	24

Semester-IV

Course No.	Course Name	L-T-P-C
CS 699	Project-II	0-0-24-24
	Total	24

* Indicates minimum required credits

CS 512 Design and Analysis of Algorithms 3-0-0-6

Models of Computation: space and time complexity measures, lower and upper bounds; Design techniques: greedy method, divide-and-conquer, dynamic programming; Amortized analysis: basic techniques, analysis of Fibonacci heap and disjoint-set forest; Graph algorithms: connectivity, topological sort, minimum spanning trees, shortest paths, network flow; String matching; Average-case analysis; NP-completeness.

Text Books:

1. Cormen, T. H., Leiserson, C. E., Rivest, R. L. and Stein, C., *Introduction to Algorithms*, MIT Press, 2009.
2. Kleinberg, J. and Tardos, E., *Algorithm Design*, Addison Wesley, 2006.

References:

1. Dasgupta, S., Papadimitriou, C. and Vazirani, U., *Algorithms*, McGraw-Hill, 2007.

2. Aho, A., Hopcroft, J. E. and Ullman, J.D., *The Design and Analysis of Computer Algorithms*, Pearson, 2002.

CS 513 Programming Lab

0-0-3-3

Syllabus:

Experiments would be designed to provide hands-on experience in programming data structures and algorithms, to learn a few systems programming tools, and scripting.

References:

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.
3. M. A. Weiss, *Data Structures and Algorithm Analysis in C++*, Addison-Wesley, 2007.

CS 513 Data Structures Lab

0-2-2-6

Assignments are designed to provide hands-on experience in programming the following data structures and algorithms using the C programming language. Elementary data structures: arrays, matrices, linked lists, stacks, queues, binary trees, tree traversals; Balanced binary search trees: red-black trees, B-trees; Priority queues: binary heap; Sorting and searching: bubble, insertion, merge, quick sort, heap sort, binary search; Hashing; Strings: tries, suffix arrays, suffix trees; Sets: linked-list, disjoint-set forest; Graphs: adjacency list, adjacency matrix, depth first search, breadth first search.

Text Books:

1. Weiss, M. A., *Data Structures and Algorithm Analysis in C*, Pearson, 2002.
2. Cormen, T. H., Leiserson, C. E., Rivest, R. L. and Stein, C., *Introduction to Algorithms*, MIT Press, 2009.

References:

1. Horowitz, E. and Sahni, S., *Fundamentals of Data Structures in C*, University Press, 2008.
2. Sedgwick, R., *Algorithms in C Parts 1-4: Fundamentals, Data Structures, Sorting, Searching*, Pearson, 1997.
3. Sedgwick, R., *Algorithms in C Part 5: Graph Algorithms*, Pearson, 2001.
4. Goodrich, M. T. and Tamassia, R., *Data Structures and Algorithms in C++*, Wiley India, 2007.
5. Kernighan, B. W. and Ritchie, D. M., *The C Programming Language*, Prentice Hall India, 1990.

CS 514 Mathematics for Computer Science

3-0-0-6

Review of sets, functions, relations; Logic: formulae, interpretations, methods of proof in propositional and predicate logic; Number theory: division algorithm, Euclid's algorithm, fundamental theorem of arithmetic, Chinese remainder theorem; Combinatorics: permutations, combinations, partitions, recurrences, generating functions; Graph Theory:

isomorphism, complete graphs, bipartite graphs, matchings, colourability, planarity;
Probability: conditional probability, random variables, probability distributions, tail inequalities.

Texts:

1. Lehman, E., Leighton, F. T. and Meyer, A. R., *Mathematics for Computer Science*, Creative Commons, 2011.
2. Rosen, K. H., *Discrete Mathematics and its Applications*, 7/e, McGraw Hill Education, 2011.

References:

1. Graham, R. L., Knuth, D. E., and Patashnik, O., *Concrete Mathematics*, 2/e, Addison-Wesley, 1994.
2. Burton, D. M., *Elementary Number Theory*, 7/e, McGraw-Hill Higher Education, 2010.
3. Diestel, R., *Graph Theory*, 4/e, Springer, 2010.
4. Feller, W., *An introduction to probability theory and its Applications* Vol. 1, 3/e, Wiley, 2008.
5. Ross, S. M., *A First Course in Probability*, 9/e, Pearson, 2012.

CS 558 Computer Systems Lab

0-1-4-6

Syllabus:

Experiments would be designed to provide hands-on experience in computer systems, to learn unix system calls, posix threads, operating system implementation, network diagnostic tools, application programming and network simulation.

---000---