

The background features a large, semi-transparent watermark of the NPTEL logo. It consists of a circular emblem with a stylized flower or star in the center, surrounded by a ring of rectangular segments. Below the emblem, the word "NPTEL" is written in large, bold, sans-serif capital letters.

NPTEL MOOC, JAN-FEB 2015  
Week 1, Module 1

# DESIGN AND ANALYSIS OF ALGORITHMS

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# Understanding Algorithms

- \* Correctness
- \* Efficiency
  - \* Asymptotic complexity,  $O()$  notation
- \* Modelling
  - \* Graphs, data structures, decomposing the problem
- \* Techniques
  - \* Divide and conquer, greedy, dynamic programming



# Expectations

- \* Background in programming
  - \* Any language (C, C++, Java)
- \* Basic data structures
  - \* Arrays, lists

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# Topics to be covered

- \* Asymptotic complexity
- \* Searching and sorting in arrays
  - \* Binary search, insertion sort, selection sort, merge sort, quick sort
- \* Graphs and graph algorithms
  - \* Representations, reachability, connectedness
  - \* Directed acyclic graphs
  - \* Shortest paths, Spanning trees



# Topics to be covered

- \* Algorithmic design techniques
  - \* Divide and conquer, Greedy algorithms, Dynamic programming
- \* Data structures
  - \* Priority queues/heaps, Search trees, Union of disjoint sets (union-find)
- \* Miscellaneous topics
  - \* Intractability, ...



# Tentative schedule

- \* Week 1: Motivation, asymptotic complexity
- \* Week 2: Searching and sorting
- \* Week 3: Graphs and basic graph algorithms
- \* Week 4: More graph algorithms, disjoint set
- \* Week 5: Divide and conquer, heaps
- \* Week 6: Search trees, greedy algorithms
- \* Week 7: Dynamic programming
- \* Week 8: Miscellaneous topics

## January

4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

## February

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28



# Evaluation

- \* Continuous evaluation
  - \* 8 Weekly quizzes
  - \* 6 programming assignments
- \* Certification exam

## Requirement for successful course completion

- \* 60% in quizzes, certification exam
- \* Submit at least 5 of 6 assignments
  - \* At least 4 with nonzero marks



# Textbooks

- \* Algorithm Design

Jon Kleinberg and Eva Tardos

- \* Algorithms

Sanjoy Dasgupta, Christos Papadimitriou and  
Umesh Vazirani

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