

# CE205 Data Structures Week-6

Graph MST, Backtracking, Topological Sorting, Shortest Paths, Connectivity, Max Flow and Cycle Detection Algorithms. Graph Isomorphism and canonization, Graph Cuts

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# 1 CE205 Data Structures

## 2 Week-6

**2.0.1 Graph MST, Backtracking, Topological Sorting, Shortest Paths, Connectivity, Max Flow and Cycle Detection Algorithms.**

**2.0.2 Graph Isomorphism and canonization**

**2.0.3 Graph Cuts**

Download DOC<sup>1</sup>, SLIDE<sup>2</sup>, PPTX<sup>3</sup>

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### 2.0.4 Outline-1

- Graph Topological Sorting
  - Graph MST
  - Graph Backtracking
    - Tug of War
    - n-Queen's Problem
    - m Coloring Problem
    - Euler & Hamiltonian Path
- 

### 2.0.5 Outline-2

- Graph Shortest Paths
  - Graph Connectivity - SCC
  - Graph Max Flow
  - Graph Isomorphism
  - Graph canonization
  - Graph Cuts
    - Min Cut
    - Max Cut
- 

### 2.0.6 Outline-3

- Alpha-Beta Pruning
  - Hasse Diagrams
  - Petri Nets
  - Bipartite Graphs
  - Cycle Detection
    - Brent's Algorithm
    - Hare and Tortoise Algorithm
  - Bayesian Network
- 

### 2.0.7 Graph Topological Sorting

- CE100
  - <https://ucoruh.github.io/ce100-algorithms-and-programming-II/week-10/ce100-week-10-graphs/?h=topolo#directed-acyclic-graphs-dag>

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<sup>1</sup>[ce205-week-6-graph-algorithms.md\\_doc.pdf](#)

<sup>2</sup>[ce205-week-6-graph-algorithms.md\\_slide.pdf](#)

<sup>3</sup>[ce205-week-6-graph-algorithms.md\\_slide.pptx](#)

- Geeks for Geeks
    - <https://www.geeksforgeeks.org/topological-sorting/>
- 

### 2.0.8 Graph MST

- CE100
    - <https://ucoruh.github.io/ce100-algorithms-and-programming-II/week-10/ce100-week-10-graphs/?h=mst#minimum-spanning-tree-mst>
  - Geeks for Geeks
    - <https://www.geeksforgeeks.org/prims-minimum-spanning-tree-mst-greedy-algo-5/>
- 

### 2.0.9 Graph Backtracking

- Tug of War
    - Geeks for Geeks
      - \* <https://www.geeksforgeeks.org/tug-of-war/>
- 

### 2.0.10 Graph Backtracking

- n-Queen's Problem
    - Geeks for Geeks
      - \* <https://www.geeksforgeeks.org/n-queen-problem-backtracking-3/?ref=lbp>
- 

### 2.0.11 Graph Backtracking

- m Coloring Problem
    - Geeks for Geeks
      - \* <https://www.geeksforgeeks.org/m-coloring-problem-backtracking-5/>
    - Tutorials Point
      - \* <https://www.tutorialspoint.com/M-Coloring-Problem#:~:text=The%20problem%20is%20to%20find,is%20ass>
- 

### 2.0.12 Graph Backtracking

- Euler & Hamiltonian Path
    - <https://www.geeksforgeeks.org/mathematics-euler-hamiltonian-paths/>
- 

### 2.0.13 Graph Shortest Paths

- Single-Source Shortest Paths (SSSP)
    - <https://ucoruh.github.io/ce100-algorithms-and-programming-II/week-11/ce100-week-11-shortestpath/>
    - <https://visualgo.net/en/sssp?slide=1>
- 

### 2.0.14 Graph Connectivity

- Strongly Connected Components
  - <https://ucoruh.github.io/ce100-algorithms-and-programming-II/tr/week-10/ce100-week-10-graphs/?h=scc#strongly-connected-components-scc>

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### 2.0.15 Graph Max Flow

- Geeks for Geeks
    - <https://www.geeksforgeeks.org/max-flow-problem-introduction/>
- 

### 2.0.16 Graph Isomorphism

- <https://www.sciencedirect.com/science/article/pii/S0747717113001193>
  - <https://www3.cs.stonybrook.edu/~algorithm/implement/nauty/implement.shtml>
  - <https://github.com/Mith13/Graphs-isomorphism>
- 

### 2.0.17 Graph Cuts

1. Min Cuts
  2. Max Cuts
- Wikipedia
    - [https://en.wikipedia.org/wiki/Cut\\_\(graph\\_theory\)#:~:text=In%20graph%20theory%2C%20a%20cut,said%20to](https://en.wikipedia.org/wiki/Cut_(graph_theory)#:~:text=In%20graph%20theory%2C%20a%20cut,said%20to)
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### 2.0.18 Graph canonization

- Wikipedia
    - [https://en.wikipedia.org/wiki/Graph\\_canonization](https://en.wikipedia.org/wiki/Graph_canonization)
- 

### 2.0.19 Cycle Detection

- <https://ucoruh.github.io/ce100-algorithms-and-programming-II/week-10/ce100-week-10-graphs/#cycle-detection>
- 

### 2.0.20 Graph Coloring

- <https://ucoruh.github.io/ce100-algorithms-and-programming-II/week-10/ce100-week-10-graphs/#graph-coloring>
- 

### 2.0.21 Alpha-Beta Pruning

- Geeks for Geeks
    - <https://www.geeksforgeeks.org/minimax-algorithm-in-game-theory-set-4-alpha-beta-pruning/>
- 

### 2.0.22 Hasse Diagrams

- Geeks for Geeks
    - <https://www.geeksforgeeks.org/discrete-mathematics-hasse-diagrams/>
-

### 2.0.23 Petri Nets

- Wikipedia
    - [https://en.wikipedia.org/wiki/Petri\\_net](https://en.wikipedia.org/wiki/Petri_net)
- 

### 2.0.24 Bipartite Graphs

- CE100
    - <https://ucoruh.github.io/ce100-algorithms-and-programming-II/week-10/ce100-week-10-graphs/?h=bipartite#bipartite-checker>
  - Geeks for Geeks
    - <https://www.geeksforgeeks.org/bipartite-graph/>
- 

### 2.0.25 Cycle Detection

- Brent's Algorithm
    - Geeks for Geeks
      - \* <https://www.geeksforgeeks.org/brents-cycle-detection-algorithm/>
  - Hare and Tortoise Algorithm
    - Geeks for Geeks
      - \* <https://www.geeksforgeeks.org/tag/tortoise-hare-approach/>
- 

### 2.0.26 Cycle Detection

- CE100
    - <https://ucoruh.github.io/ce100-algorithms-and-programming-II/week-10/ce100-week-10-graphs/?h=bipartite#cycle-detection>
- 

### 2.0.27 Bayesian Network

- <https://towardsdatascience.com/introduction-to-bayesian-networks-81031eed94e>
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*End – Of – Week – 6*