



**Hankuk University of Foreign Studies**  
**2022 Summer Session**  
**CSC 400 Algorithm Design and Analysis**  
**Course Outline**

**Course Code: CSC 400**

**Instructor: Dr. Suman Saha**

**Home Institution: Pennsylvania State University**

**Office Hours: By appointment**

**Email: sumsaha@gmail.com**

**Credit: 4**

**Class Hours:**

This course will have 52 class hours, including 32 lecture hours, professor 8 office hours, 8-hour TA discussion sessions, 4-hour review sessions.

**Course Description:**

The purpose of the course is to study how to design and analyze computer program algorithms to solve real-world problems. The course will begin with a review of the concept of algorithm complexity and basic graph algorithms; and then cover algorithm design approaches such as greedy, divide and conquer, and dynamic programming; then, a network flow problem will be introduced and algorithm design by reduction to a network flow problem will be discussed; then, the notion of problem reduction will be used to discuss and prove the computational intractability (i.e., hardness) of a problem; time permitting, approaches to handling intractable problems, such as approximation algorithms and local search algorithms, will be discussed as well.

**Course Objectives:**

After completing this course the student will be able to abstract a real-world problem to a computational problem and design an algorithm to solve the problem computationally and analyze its running time and storage space complexities.

**Required Textbooks:**



*Jon Kleinberg and Eva Tardos, Algorithm Design, Addison Wesley.*

**Grading System (1 ~ 100)**

The final score will be scaled and the scaled score will be used to assign a Course grade.

- |               |             |
|---------------|-------------|
| A+ : 95 - 100 | A : 94 - 90 |
| B+ : 89 - 85  | B : 84 - 80 |
| C+ : 79 - 75  | C : 74 - 70 |
| D+ : 69 - 65  | D : 64 - 60 |
| F : Fail      |             |

**Course Schedule:**

**Week1**

- Understand Algorithm Complexity
- Graph Algorithm
  - BFS
  - DFS
  - Dijkstra
  - Floyd Warshall
  - Prims
  - Kruskal
- Divide and Conquer
  - Binary Search
  - Merge Sort
  - Quick Sort
  - Karatsuba Algorithm for fast multiplication
- *Homework -1*

**Week2**

- Divide and Conquer
  - Finding convex hull
  - Strassen's matrix multiplication
  - Find the closest pair of points
  - Algorithm for fast Fourier transform
- Greedy Algorithm
  - Activity Selection Problem
  - Graph Coloring Problem
  - Job Sequencing Problem
  - Huffman Coding
- *Midterm Exam*



### Week3

- Dynamic Programming
  - Longest Common Subsequence
  - Longest Increasing Subsequence
  - Edit Distance
  - Minimum Partition
  - Longest Path in Matrix
  - Subset Sum Problem
  - 0-1 Knapsack Problem
  - Boolean Parenthesization Problem
- *Homework - 2*

### Week4

- Network Flow Applications
- Computation and Intractability
- NP-Hard Problem
- *Final Exam*

