King Saud University
College of Computer and Information Sciences
Computer Science Department

CSC 668 – FALL 2021

SELECTED TOPICS IN AI

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COURSE OBJECTIVES

The purpose of this course is to introduce fundamental concepts of heuristics in solving various optimization problems with emphasis on metaheuristics. The topics include basic heuristic constructs (greedy, improvement, construction); metaheuristics such as simulated annealing, tabu search, genetic algorithms, ant algorithms and their hybrids.

By the end of this course students should be able to design and implement efficient algorithms to solve complex optimization problems across a diverse range of applications, such as networking, bioinformatics, routing and scheduling, etc.

COURSE CONTENTS

PART I: COMMON CONCEPTS FOR METAHEURISTICS

a) Optimization models and methods
b) Main common concepts for metaheuristics
c) Constraint handling and parameter tuning
d) Performance analysis of metaheuristics

PART II: SINGLE SOLUTION BASED METAHEURISTICS:

a) Common concepts of fitness landscape analysis
b) Local search
c) Simulated annealing
d) Tabu Search
e) Iterated local search
f) Variable neighborhood search
g) Guided local search
h) GRASP

PART III: POPULATION BASED METAHEURISTICS

a) Common concepts of population based metaheuristics
b) Evolutionary algorithms
c) Scatter Search
d) Swarm Intelligence
e) Bees Algorithm

REFERENCES

Text Book:

- Metaheuristics from Design to Implementation, El-Ghazali Talbi- Wiley, 2009

Additional References:

- Handbook of Metaheuristics, Gendreau & Potvin (Eds.), second edition, Springer, 2010
- Essentials of Metaheuristics, Sean Luke, Lulu, First Edition, 2009