

Course Brief

Fall 2024

ARCH509: **ALGORITHMIC APPROACHES TO ARCHITECTURAL OPTIMIZATION**

Description

This course aims to provide students with a comprehensive understanding of optimization techniques by utilizing metaheuristic* and swarm-based algorithms such as the Genetic algorithm, Particle swarm optimization, Ant colony optimization, Simulated Annealing, hybrid algorithms, NSGA II, etc.

Students will learn about the principles of search techniques, how to tune the design parameters to reach a goal, and 'algorithmic thinking' enabling them to make informed decisions in their architectural designs. In addition, state-of-the-art machine learning** techniques in architectural design and optimization will be introduced in this course.

Although this course is intended for MArch and MS_DMT candidates, all students are welcome to attend, particularly those who are interested in making scholarly contributions. You will gain valuable experience and knowledge on how to utilize this tool in extensive research endeavors.

Even if you have no prior experience with Python programming, in this course you will gain a thorough understanding of the language as the optimization algorithms are written from the ground up in Python.

** Metaheuristic algorithms are problem-solving techniques that are used to find approximate solutions for optimization problems where exact solutions are difficult or impossible to find in a reasonable amount of time. These algorithms are inspired by natural phenomena or human behavior and are typically iterative and stochastic in nature. They are widely used in various fields such as engineering, computer science, and operations research to solve complex optimization problems. Some common examples of metaheuristic algorithms include genetic algorithms, simulated annealing, and particle swarm optimization.*

*** Machine learning algorithms can be used to analyze and interpret complex data sets, predict building performance, optimize building layouts for energy efficiency, generate design alternatives based on user preferences, and even automate certain design tasks. By utilizing machine learning in architectural design, architects can streamline the design process, improve decision-making, and create more innovative and sustainable buildings.*