

# INC 491(691) Optimization techniques in Engineering

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**Semester:** 1/2022

**Schedule:** Wed 09.30–12.20 (AE) Thu 08.30–12.20 (A-B)

**Classroom:** CB40710

**Instructors:**

- Asst. Prof. Dr.-Ing. Sudchai Boonto

• **Email:** `sudchai.boo@kmutt.ac.th`

**Office:** CB40601

**Tel.** 02-470-9091

**Required pre-requisites:**

Basic Linear Algebra, Calculus, Basic Programming Skill

**Course Description:**

Introduction to Optimization, Mathematical Modeling, Unconstrained Optimization, Discrete Optimization, Genetic Algorithms, Constrained Optimization, Robust Optimization, Dynamic Optimization

**Course Objectives**

- To teach students basic mathematical and computational tools for optimization techniques in engineering.
- To train students to familiar with optimization software.

**Learning Outcomes:**

- Be able to define and use the optimization concept
- Be able to apply optimization methods to engineering problems.
- Understand and apply unconstrained optimization theory to engineering problems
- Have the ability to use optimization software.

**Learning Activities:** The courses activities include lectures, computer programming, presentations, group discussions, assignments and reports on case studies.

**Learning Resources:** Website <https://staff.kmutt.ac.th/~sudchai.boo/Teaching/inc341s/inc491s.html>, and facebook group. This can include lecture material, supplementary course notes, problem sheets and solutions, and useful references.

**Course text:**

- Joaquim R. R. A. Martins, Andrew Ning, “**Engineering Design Optimization**,” Cambridge University Press, 2021
- Alexander Mitsos, “**Applied Numerical Optimization**,” Lecture Note RWTH AACHEN University
- Ashok D. Belegundu, Tirupathi R. Chandrupatla, “**Optimization Concepts and Applications in Engineering**,” Cambridge University Press, 2019

**Project:**

Final presentation about the optimization application.

**Grading scheme:**

Homework and Class participation : 25%      Midterm Exam: 25%      Final Exam: 25%  
 term assignment: 25%

- I reserve the right to modify the grading scheme.

**Course Schedule (Tentative)**

Week	Topic	Date (AE, A-B)	Lecturer
1	Introduction to Optimization	Week 1	Sudchai
2	Mathematic Tools	Week 2	Sudchai
3	Unconstraint Optimization I	Week 3	Sudchai
4	Unconstraint Optimization II	Week 4	Sudchai
5	Unconstraint Optimization III	Week 5	Sudchai
6	Unconstraint Optimization IV	Week 6	Sudchai
7	Linear Programming I	Week 7	Sudchai

Week	Topic	Date (AE, A-B)	Lecturer
8	Linear Programming II	Week 8	Sudchai
9	Midterm Exam	Week 9	Sudchai
10	Constraint Optimization I	Week 10	Sudchai
11	Constraint Optimization II	Week 11	Sudchai
12	Direct Search Method	Week 12	Sudchai
13	Multiobjective Optimization	Week 13	Sudchai
14	Integer and Discrete Programming	Week 14	Sudchai
15	Dynamic Programming	Week 15	Sudchai
16	Final Exam	Week 16	Sudchai
17	Assignment Presentation	Week 17	Sudchai

**Note:** All topics and timetable may be changed!