

Course Number: 28025
Course Name: Optimal Design

Course Type: Theory
Prerequisite: Nothing.
Level: Graduate
Group: Applied Design

Type & Max Unit: Constant 3
Corequisite: Nothing.
First Presentation: 2014-2
Last Edition: 2014-2.

Objectives:

The main goal of this course is to present the basic principles of modeling and solving the single - or multi-objective optimal design based on two categories; analytic and experimental problems. It covers classical (deterministic) and evolutionary (stochastic) techniques for analytic problems and the experimental optimal design, system identification, analysis of variance (ANOVA), Taguchi method for experimental problems.

Topics:

- **Introduction:** The role of optimization in engineering design, modeling the optimal design problems in the standard form.
- **Single objective optimal design:** Classical methods (deterministic) for solving single-objective optimal design problems, Evolutionary methods (stochastic) for solving single-objective developmental design problems
- **Multi objective optimal design:** Decomposition methods for solving multi-objective optimal design problems, Generating methods for solving multi-objective developmental design problems (evolutionary methods such as NSGA II)
- **Experimental optimal design:** Design and analysis of experiments (DOE), Basic concepts in statistical analysis, Analysis of variance (ANOVA), Design and analysis of multi factor tests; factorial design, Placket-Burman Design, Taguchi optimization

References:

- 1) Arora J. S., Introduction to Optimum Design, Elsevier Academic Press, 4th Edition 2016.
- 2) Deb K., Multi-Objective Optimization using Evolutionary Algorithms, Wiley, 2001.
- 3) Montgomery D. C., Design and Analysis of Experiments, John Wiley & Sons, 8th Edition, 2012.