

SYDE 655 Optimal Control

Winter 2021

Lectures (online/synchronous):

Mondays & Thursdays 3:30 - 4:50pm (EST)

Instructor:

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Course Description:

This course is intended to provide an understanding of the principles of optimal control and how they are used in various engineering applications. Dynamic programming, variational approach and Pontryagin's Minimum Principle, linear quadratic optimal control, discrete-time optimal control, constrained optimal control systems and model predictive control are introduced. Numerical methods for optimal control problems are also discussed briefly.

Course Objectives:

- To develop the student's insight into the optimal control theory's fundamental concepts and primary topics.
- To present the student the design and analysis of optimal control systems and to provide opportunities to employ mathematical tools and computer programs, such as MATLAB and SIMULINK, for this process.
- To improve the student's ability to communicate effectively his/her ideas and knowledge of the topics through preparation of technical reports and presentations.

Textbooks:

[1] *Optimal Control Systems*, D. Subbaram Naidu, CRC Press, 2002.

[2] *Optimal Control Theory, An Introduction*, Donald E. Kirk, Dover Publications, 2004.

[3] *Model Predictive Control course slides*, Alberto Bemporad, 2018.

Evaluation:

- Assignment #1 20%
- Assignment #2 20%
- Assignment #3 30%
- Project (Report & Presentation) 30%