Model Predictive Control

ESE 6190

MW 12:00-1:30 pm ET, Towne 313

Manfred Morari

Spring 2023

University of Pennsylvania

Lecture Material

Compilation: Manfred Morari and Melanie Zeilinger

Book: Predictive Control for Linear and Hybrid Systems

by F. Borrelli, A. Bemporad and M. Morari

Cambridge University Press, 2017

Book and Slides are available for download in Canvas.
Announcements and questions will be posted in Ed Discussion.

About the Course

Problem Sets:	Weekly/biweekly exercises, includes programming assignments.
Midterm Exam:	Written. Wed Mar 1, 12:00-1:30pm.
Final Exam:	Written. Date TBA
Grades:	30% Problem Sets 25% Midterm Exam 45% Final Exam
Office Hours:	
Prof. Morari,	Tue 3-5 pm. Levine 372
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Lecture Schedule

Actual schedule may vary depending on student interest and preparation

Dates	Topic(s)
Jan 18	Chapter 1: Introduction and Overview
Jan 18	Chapter 2: System Theory Basics
Jan 23, 25	Chapter 3: Model Uncertainty and State Estimation
Jan 30, Feb 1, 6	Chapter 4: Convex Optimization
Feb 8, 13	Chapter 5: Unconstrained Linear Quadratic Optimal Control
Feb 15, 20	Chapter 6: Constrained Finite Time Optimal Control
Feb 22	Chapter 7: Feasibility and Stability
Feb 27	Recitation Session
Mar 1	Midterm Exam

Lecture Schedule

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Dates	Topic(s)
Mar 13	Chapter 8: Invariance
Mar 15	Chapter 9: Reachability and Invariant Sets
Mar 20, 22	Chapter 10: Practical Issues
Mar 27, 29	Chapter 11: Explicit MPC
Apr 3, 5	Chapter 12: Hybrid MPC
Apr 10, 12	Chapter 13: Robust MPC
Apr 17, 19	Chapter 14: Numerical Methods/Operator Splitting Methods
Apr 24, 26	Chapter 15: Nonlinear MPC

Homework Schedule

Tentative homework due dates.

Homework No.	Due date
HW 1	Feb 1
HW 2	Feb 13
HW 3	Feb 24
HW 4	Mar 15
HW 5	Apr 3
HW 6	Apr 10
HW 7	Apr 19

Late submission policy:

5 late days in total for the whole semester.
Late homework must be submitted within 2 days of each deadline.