Winter 2018
Updated November 21 2017

AERO 550 (EECS 560) (ME 564) Linear System Theory [Girard]
AERO 551 (EECS 562) Nonlinear Systems and Control [Panagou]
AERO 740 Special Topics: Model Predictive Control [Kolmanovsky]

EECS 419 Electric Machines and Drives [Hofmann]
EECS 460 Control Systems Analysis and Design [Ozay]
EECS 461 Embedded Control [Cook, Freudenberg]
EECS 464 Hands-on Robotics [Revzen]
EECS 467 Autonomous Robotics [Kuipers]
EECS 560 (AERO 550) (ME 564) Linear System Theory [Girard]
EECS 561 (ME 561) Design of Digital Control systems [Hafner]
EECS 562 (AERO 551) Nonlinear Systems and Control [Panagou]
EECS 565 (AERO 550) Linear Feedback Control [Freudenberg]
EECS 569 Production Systems Engineering [Meerkov]
EECS 598-002 Control and Modeling of Power Electronics [Avestruz]
EECS 598-003 Motion Planning [Berenson]
EECS 598-007 Power System Markets and Optimization [Mathieu]

ME 543 Analytical and Computational Dynamics 1 [Remy]
ME 561 (EECS 561) Design of Digital Control systems [Hafner]
ME 564 560 (AERO 550) (EECS 560) Linear System Theory [Girard]
ME 565 Battery Systems and Control [Siegel]
ME 566 Hybrid Electric Vehicles [Grewe, Liu]

ROB 550 Robotics Systems Laboratory [Gaskell]
ROB 599 Special Topics: Ethics for Robotics [Atkins, Kuipers]

Interesting IOE courses
IOE 510 - Linear Programming I
IOE 511- Continuous Optimization Methods
IOE 614- Integer Programming

COLLEGE OF ENGINEERING
AEROSPACE ENGINEERING
UNIVERSITY OF MICHIGAN

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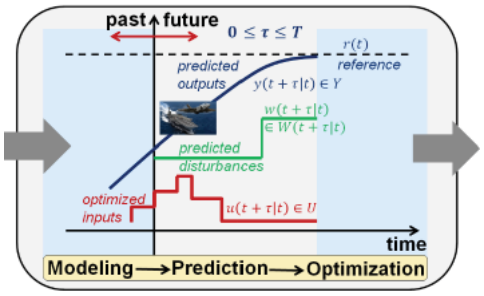
AEROSP 740: Model Predictive Control



In recent years **Model Predictive Control (MPC)** has become both a leading industrial technology and a success story for ``advanced'' control, as well as an academic discipline for graduate level research. MPC provides, via an iterative open loop optimal control implemented by repetitive online optimization, a nonlinear feedback control law that enforces system state and control constraints and optimizes system performance. MPC is also a vibrant and cross disciplinary branch of mathematical control theory that fuses and synergistically treats control–theoretic issues (such as stability, performance, feasibility, robustness, etc.) for constrained systems with the optimization theory and numerical computations. The course will provide an introduction to essentials of Model Predictive Control and more advanced topics. Applications will also be discussed.

The topics covered will include:

1. Introduction, systems with constraints, MPC history and essentials
2. Linear Quadratic Model Predictive Control
3. Numerical optimization methods for linear quadratic Model Predictive Control
4. Stability theory for linear and nonlinear discrete-time systems
5. Nonlinear Model Predictive Control (NMPC)
6. Numerical optimization methods for NMPC
7. Advanced MPC: Robust MPC, Stochastic MPC, Economic MPC, Distributed MPC, etc.
8. Simpler schemes for enforcing constraints such as reference governors
9. Applications

Instructor:
Professor Ilya Kolmanovsky

Meets:
Monday and Wednesday
4:30-6:00 PM
1008 FXB Building

Pre-requisites:
AEROSP 550 (Linear Systems Theory) or instructor permission

Questions:
Please contact Prof. Kolmanovsky (ilya@umich.edu)