# Syllabus

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- Subject : Theory of PID Control

- Textbook 1 : Nonlinear Control (by Hassan K. Khalil)

- Textbook 2 : PID Control Design for Robotic Manipulator (by Youngjin Choi)

- Textbook 3 : Model Predictive Control System Design and Implementation Using Matlab (by Liuping Wang)

- Textbook 4 : Disturbance Observer-Based Control: Methods and Applications (by Shihua Li, *et. al*)

(Summary)

As a fundamental, several concepts such as equilibrium points, stability, and passivity are introduced for control system design and synthesis. The PID control is suggested as a representative one for control systems. Though the PID control has a long history as much as its life force since Ziegler and Nichols published the empirical tuning rules in 1942, surprisingly, it has never been changed in the structure itself. The strength of PID control lies in the simplicity, lucid meaning, clear effect, and possibility to be combined with other control schemes such as model predictive control and disturbance observer. In this class, we will deal with how to design PID control combined with disturbance observer.

(New Schedule)

(1st week) Chapter 1 Introduction (Nonlinear Control)

(2nd week) Chapter 2 Two-Dimensional Systems (Nonlinear Control)

(3rd week) Chapter 3 Stability of Equilibrium Points (Nonlinear Control)

(4th week) Chapter 5 Passivity (Nonlinear Control)

(5th week) Exam 1

(6th week) Chapters 2,3 Nonlinear Mechanical Systems, Optimization for Control (PID Control)

(7th week) Chapter 4 Regulation and Tracking Control (PID Control)

(8th week) Chapter 5 $\mathcal{H}_\infty$ Optimality of PID Control (PID Control)

(9th week) Chapter 6 Performance Tuning (PID Control)

(10th week) Exam 2

(11th week) Chapter 1 Linear Model Predictive Control (MPC)

(12th week) Another Topic of Model Predictive Control (MPC)

(13th week) Chapter 2 Linear Disturbance Estimator (DOB)

(14th week) Chapter 3 Basic Nonlinear Disturbance Observer (DOB) Systems (DOB)

(15th week) Exam 3

(16th week) Presentation of Term Paper

(Grade)

Exam1 (20%) + Exam2 (30%) + Exam3 (30%) + Attendance (5%) + HW (5%) + Term Paper (10%)