

Pre-requisites: Numerical optimization. General concepts of Model Predictive Control (MPC). MPC based on quadratic programming. General stability properties. MPC based on linear programming. Models of hybrid systems: Piecewise affine systems. Multi-parametric programming and explicit linear MPC. Stochastic MPC: basic concepts, approaches based on scenario enumeration. Linear parameter- and time-varying MPC and applications to nonlinear dynamical systems. Lab Practice: Simulations on selected applications of MPC : helicopter, Solar plant.

**TEXT BOOKS/ REFERENCES:**

1. E. F. Camacho C. Bordons , “Model predictive control”, 2<sup>nd</sup> edition, Springer 2007
2. James B. Rawlings, David Q, “Model Predictive Control: Theory, Computation, and Design”, 2<sup>nd</sup> edition, 2009
3. A. Bemporad, M. Morari, V. Dua, and E.N. Pistikopoulos, ”The explicit linear quadratic regulator for constrained systems”, *Automatica*, vol. 38, no. 1, pp. 3–20, 2002
4. A. Bemporad, “A multiparametric quadratic programming algorithm with polyhedral computations based on nonnegative least squares”, *IEEE Trans. Automatic Control*, vol. 60, no. 11, pp. 2892–2903, 2015.
5. A. Bemporad and M. Morari, “Control of systems integrating logic, dynamics, and constraints”, *Automatica*, vol. 35, no. 3, pp. 407–427, 1999
6. F.D. Torrisi and A. Bemporad, “HYSDEL — A tool for generating computational hybrid models”, *IEEE Trans. Contr. Systems Technology*, vol. 12, no. 2, pp. 235–249, Mar. 2004
7. D. Bernardini and A. Bemporad, “Stabilizing model predictive control of stochastic constrained linear systems”, *IEEE Trans. Automatic Control*, vol. 57, no. 6, pp. 1468–