Course guide
340657 - CPSI - Model Predictive Control for Intelligent Systems

Unit in charge:	Vilanova i la Geltrú School of Engineering
Teaching unit:	707 - ESAII - Department of Automatic Control.
Degree:	MASTER'S DEGREE IN AUTOMATIC SYSTEMS AND INDUSTRIAL ELECTRONICS (Syllabus 2012). (Optional subject).

Academic year: 2025   **ECTS Credits:** 5.0   **Languages:** Spanish

LECTURER

Coordinating lecturer:	Ramon Guzmán
Others:	Guzman Sola, Ramon Duarte Mejia, Josue Neftali

TEACHING METHODOLOGY

LEARNING OBJECTIVES OF THE SUBJECT

El objetivo de esta asignatura es aportar al alumno conocimientos avanzados de control predictivo para sistemas inteligentes. El estudiante aprenderá como diseñar e implementar diferentes algoritmos basados en técnicas de control predictivo.

STUDY LOAD

Type	Hours	Percentage
Hours large group	30,0	24.00
Hours small group	15,0	12.00
Self study	80,0	64.00

Total learning time: 125 h

CONTENTS

Introduction

Description:
This topic will introduce the student to some preliminary aspects necessary to understand predictive control. It will also provide an introductory overview of what this control technique is and what it is used for.

Full-or-part-time: 1h
Theory classes: 1h

Predictors and estimators in MPC

Description:
In this topic, different estimators and predictors used in predictive control (Kalman filters, Smith predictor...) will be covered.

Full-or-part-time: 6h
Theory classes: 4h
Practical classes: 2h

Predictive Control with state variables

Description:
This topic covers the design of MPC controllers for state-space systems. We will see how to calculate controller gains by minimizing a cost function and how to add constraints to obtain optimal control.

Full-or-part-time: 14h
Theory classes: 12h
Practical classes: 2h

Generalized Model Predictive Control (GPC)

Description:
In this topic, we will see how to design a Generalized Predictive Controller (GPC) using the system's CARIMA model. We will cover the design for both delay-free systems and systems with large delays. The student will also learn how to use a Smith Predictor (SP) in GPC.

Full-or-part-time: 14h
Theory classes: 12h
Practical classes: 2h

Predictive control for MIMO systems

Description:
In this topic, we will see how to design MPC controllers for multivariable (MIMO) systems.

Full-or-part-time: 14h
Theory classes: 12h
Practical classes: 2h

Finite Control Set Model Predictive Control

Description:
In this topic, we will see a new predictive control technique for finite state systems.

Full-or-part-time: 6h
Theory classes: 4h
Practical classes: 2h

GRADING SYSTEM