

## **OPTIMAL AND ADAPTIVE CONTROL**

Mestrado em Engenharia Electrónica e de Computadores

---

Code: 26803

Main Scientific Area: Intelligent Systems and Control

Lecturer: Vitor Hugo Mendes da Costa Carvalho

Language of Instruction: Portuguese

Regime: S2

Contact Hours: 30h Total Workload: 130h

ECTS: 6,0

---

### **Objectives**

This UC includes the analysis and development of non-linear control systems where examples of applications and case studies will be presented. It focuses on non-linear control systems, linearization of feedback and optimum control. Applications include control in systems: robotic, fluid, electronic / electrical, dynamic and biological.

### **Learning Outcomes**

Students who successfully complete this course should be able to: Distinguish between linear and non-linear control systems. Understand the main methods of optimal and adaptive control. Design optimal and adaptive control systems. Use simulation tools.

### **Course Contents**

1. Introduction to the control of non-linear systems
2. Plan-phase analysis
3. Lyapunov stability theory
4. Input-output stability analysis
5. Linearization of feedback
6. Adaptive control
7. Optimal control
8. Applications

### **Recommended Bibliography**

Khalil, H.K., Nonlinear Systems, Prentice-Hall, 3/ed., 2002. Lewis, F.L. and V.L. Syrmos, Optimal Control, John Wiley Sons, 2/ed, 1995. Vidyasagar, M., Nonlinear Systems Analysis, Prentice-Hall, 2/ed., 1993. Vincent, T.L. and W.J Grantham, Nonlinear and Optimal Control Systems, Wiley-Interscience, 1997

### **Learning and Teaching Methods**

The syllabus contents are presented in order to explore in a sustained way the subjects necessary to complement the training of students in the domain of optimal and adaptive control, seeking to deepen concepts related to areas of the greatest importance for the control system design activities. The content of the proposed program addresses the various aspects essential to the fulfillment of these objectives, namely with regard to current topics and recent developments.

### **Assessment Methods**

The teaching methodology will be based on theoretical-practical and simulation classes, using whenever possible the real cases of Engineering. The learning results of this UC will be individually evaluated by carrying out a simulation work (50%) and writing a scientific article (50%).