FACULTY OF **ENGINEERING**

DEGREE COURSE: **COMPUTER AND CONTROL ENGINEERING**

MASTER DEGREE: **COMPUTER AND CONTROL ENGINEERING**

**SUBJECT**: SIMULATION METHODOLOGIES AND TECHNOLOGIES

**LECTURER**: GUIDO ODDI

Email address: guido.oddi@uniecampus.it

## OBJECTIVES

1. Classification of mathematical models
2. Identification of the mathematical models
3. Analysis and control of mathematical models
4. Examples of simulation of meaningful mathematical models

## CONTENTS

- The model -based control
- Limits of validity of the models
- Ordinary Differential Equations
- Mechanical Systems
- Electrical Systems
- Hydraulic systems
- Telecommunication networks
- Method of analogies
- Discretization Methods
- Mathematical model of a system
- Transfer function of a system
- Systems of feedback control
- Objectives and input signals
- Specifications and performance in the domain t
- Stability of controlled systems
- Method of the root locus
- Frequency Response
- Specifications and performance in the domain f
- Design of control laws in the domain s
- Design of control laws in the domain f
- PID Controllers
- Introduction to MATLAB
- Simulation of dynamic systems with MATLAB
- Simulation of dynamic systems with Simulink
- Root locus with MATLAB
- Bode with MATLAB
- Nyquist diagrams with MATLAB

- Diagrams Nichols with MATLAB
- Simulation of a delay
- Simulation of the poles-zeroes effects
- Simulation of the inverted pendulum
- Principles of Data processing

## LEARNING OUTCOMES

Understanding how to choose and use the best dynamic models to model real systems using professional simulation software.

## ASSESSMENT

Written exam: multiple-choice tests and open-ended questions

## RECOMMENDED TEXTBOOKS

Even if the provided material is sufficient for a complete comprehension of the course the following reading is suggested:

- "Modern Control Systems", 12° Edition, Dorf R. C. and Bishop R. H.,