DIPARTIMENTO
DI INGEGNERIA
DELL'INFORMAZIONE

Control Systems Engineering

Preparation of the study plan

INSTRUCTIONS 2024-25

Study Plan

Selection of courses and activities to be completed for graduation.

Total formative credit units: 120 – 126 cfu

Common mandatory activities (69 cfu)

Systems Theory	9 cfu	(Year 1, Semester 1)
Machine Learning	9 cfu	(Year 1, Semester 1)
Digital Control	6 cfu	(Year 1, Semester 1)
Estimation and Filtering	6 cfu	(Year 1, Semester 2)
Control Engineering Laboratory	9 cfu	(Year 1, Semester 2)
Final Thesis	21 cfu	
Internship / Research Training	9 cfu	

Remaining activities (51-57 cfu)

The remaining activities of the study plan can be chosen by:

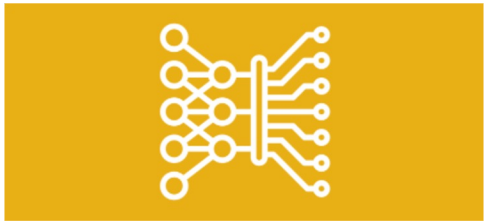
- ✓ selecting one of the 4 suggested paths with the same structure (30 path cfu + 6 control cfu + 15 elective cfu) and automatic approval:
  - Machine Learning
  - Robotics
  - Industrial Automation
  - Complex systems
- ✓ by preparing a customized plan according to the student's interests.

  It must be approved by the teaching committee.

All study plans must be submitted via UNIWEB.

Machine Learning Path

30 path cfu + 6 control cfu + 15 elective cfu



Path Courses

Convex Optimization

Learning Dynamical Systems

Reinforcement Learning

Computer Vision

"Advanced Control"

Nonlinear Systems & Control

Robotics and Control 1

Adaptive and Model Predictive Control

"Methods and Models"

Game Theory

Neural Networks and Deep Learning

Learning from Networks

Network Dynamical Systems

"Computation and measurements"

Big Data Computing

Measurements Architectures for Cyber-Physical Systems

Robotics Path

30 path cfu + 6 control cfu + 15 elective cfu

Path Courses

Robotics and Control 1

Robotics and Control 2

Convex Optimization

Computer Vision

"Learning"

Learning Dynamical Systems

Reinforcement Learning

"Applied"

Industrial Robotics

Intelligent Robotics

Robotics Laboratory

"Industrial"

Modeling and Control of Electric Drives

Embedded Real-Time Control

Measurement Architectures for CPS

Design of Mechanical Drives

"Advanced Control"

Nonlinear Systems & Control

Network Dynamical Systems

Industrial Automation Path

30 path cfu + 6 control cfu + 15 elective cfu

Path Courses

Convex Optimization

Embedded Real-Time Control

Industrial Automation

Modeling and Control of Electric Drives

"Applied"

Industrial Robotics

Computer Vision*

Measurement Architectures for CPS

Design of Mechanical Drives

"Disruptive"

Reinforcement Learning

Information Security

Computer Vision**

Adaptive & Model Predictive Control

"Methodological"

Learning Dynamical Systems

Robotics and Control 1

Complex Systems Path

30 path cfu + 6 control cfu + 15 elective cfu

Path Courses

Learning Dynamical Systems

Convex Optimization

Mathematical Physics

Nonlinear Systems and Control

"Nonlinear Dynamics"

Network Dynamical Systems

Learning from Networks

Game Theory

"Nonlinear Dynamics"

Robotics and Control 1

Robotics and Control 2

Reinforcement Learning

"Information"

Automata, Languages and Computation

Quantum Information & Computing

Game Theory

"System Biology"

System Biology

Control of Biological Systems

Mathematical Cell Biology

Customized Path and Full Course List

Rules: Total credits must be 120-126. 39cfu are mandatory courses; 21cfu are thesis; 9cfu are Internship/RT
In addition: AT LEAST 15 CORE CFU and AT LEAST 15 INTEGRATIVE CFU.
Moreover: 9-15 ELECTIVE CFU from any Master program of UNIPD (including the following list).

CORE

- Industrial Automation (9cfu)
- Learning Dynamical Systems (9cfu)
- Robotics and Control 1 (9cfu)
- Robotics and Control 2 (9cfu)
- Adaptive and Model Predictive Control (6cfu)
- Reinforcement Learning (6cfu)
- Nonlinear Systems and Control (6cfu)
- Embedded Real-Time Control (6cfu)
- Network Dynamical Systems (6cfu)
- Systems Biology (6cfu)
- Robotics laboratory (6cfu)
- Industrial Robotics (9cfu)
- Design of Mechanical Drives (6cfu)

INTEGRATIVE

- Convex Optimization (6cfu)
- Advanced Topics in Optimization (6cfu)
- Mathematical Physics (9cfu)
- Digital Signal Processing (6cfu)
- Quantum Information and Computing (6cfu)
- Neural Networks and Deep Learning (6cfu)
- Measurement Architectures for Cyber-physical Systems (9cfu)
- Computer Vision (9cfu)
- Computer Vision (6cfu)
- Intelligent Robotics (9cfu)
- Big Data Computing (6cfu)
- Learning from Networks (6cfu)
- Game Theory (6cfu)
- Information Security (6cfu)
- Automata, Languages and Computation (9cfu)
- Control of Biological Systems (6cfu)
- Smart Grids (6cfu)
- Automotive and Domotics (9cfu)
- ~~**Stochastic Processes (6cfu)**~~
- Modeling and Control of Electric Drives (9cfu)
- Mathematical Cell Biology (6cfu)

Customized Path: how to prepare for UNIWEB

Choose your courses from the list and other masters and organize them in groups:

- Group C: Core;
- Group I: Integrative;
- Group M: *Robotics and Control 2*, if you want to include it. It counts as 6 core and 3 integrative CFU;
- Group E: Other master programs (Elective);

Check 1: The (sub)total should be in the 51-57 CFU interval. If not, remove or add some;

Check 2: Core (Group C) should be *at least* 15, integrative (Group E) should be *at least* 15. If not, add CFU in the group;

Check 3: Other master programs should be *at most* 15;

Next, move to Group E (elective) enough exams from those you selected in groups C,I so that:

- E has at least 9 CFU;
- 3 checks above are still satisfied. Group E courses do not count towards Check 2.

Now you should be able to successfully insert this plan in UNIWEB, associating the groups (and subgroups for E) to the different “rules”.

Questions?

More info at:

https://lauree.dei.unipd.it/lauree-magistrali/control-systems-engineering/

https://stem.elearning.unipd.it/mod/book/view.php?id=234&chapterid=62

Ask for help or suggestions by writing to:

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