COURSE DETAILS

"LABORATORY OF AUTONOMOUS VEHICLE DESIGN AND DEVELOPMENT"

SSD ING-IND/13 ING-IND/15

DEGREE PROGRAMME: AUTONOMOUS VEHICLE ENGINEERING (MOVE)

ACADEMIC YEAR 2022-2023

GENERAL INFORMATION – TEACHER REFERENCES

TEACHER: SERGIO SAVINO, SALVATORE STRANO
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GENERAL INFORMATION ABOUT THE COURSE

INTEGRATED COURSE: LABORATORY OF AUTONOMOUS VEHICLE DESIGN AND DEVELOPMENT
MODULE: AUTONOMOUS VEHICLE SIMULATION AND EXPERIMENTAL TESTING
SSD OF THE MODULE: ING-IND/13
YEAR OF THE DEGREE PROGRAMME: II
SEMESTER: I
CFU: 6

REQUIRED PRELIMINARY COURSES (IF MENTIONED IN THE COURSE STRUCTURE "REGOLAMENTO")

none

PREREQUISITES (IF APPLICABLE)

Basic knowledge of mechanics; basic knowledge of the Matlab/Simulink environment

LEARNING GOALS

The module is intended to provide the student with the fundamentals of motion planning and control strategies of mechanical systems to develop a system with autonomous guidance. The module covers advanced topics of modelling that represent the starting point to develop autonomous vehicle prototypes, by means of laboratory experiences of simulations and experimental tests.

EXPECTED LEARNING OUTCOMES (DUBLIN DESCRIPTORS)

Knowledge and understanding

The didactic activities included in the teaching aim to provide the student with all the methodological tools necessary to tackle the study of a mechanical system that must be enriched with a degree of autonomy.
The student needs to show ability to know and understand problems related to autonomous systems motion planning.

Applying knowledge and understanding

The module delivers ability and tools needed to apply the knowledge in practice, fostering the ability to use methodological tools to develop models of mechanical systems that can be used to plan the movement and control strategies of such systems.

COURSE CONTENT/SYLLABUS

- Motion planning.
- Laws of motion and trajectories.
- Elementary laws of motion.
- Criteria for choosing the laws of motion.
- Minimum actuation time.
- Scaling of the laws of motion.
- Planning of laws of motion and trajectories of a mobile system.
- Path following and Trajectory tracking.
- Laboratory experiences to visualize the trajectories. **(3CFU)**
- Integration between sensors and autonomous vehicles.
- Vision systems in motion planning applications.
- Simulations and experimental verifications of autonomous driving control strategies.
- Laboratory experiences. **(3CFU)**

READINGS/BIBLIOGRAPHY

Rossi C., Lezioni di Meccanica dei Robot, Edizioni scientifiche ed artistiche, 2012.
Rossi C., Brain, Vision and AI, IN-TECH, 2008.
Hall E., Advances in Robot Manipulators, IN-TECH, 2010.
Lecture notes available on the teachers' websites

TEACHING METHODS

The teaching activities will be organized as follows: a) lectures for about 50% of the total hours, b) practical exercise in the classroom based on software Matlab (https://www.mathworks.com/) and experimental tests for about 50% of the total hours.

EXAMINATION/EVALUATION CRITERIA

a) Exam type:

Exam type	
written and oral	
only written	
only oral	X
project discussion	X
other	

b) Evaluation pattern:

The evaluation of the module is obtained according to the scores achieved by the student in the discussion of a project during the oral exam.

The final grade of the course Laboratory of Autonomous Vehicle Design and Development is formulated by the Examination Committee as mean of the judgment of the two modules that have equal weight.