Intelligent decision-making in robotics

Academic Year: (2023 / 2024)

Department assigned to the subject: Systems Engineering and Automation Department

Coordinating teacher: CASTRO GONZALEZ, ALVARO

Type: Compulsory ECTS Credits : 3.0

Year : 3 Semester : 1

DESCRIPTION OF CONTENTS: PROGRAMME

- 1. Introduction: autonomy in robotics, common terms, examples of applications, high-level vs. low-level decisions
- 2. Robotics paradigms: hierarchical, reactive, deliberative, hybrid
- 3. Dynamic Programming
- 4. Utility and Decision Theory
- 5. Game Theory
- 6. Probabilistic methods (Kalman filters, Particle filters, HMM, Dynamic Bayesian networks, POMDPs)
- 7. Reinforcement Learning
- 8. Bio-inspired Decision Making Systems

LEARNING ACTIVITIES AND METHODOLOGY

THEORETICAL PRACTICAL CLASSES.

Knowledge and concepts students must acquire. Receive course notes and will have basic reference texts. Students partake in exercises to resolve practical problems.

TUTORING SESSIONS.

Individualized attendance (individual tutoring) or in-group (group tutoring) for students with a teacher. Subjects with 6 credits have 4 hours of tutoring/ 100% on- site attendance.

STUDENT INDIVIDUAL WORK OR GROUP WORK.

Subjects with 6 credits have 98 hours/0% on-site.

WORKSHOPS AND LABORATORY SESSIONS.

Subjects with 3 credits have 4 hours with 100% on-site instruction. Subjects with 6 credits have 8 hours/100% on-site instruction.

ASSESSMENT SYSTEM

FINAL EXAM.

Global assessment of knowledge, skills and capacities acquired throughout the course. The percentage of the evaluation varies for each subject between 60% and 0%.

CONTINUOUS EVALUATION.

Assesses papers, projects, class presentations, debates, exercises, internships and workshops throughout the course. The percentage of the evaluation varies for each subject between 40% and 100% of the final grade.

% end-of-term-examination:	60
% of continuous assessment (assigments, laboratory, practicals):	40

BASIC BIBLIOGRAPHY

- D.P. Bertsekas Dynamic Programming and Optimal Control, Vols. I & II, Athena Press, 2017

- B. Christian, T. Griffiths Algorithms to Live By, William Collins Press, 2016

- M. Mitzenmacher, E. Upfal Probability and Computing: Randomization and Probabilistic Techniques in Algorithms and Data Analysis, Cambridge University Press, 2017

- R.R. Murphy Introduction to AI Robotics, MIT Press, 2000

Review date: 15-02-2024

ADDITIONAL BIBLIOGRAPHY

- Bertsekas and Tsitsiklis Introduction to Probability, Athena Scientific.
- Kochenderfer Decision Making Under Uncertainty: Theory and Application, MIT Lincoln Laboratory Series.
- Sutton and Barto Reinforcement Learning: An Introduction, http://incompleteideas.net/sutton/book/the-book.html.