Artificial Intelligence

Academic Year: (2024 / 2025) **Review date: 21-02-2025**

Department assigned to the subject: Computer Science and Engineering Department

Coordinating teacher: MOLINA LOPEZ, JOSE MANUEL

Type: Compulsory ECTS Credits : 6.0

Year : 2 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Programming (Course: 1 / Semester: 1)
Discrete Mathematics: (Course: 1 / Semester: 2)

LEARNING OUTCOMES

RA1.2: Knowledge and understanding of engineering disciplines underlying their specialisation, at a level necessary to achieve the other programme outcomes, including some awareness at their Forefront.
RA1.3: Awareness of the wider multidisciplinar y context of engineering.
RA2.2: Ability to identify, formulate and solve engineering problems in their field of study; to select and apply relevant methods from established analytical, computational and experimental methods; to recognise the importance of non-technical societal, health and safety, environmental, economic and industrial constraints.
RA3.1: Ability to develop and design complex products (devices, artefacts, etc.), processes and systems in their field of study to meet established requirements, that can include an awareness of non-technical ¿ societal, health and safety, environmental, economic and industrial ¿ considerations; to select and apply relevant design methodologies.
RA5.1: Understanding of applicable techniques and methods of analysis, design and investigation and of their limitations in their field of study.
RA6.1: Ability to gather and interpret relevant data and handle complexity within their field of study, to inform judgements that include reflection on relevant social and ethical issues.
RA7.2: Ability to function effectively in a national and international context, as an individual and as a member of a team and to cooperate effectively with engineers and non-engineers.
CB1: Students have demonstrated possession and understanding of knowledge in an area of study that builds on the foundation of general secondary education, and is usually at a level that, while relying on advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study.
CB3: Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements which include reflection on relevant social, scientific or ethical issues.
CB5: Students will have developed the learning skills necessary to undertake further study with a high degree of autonomy.
CGB3: Ability to understand and master the basic concepts of discrete mathe- matics, logic, algorithmic and computational complexity, and their application to the resolution of engineering problems.
CGO9: Ability to solve problems with initiative, decision-making, autonomy and creativity. Ability to know how to communicate and convey the knowledge, skills and abilities of the profession of Technical Engineer in Computer Science.
CECRI6: Knowledge and application of the basic algorithmic procedures of com- puter technologies to design solutions to problems, analysing the suitability and complexity of the proposed algorithms.
CECRI15: Knowledge and application of the fundamental principles and basic techniques of intelligent systems and their practical application.

OBJECTIVES

In this course the fundamentals of Artificial Intelligence techniques will be seen from the conceptual point of view and from the practical point of view.

DESCRIPTION OF CONTENTS: PROGRAMME

1. An Introduction of AI
2. Production Systems
3. Search
a. Introduction
b. Uninformed Search
c. Heuristic Search
4. Uncertainty
a. Probability calculus
b. Bayesian calculus. Bayes theorem. Bayesian inference. Bayesian Networks
c. Markov based models. Markov chains. Markov models. Hidden Markov Models. Markov Decision Processes (MDP). Partially observable MDPs (POMDP).
d. Fuzzy logic
5. Robotics
6. Applied Artificial Intelligence

LEARNING ACTIVITIES AND METHODOLOGY

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THEORETICAL-PRACTICAL CLASSES. [44 hours with 100% classroom instruction, 1.67 ECTS]
Knowledge and concepts students must acquire. Student receive course notes and will have basic reference texts to facilitate following the classes and carrying out follow up work. Students partake in exercises to resolve practical problems and participate in workshops and evaluation tests, all geared towards acquiring the necessary capabilities.

TUTORING SESSIONS. [4 hours of tutoring with 100% on-site attendance, 0.15 ECTS]
Individualized attendance (individual tutoring) or in-group (group tutoring) for students with a teacher.

STUDENT INDIVIDUAL WORK OR GROUP WORK [98 hours with 0 % on-site, 3.72 ECTS]

WORKSHOPS AND LABORATORY SESSIONS [8 hours with 100% on site, 0.3 ECTS]

FINAL EXAM. [4 hours with 100% on site, 0.15 ECTS]
Global assessment of knowledge, skills and capacities acquired throughout the course.

METHODOLOGIES

THEORY CLASS. Classroom presentations by the teacher with IT and audiovisual support in which the subject's main concepts are developed, while providing material and bibliography to complement student learning.

PRACTICAL CLASS. Resolution of practical cases and problem, posed by the teacher, and carried out individually or in a group.

TUTORING SESSIONS. Individualized attendance (individual tutoring sessions) or in-group (group tutoring sessions) for students with a teacher as tutor.

LABORATORY PRACTICAL SESSIONS. Applied/experimental learning/teaching in workshops and laboratories under the tutor's supervision.

ASSESSMENT SYSTEM

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

EVALUATION SYSTEMS

SE1 - FINAL EXAM. [40 %]
Global assessment of knowledge, skills and capacities acquired throughout the course.

SE2 - CONTINUOUS EVALUATION. [60 %]
Assesses papers, projects, class presentations, debates, exercises, internships and workshops throughout the course.

BASIC BIBLIOGRAPHY

- S. Russell, P. Norvig Artificial Intelligence, Prentice Hall , 2009