Program	59TL – Telematics Engineering B. Eng.

Course number and name	
Number	595040248
Name	Interaction Systems for Social Robotics
Semester	S7 [(September-January)]

Credits and contact hours	
ECTS Credits	4,5
Contact hours	45

Coordinator's name	Gago García, Esther [esther.gago@upm.es]

Specific course information

Description of course content

Interaction Systems for Social Robotics (ISSR) focuses on robots as social agents rather than cognitive agents, considering aspects such as emotions, social standards, understanding one's surroundings, etc. These robots find themselves in the social environment in which they perceive and in which they react to. Interaction systems applied to social robotics is a multidisciplinary area where solutions are based on the application of advanced technologies and framework (Intelligent Agents, Artificial Intelligence, Unity, etc.) and on the characterization of models of human beings (Affective Computing, Activity Theory, Psychology, etc).

The b-learning course will be taught following a problem-based learning methodology. The evaluation will be based on work done individually and on the group's teamwork.

List of topics to be covered

1. What is Social Robotics?
    - 1.1. Introduction
    - 1.2. Brief History of Robots
    - 1.3. A definition of Social Robots
    - 1.4. What is Intelligence?
    - 1.5. What is Social Intelligence?
    - 1.6. Social Robots and Human Beings: HRI
2. Artificial Intelligence. Neural Networks
    - 2.1. Artificial Intelligence
        - 2.1.1. What is AI? History and definitions
        - 2.1.2. Philosophy: Strong AI vs Weak AI. Searle and Turing
        - 2.1.3. Methods: Symbolic vs subsymbolic models
        - 2.1.4. New AI
    - 2.2. Neural Networks
        - 2.2.1. What is a Neural Network?
        - 2.2.2. How does a Neural Network work?

2.2.3. Type of Neural Networks and Algorithms

3. Robot-Robot Interaction
   - 3.1. What is an Intelligent Agent?
   - 3.2. Interaction. The Rational System of Intelligent Agents
   - 3.3. Social Intelligence: Multiagent Systems
   - 3.4. Emerging behavior

4. Human-Robot Interaction
   - 4.1. Cognitive processes in humans
   - 4.2. Interaction Systems: Model and Architecture
   - 4.3. Technologies for Interaction Systems

5. Tutorial workshop I: Neural Networks
   - 5.1. Introduction
   - 5.2. Tools for design and development of Neural Networks
   - 5.3. Classification using Neural Networks

6. Tutorial Workshop II: R-R and R-E interaction
   - 6.1. Introduction
   - 6.2. Basic concepts of the Unity development platform
   - 6.3. Game requirements
   - 6.4. Support for students' work

Prerequisites or co-requisites

None

Specific goals for the course

Specific outcomes of instruction

- CE TM07 Ability to program networked, distributed, or interactive services and applications, taking into account usability and accessibility criteria.
- CG 03 Ability to express oneself in oral and written form, and to convey information through documents and public presentations.
- CG 04 Ability to abstract, analyze, and synthesize, and to solve problems.
- CG 12 Skills for interpersonal relations and work in a national and international context, with the ability to express in oral and written English.
- CG 13 Learning skills with a high degree of autonomy.
- CG 14 Skills for ethics and professional responsibility, respect for Human Rights and cultural diversity.

Further reading and supplementary materials

– Loving the Machine: The Art and Science of Japanese Robots. Timothy N. Hornyak. Kodansha International (2006).
– Unity in Action: Multiplatform Game Development in C# with Unity 5. Joe Hocking. Manning Publications (2015).
– Introducing Artificial Intelligence: A Graphic Guide. Henry Brighton y Howard Selina. Icon Books Ltd (2015)