

# STUDY GUIDE

## SOCIAL ROBOTICS

***Organised by USC***



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NATIONAL UNIVERSITY  
OF KYIV



With the support of the  
Erasmus+ Programme  
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This project has received funding from the European  
Union's Horizon 2020 research and innovation pro-  
gramme under grant agreement No 101035821.



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| 1. IDENTIFYING DATA                             |                                                                                                                                                                                                                                                                                                            |
|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Course/training name*                           | Social Robotics                                                                                                                                                                                                                                                                                            |
| Coordinating University*                        | USC                                                                                                                                                                                                                                                                                                        |
| Universities involved                           | USC                                                                                                                                                                                                                                                                                                        |
| Main Thematic Arena*                            | Transversal                                                                                                                                                                                                                                                                                                |
| Relation with the above selected Thematic Arena | Social robots are becoming more and more widespread in our society in order to develop assistive tasks for people's well-being. This course will explain the basic design methodologies of these robots for their application at homes (for social equality, Arena 2) and hospitals (for health, Arena 1). |
| Course/training field(s)*                       | Engineering                                                                                                                                                                                                                                                                                                |
| ISCED Code                                      | 0714 - Electronics and automation                                                                                                                                                                                                                                                                          |
| Related SDGs                                    | SDG 3 (Good Health and Well-being)                                                                                                                                                                                                                                                                         |
| Target audience(s)*                             | Bachelor students (2 <sup>nd</sup> and 3 <sup>rd</sup> years)   Master students                                                                                                                                                                                                                            |
| Number of ECTS credits allocated                | 2                                                                                                                                                                                                                                                                                                          |



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|                                                                    |                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Other modes of certifications</b>                               | /                                                                                                                                                                                                                                                             |
| <b>Mode of delivery*</b>                                           | Online asynchronous<br><br>One synchronous introductory session on the 4 <sup>th</sup> November at 19:00 h                                                                                                                                                    |
| <b>Language of instruction*</b>                                    | English                                                                                                                                                                                                                                                       |
| <b>Semester*</b>                                                   | 1                                                                                                                                                                                                                                                             |
| <b>Course/training dates*</b>                                      | November 2024-January 2025                                                                                                                                                                                                                                    |
| <b>Precise schedule of the lectures<br/>(Mind the time zone) *</b> | Every two weeks from 4 <sup>th</sup> November until 1 <sup>st</sup> January, a new unit will be uploaded and shared with the students to be read and analysed: Unit 1 (28-10-24), Unit 2 (11-11-24), Unit 3 (25-11-24), Unit 4 (09-12-24), Unit 5 (20-12-24). |
| <b>Key words (max 5) *</b>                                         | Human-robot interaction, robotic behaviours, robotic perception, social robots design                                                                                                                                                                         |
| <b>Catch Phrase*</b>                                               | Discover how the novel social robots that will help your loved ones are designed and tested.                                                                                                                                                                  |
| <b>Prerequisites and co-requisites*</b>                            | General engineering knowledge in maths, physics, mechanics, electronics and programming.<br><br>Students should show that they have a background knowledge in general engineering (maths, physics, mechanics, electronics and programming).                   |



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|                                                                                  |                                                                      |
|----------------------------------------------------------------------------------|----------------------------------------------------------------------|
|                                                                                  | Students should have the following language knowledge: B2 of English |
| <b>Number of EUniWell students or staff that can attend the course/training*</b> | 20                                                                   |
| <b>Course/training application procedure(s)*</b>                                 | EUniWell joint application process on EUniWell website               |

## 2. CONTACT DETAILS

|                                                      |                                                                              |
|------------------------------------------------------|------------------------------------------------------------------------------|
| <b>Department</b>                                    | Electrónica y Computación                                                    |
| <b>Name of lecturer/trainer*</b>                     | Juan Antonio Corrales Ramón                                                  |
| <b>E-mail of the trainer*</b>                        | <a href="mailto:Juanantonio.corrales@usc.es">Juanantonio.corrales@usc.es</a> |
| <b>Name and e-mail of the catalogue coordinator*</b> | Mirela Florescu, euniwell@usc.gal                                            |
| <b>Other lecturers/trainers</b>                      | /                                                                            |

## 3. COURSE/TRAINING ABSTRACT\*

The interaction between humans and robots is the main goal of novel social robots that help humans at homes, hospitals and any other public places. The different design methodologies of this interaction are detailed. The main perception mechanisms of the robot to understand the human's state are analysed by taking into account the different types of sensors that are required. After this robot's understanding, it should act by using different interfaces and organizing its behaviours according to the human's emotion and intentions. Finally, all these concepts are transferred to collaborative industrial robots for making them work next to humans.

#### 4. DEVELOPED SKILLS AND COMPETENCES\*

Place the needs of the user at the centre of the interaction between robot and person design. Understand the aspects of robot behaviour design in relation to the integration of different sensor technologies and interfaces to interact with the user. Become familiar with design and evaluation methods on the human-robot interaction.

#### 5. OBJECTIVES AND LEARNING OUTCOMES\*

User-centered design methods for social robots, perception algorithms based on multisensor information analysis, interfaces of social robots for collaborative actions, control and planning strategies for emotion-based robot behaviours, perception and control strategies for industrial collaborative robots.

#### 6. COURSE/TRAINING ORGANISATION

##### UNITS

- |    |                                                                              |
|----|------------------------------------------------------------------------------|
| 1. | Introduction to Human-Robot Interaction. Design principles of social robots. |
| 2. | Multimodal human-robot communication                                         |



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|                                                                                                                                                                                                                |                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| 3.                                                                                                                                                                                                             | Natural user interfaces         |
| 4.                                                                                                                                                                                                             | Robot behaviour control         |
| 5                                                                                                                                                                                                              | Collaborative industrial robots |
| <b>LEARNING RESOURCES AND TOOLS</b>                                                                                                                                                                            |                                 |
| Slides and associated research/technical papers.                                                                                                                                                               |                                 |
| <b>PLANNED LEARNING ACTIVITIES AND TEACHING METHODS</b>                                                                                                                                                        |                                 |
| The students should read and analyse the slides. For the important concepts of the slides, there will be associated research papers that the students could analyse to deepen their knowledge and competences. |                                 |

|                                                                                 |
|---------------------------------------------------------------------------------|
| <b>7. ASSESSMENT METHODS AND CRITERIA*</b>                                      |
| There will be automatic evaluation forms available from 07/01/25 until 14/01/25 |
| <b>RECOGNITION*</b>                                                             |
| There will be a diploma with the number of equivalent ECTS                      |
| <b>ADDITIONAL INFORMATION</b>                                                   |
|                                                                                 |

## 8. BIBLIOGRAPHY AND TEACHING MATERIALS

- Christoph Bartneck, Tony Belpaeme, Friederike Eysel, Takayuki Kanda, Merel Keijsers, Selma Sabanovic. Human-Robot Interaction: An Introduction. Cambridge University Press, 2020. ISBN: 978-1108735407. <https://www.human-robot-interaction.org/>
- Bruno Siciliano, Oussama Khatib. Springer Handbook of Robotics, 2nd Edition. Springer, 2016. ISBN: 978-3-319-32552-1

## 9. QUALITY ASSURANCE\*

The students will be able to contact the teacher for asking questions by email and organize online discussions if required. **Upon completion of each unit, the students will be asked to submit a brief exercise in pdf format showing knowledge of the lessons learned.** At the end of the course, there will be a survey to recover the opinion of the students and add improvements in the future versions of the project.