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DeCAIR Course Syllabus Form

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WP Number & Title	Work Package 2: Development of new MSc and BSc programs in AIR		
Activity Number & Title	Activity 2.2: Designing and developing syllabi and content for the agreed upon courses in the new programs		
WP Leader	Francesco Masulli, University of Genoa		
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Revision History

Version	Date	Author	Description	Action *	Page(s)
1	5/11/2021	Eyad Almaita	Original (base) document	C	1-6
2	13/12/2021	TTU Team	Revision	U	2-4
3	31/01/2022	Eyad Almaita	Revison	U	2-6
4					

(*) Action: C = Creation, I = Insert, U = Update, R = Replace, D = Delete

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<table>
<tr><td>Course title</td><td>AI and Robotics Systems Lab</td></tr>
<tr><td>Course number</td><td>0109576</td></tr>
<tr><td>Credit hours</td><td>1</td></tr>
<tr><td>ECTS (weekly contact and self-study load)</td><td>3</td></tr>
<tr><td>Prerequisites/co-requisites</td><td>Robotics systems (0109563)</td></tr>
<tr><td>Prerequisites by topic</td><td>Students are assumed to have good background in robotics systems, machine learning. Additionally, the students should have good programming skills.</td></tr>
<tr><td>Level and type (compulsory, elective)</td><td>bachelor’s compulsory course</td></tr>
<tr><td>Year of study and semester</td><td>Fifth year, first semester</td></tr>
<tr><td>Description</td><td>This course is a hands-on introduction to the key concepts of robotics and AI. Each student will use different types of robots and AI boards to learn about the general functioning of a robotics and AI systems.</td></tr>
<tr><td>Objectives</td><td>To enable the students to have hands-on experience in the fields of artificial intelligence robotics.</td></tr>
<tr><td>Intended learning outcomes</td><td>Upon successful completion of this course, students will be able to:
<table>
<tr><th>No</th><th>Intended learning Outcome (ILO)</th><th>Program learning outcome (PLO)*</th></tr>
<tr><td>1</td><td>Understand different types of robotics systems and their applications</td><td>1</td></tr>
<tr><td>2</td><td>Design and implement different functions for robotics systems (path planning, path smoothing, and vision)</td><td>1,2,5</td></tr>
<tr><td>3</td><td>Design and implement several AI algorithms using PCs and GPU boards</td><td>2,5</td></tr>
<tr><td>4</td><td>Understand how the AI is used to improve robotics systems</td><td>5,7</td></tr>
</table>
(*) The PLOs are listed in the appendix</td></tr>
<tr><td>Teaching and learning methods</td><td>Development of ILOs is promoted through the following teaching and learning methods:
Experiments will be conducted in the lab
The AI and Robot lab is open for the students to practice the practical aspects and solve the programming homework assignments.
The student solves the programming assignments in machine learning and robotics.</td></tr>
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<tr><td></td><td>

The student carries out a term project for solving a problem using ML techniques.
The student develops a professional report for each experiment.
The student presents the term project in class.

</td></tr>
<tr><td>Learning material</td><td>Lab manual, Textbook, some instructor keynotes, selected YouTube videos, and access to a personal computer and the internet.</td></tr>
<tr><td>Resources and references</td><td>A- Required book(s), assigned reading and audio-visuals:
1. Robotics Lab Manual (Upon installing the Lab This Manual will be delivered)
2. Artificial Intelligence Lab Manual (Upon installing the Lab This Manual will be delivered)</td></tr>
<tr><td>Topic outline and schedule</td><td>
<table>
<tr><th>Week</th><th>Topic</th><th>ILO</th><th>Resources</th></tr>
<tr><td>1</td><td>Intro to Robot (Motion)</td><td>1</td><td>1</td></tr>
<tr><td>2</td><td>Intro to Robot Vision (Depth and Color)</td><td>1,2</td><td>1</td></tr>
<tr><td>3</td><td>Intro to Robot Vision (Depth and Color)</td><td>1,2</td><td>1</td></tr>
<tr><td>4</td><td>Robot Navigation (path planning)</td><td>2</td><td>1</td></tr>
<tr><td>5</td><td>Robot Navigation (localization)</td><td>2</td><td>1</td></tr>
<tr><td>6</td><td>Programming robot Complex Behaviors</td><td>2</td><td>1</td></tr>
<tr><td>7</td><td>Introduction to parallel computing</td><td>3</td><td>2</td></tr>
<tr><td>8</td><td>Introduction to AI boards</td><td>3</td><td>2</td></tr>
<tr><td>9</td><td>Supervised learning</td><td>3</td><td>2</td></tr>
<tr><td>10</td><td>Supervised learning</td><td>3</td><td>2</td></tr>
<tr><td>11</td><td>Unsupervised learning</td><td>3</td><td>2</td></tr>
<tr><td>12</td><td>Deep neural networks</td><td>3,4</td><td>2</td></tr>
<tr><td>13</td><td>Autonomous Robots</td><td>3,4</td><td>1, 2</td></tr>
<tr><td>14</td><td>Autonomous Robots</td><td>3,4</td><td>1, 2</td></tr>
<tr><td>15</td><td>Finals</td><td>1-4</td><td>1, 2</td></tr>
</table>
</td></tr>
<tr><td>Evaluation tools</td><td>Opportunities to demonstrate achievement of the ILOs are provided through the following assessment tools:
<table>
<tr><th>Assessment tool</th><th>Mark</th><th>Topic(s)</th><th>Time</th></tr>
<tr><td>Lab reports</td><td>40%</td><td>Programming aspects</td><td>W1-W14</td></tr>
<tr><td>Midterm exam</td><td>20%</td><td>till supervised learning</td><td>W9</td></tr>
<tr><td>Final exam</td><td>40%</td><td>All material</td><td>W15</td></tr>
<tr><td>Total</td><td>100%</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>Student requirements</td><td>The student should have a computer and internet connection.</td></tr>
<tr><td>Lab policies</td><td>A- Attendance policies:

Attendance is required. Class attendance will be taken every class and the university polices will be enforced in this regard.

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	B- Absences from exams and submitting assignments on time: • A makeup exam can be arranged for students with acceptable absence causes. • Assignments submitted late, but before announcing or discussing the solution can be accepted with 25% penalty. • The project report must be handed in in time. C- Health and safety procedures: • All health and safety procedures of the university and the school should be followed. D- Honesty policy regarding cheating, plagiarism, misbehavior: • All submitted work must be of the submitting student. • Other text or code must be properly quoted with clear source specification. • Cheating will not be tolerated. E- Available university services that support achievement in the course: • Microsoft Teams team and Moodle course page • AI Lab for practicing the practical aspects and solving the programming assignments. • Program announcements Facebook group
Additional information	None

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PLOs for the BSc in Intelligent Systems Engineering

Students who complete the BSc in Intelligent Systems Engineering (ISE) will be able to:

1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

3. Communicate effectively with a range of audiences.

4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

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