Course title	**Autonomous Systems**
Course number	COMP 626
Credit hours (lecture and lab)	3 (3 + 0)
ECTS (weekly contact and self-study load)	6 (3 + 3)
Prerequisites/co-requisites by course number and name	None
Prerequisites by topic (other than the formal prerequisites above)	None
Level and type (compulsory, elective)	Masters' elective course
Year of study and semester	Any
Catalogue description	Introduction to autonomous systems including the architecture and design of agents, models and knowledge representations, control of robotic manipulators, machine vision, the dynamics of wheeled, air, space and underwater robots, and navigation. Sensing and perception, Planning and decision making, Multi-robot systems, Control of robot kinematics and dynamics.
Objectives	This course introduces the concepts, principles, methods, and implementation techniques of autonomous systems. The course puts prominence on fully automatic motion planning, state estimation, localization and mapping, kinematics, and robot learning.
Intended learning outcomes	Upon successful completion of this course, students will be able to:

No	Intended learning Outcome (ILO)	PLO*
1	Demonstrate understanding of applied terminology, and list applications, of real time systems.	1, 2, 3, 5, 6
2	Demonstrate the ability to translate requirements of real-time systems into forms that can be encoded.	1, 2, 3
3	Apply simple real time functions using a real time operating system and a programming language suitable for embedded real-time systems.	1, 2, 3, 4
4	Apply real-time methodology to multiprocessor and distributed systems.	2, 3, 4
5	Re-cast practical design problems into real time task models for the purpose of analysis, evaluation or implementation	2, 3, 4, 5, 6

	(*) The Program learning outcome (PLOs) are listed in the appendix
Teaching and learning methods	Development of ILOs is promoted through the following teaching and learning methods: • The AI Lab. is open for the students to practice the practicalaspects and solve the programming homework assignments. • The student attends the class presentations and participates in the discussions. • The student joins the related online team/group and participates in its discussions. • The student studies the reference material, including books and videos. • The student solves the programming assignments in robotics. • The student carries out a term project for solving a problem using robotics techniques. • The student develops a professional report for the term report. • The student presents the term project in class.
Learning material type	Textbook, class handouts, some instructor keynotes, selected YouTube videos, and access to a personal computer and the internet.
Resources and references	A- Required book(s), assigned reading and audio-visuals: 1. Dilip Kumar Pratihar. Intelligent Autonomous Systems: Foundations and Applications. Springer. B- Recommended book(s), material and media: 2. Alain Cardon, Mhamed Itmi. New Autonomous Systems. Wiley.
Topic outline and schedule	

Week	Topic	ILO	Resources
1-2	Towards intelligent Autonomous Systems	1, 2, 3	1, 2
3-4	General aspects Autonomous Systems	1, 2, 3, 4	1
5-6	Design of Autonomous robots	3, 4, 5	1, 2
7	Learning for multiple source information	2, 4	1, 2
8	Condition monitoring of internal agent	3, 5	1, 2
9-10	Present states and future possibilities	3, 4	1
11-13	Planning using soft computing	2, 3, 4	1, 2
14	High dimensional Neural Networks	3, 4, 5	1
15	Project Presentations	All	

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<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>Homework assignments</td><td>10%</td><td>Theoretical aspects</td><td>W1-W14</td></tr>
<tr><td>Midterm exam</td><td>30%</td><td>Applications</td><td>W8</td></tr>
<tr><td>Term project report and presentation</td><td>20%</td><td>Practical and presentation aspects</td><td>W3-W15</td></tr>
<tr><td>Final exam</td><td>40%</td><td>All material</td><td>W16</td></tr>
<tr><td>Total</td><td>100%</td><td></td><td></td></tr>
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<tr><td>Student requirements</td><td>The student should have a computer and internet connection.</td></tr>
<tr><td>Course 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.
B- Absences from exams and not 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:
• Open-book exams
• 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:
• Moodle course page
• AI Lab for practicing the practical aspects and solving the programming assignments.
• Program announcements Facebook group</td></tr>
<tr><td>Additional information</td><td>None</td></tr>
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