COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
Robotic System Control Algorithms	

Academic staff	Core academic unit(s)
Coordinating: Assoc. prof. dr. Gintautas Daunys **Other:**	Šiauliai Academy

Study cycle	Type of the course unit
First cycle	Mandatory / Individual studies

Mode of delivery	Semester or period when it is delivered	Language of instruction
Face-to-face	5th semester	Lithuanian / English

Requisites	
Prerequisites:	**Co-requisites (if relevant):**

Number of ECTS credits allocated	Student's workload (total)	Contact hours	Individual work
5	133	56	77

Purpose of the course unit		
Understand robot control algorithms and be able to apply them.		
Learning outcomes of the course unit	**Teaching and learning methods**	**Assessment methods**
Knowledge of robot control algorithms	Traditional and interactive lectures, Python programing	Written exam, assignments (laboratory works),
Ability to implement robot control algorithms in software.	Interactive lectures, Python programing	Assignments (laboratory works),
Ability to tune parameters of robot control algorithms.	Interactive lectures, Python programing.	Assignments (laboratory works),
Ability to train robot control algorithms using deep learning	Interactive lectures, Python programing	Written exam, assignments (laboratory works),
Ability individually study newest information about robot control algorithms and evaluate them	Individual reading and analysis, Python programing	Written exam, assignments (laboratory works)

Content	Contact hours							Individual work: time and assignments	
	Lectures	Tutorials	Seminars	Workshops	Laboratory work	Internship	**Contact hours, total**	**Individual work**	**Tasks for individual work**
1. Robots kinematics	4				2		**6**	**4**	Writing programs individually using Python.
2. Robot dynamics	4				2		**6**	**6**	Writing programs individually using Python.
3. Classical control theory	4				4		**8**	**6**	Writing programs individually using Python.
4. Markov decision process	2				8		**10**	**6**	Individual reading. Writing programs individually using Python.
5. Reinforcement learning using deep learning	6				12		**18**	**8**	Individual reading. Writing programs individually using Python.
6. Localization algorithms	4				0		**4**	**12**	Individual reading. Writing programs individually using Python and Pytorch.
7. Motion planning algorithms	4				0		**4**	**12**	
8. Preparation for exam	0				0		**0**	**23**	Individual reading.
Total	28				28		**56**	**77**	

Assessment strategy	Weight %	Deadline	Assessment criteria
1. Programming assignments for topics 1-2	10%	Week 6	Assessment by grade in 10 point system. Grade depends on: efficiency of code, completeness of performed tests, clarity of description and quality of conclusions. All assignments are obligatory. The cumulative score is calculated only when all interim assignments have been evaluated.
2. Programming assignments for topics 3	10%	Week 8	
3. Programming assignments for topics 4	10%	Week 10	
4. Programming assignments for topic 5	10 %	Week12	
5. Programming assignments for topics 6-7	10 %	Week14	
6. Exam	50%	During Exam Session	Test with 10 open-ended questions. The value of each question is 1 point.

Author (-s)	Publishing year	Title	Issue of a periodical or volume of a publication	Publishing house or web link
Required reading				
Herath, & St-Onge, D.	2022	Foundations of Robotics		Springer
Tzafestas	2013	Introduction to Mobile Robot Control		Elsevier

Sutton R., Barto A.	2022	Reinforcement Learning: An Introduction		http://www.incompleteideas.net/book/the-book.html
Recommended reading				
Palanisamy, Praveen.	2018	Hands-On Intelligent Agents with OpenAI Gym: Your guide to developing AI agents using deep reinforcement learning.		Packt Publishing Ltd
Stanford University course website	2022	CS234.: Reinforcement Learning Winter 2022		https://web.stanford.edu/class/cs234/modules.html
Other sources will be anounced during the first lecture.				