



COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
Recognition and Processing Methods of Digital Objects	

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

Study cycle	Type of the course unit
First	Mandatory

Mode of delivery	Semester or period when it is delivered	Language of instruction
Face-to-face or blended learning	7 semester	English

Requisites	
Prerequisites: Artificial Intelligence	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		
To develop the abilities to apply image and sound processing algorithms for the control of robotic systems.		
Learning outcomes of the course unit	Teaching and learning methods	Assessment methods
Knowledge video and audio signal processing algorithms.	Traditional and interactive lectures, Python programing.	Written exam, assignments (laboratory works).
Ability to analyze the eligibility of algorithms to perform specific robotics tasks.	Interactive lectures, Python programing.	Assignments (laboratory works).
Ability to create and train signal processing neural networks.	Interactive lectures, Python programing.	Assignments (laboratory works).
Ability to prepare a specification for a robotics product that processes video and audio information	Interactive lectures, Python programing.	Written exam, assignments (laboratory works).
Ability individually study newest information about image and sound processing algorithms	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. Image formation. Image sensor. Digital camera.	4				0		4	4	Individual reading.
2. Image processing algorithms.	4				4		8	6	Writing programs individually using Python.
3. Image classification neural networks.	4				8		12	12	Individual reading. Writing programs individually using Python.
4. Object Detection. YOLO algorithm.	4				4		8	8	Writing programs individually using Python.
5. Semantic Segmentation. Visual Simultaneous Localization and Mapping (Visual SLAM).	4				4		8	8	Writing programs individually using Python.
6. Sound features extraction.	4				4		8	4	Writing programs individually using Python.
7. Speech recognition and synthesis.	4				4		8	12	Writing programs individually using Python.
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 2	5 %	Week 4	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	15%	Week 6	
3. Programming assignments for topics 4	5%	Week 8	
4. Programming assignments for topic 5	10 %	Week10	
5. Programming assignments for topics 6	5 %	Week12	
6. Programming assignments for topics 7	10 %	Week14	
7. 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				
Richard Szeliski	2022	Computer Vision: Algorithms and Applications.		Springer. https://szeliski.org/Book/

Jinyu Li, Li Deng, Reinhold Haeb- Umbach, Yifan Gong	2015	Robust Automatic Speech Recognition: A Bridge to Practical Applications		O'Reilly
Recommended reading				
E.R. Davies, Matthew A.	2021	Advanced Methods and Deep Learning in Computer Vision		Academic Press
Ali Tourani, Hriday Bavle, Jose-Luis Sanchez-Lopez, Holger Voos	2022	Visual SLAM: What are the Current Trends and What to Expect?		https://arxiv.org/pdf/2210.10491.pdf
Ilias Papastratis	2021	Speech Recognition: a review of the different deep learning approaches		https://theaisummer.com/speech-recognition/
Sergios Karagiannakos	2021	Speech synthesis: A review of the best text to speech architectures with Deep Learning		https://theaisummer.com/text-to-speech/