RTU Course "Inteligent robot motion planning"

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General data

Code	DSP714
Course title	Inteligent robot motion planning
Course status in the programme	Compulsory/Courses of Limited Choice
Responsible instructor	Agris Ņikitenko
Volume of the course: parts and credits points	1 part, 4.5 credits
Language of instruction	LV
Annotation	The study course provides theoretical knowledge on classic and modern planning methods as well as through individual practical assignments provides skills for the application of the methods.
Goals and objectives of the course in terms of competences and skills	The study course goal is to provide students with theoretical knowledge and practical skills for robot motion planning methods using strategies and algorithms corresponding to the selected problem. The tasks of the study course are to develop skills: - to map a planning problem into a mathematical problem with its goal descriptions; - to select methods and algorithms that correspond to the planning problem; - to apply particular methods for discrete and continuous planning problems; - to extend the existing planning methods to planning domains with uncertainties or other relevant factors.
Structure and tasks of independent studies	The study course includes a few practical assignments for individual work in the following chapters: 1) Discrete planning methods; 2) Geometric representations and configuration spaces; 3) Continuous planning methods. The results of the works provide the basis for the final evaluation of the study course.
Recommended literature	Obligātā/Obligatory: 1) S.M. LaValle, Planning algorithms, Cambridge University Press, 2006 2) S.Russell, P.Norvig Artificial intelligence: a modern approach 4th edition, Pearson Education Inc., 2021. 3) P.Boscariol, D.Richiedei, Optimization of Motion Planning and Control for Automatic Machines, Robots and Multibody Systems, Mdpi AG, 2020, 266 pages.
Course prerequisites	Mathematics.

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
Introduction.	4	0	0	0
Discrete planning.	12	10	0	0
Geometric representations and configuration space.	8	8	0	0
Sampling planning and sample quality.	12	10	0	0
Combinatorial planning.	12	10	0	0
Introduction to decision theory.	6	0	0	0
Planning under uncertainty.	12	10	0	0
Differencial contraints.	6	0	0	0
Total:	72	48	0	0

Learning outcomes and assessment

Learning outcomes	Assessment methods
Is able to characterize planning problems for robotic systems.	Separate questions in the exam.
Is able to select particular methods for appropriate planning problems.	Separate questions in the exam.
Is able to apply discrete planning techniques.	Separate questions in the exam. Assessment of individual practical work.
Is able to apply continuous planning techniques.	Separate questions in the exam. Assessment of individual practical work.
Is able to describe configuration spaces and differential constraints essentials in the planning context.	Separate questions in the exam.

Evaluation criteria of study results

Criterion	%
Individual practical work	75
Exam	25

Total:	100

Study subject structure

Part	CP	Hours			Tests		
		Lectures	Practical	Lab.	Test	Exam	Work
1.	4.5	2.0	1.0	0.0		*	