RTU Course "Design of Smart and Green Cutting Tools"

31000 Faculty of Civil and Mechanical Engineering

General data

Code	MMM778
Course title	Design of Smart and Green Cutting Tools
Course status in the programme	Compulsory/Courses of Limited Choice; Courses of Free Choice
Responsible instructor	Artis Kromanis
Volume of the course: parts and credits points	1 part, 9.0 credits
Language of instruction	LV, EN
Annotation	The study course contains a general overview of smart and green cutting tools. The use of sensors in the smart cutting tools is analysed as well as its implementation in solutions of Internet-of-Things. Overview and analysis use of cutting tool materials for smart and green cutting tools. Research of ability to use smart and green cutting tools in CNC machines. Analysis on possibilities to us environmentally friendly machining in future.
Goals and objectives of the course in terms of competences and skills	The goal of the subject is to discuss principles on smart and green or so-called environmentally friendly cutting tools. Assignments - to create understanding and competencies on trends of smart and green cutting tools. To strengthen skills on analytical evaluation and prediction of modern processing techniques and technology development including smart and green cutting tools in the industry.
Structure and tasks of independent studies	An individual assignment is directed towards drafting a topical report - paper. Research should address the latest sources of information by identifying trends of science and technology progress for evaluation of modern manufacturing process and technology development, especially the use of smart and green cutting tools. The aim of the paper: to strengthen skills of information source analysis and acquire skills to prepare reports and overview of information sources used in a doctoral thesis.
Recommended literature	Walker, John R.,. Machining fundamentals / by John R. Walker, Bob Dixon., xii, 644 lpp. : ilustrācijas ; 29 cm Altintas, Yusuf,. Manufacturing automation : metal cutting mechanics, machine tool vibrations, and CNC design /Yusuf Altintas. Cambridge ; New York : Cambridge University Press, 2012., xii, 366 lpp. : il. ; 26 cm. Smith, Graham T.,. Cutting tool technology : industrial handbook /Graham T. Smith. London : Springer, c2008., XII, 599 lpp. : il. ; 27 cm Asch, Rainer.. Mathematik und Geometrie zur CNC-Technik : Standardaufgaben fuer die spanende Bearbeitung und Uebungsbeispiele mit Loesungen /Rainer Asch, Friedrich Lohrberg. Wuerzburg : Vogel Buchverlag, 1992., 86 S. : Abb. Kief, Hans B.. CNC handbook / Hans B. Kief, Helmut A. Roschiwal ; translated by Jefferson B. Hood. New York [etc.] : McGraw-Hill, ©2013., ix, 466 lpp. : ilustrācijas ; 25 cm. Suh, Suk-Hwan. Theory and design of CNC systems / Suk-Hwan Suh, Seong-Kyoon Kang, Dae-Hyuk Chung, Ian Stroud., xx, 455 lpp. : ilustrācijas ; 25 cm. Metal cutting : research advances /J. Paulo Davim, editor. New York : Nova Science Publishers, c2010., 247 lpp. : il. ; 27 cm. Intelligent machining : modeling and optimization of the machining processes and systems /edited by Tugrul Özel, J. Paulo Davim. London, UK : ISTE ; Hoboken, NJ : Wiley, 2009., ix, 275 lpp. : il.
Course prerequisites	Cutting theory

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
General overview of smart cutting tools	4	30	0	0
Use of sensors in the smart cutting tools	2	20	0	0
Materials of cutting tools and its possibility to use for smart cutting tools	2	20	0	0
Adjustment of cutting machines to the smart cutting tools	4	32	0	0
Use of Internet-of-Things for the smart cutting tools	2	20	0	0
General overview of green cutting tools	4	40	0	0
Cutting tool materials and its use for green cutting tools	4	16	0	0
Environmentally friendly machining	4	36	0	0
Total:	26	214	0	0

Learning outcomes and assessment

Learning outcomes	Assessment methods
Understands smart cutting tools, their advantages and disadvantages, as well as their possible implementation in the present state industry.	Tasks will be assigned. Independent work. Discussion.

Knows how to use appropriate information databases for evaluation of smart and green cutting tool technology.	Elaborated paper of independent work will be evaluated in compliance with objectives of doctoral thesis chapters. Seminar.
Able to apply gained knowledge and skills for analysis of the development of smart and green cutting tools.	Gained knowledge, abilities and skills will be tested in practical work, tests and examination
Understands green cutting tools, their advantages and disadvantages, as well as their possible implementation in the present state industry.	Tasks will be assigned. Independent work. Discussion.

Evaluation criteria of study results

Criterion	%
Assignments	70
Exam	30
Total:	100

Study subject structure

Part	CP	Hours			Tests			Tests (free choice)		
		Lectures	Practical	Lab.	Test	Exam	Work	Test	Exam	Work
1.	9.0	2.0	4.0	0.0		*			*	