Course description

Department/Unit /	KTO / ATPA			**Academic Year**	2023/2024	
Title	Additive Manufacturing in Industry			**Type of completion**	Exam	
Accredited/Credits	Yes, 4 Cred.			**Type of completion**	Combined	
Number of hours	Lecture 2 [Hours/Week] Tutorial 2 [Hours/Week]					
Occ/max	Status A	Status B	Status C	**Course credit prior to**	YES	
Summer semester	0 / -	0 / -	0 / -	**Counted into average**	YES	
Winter semester	0 / -	0 / -	6 / -	**Min. (B+C) students**	5	
Timetable	Yes			**Repeated registration**	NO	
Language of instruction	English			**Semester taught**	Winter semester	
Optional course	Yes			**Internship duration**	0	
Evaluation scale	1|2|3|4			**Ev. sc. – cred.**	S|N	
No. of hours of on-premise						
Auto acc. of credit	Yes in the case of a previous evaluation 4 nebo nic.					
Periodicity	K					
Substituted course	KTO/ATP					
Preclusive courses	N/A					
Prerequisite courses	N/A					
Informally recommended courses	N/A					
Courses depending on this Course	N/A					

Course objectives:

The main aim of the course is to acquaint students with current trends in AM technologies in selected areas of industry. For the products are subjected different requirements by the customer. Designed construction must be safety, reliability and economic requirements. To do this, the various tools and procedures are used and that will be described to students. After graduation, the student should be able to apply individual variants separately.

Requirements on student

Active participation in exercises.
Submission of semester work.
Exam - practical part, written test and oral exam.

Content

Lecture:
1) Safety, AM Technology in Industrial Practice
2) Topological Optimization
3) SW Tools for Predicting Safe and Reliable AM Process
4) 3D Print vs Conventional Production
5) ISO in AM Technology
6) Mechanical Properties of 3D printed Components vs Conventional Material
7) AM in Automotive
8) AM in Aerospace
9) AM in the Tooling area
10) Hybrid 3D Printing Technology

Exercises:
1) Safety, Data preparation for topological optimization
2) Topological optimization
3) Topological optimization

4) Analysis of critical locations of topologically optimized components
5) Setting model for deformation calculation
6) Setting the model for the calculation of deformations
7) Preparation of data for 3D printing
8) Design of part measurement methods from the desired shape
9) Postprocessing and measurement
10) Evaluation of achieved results

Fields of study

Guarantors and lecturers

- **Guarantors:** Doc. Ing. Miroslav Zetek, Ph.D. (100%)
- **Lecturer:** Doc. Ing. Miroslav Zetek, Ph.D. (50%), Doc. Ing. Ivana Zetková, Ph.D. (50%)
- **Tutorial lecturer:** Doc. Ing. Miroslav Zetek, Ph.D. (50%), Doc. Ing. Ivana Zetková, Ph.D. (50%)

Literature

- **Basic:** Surhone, Lambert M.; Timpledon, Miriam T.; Marseken, Susan F. *Selective laser sintering : carbon dioxide laser, plastic, metal, direct metal laser sintering*. 2010. ISBN 978-613-1-02423-8.
- **Recommended:** Leach, Richard. *Characterisation of areal surface texture*. Berlin : Springer, 2013. ISBN 978-3-642-36457-0.
- **Recommended:** Bártolo, Paulo Jorge. *Virtual and rapid manufacturing : advanced research in virtual and rapid prototyping : proceedings of the 3rd International Conference on Advanced Research in Virtual and Rapid Prototyping, Leira, Portugal, 24 - 29 September, 2007*. London : Taylor & Francis, 2008. ISBN 978-0-415-41602-3.

Time requirements

All forms of study

Activities	Time requirements for activity [h]
Preparation for an examination (30-60)	30
Contact hours	20
Practical training (number of hours)	30
Undergraduate study programme term essay (20-40)	30
Total:	**110**

assessment methods

Knowledge - knowledge achieved by taking this course are verified by the following means:

Written exam

Seminar work

Oral exam

Skills - skills achieved by taking this course are verified by the following means:

Practical exam

Skills demonstration during practicum

Competences - competence achieved by taking this course are verified by the following means:

Skills demonstration during practicum

Describe individual methods of modern technologies in context

prerequisite

Knowledge - students are expected to possess the following knowledge before the course commences to finish it successfully:

to describe basic 3D printing technology

describe of the preparation process

work independently with drawing documentation and halth safety of 3D printing

Skills - students are expected to possess the following skills before the course commences to finish it successfully:

prepared parts in SW Magics

hand machined part

modify the model for 3D printing needs in the selected SW

Competences - students are expected to possess the following competences before the course commences to finish it successfully:

N/A

N/A

N/A

To be oriented in the methods of engineering technologies

teaching methods

Knowledge - the following training methods are used to achieve the required knowledge:

Lecture

Lecture supplemented with a discussion

Skills - the following training methods are used to achieve the required skills:

Practicum

Laboratory work

Discussion

Skills demonstration

Competences - the following training methods are used to achieve the required competences:

Practical exercises with demonstrations

learning outcomes

Knowledge - knowledge resulting from the course:

describe additive manufacturing of parts in different area of engineering sectors

describe differences of the mechanical properties between 3D printed parts vs standard material

describe topological optimization tools

Skills - skills resulting from the course:

edit the part with advanced features in SW Magics

design of the light part

remove critical areas of 3D print jobs by using SW to calculate deformations

Competences - competences resulting from the course:

N/A

N/A

N/A

To be oriented in modern production technologies

Course is included in study programmes:

Study Programme	Type of	Form of	Branch	Stage St. plan v.	Year	Block	Status	R.year	R.

Study Programme	Type of	Form of	Branch	Stage	St. plan v.	Year	Block	Status	R.year	R.
Design of Power Machines and Equipment	Postgraduate Master	Full-time	Digital Manufacturing	1	2021	2023	Compulsory courses	A	2	ZS
Design of Power Machines and Equipment	Postgraduate Master	Full-time	Manufacturing Machines and Technologies	1	2021	2023	Povinné předměty 2. roč.	A	2	ZS
Design of Power Machines and Equipment	Postgraduate Master	Full-time	Digital Manufacturing	1	2021	2023	Povonně volitelné předměty 2. roč. ZS	B	2	ZS