Course description

1 General information

Course name	**Non-conventional and additive manufacturing processes**
Course code	
Level of study (B.Sc, M.Sc., Ph.D.)	B.Sc
ECTS	5
Course manager	Sebastian Skoczypiec, PhD, DSc, Eng., Prof. of CUT
Course length	One (1) semester
Coordinator for international programs	erasmus@mech.pk.edu.pl

2 Prerequisites

- Basic knowledge of physics, chemistry, machine building, computer aided design and manufacturing

2 Program

Type	Lectures	Classes	Labs	Computer labs	Project	Seminar
Hours	30		30			

3 Contents

Lectures		
No.		Hours
1	Conventional vs Unconventional machining	2
2	Mechanical non-conventional processes (ultrasonic, water jet, abrasive water jet and ice jet machining)	3
3	Electrochemical machining (electrochemical deburring, sinking, drilling, and milling)	3
4	Thermal non-conventional processes (electrodischarge, laser beam, electron beam, plasma beam machining)	5
5	Hybrid manufacturing processes (principles, electrochemically assisted machining, ultrasonic assisted machining, laser assisted machining, electrochemical-electrodischarge machining etc.)	4
6	Additive manufacturing processes (principles, solid-based, liquid-based and powder-based methods). Reverse engineering.	8
7	Idea of rapid prototyping, tooling and manufacturing, examples of application.	2
8	The role of non-conventional manufacturing processes in modern manufacturing chain.	1
9	Future trends in non-conventional machining, hybrid machining and additive manufacturing.	2
Σ		30

Labs		
No.		Hours
1	Electrochemical machining	2
2	Electrodischarge sinking	2
3	Electrodischarge drilling	2
4	Precise laser machining	4
5	Electrochemical and electrodischarge micromachining	2
5	Electrochemical-electrodischarge machining	2
6	Photogrammetry	6
7	Fused Deposition Modelling	4
8	Stereolitography (SLA)	4
9	Final classes	2
Σ		30

3 Learning Outcomes (skills and knowledge):

- Student knows pros and cons of non-conventional machining.
- Student understand physical principles of selected non-conventional manufacturing processes
- Student can explain the role of non-conventional manufacturing processes in manufacturing chain.
- Student can explain what is reverse engineering
- Student knows principles of additive manufacturing
- Student understands principles of additive manufacturing process planning and execution
- Student knows advantages and drawbacks of parts manufactured by additive methods
- Student can describe main methods of 3D scanning.

4 Assessment policy (examination):

- Understanding the merits of non-conventional manufacturing.
- Understanding the merits of hybrid machining.
- Understanding the merits of additive manufacturing.
- Ability to select the adequate non-conventional, hybrid or additive manufacturing method for given part.

5 Literature

- Hassan El-Hofy. Advanced Machining Processes. Nontraditional and Hybrid Machining Processes, McGraw-Hill, 2005.
- Helmi A. Youssef, Hassan El-Hofy, Machining Technology: Machine Tools and Operations, CRC Press, 2008.
- Ian Gibson, Additive Manufacturing Technologies, 2010
- Bert Huis in ’t Veld, Micro additive manufacturing using ultra short laser pulses, CIRP Annals - Manufacturing Technology 64 (2015) 701–724