Course description

1 General information

Course name	Simulation and CNC technology
Course code	
Level of study (B.Sc, M.Sc., Ph.D.)	M.Sc.
ECTS	4
Course manager	Prof. dr hab. inż. Zębala Wojciech, M-06
Course length	One (1) semester
Coordinator for international programs	erasmus@mech.pk.edu.pl

2 Prerequisites

- completed courses in mathematics and physics

3 Program

Type	Lectures	Classes	Labs	Computer labs	Project	Seminar
Hours	30	0	30		15	0

4 Contents

Lectures		
No.		Hours
1	Features and advantages of machining simulation models.	3
2	Characteristics of numerical calculation methods used in simulation models.	3
3	Construction of simulation models. Geometric and material models. Determination of boundary and initial conditions. Numerical calculation errors.	4
4	Examples of models of basic machining processes (turning, milling, drilling).	4
5	Distribution of stress, strain and temperature fields in the chip forming zone.	4
6	Monitoring and supervising of machning	4
7	CNC machines tools and processes	4
8	CAD/CAM programs, programming and methods	4

labs		
No.		Hours
1	Operation of programs for cutting processes simulating	6
2	Modeling of cutting force components, stress distribution and temperature in the machining zone during the turning process.	8
3	Design of manufacturing process with CAD/CAM systems	8
4	Optimization of cutting parameters for the turning and milling process	8

Project		
No.		Hours
1	Optimization of strategy in turning	4
2	Optimization of strategy in milling	6
3	Optimization of strategy in drilling	5

5 Learning Outcomes (skills and knowledge):

- The student is able to define the modern methods of mathematical modeling of machining processes.
- Student is able to analyze the distribution of stress, strains and temperature fields in the cutting zone
- The student can solve problem with the CAD/CAM programming, simulation and optimization of the machining process
- The student is ready to cooperate in a team as a member, leader or a person inspiring innovative solutions.

6 Assessment policy (examination):

- Report concerning laboratory classes
- Laboratory tests

7 Literature

1. Angelos P. Markopoulos, J. Paulo Davim Advanced Machining Processes Innovative Modeling Techniques, CRC Press 2017
2. Wit Grzesik Advanced Machining Processes of Metallic Materials: Theory, Modelling, and Applications, Elsevier 2008
3. Markopoulos, Angelos P. Finite Element Method in Machining Processes, Springer 2012
4. Wojciech Zębala Modelowanie Procesów Skrawania. Kraków 2011