

Lp.	Content	h
1.	Introduction to the principles of multi-body System modelling.	2
2.	Fundamentals of mechanism modelling in multi-body dynamics simulation systems – modeling of links, kinematic pairs and defining kinematic constraints.	2
3.	Spatial mechanisms modelling – load modelling, conducting calculations, introduction to methods of visualization and interpretation of simulation results.	2
4.	Test on the basics of modelling.	2
5.	Simulation studies of linkage-gear mechanisms (fixed axis , planetary, and differential) – model development (project 1).	2
6.	Investigation of the kinematic properties of gear transmissions (project 1).	2
7.	Simulation studies of spatial manipulators – forward and inverse kinematics: model development (project 2).	2
8.	Fundamentals of control system modelling: modelling a regulator (project 2).	2
9.	Investigations into the kinematic and dynamic behavior of a manipulator following a specified trajectory, incorporating control (Project 2).	2
10.	Fundamentals of advanced mechanical system modelling – selected topics (contact force and friction modelling).	2
11.	Simulation studies of selected spatial kinematic systems (e.g., constriction machines, machine mechanisms, and vehicles) – model development (project 3).	2
12.	Investigations of the kinematics and dynamics of motion – analysis of simulation results (project 3).	2
13.	Simulation of advanced mechanical systems – model development (project 4).	2
14.	Simulation studies of motion dynamics – analysis of simulation results (project 4).	2
15.	Assessments and supplementary work.	2

The condition to acquire a positive grade from the course is to have a positive grade from all given projects.

Unfinished work may only be completed during consultation hours or on the last project. The final class session serves as the ultimate deadline for fulfilling all course requirements.

Primary literature:

- Frączek J., Wojtyra M.: **Metoda układów wielocłonowych w dynamice mechanizmów.** Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2007.
- Gronowicz A.: **Podstawy analizy układów kinematycznych.** Oficyna wydawnicza PWr. Wrocław 2003.
- Gronowicz A. i inni: **Teoria maszyn i mechanizmów. Zestaw problemów analizy i projektowania.** Oficyna wydawnicza PWr. Wrocław 2000.

Additional literature:

- Miller S.: **Teoria maszyn i mechanizmów. Analiza układów mechanicznych.** Oficyna wydawnicza PWr. Wrocław 1996.
- Miller S.: **Układy kinematyczne. Podstawy projektowania.** WNT 1988.
- MSC Knowledge Base,
<https://simcompanion.mscsoftware.com/infocenter/index?page=home>, 2019