

## ADMISSION TO DOCTORAL STUDIES

Session September 2025

**Field of doctoral studies: Mechanical Engineering**

**Doctoral supervisor: Prof.Dr.Eng. Maria Luminita SCUTARU**

### TOPICS FOR THE ADMISSION TO DOCTORAL STUDIES

**TOPIC 1:** Comparative Analysis of Analytical Mechanics Methods in the Modeling of Hybrid Multibody Systems

**Contents / Main aspects to be considered**

- Application of analytical mechanics methods in the modeling of hybrid multibody systems
- Mathematical formulation of the motion equations, the integration of mechanical constraints and interactions
- Implementation and analysis of simulations.

**Recommended bibliography:**

1. Haug, E. J. , Computer-Aided Kinematics and Dynamics of Mechanical Systems: Volume I: Basic Methods, 1989
2. Shabana, A. A. , Dynamics of Multibody Systems (4th ed.). Cambridge University Press, 2013
3. Zhu, R.; Yang, G.; Fang, Z.; Chen, C.-Y.; Li, H.; Zhang, C. Quasi-Coordinates-Based Closed-Form Dynamic Modeling and Analysis for a 2R1T PKM with a Rigid-Flexible Structure. Machines 2023
4. Pappalardo, C.M.; Del Giudice, M.; Oliva, E.B.; Stieven, L.; Naddeo, A. Computer-Aided Design, Multibody Dynamic Modeling, and Motion Control Analysis of a Quadcopter System for Delivery Applications. Machines 2023

**Prerequisites / Remarks:** *to be adapted/ completed/ deleted*

☒ **Scientific Doctorate (full-time only)**

☐ **Professional Doctorate (full-time or part-time)**

☒ **without tuition fee (state budget funded)**

☐ **with tuition fee or with funding from other sources than the state budget**

**TOPIC 2:** Analytical methods in the dynamics of multibody systems with biomechanical applications

**Contents / Main aspects to be considered**

1. Development and analysis of mathematical models for multibody systems with biomechanical structures
2. Investigation of analytical methods for simulating the dynamics of multibody systems

3. Experimental testing and data analysis for validation of analytical models
<b>Recommended bibliography:</b> 1. W. Schiehlen- Advanced Multibody System Dynamics, Springer, 2010 2. Josep M Font - Multibody Dynamics, Computational Methods and Applications, Springer, 2016 3. Ehsani, H. , Empirically-based Multibody Dynamics for Modeling the Human Body Musculoskeletal System, 2023
<b>Prerequisites / Remarks:</b> <i>to be adapted/ completed/ deleted</i>
<input checked="" type="checkbox"/> <b>Scientific Doctorate (full-time only)</b> <input type="checkbox"/> <b>Professional Doctorate (full-time or part-time)</b>
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Doctoral supervisor,

Prof. Dr. Eng. Maria Luminita SCUTARU

Signature

Coordinator of the field of doctoral studies,

Prof. Dr. Eng. Maria Luminita SCUTARU

Signature