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MASTER THESIS TOPIC

Student:	**Bc. Alexey Morozov**
Student's ID:	77593
Study programme:	Automation and Information Engineering in Chemistry and Food Industry
Study field:	Cybernetics
Thesis supervisor:	Ing. Martin Klaučo, PhD.
Consultant:	Ing. Matúš Furka
Workplace:	Oddelenie informatizácie a riadenia procesov

Topic: **Nonlinear Predictive Control of Rotary Inverted Pendulum**

Language of thesis: English

Specification of Assignment:

This thesis deals with the design and implementation of a non-linear predictive controller on a rotary inverted pendulum. The main task of this thesis is to design an optimal swing-up controller using the calculus of variations method.

Particular tasks include
1. Mathematical modeling of the rotary pendulum device.
2. Development of a heuristic swing-up controller.
3. Construction of optimal swing-up controller.
4. Numerical solution to optimal control problems, and evaluation of its performance
5. Implementation and testing of controllers in Matlab/Simulink environment.

Length of thesis: 60

Selected bibliography:

1. Mikleš, J. – Fikar, M. *Process modelling, identification and control 2. Identification and Optimal Control.* 2004. 260 p. ISBN 80-227-2132-8.
2. Klaučo, M. – Kvasnica, M. *MPC-Based Reference Governors: Theory and Case Studies.* Londýn,: Springer, 2019. 137 p. ISBN 978-3-030-17404.
3. Joel A E Andersson and Joris Gillis and Greg Horn and James B Rawlings and Moritz Diehl, CasADi – A software framework for nonlinear optimization and optimal control, Mathematical Programming Computation, Springer, 2019

Assignment procedure from: 26. 02. 2020
Date of thesis submission: 07. 06. 2020

Bc. Alexey Morozov
Student

doc. Ing. Michal Kvasnica, PhD.   **prof. Ing. Miroslav Fikar, DrSc.**
Head of department   Study programme supervisor