

# Advanced Robot Control

## Introduction

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# Credit rules (1/2)

Lecture ends with a final test.

The final grade for the course is calculated using below formula

$$G = \frac{1}{2}T + \frac{1}{2}L \quad (1)$$

where  $T$  is a grade from lecture test and  $L$  is a grade from laboratory classes.

Both grades ( $T$  and  $L$ ) have to be positive to get a positive course grade.



# Credit rules (2/2)

Short tests cover material from present or previous lectures.

$$T = \frac{1}{n-1} \sum_{i=1}^{n-1} T_{s,i} \quad (2)$$

where

- $T_{s,i}$  –  $i^{\text{th}}$  short test grade,
- $n$  – total number of short tests.

The worst grade from short test is rejected, it includes the situation when the student is not present at the lecture when a short test is written.

If above condition is not met then  $T = T_f$  (grade from final test).



# Website

Additional information about this course is available at `edu.domski.pl` (available in English).  
You have to go to *Courses->Advanced Robot Control* tab and select *lecture* or *laboratory classes*



# Office hours

Office hours are available at `edu.domski.pl`.  
You have to go to *Office hours* tab.  
The office hours are held in room 209A, building C3.



# Course outline

The course covers following subjects:

- input–output decoupling method for a manipulator,
- static linearisation,
- model predictive control,
- introduction to real-time operating systems,
- embedded system design,
- system decomposition,
- implementation of robot controller on a microcontroller.



# Literature

- Siciliano, B. and Khatib, O., *Handbook of Robotics*, 2007, Springer,
- Ben-Ari, M. and Mondada, F., *Elements of Robotics*, 2018, Springer,
- Åström, K. J. and Häggglund, T., *PID Controllers: Theory, Design, and Tuning*, 1995, Instrument Society of America,
- Real Time Engineers Ltd., *The FreeRTOS™ Reference Manual*, 2016,
- Bräunl, T., *Embedded Robotics*, 2008, Springer,
- Wescott, T., *Applied Control Theory for Embedded Systems*, 2006, Elsevier,
- Ławryńczuk, M., *Nonlinear Predictive Control Using Wiener Models*, 2022, Springer Cham,
- C. C. de Wit, B. Siciliano, and G. Bastin., *Theory of Robot Control*, 1996, Springer-Verlag London,
- lecture notes,
- manufacture manuals.

