Computer Controlled Systems

Introduction
Course conditions

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Course data, web-page

Computer controlled systems

2016/2017 spring, **Tuesday**
Lectures: 10:00 - 11:30, I122
Tutorials: 11:45 - 13:15, *basic level*: I104, *advanced level*: I122

Neptun code: VEMISAM344S

Lecturers: Prof. Katalin Hangos (hangos.katalin@virt.uni-pannon.hu),
Dr. Attila Magyar (magyar.attila@virt.uni-pannon.hu)

Web-page:
http://virt.uni-pannon.hu/index.php/oktatas/tantargyak/251-szamitogepvezerelt-szabalyozasok-elmelete

Study and evaluation

Course notes:
Hangos K., Bokor J., Szederkényi G.: Computer Controlled Systems
Pannon Egyetemi Kiadó

Basic level group - Homework:
weekly in e-mail, deadline: the lecture time next week

Advanced level group - Individual project tasks:
in e-mail, deadline: announced on the tutorial

Requirements, evaluation and grading:
Compulsory presence on both lectures and tutorials
Intra semester closed book test (the notions and tools) - min. 66 %
Basic level group: written test from tutorial problems - min. 30 %
Advanced level group: submitting the solution of the project tasks in time

Course mark offered (without exam):
Basic level group: open book written test from tutorial problems $>$ 66 %
Advanced level group: if the solution of the individual project tasks is good or excellent

Course content – 1

Dynamic system models

- Signals and systems, construction of dynamic models using engineering principles
- Continuous time dynamic models: linear time-invariant, input-output and state space; nonlinear state space, robust models, linearization
- Discrete time dynamic models: linear time-invariant, input-output and state space; sampling, discrete event system models

Dynamic analysis

- Reachability, controllability, observability; joint controllability and observability, minimal models
- Stability: BIBO and asymptotic stability: Lyapunov theory, stability region (domain of attraction)

Course content – 2

Controller design

- Feedback controllers, model-predictive controllers
- State feedback controllers: pole placement controller, state filtering

Discrete time stochastic systems

- Discrete time LTI stochastic models: random variables, stochastic processes, stochastic imput-output and state space models
- Parameter estimation in dynamic models: matematical statistics, least squares methods

Preliminary knowledge

Mathematical analysis

- complex numbers, functions with complex variables
- Laplace transformation

Linear algebra

- matrix and vector manipulations
- linear space, basis, eigenvalue, eigenvector

Elements of random variables and their calculus

- random variable, probability density function
- mean value, variance, correlation, independence
- normal (Gauss) distribution

Introduction to control technology

- signals and systems, linear systems, single-input single-output case
- transfer function, poles, stability