Title: Computer tools

Lecturer: Asst. Prof. Dr. Marko Jankovec

Aim of the course:
To get acquainted with computer-aided electronic design tools and develop skills necessary to use computer tools in the process of design and implementation of electronic circuits and systems.

Required (pre)knowledge:
Computers, Programming, Basics of analog and digital electronics

Contents:
Introduction to graphical programming. Graphical programming languages, G-language, LabVIEW programming concepts. LabVIEW environment. Concept of Virtual Instrument (VI) and sub-instrument (SubVI). Program and data flow. Software constructs in LabVIEW. Programming VIs and functions. Error handling, VI editing and debugging. Memory, performance, and determinism. Design patterns of VIs and subVIs. LabVIEW mathematic and analysis functions. LabVIEW connection to physical world. Data acquisition systems. Automatic measuring environment.
The LABVIEW part of the course complies with National Instruments LabVIEW Academy program. The students that pass this course are granted to make a free of charge CLAD (Certified LabVIEW Associate Developer) exam.
Electronic design automation. Tools for analysis, simulation and optimization of electronic circuits. The structure of the SPICE program for simulation of electronic circuits. Textual and graphical interface. Basic analyses. Numerical methods for basic analyses. Advanced analyses. Models and model editor. Optimization of circuits. Modeling and simulation of digital circuits. Circuit simulation of mixed signals. Examples and laboratory exercises are performed using LT spice from Linear Technologies.
General information about tools for PCB design. Rules for design of electrical schemes. Net list. The organization and use of libraries. Printed circuit board design. Components layout and routing of printed circuit boards. Automatic generation of documentation. Signal integrity tools. Hardware and software co-design. Simulators and emulators, in-circuit debugging. Tools for automatic testing of electronic circuits. Examples and laboratory exercises are performed using Altium designer.

Selected references:

- Robert H. Bishop, Learning with Labview 7 Express, Pearson Prentice-Hall Int., 2004, ISBN 0-13-117605-6
- LabVIEW Core 1 and Core 2 Course Manual and Exercises, 2009.
- NI LabVIEW Academy Student Workbook, 2009.
- Laung-Terng Wang, Yao-Wen Chang, Kwang-Ting (Tim) Cheng, Electronic design automation : synthesis, verification, and test, 2009, ISBN: 978-0-12-374364-0
- Kenneth S. Kundert, The Designer's Guide to SPICE and Spectre, 1995. ISBN 0-7923-9571-9