Syllabus

Ben-Gurion University of the Negev

Department of Electrical and Computer Engineering

Digital Control of Switch-Mode Converters

361-2-2020

Dr. Mor M. Peretz

Course Description:

PWM converters, Basics of feedback theory and graphical representation, Relationship between LoopGain and dynamic response, **Analog feedback networks**, **Digital feedback**, A/D and Modulator resolutions, Frequency response design,Time-domain digital controller design, Ragazzini method, Local response vs. complete response, Template-oriented controller, **System identification of PWM converters**, **Resonant Converters**, Control of resonant converters, State-space representation of switch-mode converters, **Non-linear control of switch-mode converters**, Time-optimal control, Minimum deviation control, state-space control.

Course Objectives:

To provide knowledge of general control issues of switching systems and introduce the concepts of digital control and non-linear control for switch-mode converters.

Course Structure:

Lecture: 3.0 Exercise: Lab: Total # of Points: 3.0

Course requirements: *(Include required pre-courses, compulsory attendance, etc.)*

1. Intended for expert and non-expert audience.
2. General E&CE grad. Students.
3. Undergrads who took DCDC course (361-1-4561) may also enroll.

Structure of Final Course-Grade:

	Component	Weight
1.	Final project	80%
2.	Seminar presentation	20%
	Total:	**100%**

A "Pass" requirement regarding final exam: Yes/No

Lecturer Details:

Reception hours: Wednesdays, 14:00-15:00, Building 64, Room 4
E-mail: morp@bgu.ac.il

Description of Meetings (order may be modified)

1. PWM converters
2. Basic feedback theory
3. PWM converters as feedback systems
4. Analog feedback networks
5. Digital feedback
6. Time-domain digital controller design
7. System identification of PWM converters
8. Resonant Converters
9. Control of resonant converters
10. State-space representation of switch-mode converters
11. Non-linear control of switch-mode converters
12. Selected topics in modern control of power management systems

References:

Course textbooks *(state only books that appear in the above table)*

1. Handouts of Prof. Mor M. Peretz

2. Gene F. Franklin, J. David Powell, Michael L. Workman, *Digital control of dynamic systems*, 3rd ed., Ellis-Kagle Press, 2010.

3. Material of course website