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:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Final project</td>
<td>90%</td>
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<tr>
<td>Seminar presentation</td>
<td>10%</td>
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<tr>
<td>Total</td>
<td>100%</td>
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A "Pass" requirement regarding final exam: Yes/No

Lecturer Details:

Reception hours: Wednesdays, 13:00-14:00, Building 33, Room 105
E-mail: morp@ee.bgu.ac.il  Telephone:

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 Dr. Mor M. Peretz
3. Material of course website