

The University Of Toledo

Existing Graduate Course Modification Form

* denotes required fields

Contact Person*: Raghav Khanna Phone: 530-8183 (xxx - xxxx) Email: raghav.khanna@utoledo.edu

Present

Proposed

Supply all information asked for in this column.(Supply core, research intensive and transfer module info if applicable)

Fill in appropriate blanks only where entry differs from first column.

College*: College of Engineering
Dept/Academic Unit*: Electrical Engineering and Computer Science
Course Alpha/Numeric*: EECS 8450

College: College of Engineering
Dept/Academic Unit: Electrical Engineering and Computer Science
Course Alpha/Numeric: EECS 8450

Course Title: Dynamic Analysis of Switching Converters

Course Title: Advanced Power Electronics

Credit hours: Fixed: 3 or Variable: to

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Cross Listings:

Cross Listings:

Form for cross listings with Insert and Remove buttons and instructions.

Form for cross listings with EECS 6450, Insert and Remove buttons and instructions.

Prerequisite(s)(if longer than 50 characters, please place it in Catalog Description):

EECS 5490

Prerequisite(s)(if longer than 50 characters, please place it in Catalog Description):

EECS 5480

Corequisite(s)(if longer than 50 characters, please place it in Catalog Description):

Corequisite(s)(if longer than 50 characters, please place it in Catalog Description):

Catalog Description (only if changed) 75 words max:

Cyclic steady-state analysis of the switching power converter using switching functions. Dynamic modeling of the switching converter as a discrete time system and as a switching period averaged system.

Catalog Description (only if changed) 75 words max:

Dynamic analysis of DC-DC power conversion circuits. State space and converter transfer functions. Analytical semiconductor device modeling techniques. Sinusoidal pulse width modulation in inverter circuits. Isolated DC-DC converters.

Has
course
content
changed?

 Yes

 No


If course content is changed, give a brief topical outline of the revised course below(less than 200 words)


Instead of focusing only on dynamic analysis of converters, I would like to include contemporary topics on wide bandgap semiconductor device modeling and sinusoidal pulse width modulation. In short, I would like to "modernize" the course.

Proposed effective term*: (e.g. 201140 for 2011 Fall)

File Type	View File
Syllabus	View








List any course or courses to be deleted.

Effective Date: 

Effective Date: 

Comments/Notes:

Rationale:**Approval:**

Department Curriculum Authority:	<input type="text" value="Richard G. Molyet"/>		<input type="text" value="Date 2017/04/14"/>
Department Chairperson:	<input type="text" value="Mansoor Alam"/>		<input type="text" value="Date 2017/04/14"/>
College Curriculum Authority or Chair:	<input type="text" value="Efstratios Nikolaidis"/>		<input type="text" value="Date 2017/04/14"/>
College Dean:	<input type="text" value="Mohamed Samir Hefzy"/>		<input type="text" value="Date 2017/04/26"/>
Graduate Council:	<input type="text" value="Andrea Kalinoski (GCEC for GC 08-11-"/>		<input type="text" value="Date 2017/08/11"/>
Dean of Graduate Studies:	<input type="text" value="Amanda C. Bryant-Friedrich"/>		<input type="text" value="Date 2017/08/14"/>
Office of the Provost :	<input type="text" value="Margaret F. Traband"/>		<input type="text" value="Date 2017/08/15"/>

Administrative Use Only

Effective Date:  (YYYY/MM/DD)

CIP Code:


Subsidy Taxonomy:

Program Code:

Instructional Level:

Registrar's Office Use Only

Processed in Banner on:

Processed in Banner by:

Banner Subject Code:

Banner Course Number:

Banner Term Code:

Banner Course Title:



Dynamic Analysis of Switching Converters

The University of Toledo
Electrical Engineering and Computer Science Department, College of Engineering
EECS 6450/8450-001, CRN #: 33116

Instructor:	Raghav Khanna, Ph.D.	Class Location:	Palmer Hall 2450
Email:	Raghav.Khanna@utoledo.edu	Class Day/Time:	T, R: 12:30 – 1:45
Office Hours:	T, R: 3:00 – 5:00 or by appointment	Lab Location:	N/A
Office Location:	Nitschke 2056	Lab Day/Time:	N/A
Office Phone:	419-530-8183	Credit Hours:	3.0
Term:	Spring 2016		

COURSE/CATALOG DESCRIPTION

Dynamic analysis of DC-DC power conversion circuits. State space and converter transfer functions. Analytical semiconductor device modeling techniques. Dynamic analysis of sinusoidal pulse width modulation in inverter circuits. State space analysis of isolated DC-DC converters.

COURSE OVERVIEW

N/A

STUDENT LEARNING OUTCOMES

By the end of the course, students will be able to:

1. Derive small signal equivalent circuits of various DC-DC converters
2. Understand state space analysis of DC-DC converters
3. Understand transfer functions of DC-DC converters and right hand plane zeros
4. Understand the dynamics of sinusoidal pulse width modulation
5. Perform analytical semiconductor device modeling techniques

TEACHING STRATEGIES

Lecture based, with communication via email often. **Check your email regularly.** Blackboard will be used as a tool for posting course-related materials. *PhD students will be required to do extra work.*

PREREQUISITES AND COREQUISITES

Prerequisite: Electronic Energy Processing I or equivalent is **required.**

REQUIRED TEXTS AND ANCILLARY MATERIALS

Two *recommended* (not required) texts for the course are:

1. M.H. Rashid, "Power Electronics: Circuits, Devices, and Applications," 4th edition, Pearson 2014
ISBN 13: 978-0-13-312590-0
2. R. W. Erickson, D. Maksimovic, "Fundamentals of Power Electronics," 2nd edition, Kluwer 2001
ISBN: 0-7923-7270-0



TECHNOLOGY REQUIREMENTS

Assignments and announcements will be posted on blackboard. Please check blackboard and your email regularly.

UNIVERSITY POLICIES

The University is an equal opportunity educational institution. Please read [The University's Policy Statement on Nondiscrimination on the Basis of Disability Americans with Disability Act Compliance](#).

Academic Accommodations

The University of Toledo is committed to providing equal access to education for all students. If you have a documented disability or you believe you have a disability and would like information regarding academic accommodations/adjustments in this course please contact the [Student Disability Services Office](#).

ACADEMIC POLICIES

1. Attendance is not taken, however class participation constitutes a portion of the grade.
2. Students are responsible for obtaining materials and course/homework/exam information missed due to an absence.
3. Absences on a midterm or final exam date will be excused only in the event of extreme circumstances. Should this happen, students are requested to notify the instructor.
4. The use of cell phones, including texting and game-playing is not permitted. Laptops and tablets can be used only as tools for taking notes.
5. Late homeworks are not accepted except for extreme circumstances.
6. Academic dishonesty:
http://www.utoledo.edu/catalog/2000catalog/admissions/academic_dishonesty.html

COURSE EXPECTATIONS

PhD students will be required to do extra work. See the Academic Policies section above.

GRADING

The final grade will be calculated based on a midterm exam, final exam, class participation, homework assignments and a final presentation. Homeworks are typically assigned once per week, and are due a week later. There will be approximately 10 homework assignments.

Midterm Grading: 25%

1 midterm exam: Date to be determined

Final exam: 25%

1 final exam: Date to be determined

Final group presentation: 20%

- MS Students, group presentation and group paper
- PhD Student, single person presentation and paper



Homework assignments: 20%

Several homework assignments will be given, together they will constitute 20%

Class participation: 10%

While attendance will not be taken, I will be able to determine your involvement in class.

The final grade is calculated as follows:

A: 93-100 %	C ⁺ : 77-79.9
A ⁻ : 90 – 92.9	C: 73-76.9
B ⁺ : 87-89.9	C ⁻ : 70-72.9
B: 83-86.9	D: 60-69.9
B ⁻ : 80-82.9	F: <60

COMMUNICATION GUIDELINES

Please check your email and blackboard regularly.

STUDENT SUPPORT SERVICES

There are several resources available on campus to students who may be struggling with course material. Please contact me if you should require access to these services. For students requiring academic accommodations, please contact Student Disability Services: 419-530-4981, Rocket Hall 1820, studentdisabilitysvs@utoledo.edu

COURSE SCHEDULE

The following is a list of topics and their *tentative* scheduling:

1. Review of steady-state DC-DC Converters. Small signal analysis of non-isolated DC-DC converters (Week 1-4)
2. Isolated DC-DC converters (Week 5-7) in steady-state.
3. Small signal analysis of isolated DC-DC converters. (Weeks 8-9).
4. Review of inverters and sinusoidal pulsed width modulation (10-11)
5. Analytical semiconductor device modeling (Week 12-14)

*The instructor reserves the right to change the syllabus at any time if needed.