

The University of Texas at Dallas

Title: Energy Harvesting, Storage and Powering for Microsystems

Course Information

Course Section: **EECT6379.001.20S**
Instruction Mode: Face-to-Face
Class Level: Graduate
Activity Type: Lecture
Credit Hours: 3

Contact Information

Lecture Time: 10:00am-12:45pm, Fridays
Location: CB3 1.304
Instructor: Brian Ma (Email: brian.ma@utdallas.edu)
Office Hours: 1:15-2:45pm, Wednesdays
TA: Lixiong Du
Office Hours: 1:00-2:30pm, Tuesdays

Prerequisites

EE 3311 and EE 3310, or equivalent; Cadence/HSPICE tools.

Course Description

This course focuses on device, circuit and system design concepts and working principles on critical power and energy issues for internet-of-things (IoTs), including energy harvesting, storage and power delivery. The goal of the course is to offer our graduate students the state-of-art technologies in the fast growing IoT areas. The course is designed with two major parts. In the first part, it prepares the students with fundamental knowledge on semiconductor devices, power electronic circuits and control and operation methods. In the second part, the electrical (and mechanical to certain topics) characteristics of various renewable energy sources including solar, kinetic, electromagnetic sources, will be addressed, followed by corresponding harvesting & management circuits and methods with state-of-art examples.

Student Learning Objectives/Outcomes

- Ability to analyze and design power stage of second order switch mode power converters
- Ability to analyze and design switched-capacitor power converters
- Ability to analyze and design fundamental control methods for switch mode and switched-capacitor power converters
- Ability to analyze and design basic maximum power point tracking circuits for various energy harvesting mechanisms

Required Textbooks and Materials

Lecture notes & class reading materials

Suggested Course Materials

- References: R1. *Fundamentals of Power Electronics*, Second Edition, R.W. Erickson and D. Maksimovic, Kluwer Academic Publishers (2001);
R2. *Enabling the Internet of Things*, M. Alioto, Springer (2017);

- R3. ***Analog Integrated Circuit Design***, second Edition, T. C. Carusone, D. Johns, K. Martin, Wiley (2011);
- R4. ***Fundamentals of Microelectronics***, second Edition, B. Razavi, Wiley (2013).

Grading Policy

Term Paper	15%
Homework	20%
Quizzes & Professionalism	15%
Midterm Project	20%
Final Project	30%

Quizzes & Professionalism:

There will be several quizzes to be conducted in class. In general, the questions in a quiz are fundamental and directly related to the class materials that have been recently covered. The purpose of the quizzes is to help the students further understand the class materials with active classroom participation.

The professionalism portion of your grade depends on your adherence to the university class policies.

Homework Assignment

In general, homework will be assigned when a major class topic is delivered. You will be given sufficient time to complete each homework, so **no late submission is allowed**. The due date of each assignment will be specified when it is announced.

Midterm & Final Projects:

A critical goal of graduate education is to develop the students research capability with scientific research methods. The final project is designed for such a purpose. To accomplish the project successfully, the students are required to identify research challenges, set up research schedule, develop step-by-step research milestones and eventually fulfill research tasks efficiently and effectively.

UT Dallas Temporary Policy Exceptions due to CoVID-19:

Please see the detail at <https://www.utdallas.edu/registrar/temporary-policy-exceptions-for-cr-nc-and-p-f-grading/>

Code of Academic Integrity

Violations of this code can lead to sanctions and even expulsion from the University. The guiding principle is that submitted work must be the student's own. However, the complete implications of the code are explained on the University's web page at: <https://www.utdallas.edu/conduct/integrity>.

Withdrawals

If you wish to withdraw, correct procedure must be followed. Simply stopping attendance does not drop you from the course. If you do not withdraw according to procedure, your name will appear on the final grade report with a failing grade.

Incompletes

A course grade of “incomplete” (I) can be awarded only in cases of documented hardship, such as a medical or family emergency.

Comet Creed

This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:

“As a Comet, I pledge honesty, integrity, and service in all that I do.”

UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University’s policies and procedures segment of the course syllabus including Sharing Confidential Information pursuant to Title IX and the link to UT Dallas’ Campus Carry webpage.

Please go to <http://go.utdallas.edu/syllabus-policies> for these policies.

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.