MEC 518 (Energy Harvesting) Instructor: Prof. Ya Wang
Spring 2017

Course Syllabus

COURSE LEARNING OBJETIVES: Energy Harvesting has become a very strong area of research and is being widely pursued by academia, industry, and national laboratories all over the world. The prominence of this field can be realized from the continuously growing funding in this field. It is fascinating field of study, which combines the interdisciplinary knowledge from mechanical engineering, materials science, semiconductor physics, and electrical engineering. Unused power exists in various forms such as industrial machines, human activity, vehicles, structural vibrations, wasted heat and environment sources. In past decades, several energy-harvesting approaches have been proposed using smart materials and structures and combining with mechanisms such as thermoelectric, magnetoelectric, piezoelectric, and electrets. This course will introduce the students all of these mechanisms and methods for generating electricity and storing it in a media that allows subsequent use. The aim of this course is to develop basic understanding of energy harvesting phenomenon and apply it to common engineering problems such as structural health monitoring, remote surveillance, powering embedded systems as in automobiles and implantable devices.

INSTRUCTOR: Ya Wang, 153 Light Engineering
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OFFICE HOURS: Monday (9 – 11 am, 2 - 4pm)

REQUIRED TEXT: None, Course Notes and Power Points Slides available to Students

PREREQUISITES: MEC 310, MEC 532, Knowledge of Matlab

LECTURE HOURS: Mon (4 pm -6:50 pm)
Melville LBR N4000

HOMEWORK: Roughly 4 homework assignments
Each assignment is due one week after it is assigned.
• Late homework will receive half credit before the solutions are posted and will not be accepted after that.

PROJECT: One design project will be given.
A written report is required for the design project.

EXAMS: 2 Midterms (in class, 120 minutes each)
1 Final Exam
NO makeup exams

GRADING: Semester letter grade is based upon your performance in the following categories, provided that you have competed and passed *all* "Competency Exams" (see next page).
Homework 20%

Project	30%
Midterm	30%
Final Exam	20%

GRADING SCALE: NOT a curve – simple percentage of all course work, as follows:

A: >=95%	A- : >=90%	B+ : >=86%
B: >=82%	B- : >=78%	C+ : >=74%
C: >=70%	C- : >=66%	D+ : >=63%
D: >=60%	F: <60%	

COURSE LEARNING OBJECTIVES	**ASSESSMENT TOOLS**
1. Know the principles of energy harvesting	Exams, Project
2. Know smart materials applied for energy harvesting	Exams, Project
3. Understand how to model vibration energy harvesting system	Exams
4. Know how to model thermoelectric energy harvesting system	Exams
5. Understand how to model Piezoceramic transduction	Exams
6. Understand how to model Piezoceramic actuation	Exams
7. Know how to design energy harvesting devices	Exams
8. Know how to characterize various smart materials as harvester, sensor and actuators	Exams
9. Understanding the impact of smart materials in energy harvesting, vibration suppression, and other engineering solutions	Exams

Tentative Schedule

MOTIVATING SYSTEMS	10%
METHODS OF HARVESTING	10%
PIEZOELECTRIC BASICS	10%
MODELING ELECTROMECHANICAL SYSTEM	10%
PZT COMPOSITES	05%
PZT SENSORS AND ACTUATORS	10%
STACK ACTUATOR	10%
PZT SHUNTS	10%

POWER CONDITIONING AND STORAGE	05%
ENGINEERING APPLICATIONS	10%
CURRENT ENGINEERING PROBLEMS	10%
	Total 100%

BLACKBOARD: All homework assignments and solutions will be posted on the Blackboard course account (http://blackboard.sunysb.edu). For problems logging in, go to the helpdesk in the Main Library SINC Site or the Union SINC Site, you can also call: 631-632-9602 or e-mail: helpme@ic.sunysb.edu

I use email and blackboard exclusively to communicate with you off class. It is your responsibility to make sure that your email id is a current one on the blackboard system. I suggest that you use a university email id for this class; it is free and official.

ACADEMIC HONESTY: campus policies on academic honesty are available on the Web (http://naples.cc.sunysb.edu/CAS/ajc.nsf/pages/info). Academic dishonesty is an extremely serious offense and will not be tolerated in any form. Academic dishonesty in general is the presentation of intellectual work that is not originally yours. Examples include, *but are not limited to*, copying or plagiarizing class assignments including homework, reports, designs, computer programs, graphics, and other submitted materials; copying or otherwise communicating answers on exams with other students; bringing unapproved aids, either in physical (written) or electronic form to an exam; obtaining copies of an exam prior to its administration, etc. Academic dishonesty violates both the ethical and moral standards of the Engineering profession and all infractions related to academic dishonesty will be prosecuted to the fullest via the CEAS CASA committee. For you, the honest student, academic dishonesty results in lower class curves, hence a depression in your GPA and class standing, while cheapening the degree you earn.

SPECIAL NOTE ON ADA:

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Disability Support Services, ECC (Educational Communications Center) Building, room 128, (631) 632-6748. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential. Students requiring emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information, go to the following web site http://www.ehs.sunysb.edu/fire/disabilities/asp