ENME 489Y – Remote Sensing: Spring 2018 Syllabus

Department of Mechanical Engineering

Lecture Details
Tuesday & Thursday, 9:30 am to 10:45 am
Atlantic Building, Room 2400

Instructor
Steven E. Mitchell, Ph.D. (mitchels@umd.edu)
Office: EGR 2128
Office Hours: Tuesdays & Thursdays 12:00 pm to 1:00 pm, and by request
Preferred Means of Contact: Piazza
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Teaching Fellow
Will Bogdan (wbogdan@terpmail.umd.edu) Office Hours: Tu/Th 4:30 – 6:00 pm

Course Description
This course explores the fundamentals of remote sensing techniques including light detection and ranging (lidar), radar, and computer vision in the context of emerging technologies such as autonomous navigation and terrain modelling.

This course includes lectures from guest speakers of significant reputation in their respective branches of remote sensing.

This course requires completion of a project employing the course material, CAD, rapid prototyping, and data collection & processing. The project provides students an opportunity to experience a hands-on project involving a remote sensing technology that is closely related to their area of study. Specific project details will be provided in the beginning weeks of the course.

Textbook
While there is no official textbook requirement for the course, the following texts cover the course material and may augment the lecture materials:

- Laser Remote Sensing: Fundamentals & Applications by Measures, 1984
- Laser Remote Sensing by Fujii and Fukuchi, 2005
- Introduction to Sensors for Ranging and Imaging by Booker, 2009
- Topographic Laser Ranging and Scanning: Principles and Processing by Shan and Toth, 2009
- Manual of Airborne Topographic Lidar by Renslow, 2012
- Radar Systems Analysis and Design Using MATLAB by Mahafza, 2015
- Practical Python and OpenCV by Rosebrock, 2014

Grading Policy
Course grades will be based on the following approximate grade weights:

Attendance & Participation	10%
Assignments & Exercises	30%
Project	60%

Attendance and participation will be self-evaluated with final grade decisions made by the professor. Assignments and exercises will be performed both in and outside class hours. Preparation, alertness, and performance in the classroom will be factors used to arrive at a final grade.

It is your responsibility to confirm the proper grades are recorded online for all graded work. You have **one week from the date graded work is returned to dispute a grade**.

Course Objectives

Full details regarding course objectives can be found on the departmental website. These include:

1. Analyze the performance of active remote sensing techniques such as those using lidar and radar.
2. Analyze the performance of passive remote sensing techniques such as those using digital image processing.
3. Apply engineering knowledge and techniques to the design, assembly, and evaluation of remote sensing instrumentation.
4. Use computer-aided analysis and design tools (CREO, Python, Matlab).

Academic Integrity

By enrolling in this course, each student assumes full responsibility as a participant in UMCP's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. For more information on the Code of Academic Integrity or the Student Honor Council, please visit http://www.shc.umd.edu.

ABET Program Criteria

In addition to teaching the subject material, accreditation of the Department of Mechanical Engineering at UMCP by ABET requires the curriculum to meet certain criteria. This course is designed to provide the students with the following ABET originated concepts:

a) An ability to apply knowledge of mathematics, science, and engineering.
b) An ability to design and conduct experiments, as well as to analyze and interpret data.
c) An ability to design a system, component, or process to meet desired needs within realistic constraints.
d) An ability to function on multi-disciplinary teams.
e) An ability to identify, formulate, and solve engineering problems.
f) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Syllabus Note

This course syllabus is subject to change. The most recent version is available on the course website (Canvas). ***Please check regularly for updates***.

ENME 489Y – Remote Sensing: Spring 2018 Class Schedule

Department of Mechanical Engineering

Week	Dates	Topic / Event	Reading / Other
1	1/25	Course Introduction	
2	1/30 2/1	Introduction to remote sensing Introduction to Python & PyCharm **Homework #0.1 due 2/1**	Toth Chapter 1 IntroRemoteSensing.pdf
3	2/6 2/8	Lidar remote sensing: fundamentals OpenCV fundamentals	IntroLidar.pdf Searchlight.pdf
4	2/13 2/15	The lidar equation Automatic Lane Detection *2/15 NGC Innovation Challenge: Sensing for Autonomous Vehicles* **Homework #1 due 2/13**	Fujii Chapter 1
5	2/20 2/22	Lidar system design & performance Automatic Lane Detection *2/21 Optional seminar: Ford Motor Company - Autonomous Vehicles Update* **Homework #2 due 2/22**	Harding.pdf
6	2/27 3/1	Lidar altimetry *3/1 Guest lecture: David Rabine, NASA Goddard Spaceflight Center* **MPR #1 due 2/28** **Homework #3 due 3/1**	Degnan_2016.pdf
7	3/6 3/8	Lidar altimetry *3/8 Guest lecture: Ryan Kirkpatrick, US Army Geospatial Research Lab*	Crosby.pdf
8	3/13 3/15	Lidar demonstration **Homework #4 due 3/15**	
9	3/20 3/22	*UMD SPRING BREAK*	
10	3/27 3/29	Lidar data acquisition & processing *3/29 Guest lecture: Dr. Jonathan Resop, University of Maryland* **MPR #2 due 3/31**	VLP-16.pdf
11	4/3 4/5	Open session: project support *4/5 Guest lecture: Frank Bertini, Velodyne* **Homework #5 due 4/5**	
12	4/10 4/12	Open session: project support **Homework #6 due 4/13**	
13	4/17 4/19	Open session: project support *4/19 Guest lecture: Eugenia de Marco, NASA Goddard Spaceflight Center* **Homework #7 due 4/20**	
14	4/24 4/26	Open session: project support *4/26 Guest lecture: Dr. Abbie Watnik, U.S. Naval Research Laboratory* **MPR #3 due 4/30** **Homework #8 due 4/27**	
15	5/1 5/3	**Final Project Presentations**	**Final Project Videos Due 5pm Thursday 5/17**
16	5/8 5/10	**Final Project Presentations**	