MARYLAND APPLIED GRADUATE ENGINEERING

Course: ENPM808C – Ocean Energy Harvesting
Semester: Fall 2021
Day(s): Thu
Time: 4:00-6:40 pm
Location: TBD
Instructor: Yunho Hwang
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Course Description

The course presents the ocean energy harvesting technologies: ocean thermal energy, wave energy, tidal energy and wind energy. To establish the baseline, current power generation technologies are reviewed. Then ocean thermal energy conversion technology are studied in details. To assist the design of ocean energy harvesting systems, fundamentals of heat transfer and fluid mechanics are summarized. Then wave, tidal and wind energy harvesting systems are studied. For each subject, either literature reviews or representative system modeling will be conducted. For the modeling, Engineering Equations Solver software is utilized. By applying underlying principles, the OTEC system is designed and its economy is analyzed as a final design project.

ELMS Site: TBA

- **Prerequisites by Topic:** Undergraduate Thermodynamics and Heat Transfer
- **Communication Outside the Classroom:** Emails and ELMS site will be used for communication.
- **Statement of Course Goals:** Students are expected to learn a solid understanding of the current power generation technology; fundamentals of heat transfer; production, conversion and utilization of ocean energy; limitations and opportunities. Particular emphasis is placed on the design of ocean energy harvesting systems.
- **Student Learning Outcomes**: Students are expected to learn in depth the application of heat transfer processes and thermodynamic cycles to ocean energy harvesting systems. This course is a technical design elective and pulls together the background knowledge in real life examples of design and evaluation.
- **Course Schedule:** Class at 4:00-6:40 pm.
- **Due Dates:** Project report should be returned in one week after assignment.
- **Expectations for Students:** Students are expected to become familiar with general engineering software (Engineering Equation Solver) to deepen their applicability of heat transfer and thermodynacmi cycle concepts to real applications.
- **Grading Procedures:** There will be a mid-term exam to test conceptual understanding of the material taught; four projects; and a final design project. Individual students (or team) will be asked to make a presentation for their projects. Final grade will be determined with the following weighting: Mid-term exam 20%, Projects 40% and Final Project 40% of final grade. Student work will be based largely on literature reviews and

computer based take-home projects. Obtaining the correct numerical solution will be the minimum expected; the written explanation of the meaning of the physics of the problem, the constraints assumed and the solution will be the substance upon which the individual's final grade will depend.

Textbook(s)

- John Twidell & Tony Weir, Renewable Energy Resources, Third Edition
  ISBN 9780415584388, Taylor and Francis, 2006

Course Outline

- 1. Recent Energy and Environmental Issues
- 2. Power Generation Technologies
- 3. EES Overview
- 4. Renewable Energy
- 5.1 Ocean Thermal Energy Conversion
- 5.2 OTEC Components
- 5.3 OTEC Systems
- 6.1 Heat Transfer Overview
- 6.2 Conduction
- 6.3 External Convection
- 6.4 Internal Convection
- 6.5 Boiling and Condensation
- 6.6 Heat Exchanger Design
- 7. Wave Energy
- 8. Tidal Energy
- 9. Wind Energy

Code of Academic Integrity

The University of Maryland, College Park has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Code of Academic Integrity of the Student Honor Council, please visit http://shc.umd.edu/SHC/HonorPledgeInformation.aspx.