

1. Department, Course Number, Title

ORE 677, Marine Renewable Energy

2. Designation as a Required or Elective Course

Ocean Resources Engineering Required Course

3. Course Catalog Description

Ocean thermal energy conversion (OTEC) systems: applicability, thermodynamics, design challenges; wave energy converters: floating devices, oscillating water column, optimal hydrodynamic performance; current, tidal and offshore wind power. Prerequisite: ORE 607; basic knowledge of thermodynamics desirable.

4. Prerequisites

Water Wave Mechanics

5. Textbooks and/or Other Reading Material

Textbooks: None

Reference books:

1. Renewable Energy from the Ocean – a Guide to OTEC, W.H. Avery and C. Wu, Oxford University Press, 1994.
2. Ocean Wave Energy Conversion, M.E. McCormick, Dover Publications, 2007.
3. Ocean Wave Energy – Current Status and Future Perspectives, J. Cruz (ed.), Springer, 2008.
4. Wind Energy Explained – Theory, Design and Application, J.F. Manwell, J.G. McGowan, A.I. Rogers, Wiley & Sons, 2004.

6. ABET Course Learning Outcomes

1. An understanding of the principles and applicability of OTEC systems.
2. An understanding of the design principles and engineering criteria to develop functional and efficient electrical power generation from wave, wind, current and tidal resources.
3. An understanding of the role of ocean renewable energy within the current worldwide framework of energy production.

7. Topics Covered

1. Economic, social and political context of energy production.
2. Estimation of the OTEC resource.
3. Thermodynamics of basic OTEC cycles.
4. Design of pipes, pumps, heat exchangers, turbines, generators.
5. Floating wave energy converters and oscillating water columns.
6. Optimal hydrodynamic performance.
7. Design principles and constraints.
8. Current, tidal and wind power production.

8. Class/laboratory schedule

Two 1.25-hour sessions per week.

9. Contribution of Course to Meeting the Requirements of Criterion 5

Assessment

Homework (50%)

Course Project (50%)

Usage of Engineering Tool and Computers

Computer use required for engineering report for data and word processing.

Contribution to Professional Component

Engineering Science: 1 credit

Engineering Design: 2 credits

10. Relationship to Program Outcomes

Program Outcome 2: Basic science, mathematics, & engineering

Program Outcome 4: Ocean engineering specialization

Program Outcome 6: Problem formulation & solution

Program Outcome 7: Design & optimization in ocean engineering

Program Outcome 9: Professional issues

11. Prepared by and date of preparation

G.C. Nihous, Spring 2009