1. Department, Course Number, Title

ORE 678, Marine Mineral Resources Engineering

2. Designation as a Required or Elective Course

Required for Resources track

3. Course Catalog Description

Activities in marine minerals development are examined in a multidisciplinary systems approach involving engineering, Earth and environmental sciences and economics. Pre: Consent

4. Prerequisites

   Applied mechanics
   Engineering economics

5. Textbooks and/or Other Reading Material


6. ABET Course Learning Outcomes

   The course familiarizes students with the mineral resources of the ocean and the engineering challenges faced to exploit them. Specific course learning outcomes include:
   1. Ability to formulate the design issues involved in underwater mining equipment.
   2. An understanding of the range and type of ocean mineral deposits.
   3. Ability to articulate the environmental, economic and energy issues involved in ocean mineral development

7. Topics Covered

   - Introduction to Marine Minerals
   - Peak Everything - Running out of Commodities
   - Manganese Nodules and Marine Mining
   - Deep Sea Mining Technology
   - Minerals Processing
   - Offshore Oil and Gas
   - Oil and Gas Technology, Future Oil Sources and Issues
   - Economics of Marine Minerals
   - World Metal Markets
   - Formation Processes of Polymetallic Sulfides (PMS) on the Ocean Floor: Geology of the Smoker and PMS
   - Chemistry of Hydrothermal Vents and Polymetallic Sulfides
   - PMS Deposits: From Smoker to an Ore Body
   - Case Studies on the Ocean Floor: The Red Sea
   - Ferromanganese Crusts, Methane Hydrates, Placers
8. Schedule
   Two 1.25-hour sessions per week.

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

   Usage of Engineering Tools and Computers
   Matlab and Excel

   Contribution to Professional Component
   Engineering Science: 2 credits
   Design: 1 credit

10. Relationship to Program Outcomes
    Program Outcome 1: Broad Education
    Program outcome 2: Basic science, mathematics, & engineering
    Program Outcome 4: Ocean engineering specialization
    Program Outcome 5: Use of latest tools in ocean engineering
    Program Outcome 6: Problem formulation & solution
    Program Outcome 9: Professional issues
    Program Outcome 10: Communication skills
    Program Outcome 11: Research & contemporary issues

11. Prepared by
    J.C Wiltshire, Spring 2009