1. **Department, Course Number, Title**

   ORE 707, Nonlinear Water Wave Theories

2. **Designation as a Required or Elective Course**

   Elective

3. **Course Catalog Description**

   Higher-order theories. Forced oscillations. Stokes theory. Nonlinear shallow-water wave equations and hydraulic jumps; effects of rotation. Internal waves. Analytical techniques necessary will be developed as course progresses. Pre: consent.

4. **Prerequisites**

   1. Advanced Applied Mathematics
   2. Linear Water Wave Theory

5. **Textbooks and/or Other Reading Material**

   Textbook: Notes by R.C. Ertekin
   Reference books:

6. **ABET Course Learning Outcomes**

   (Course objectives) This course is designed to introduce graduate students into the treatment of nonlinear water waves in both deep and shallow waters.

7. **Topics Covered**

   1. Approach of Linear and nonlinear systems.
   2. Higher-order approximations to water waves.
   3. Perturbation methods.
   4. Stokes’ theory.
   5. Shallow-water waves - KdV and Boussinesq equations.
   7. Internal waves.
   8. Theory of directed fluid sheets.
   9. Nonlinear drift forces on offshore platforms.

8. **Class/laboratory 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
Write programs to solve various nonlinear wave propagation problems in time domain on workstations and micro computers.

**Laboratory Projects**
1. Linear-Nonlinear response model, ship and platform motions.
2. Selected shallow-water wave problems, shoaling, run-up.
3. Potential and viscous drift forces on floating bodies.

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

10. **Relationship to Program Outcomes**
    Program Outcome 2: Basic science, mathematics, & engineering
    Program Outcome 6: Problem formulation & solution

11. **Prepared by and date of revision/preparation**
    R.C. Ertekin, 2009