<p style="text-align:center">EOC 4412 Ocean Structures
ABET Course Syllabus</p>

1. **Course number and name:** EOC 4412 Ocean Structures

2. **Credits and contact hours:** 3 credits / Two 80 minute lectures each week

3. **Instructor's or course coordinator's name:** Dr. H. Mahfuz

4. **Text book, title, author, and year:**
   - Dynamics of Offshore Structures, 2nd ed., 1984, James F. Wilson, John Wiley and Sons
   - Introduction to Matrix Methods of Structural Analysis, 1966-04, Harold C. Martin, McGraw Hill, Inc.
   - Introduction to Composite Materials, Stephen W. Tsai and H. Thomas Hahn, CRC Press, 1980.
   - In addition, graduate students will be given extra reading materials for fluid-structure interaction

5. **Specific course information:**
   (a) Brief description of the content of the course (catalog description): The course deals with matrix and finite element methods, environmental loading, stability, and dynamics of floating body applied to ocean structures.

   (b) Prerequisites: EOC 3410C Structural Analysis (with a grade of C or above).

   (c) indicate whether a required, elective, or selected elective course in the program: Elective

6. **Specific goals for the course:**
   (a) Specific outcomes of instruction (course specific objective): The course introduces students to fundamental knowledge of structural modeling and mathematical methods needed to analyze offshore and coastal structures which includes buoys, moored ships, dynamics of floating platforms, wave forces on structures, structures fixed to the bottom, cable-stayed, and gravity type designs.

   (b) Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course. The learning outcomes of the course (and related ABET Criterion 3) outcomes are:

   1. Ability to formulate a structural model and natural forces imposed by the ocean environment. (a, e, k/1)
   2. Ability to use the stiffness method to analyze beams, trusses, and frames. (a, e, k/1)
   3. Ability to model cable restraints and soil foundation restraints. (a, e, k/1)
   4. Ability to determine wave forces on ocean structures. (a, e, k/1)
   5. Ability to determine structural response in irregular seas. (a, e, k/1)
   6. Knowledge of statistical representation of sea states. (a, e, k/1)
   7. Ability to analyze composite structures using anisotropic constitutive equations. (a, e, k/1)
   8. A recognition of the need for, and an ability to engage in life-long learning (i/7)
   9. A term project to reflect contemporary issues in the scientific, technological and environmental issues related with offshore structures (j/4)
   10. Ability to communicate effectively through presentations and submitting written reports in a professional manner (g/3)

7. **Brief list of topics to be covered:**

   - Structures in the Offshore Environment.
   - Structure Force Interactions
   - Ice Impact, and Wave Slamming
   - Structural Mass and Stiffness

- Matrix Methods Introduction
- Introduction to finite element method
- Stiffness and Displacement Methods
- Application to Trusses, Beams, and Frames
- Cable Restraints
- Wave loading of Cylinders
- Deterministic Responses for Single Degree of Freedom Structures
- Natural Frequencies of Linear Systems Rayleigh Method
- Response of linear systems to earthquake loading
- Impulse Response Function
- Statistical Descriptions of Offshore Waves
- Significant Wave, Wave Energy Spectra
- Selection of Design Wave Spectra
- A term project in offshore structures addressing contemporary issues in design and environmental challenges