Miami Dade College

Course Competencies Template - Form 112

GENERAL INFORMATION	
Name: Diane King	Phone #:77021
Course Prefix/Number: ETM2310	Course Title: Fluid Mechanics
Number of Credits: 3	
Degree Type	☐ B.A. ☐ B.S. ☐ B.A.S ☐ A.A. ☒ A.S. ☐ A.A.S. ☐ C.C.C. ☐ A.T.C. ☐ V.C.C
Date Submitted/Revised: 12/10/2010	Effective Year/Term: 2011-1
☒ New Course Competency ☐ Revised Course Competency	
Course to be designated as a General Education course (part of the 36 hours of A.A. Gen. Ed. coursework): ☐ Yes ☒ No	
The above course links to the following Learning Outcomes: ☐ Communication ☒ Numbers / Data ☒ Critical thinking ☐ Information Literacy ☐ Cultural / Global Perspective ☐ Social Responsibility ☐ Ethical Issues ☒ Computer / Technology Usage ☐ Aesthetic / Creative Activities ☐ Environmental Responsibility	
Course Description (limit to 50 words or less, must correspond with course description on Form 102): This course is for students preparing for nuclear power plant systems operations. Students will learn the basics of fluid theory, pump theory and operations, and how to perform calculations using the International System of Measurements (SI) and United States (US) measurement systems. Prerequisite: ETP1200, MAC1105. A.S. degree credit only. (3 hr. lecture).	
Prerequisite(s): ETP1200, MAC1105	Corequisite(s):

Course Competencies: (for further instruction/guidelines go to: http://www.mdc.edu/asa/curriculum.asp)

Competency 1: The student will demonstrate an understanding of units and properties measurements by:

1. Defining the following terms:
   - conversion factor.
   - system.
   - working fluid.
   - properties.
2. Explaining the difference between intensive and extensive properties.
3. Defining the following terms including units, symbols, and equations as appropriate:
   - mass.
   - specific volume (n).
   - density (p).
   - specific weight.
   - specific gravity.
4. Performing calculations involving the properties of a substance.

Competency 2: The student will demonstrate an understanding of units and properties pertaining to temperature and pressure by:

1. Defining "temperature" including symbols and units (four temperature scales).
2. Performing conversions between absolute and relative temperature scales.
3. Defining "pressure" including symbols, units, and equations.

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4. Explaining hydrostatic pressure including the relationship between fluid height, density and the resulting pressure.
5. Stating how an applied force is transmitted through a confined fluid as stated by Pascal's Law (Principle).
6. Defining each of the following units of measurement:
   - absolute pressure.
   - atmospheric pressure.
   - gage pressure.
   - vacuum pressure.
   - differential pressure.
7. Performing conversions between absolute and relative pressure scales including absolute, gage, and vacuum pressure.

Competency 3: The student will demonstrate an understanding of basic fluid static and dynamic concepts by:

1. Defining fluid.
2. Distinguishing between fluids and other substances.
3. Stating and explaining Pascal's principle.
4. Solving problems applying Pascal's principle.
5. Defining and explaining buoyancy.
6. Stating and explaining Archimedes' principle.
7. Defining and explaining the following terms:
   - mass flow rate.
   - volumetric flow rate.
8. Describing the two types of fluid flow.
9. Defining viscosity.
10. Explaining the effects of temperature on the viscosity of fluids.

Competency 4: The student will demonstrate an understanding of fluid flow profiles and energy balances by:

1. Discussing the velocity profiles for laminar flow and turbulent flow.
2. Solving problems using the continuity of fluid flow equation.
3. Explaining Bernoulli's equation, including how, when and why it is used, and solving problems applying Bernoulli's equation.
4. Explaining the relationship between elevation head, velocity head, and pressure head in a fluid system.
5. Explaining and distinguishing between static pressure, dynamic pressure, and total pressure.
6. Defining and explaining head loss, and the effects of viscosity.
7. Discussing operational considerations of viscosity as related to head loss.
8. Defining and explaining pump head.

Competency 5: The student will demonstrate an understanding of the principles associated with pumps by:

1. Identifying the types of pumps, including: centrifugal, axial, mix flow, and positive displacement.
2. Describing the applications of pumps, including series and parallel operations.
3. Identifying pump components including impeller, bearings, seals, shafts, diffusers, volute.
4. Explaining the operating characteristics of pumps.
5. Discussing failure mechanisms and symptoms, including excessive vibration, seizure, bad bearings, etc.).
6. Discussing the impact of environmental conditions on pump operations.
7. Explaining common defects, indicators of wear, or malfunctions of pumps.
8. Explaining the principles associated with pumps and describing the following:

- applications (series and parallel operation).
- components (impeller, bearings, seals, shafts, diffuser, volute).
- types (centrifugal, positive displacement, such as reciprocating, gear type).
- operating characteristics, including centrifugal pump laws, net positive suction head (NPSH), requirements of minimum flow and effect of dead-heading pump, pump starting duty causes and indications of cavitation and how to prevent it.
- failure mechanisms and symptoms, such as excessive vibration, seizure, bad bearings.
- impact of environmental conditions, e.g., dust, moisture.

Competency 6: The student will demonstrate an understanding of energy losses and proper sizing of pumps by:

1. Using Bernoulli's equation to solve pump head loss and work problems.
2. Describing the relationship between Reynolds number and friction factor.
3. Explaining the effects on head loss from friction factor and relative roughness.
4. Describing types of fluid flow measurement devices.
5. Correcting flow measurements based on density changes.
6. Explaining two-phase flow, including an explanation of the two-phase friction multiplier and slip ratio.
7. Explaining the purposes of pumps.
8. Explaining the principles of operation of a centrifugal pump.
9. Describing how flow rates are controlled for systems containing centrifugal pumps.
10. Defining and explaining the following terms:
    - cavitation.
    - net positive suction head (including required and available).
    - gas binding.
    - axial thrust.
    - pump run out.
    - shutoff head.
11. Explaining how operating a centrifugal pump at shutoff head may cause overheating and describing the methods used to avoid overheating.
12. Describing how flow rates are controlled in systems containing positive displacement pumps.
13. Discussing the relationship between pump speed, head, flow, and power without using formulas or calculations.