Lesson Plan

Lesson: ____ME311 Force on Plane Surface_____

Timeframe: ____Friday 10:00-10:50_____

Materials needed:
Randomized student group list
Handout of the problems that will be distributed to groups

Objectives:

Basic:

1. Find out the equation to calculate hydrostatic force on a plane surface

2. Learn the meaning of each term in equation mentioned in No.1: center of gravity, resultant force, height of center of gravity from free surface

3. Find out the equation to calculate the location of the resultant hydrostatic force on a plane surface (center of pressure)

4. Review moments of inertia for various cross sections (Ixx, Ixy, CG).

Advanced:

1. Be able to use the hydrostatic force equation to calculate resultant force on a plane surface

2. Be able to determine the location (both x and y) of resultant force on a plane surface

3. Be able to analyze problems involving hydrostatic force on plane and curved surfaces

Background:
On any surface or body that is submerged in water or any other liquid, there is a force acting because of the hydrostatic pressure. Learn how to determine the magnitude of this force.

Study of hydrostatic forces on submerged or static surfaces is very important for the design and engineering processes. Construction of dams, installation of underwater hydraulic systems, and forces exerted on ships are some of the important and crucial processes that require study of hydrostatic forces.

Introduction to Lesson:
In this class we will learn how to use calculate the resultant force from fluid pressure and where this resultant force locate. This will help us in finding if the structure is stable or if the design is practical. We will work on some problems under different situation.

Procedure [Time needed, include additional steps if needed]:

Pre-Class Individual Space Activities and Resources:

Steps	Purpose	Estimated Time	Learning Objective
Step 1: Watch video lecture: Hydrostatic force on a plane surface: https://www.playposit.com/share/1/620462	*Learn the derivation of finding the resultant force due to hydrostatic pressure.*	**15min**	*Basic 1,2*
Step 2: Watch video lecture: Center of pressure on a place surface: https://www.playposit.com/delivery/298217/620465/center-of-pressure-of-a-plane-surface	*Learn the derivation of finding the center of pressure (location of the resultant force due to hydrostatic pressure)*	**15min**	*Basic 3*
Step 3: Read book and finish Smart Book online reading assignment	*Get familiar with concept of this section*	**10 min**	*Reinforce of the concept of each term in the equation Basic 2,4*
Step 4: Finish Quiz 2 before come to class	*Test if you have grasp the key concept of the section*	**5min**	*Reinforce of the concept of each term in the equation Basic 1-4*
Step 5: Preview Class Problems for the next class	*Give students a chance to preview all the problems to work on the next class and give them chance to prepare if they wish to. They do not know which problem they will be assigned to in class.*	**varies**	*Advanced 1-2*

In-Class Group Space Activities and Resources:

Steps	**Purpose**	**Estimated Time**	**Learning Objective**
Step 1: Recap of quiz2	*Point out the common mistakes in quiz2 and make sure the students get the fundamental concept correct*	**5 min**	*Reinforce Basic 1-4*
Step 2: Assign 3-4 students into one group and distribute on problem per group	*Randomize student group to prevent students get a chance to work with different classmates.*	**2min**	
Step 3: Work out problems in group, must achieve one copy of clean hand written solution	*Give students time to work in a group with discussion.*	**10-13min**	*Advanced 1-3*
Step 4: The group that finishes first will come up to teach how to solve their problem (plane surface). They do not need to work out the number, but just work out the steps to solve the problem. They will receive challenge from students	*Force student to come to the front to speak out will enhance their understanding of the problem and by answering other students' questions they will learn the subject better.*	**15 min**	*Advanced 1-3*
Step 5: The group that finishes second will come up to teach how to solve their problem. They do not need to work out the number, but just work out the steps to solve the problem. They will receive challenge from students	*Same as above*	**15 min**	*Advanced 1-3*

Closure/Evaluation: The two groups coming to the board will receive some small rewards for being able to solve the problems fast. All the solutions of all the problems will be shared by letting each group upload a copy of their solution.

Analysis:

The class will help build students ability to working in groups. And by letting them rotate group members, they can have the opportunity to make more friends and make the classroom more friendly. By forcing them to speak up in the class will force them to think harder and be more familiar with the knowledge in order to be prepared for answers.

Post-Class Individual Space Activities:

1. Review lecture slides and check if you have met with all the objectives of this lesson

2. Finish Quiz2 by the end of Thursday

3. Upload Friday worked problems on Blackboard Discussion.

Connections to Future Lesson Plan(s):

This subject is the foundation to next class: force on curved surface.