Teaching and Learning Objectives of Week 2

1. Define, Illustrate, and Compare and Contrast the following terms and concepts:
    - Density
        - Specific weight
        - Specific gravity
    - Pressure
        - Atmospheric pressure
        - Absolute vs. gage pressure
    - Pressure distribution in stationary fluids (Hydrostatics)
        - Hydrostatic pressure distribution
            - Manometers
            - Barometers
        - Hydrostatic force on a plane surface
            - Properties of a plane surface:
                - Centroid of the area
                - Moment of inertia of the area
            - Center of pressure for the force distribution vs. centroid of the area
            - Resultant force – magnitude, direction, and point of application
        - Buoyancy force – Archimedes Principle

2. Given the specific gravity of a fluid, calculate its density and its specific weight.
3. Explain the difference between absolute, gage, and vacuum pressures and use them correctly in calculations.
4. Given a stationary body of fluid containing one or more fluids, calculate the pressure difference between any two points within the fluid body.
5. Given a vertical or inclined manometer that contains one or more fluids calculate the pressure difference indicated by the manometer.
6. Given a surface subjected to a *uniform* pressure, determine the magnitude, direction, line of action, and point of application of the resultant force due to the *uniform* pressure.
7. Given a surface submerged in a stationary fluid, sketch the pressure distribution on the surface.
8. Given a plane surface submerged in a stationary fluid, determine the magnitude, direction, line of action, and point of application of the following forces:

    … F_o, the force on the surface due to the uniform pressure P_o at the free surface of the fluid,
    … F_w, the force on the surface due only to the non-uniform liquid pressure γh,, and
    … F_R, the resultant hydrostatic force on the surface produced by combining F_o and F_w.
9. Given a problem and a system where some surfaces are submerged in a stationary fluid, determine the resultant hydrostatic forces acting on the system and use these forces in a complete analysis to determine the necessary information. (Knowledge of hydrostatic forces is primarily of interest because of their use in the analysis and design of systems with

submerged surfaces, *e.g.* dams, gates, tank walls and hatches, submarines, *etc.* Using the resultant hydrostatic force in a complete analysis is just as important as being able to determine the resultant hydrostatic force!)

10. Given an object partially or totally submerged in a fluid, determine the buoyancy force exerted by the fluid on the submerged object.
11. Where applicable, use the buoyancy force concept to solve for the hydrostatic force acting on a submerged surface.