FLUID MECHANICS I

ENGINEERING 5961

Course Content [# lectures]

Fluid Statics: [3] This section develops the pressure depth law for fluids at rest. It covers the hydrostatic roll stability of floating bodies and loads on gates.

Conservation Laws: [3] This section develops the conservation laws of mass, momentum and energy for flow in a stream tube. It develops the Bernoulli equation for flow of an ideal or zero viscosity fluid.

Scaling Laws: [2] This section develops scaling laws for engineering fluid flows in terms of special non dimensional numbers. These laws are then used to predict prototype behavior from model behavior.

Loads on Bodies: [2] This section covers lift and drag loads on bodies in a flow. The concept of boundary layer separation is introduced.

Momentum Devices: [3] This section deals with the devices which change fluid momentum. It also covers the impact of jets with structures.

Turbomachines: [3] This section develops the angular momentum theory for turbomachines such as pumps and turbines.

Pipe Networks: [6] This section deals with pressure losses in pipe networks caused by fluid friction. This includes networks with turbomachines.

Learning Outcomes

Upon successful completion of this course, the student will be able to:

1. Calculate hydrostatic loads on gate structures.
2. Calculate hydrostatic roll stability of floating bodies.
3. State the conservation laws for stream tube flow.
4. Understand the limitations of the Bernoulli equation.
5. Apply scaling laws to engineering flow situations.
6. Calculate loads generated by momentum devices.
7. Calculate jet impact loads on structures
8. Understand turbomachine theory.
9. Calculate energy losses in pipe networks.
10. Understand the concept of system demand.
11. Select turbomachines for pipe networks.