1. EM316 Thermofluid Sciences I

2. Credit Hours (3) / Contact Hours (3)

3. Course Director: Cody Brownell

4. Text book: “Fundamentals of Thermal-Fluid Sciences” Cengel, Cimbala, Turner. McGraw Hill.

   Other supplemental materials: n/a

5. Specific course information
   a. course catalog description:
      A first course in thermal systems that covers incompressible fluid mechanics and heat transfer. Topics in fluid mechanics include properties of fluids, fluid statics, integral conservation equations, differential field analysis, dimensional analysis and similitude, incompressible boundary layers, viscous flow in conduits and flow about immersed bodies. Topics in heat transfer include one-dimensional steady conduction, convection and radiation exchange. Heat transfer emphasis is related to heat exchangers and electronics cooling applications.
   b. Prerequisites: SC112
      Co-requisites: SM212
   c. This course is required for the General Program.

6. Specific goals for the course (course outcomes)

   Students can effectively;

   1. Identify open and closed system; and apply conservation of mass, momentum, and energy to those systems (A,B,C).
   2. Solve hydrostatic problems involving manometers, variation of pressure with depth and hydrostatic forces on planar surfaces (A,B,C).
   3. Apply buoyancy to the determination of hydrostatic forces, righting moments and terminal velocity (A,B,C,D).
   4. Perform a dimensional analysis using the Buckingham Pi Theorem and use that information to determine the similarity/scaling of experiment results (A,B,C,D).
   5. Apply Bernoulli’s equation to fluid dynamic problems, and demonstrate an understanding of the applicability Bernoulli’s equation (A,B,C).
   6. Calculate major and minor losses, and use that information in the steady flow energy equation to calculate pressure or pump head (A,B,C,D).
   7. Solve fluid dynamic problems involving external flow. Calculate drag forces on 2D and 3D bodies. Calculate lift and drag forces on foils (A,B,C,D).
   8. Solve heat transfer problems that include conduction, convection and radiation. Solve heat transfer problems using the resistor analogy with conduction and convection resistances in Cartesian and cylindrical coordinates (A,B,C).
   9. Calculate convection heat transfer coefficients for internal and external flow based on the flow conditions, geometry and fluid properties (A,B,C).

7. Specific program outcomes address by this course

	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Introduced											
Reinforced	X	X			X		X		X	X	X
Mastered											

8. Brief list of topics to be covered
   a. First Law of Thermodynamics in Closed Systems
   b. First Law of Thermodynamics in Open Systems
   c. ε-NTU Heat Exchanger Analysis
   d. 2^{nd} Law of Thermodynamics
   e. Internal Combustion Engines
   f. Gas Power Cycles
   g. Vapor Power Cycles
   h. Vapor-Compression Refrigeration