**MAE 303 – Mechanics of Fluids – Chapter 1-Definitions of Some Important Terms**

1. fluid – a material that initially deforms under the application of a shear stress and continues to deform; matter in liquid or gaseous state
2. solid – a material that initially deforms under the application of a shear stress but does not continue to deform – additional deformation results in failure
3. fluid mechanics – the study of fluids at rest and in motion and the forces acting within the fluid and on any solid boundary the fluid contacts
4. fluid statics – the study of fluids at rest
5. fluid dynamics – the study of fluids in motion
6. incompressible fluid – a fluid which has constant density
7. compressible fluid – a fluid which has variable density
8. compressible flow – flow of a gas at a Mach number greater than 0.30
9. Mach number – local flow speed divided by the local speed of sound
10. speed of sound = √ γ R T
11. R - gas constant for the flowing gas
12. T - absolute temperature in K or R
13. γ - ratio of specific heats = cp/cv
14. cp - specific heat at constant pressure
15. cv - specific heat at constant volume
16. specific weight – weight per unit volume
17. specific gravity – density of material divided by the density of water
18. **subsonic flow – flow with Mach number less than 1**
19. **sonic flow – flow at M = 1**
20. **transonic flow – flow with Mach number from 0.8 to 1.2**
21. **supersonic flow – flow with Mach number greater than 1**
22. **hypersonic flow – flow with Mach number equal to 6 or greater**
23. viscosity – physical characteristic of a fluid which gives a measure of its ability to flow
    1. dynamic viscosity (N∙s/m^2) (lbf∙s/ft^2)- μ (for Newtonian Fluids)
    2. kinematic viscosity (m^2/s) (ft^2/s)- ν=μ/ρ (for fluids in motion)
24. inviscid fluid – fluid with viscosity of zero
25. viscous fluid – fluid which has a finite value of viscosity and in which friction is important
26. **Newtonian fluid – fluid which displays a linear relationship between shear stress and strain**
27. non-Newtonian fluid – fluid which displays a non-linear relationship between shear stress and strain
28. **steady flow – fluid in which physical characteristics are independent of time**
29. **unsteady flow – fluid in which physical characteristics are dependent on time**
30. **laminar flow – flow characterized by steady values of physical parameters with** respect to time and which has negligible mass diffusion normal to flow direction
31. **turbulent flow – flow characterized by unsteady values of physical parameters with respect to time and which has appreciable mass diffusion normal to the flow direction**
32. d’Alembert’s Paradox – measurement of a finite value of drag in a wind tunnel experiment when zero drag was expected due to an inviscid fluid assumption

subsonic: M<1

sonic: M=1

supersonic: M>1

transonic: 0.8≤M≤1.2

hypersonic: M≥6