Birzeit University
Mechanical & Mechatronics Engineering Department
ENMC 4411 Thermal applications for Mechatronics
Problems Air –water- vapor mixture

Instructor: Dr. Afif Akel   **First semester 2021-2022**

12.75

Atmospheric air is at 100 kPa, 25°C and relative humidity 75%. Find the absolute humidity and the dew point of the mixture. If the mixture is heated to 30°C what is the new relative humidity?

12.78

A flow of 1 kg/s saturated moist air (relative humidity 100%) at 100 kPa, 10°C goes through a heat exchanger and comes out at 25°C. What is the exit relative humidity and how much power is needed?

12.79

A new high-efficiency home heating system includes an air-to-air heat exchanger which uses energy from outgoing stale air to heat the fresh incoming air. If the outside ambient temperature is −10°C and the relative humidity is 30%, how much water will have to be added to the incoming air, if it flows in at the rate of 1 m^3/s and must eventually be conditioned to 20°C and 40% relative humidity?

12.84

Ambient moist air enters a steady-flow air-conditioning unit at 102 kPa, 30°C, with a 60% relative humidity. The volume flow rate entering the unit is 100 L/s. The moist air leaves the unit at 95 kPa, 15°C, with a relative humidity of 100%. Liquid condensate also leaves the unit at 15°C. Determine the rate of heat transfer for this process.

12.90

A flow moist air at 100 kPa, 40°C, 40% relative humidity is cooled to 15°C in a constant pressure device. Find the humidity ratio of the inlet and the exit flow, and the heat transfer in the device per kg dry air.