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Heat Transfer

Course Number: ME-02-102

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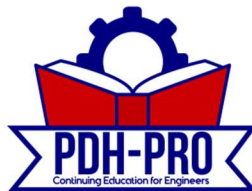
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TERMINAL OBJECTIVE

- 1.0 Given the operating conditions of a thermodynamic system and the necessary formulas, **EVALUATE** the heat transfer processes which are occurring.

ENABLING OBJECTIVES

- 1.1 **DESCRIBE** the difference between heat and temperature.
- 1.2 **DESCRIBE** the difference between heat and work.
- 1.3 **DESCRIBE** the Second Law of Thermodynamics and how it relates to heat transfer.
- 1.4 **DESCRIBE** the three modes of heat transfer.
- 1.5 **DEFINE** the following terms as they relate to heat transfer:
- Heat flux
 - Thermal conductivity
 - Log mean temperature difference
 - Convective heat transfer coefficient
 - Overall heat transfer coefficient
 - Bulk temperature
- 1.6 Given Fourier's Law of Conduction, **CALCULATE** the conduction heat flux in a rectangular coordinate system.
- 1.7 Given the formula and the necessary values, **CALCULATE** the equivalent thermal resistance.
- 1.8 Given Fourier's Law of Conduction, **CALCULATE** the conduction heat flux in a cylindrical coordinate system.
- 1.9 Given the formula for heat transfer and the operating conditions of the system, **CALCULATE** the rate of heat transfer by convection.
- 1.10 **DESCRIBE** how the following terms relate to radiant heat transfer:
- Black body radiation
 - Emissivity
 - Radiation configuration factor

ENABLING OBJECTIVES (Cont.)

- 1.11 **DESCRIBE** the difference in the temperature profiles for counter-flow and parallel flow heat exchangers.
- 1.12 **DESCRIBE** the differences between regenerative and non-regenerative heat exchangers.
- 1.13 Given the temperature changes across a heat exchanger, **CALCULATE** the log mean temperature difference for the heat exchanger.
- 1.14 Given the formulas for calculating the conduction and convection heat transfer coefficients, **CALCULATE** the overall heat transfer coefficient of a system.
- 1.15 **DESCRIBE** the process that occurs in the following regions of the boiling heat transfer curve:
 - a. Nucleate boiling
 - b. Partial film boiling
 - c. Film boiling
 - d. Departure from nucleate boiling (DNB)
 - e. Critical heat flux

TERMINAL OBJECTIVE

- 2.0 Given the operating conditions of a typical nuclear reactor, **DESCRIBE** the heat transfer processes which are occurring.

ENABLING OBJECTIVES

- 2.1 **DESCRIBE** the power generation process in a nuclear reactor core and the factors that affect the power generation.
- 2.2 **DESCRIBE** the relationship between temperature, flow, and power during operation of a nuclear reactor.
- 2.3 **DEFINE** the following terms:
- Nuclear enthalpy rises hot channel factor
 - Average linear power density
 - Nuclear heat flux hot channel factor
 - Heat generation rate of a core
 - Volumetric thermal source strength
- 2.4 **CALCULATE** the average linear power density for an average reactor core fuel rod.
- 2.5 **DESCRIBE** a typical reactor core axial and radial flux profile.
- 2.6 **DESCRIBE** a typical reactor core fuel rod axial and radial temperature profile.
- 2.7 **DEFINE** the term decay heat.
- 2.8 Given the operating conditions of a reactor core and the necessary formulas,
CALCULATE the core decay heat generation.
- 2.9 **DESCRIBE** two categories of methods for removing decay heat from a reactor core.



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the technical materials.