University of Technology
Department of Electromechanical Engineering
MSc. Course of Electromechanical Engineering
Branch of Energy Engineering

MSEM 203

Convective and Process Heat Transfer

Weekly/Hours	
Theoretical	**Practical**
2	-

Course Description:

The course presents an elementary treatment of the convection heat transfer, and energy balance on the flow system and determines the influence of the flow on the temperature gradients in the fluid. This course deals with the convection processes associated with a change of phase (Condensation and Boiling phenomena) of a fluid and the heat transfer application to the design of heat exchanger equipment.

Course Goals:

The purpose of this course is to understand the principles of convection heat transfer during phase change and thermal flow through heat exchanger equipment. Analysis thermal and hydrodynamic boundary layer through laminar and turbulent convection heat transfer process.

Syllabus:

1 – Convection Heat Transfer:

a – Fundamental Equations:

- Local Equations.

- Integral Conservation Equations.
- Boundary Conditions.
- Heat Transfer Coefficients.

b – Laminar Fully Developed Forced Convection in Ducts:

- Hydrodynamics.
- Heat Transfer.

c – Forced Convection in Boundary Layer Flows:

- Hydrodynamics.
- Heat Transfer.
- Integral Method.

d – External Natural Convection:

- Natural Convection near Vertical Wall.
- Integral Method.
- Mixed Convection.

e – Internal Natural Convection:

- Fully Developed in Vertical Duct Heated.
- Enclosure With Vertical Walls Heated.

f – Turbulent Convection:

- Internal Wall Flows.
- External Wall Flows.

2 – Condensation and Boiling Heat Transfer:

- Condensation Heat Transfer.
- Condensation Number.
- Film Condensation inside Horizontal Tubes.
- Boiling Heat Transfer.

3 – Process Heat Transfer;

Application of Fundamental Principle of Single and Two Phase Fluid Dynamics and Heat Transfer to the Design and Analysis of:

- Double Pipe Heat Exchangers.
- Shell and Tube Heat Exchangers.
- Fin-Plate Heat Exchangers.
- Cross Flow Heat Exchangers.

References:

1 – Convection Heat Transfer, Michel Favremarinet, Sedat Tardu, Wiley, 2009.

2 – Convection Heat Transfer, Louis C. Burmeister, Wiley, 1983.

3 – External Surface Heat Transfer, Allan D. Kraus, 1991.