

In the name of God

Convection Heat Transfer Fall 1397 (2018)

Course outline and study Guide

Textbook: Heat Convection, L. M. Jiji Second Edition,

Other References:

- Convection Heat transfer, A. Bejan
- Convective Heat and Mass Transfer, Kays,
- Convection Heat transfer, Arpaci, and Larsen
- Hand notes

Week	Contents	Chapter
1	Introduction and Basic concepts	Chapter 1
2	Differential Formulation of the Basic Laws (Continuity, momentum and energy equations)	Chapter 2
3	Simplification of the Governing Equations, Exact Solutions, Couette Flow, Poiseuille Flow, Rotating Flow	Chapter 3
4	The Boundary Layer Concept, Summary of Boundary Layer Equations for Steady Laminar Flow, Solutions: External Flow, Laminar Boundary Layer Flow over Semi-infinite Flat Plate: Uniform Surface Temperature,	Chapter 4
5	Applications: Blasius Solution, Pohlhausen's Solution, and Scaling, Laminar Boundary Layer Flow over Semi-infinite Flat Plate: Variable Surface Temperature, Laminar Boundary Layer Flow over a Wedge: Uniform Surface Temperature	Chapter 4
6	Approximate Solutions; Differential vs. Integral Formulation, Integral Method Approximation: Mathematical Simplification, Accuracy of the Integral Method, Integral Formulation of the Basic Laws	Chapter 5
7	Integral Solutions; Flow Field Solution: Uniform Flow over a Semi-infinite Plate, Temperature Solution and Nusselt Number: Flow over a Semi-infinite Plate, Uniform Surface Flux	Chapter 5
8	Heat Transfer in Channels; General Features, Hydrodynamic and Thermal Entrance Lengths, Channels with Uniform Surface Heat Flux, Channels with Uniform Surface Temperature, Determination of Heat Transfer Coefficient, Thermal Entrance Region	Chapter 6
9	Mid-Term Exam	
10	Basic Concepts; Stability, Transition and Turbulent Flow	Hand Notes

11	Convection in External Turbulent Flow; Conservation Equations for Turbulent Flow, Analysis of External Turbulent Flow, Momentum Transfer in External Turbulent Flow, Energy Transfer in External Turbulent Flow	Chapter 8
12	Convection in Turbulent Channel Flow; Entry Length, Governing Equations, Universal Velocity Profile, Friction Factor for Pipe Flow, Momentum-Heat Transfer Analogies, Algebraic Method Using Universal Temperature Profile, Other Correlations for Smooth Pipe, Heat Transfer in Rough Pipes	Chapter 9
13	Free Convection; Features and Parameters of Free Convection, Governing Equations, Laminar Free Convection over a Vertical Plate, Inclined Plates	Chapter 7
14	Integral Formulation of Conservation of Momentum, Integral Formulation of Conservation of Energy, Integral Solution, Basic Concepts in Mixed Convection	Chapter 7 & Hand Notes
15	Presenting Term Projects	
16	Presenting Term Projects	

Marks:

- Homework (15%)
- Term-Exam and Projects (25%).
- Final Exam (60%)

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