Course Syllabus
Vm335 Heat Transfer

Summer 2017 Course Syllabus

Class Schedule

MW10:00-11:40 AM

Location: E-4-405

Instructor

Prof. Bao, Hua

Room 417, JI Building

Office Hour: M 14:30-15:30

hua.bao@sjtu.edu.cn

Meeting outside office hours by email appointment only

TA

Tong, Zhen

Office Hour: Tue (18:30–20:00);

Room 412 Smart Grid Bldg.

zhentong@sjtu.edu.cn

Liu, Chenyang

Office Hour: Mon (18:30-20:00)

Room 410 Smart Grid Bldg.

liuchenyang@sjtu.edu.cn

Textbook (required)

Principles of Heat and Mass Transfer Seventh Edition by Frank P. Incropera, David P. DeWitt, Theodore L. Bergman, Adrienne S. Lavine, ISBN: 978-0-470-64615-1

Note: feel free to use the sixth edition of this textbook, but all the homework and reading assignments are based on the seventh edition.

Course Outline

Heat transfer by conduction, convection, radiation; heat storage, energy conservation; steady-state/transient conduction heat transfer; thermal circuit modeling; multidimensional conduction; surface radiation properties, enclosure radiation exchange; surface convection/fluid streams over objects, nondimensional numbers, laminar, turbulent, thermobuoyant flow, boiling and condensation; heat exchangers; design of thermal systems, solvers for problem-solving/design.

Grading Policy

Quiz and Performance 5%

Homework 15%

Mid-term I 25%

Mid-term II 25%

Final 30%

Grade Curving:

If median < 80, grades will be curved to that the median is 80.
After curving, A- or above for grade >= 85; F for grade < 50
Honor code violation punishment will be applied on the given grade above.

Unethical Conduct

Unethical behavior (e.g., copying others' homework, cheating during exam) will be reported to the honor council.

You are free to discuss homework with each other. However, the work that you submit must be your own.
Any suspicious violation of the honor code will be reported to the honor council.
In summer 2013, ~ 20 suspicious violations (Ve320) are reported to the honor council. All are due to copying homework and inappropriate use of solution manual.

Homework

Due date will be posted (usually on) Wednesday. Graded assignments will be returned during lecture.
Homework problems due at the start of the class (10 AM). Late homework will NOT be accepted.
Solutions will be posted after the homework is due.

In-class Participation

In-class exercises given once a while

-- 5-15 minutes duration

-- Textbook essential

Class attendance mandatory
Lecture notes may not be posted.

Course Objectives

Understand the physical origins of various transport mechanisms
Identify the relevant transport processes
Perform engineering calculations and develop design rules

Vm335 Heat Transfer

Lecture Topics and Corresponding Reading Materials

No.	Topic	Reading Material
1	Introduction, Rate Equations	1.1, 1.2
2	Rate Equations, Conservation Laws	1.3-1.7
3	Introduction to Conduction	2.1, 2.2
4	Conduction Conservation Equations	2.3-2.5
5	1-D Steady-State Conduction, Thermal Resistance	3.1, 3.2
6	Variable Area, Radial Conduction	3.3, 3.4
7		

Thermal Energy Generation

3.5

8

Extended Surfaces

3.6-3.6.2

9

Extended Surfaces

3.6.3-3.7

10

2-D Steady-State Conduction

4.1-4.3

11

Finite-Difference Method

4.4-4.6

12

Transient Conduction – Lumped Capacitance

5.1-5.3

13

Analytical Results

5.4

14

Analytical Results

5.5-5.6

15

Numerical (Finite Volume) Method

5.10, 5.11

16

The Convective Transfer Problem

6.1-6.3

17

Convective Transfer Equations, Dimensionless Conservation Equations and Parameters, Similarity

6.4-6.6

18

Heat-Mass Analogy, Evaporative Cooling

6.7.1-6.7.2

19

External Flow - The Flat Plate

7.1-7.3

20

External Flow - Other Geometries

7.4, 7.5

21

Internal Flow

8.1-8.3.2

22

Internal Flow

8.3.3-8.5

23

Free Convection

9.1-9.6

24

Boiling Heat Transfer

10.1-10.4

25

Condensation

10.6-10.9

26

Heat Exchangers, LMTD Method

11.1-11.3

27

Heat Exchangers, NTU Method

11.4, 11.5

28

Thermal Radiation, Definitions and Energy Balances

12.1

29

Radiation Intensity

12.2-12.3

30

Blackbody Emission, Real Surface Emission

12.4, 12.6

31

Irradiation

12.3.3, 12.6

32

Kirchhoff’s Law, Gray and Non-Gray Surfaces, Environmental Radiation

12.7-12.9

33

The View Factor

13.1

34

Blackbody Radiation Exchange

13.2

35

Diffuse Gray Surface, Radiation Exchange

13.3

36

Enclosure Calculations, Multimode Processes

13.4

Note: All the topics above are planned our course, but each class may cover one or more topic(s). Some topics might also be omitted depending on the class progress. Please take notes and find out the corresponding reading materials according to the course progress.

Homework

Below is the list of homework problems throughout the semester. The homework will be assigned weekly based on the progress of lectures.

1.4, 1.26, 1.45, 1.69, 1.76a

2.5, 2.31, 2.54

3.3, 3.4a, 3.28, 3.39, 3.48, 3.90, 3.98ab, 3.123, 3.136, 3.126, 3.146

4.27, 4.31, 4.46, 4.61

5.6, 5.36, 5.49, 5.60a, 5.125

6.7, 6.9, 6.27, 6.29, 6.66, 6.75

7.3a, 7.8, 7.47, 7.134

8.7, 8.12, 8.23abcd, 8.26a

9.4, 9.18,

10.6, 10.26a, 10.53, 10.73

11.18, 11.47, 11.25a, 11.64

12.1, 12.6, 12.15, 12.20, 12.37a, 12.62, 12.64, 12.69, 12.71ab, 12.95a, 12.114

13.1, 13.15, 13.17, 13.19, 13.21, 13.55abc, 13.61, 13.83, 13.94ab