Heat and Mass Transfer
CENG 3220

- Instructor: Dr Ping Gao
- Office: Room 4560, Academic Building
- Email: kepgao@ust.hk; Tel: 23587126 (office)
- Lecture hours: 13:30-14:50, Wednesdays and Fridays

- Venue: Room 2404 (lifts 17/18), Academic Building.

Tutorials:

- Teaching assistants: Qinghua Zhang (qzhangaz@connect.ust.hk) ; Chun Ki Yeung (ckyeungad@connect.ust.hk)
- Venue and schedule: Room 2503, Academic building 10:30-11:50 am, Mondays. (3 three students TBA).
- N.B. You are all required to attend tutorials. The TAs may conduct quizzes during tutorials without any prior announcements.
- Website: http://canvas.ust.hk

Objectives

This course aims to introduce the rate equations for two of the most important transport processes in Chemical Engineering, namely, heat and mass transfer. Students will be able to predict the rates of molecular transport processes in simple geometries, i.e. conduction and molecular diffusion using both analytical and numerical methods. For the convective processes, they are expected to be able predict the heat and mass transfer coefficients by taking the analogy with momentum transfer process based on Process Fluid Mechanics. At the end of the course, they will be able to apply the rate equations to design simple heat exchangers and continuous contact mass transfer columns.

- ***Assessments:***

  Home assignment: 10 %

  Midterm: 35%

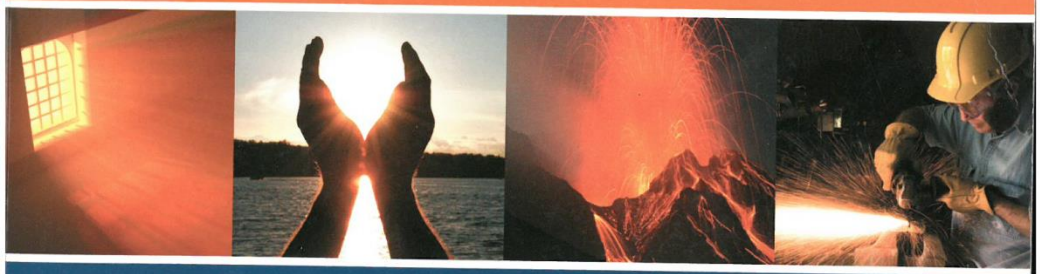
  Final: 55%

- **References:**

(1) Y.A. Cengel: “Heat Transfer”, 5th edition, McGraw Hill, Singapore, 2015

(2) A.F. Mills: "Basic Heat and Mass Transfer", 2nd Edition, Prentice Hall, 1999.

Fourth Edition in SI Units



HEAT *and* MASS TRANSFER

Fundamentals and Applications

YUNUS A. ÇENGEL • AFSHIN J. GHAJAR

Course Outline

1. Heat Conduction and Heat Transfer

1) Introduction
2) Steady one-dimensional flow of heat through a slab of parallel sides
3) Steady one-dimensional flow through several layers
4) Steady radial flow of heat in a cylinder
5) Steady radial flow in a spherical system
6) Extended surfaces for heat transfer
7) Unsteady state heat conduction

2. Diffusion and Mass Transfer

1) Introduction
2) Diffusion with moving fluid
3) Uni-directional diffusion – Stefan's method for measuring diffusion coefficient
4) Mass transfer from a volatile sphere
5) Total evaporation of a sphere
6) Counter diffusion

3. Dimensional analysis of transfer processes

1) Forced convective heat transfer
2) Heat transfer to laminar flow in a pipe
3) Forced convective mass transfer
4) Free convection
    1) Heat transfer situation
    2) Mass transfer situation

4. Heat and mass transfer to turbulent flow

1) Forced convective heat transfer
2) Heat transfer to laminar flow in a pipe
3) Forced convective mass transfer
4) Free convection
    1) Heat transfer situation
    2) Mass transfer situation

5. Forced transfer processes

1) Addition of heat transfer coefficients
2) Concentric tubular heat exchanger
3) Fouling