computer models and some of which will be implemented as exercises by the program Mathcad.

Textbook: Wesselingh, J.A. and Krishna, R., Mass Transfer in Multicomponent Mixtures, Delft

3.5 Simplifying the Mathematics
3.6 The Film Model
3.7 Difference Form of the Driving Force

Chapter 4. Friction（3 hours）
4.1 Friction Coefficients and Diffusivities
4.2 Velocities and the Bootstrap
4.3 Velocities and Fluxes
4.4 The Difference Equation
4.5 Mass Transfer Coefficients

Chapter 5. Binary Examples（2 hours）
5.1 Stripping
5.2 Polarisation
5.3 Vaporisation
5.4 Gasification of a Carbon Particle
5.5 Binary Distillation

Chapter 6. Ternary Examples（3 hours）
6.1 From Binary to Ternary
6.2 A Condenser
6.3 A Ternary Distillation
6.4 A Ternary Reaction
6.5 Binary Approximation of a Ternary

Chapter 7. Non-idealities（3 hours）
7.1 Chemical Potential and Activity
7.2 Non-ideal Binary Distillation
7.3 A Simple Model of Non-idealities

7.4 Large Non-Idealities: Demixing
7.5 Maxwell-Stefan versus Fick
7.6 When can we neglect Non-ideality?
7.7 Mass Transfer in Liquid-Liquid Extraction
Chapter 8. Diffusion Coefficients（2 hours）
8.1 Diffusivities in Gases
8.2 Diffusivities in Liquids
8.3 How do you measure diffusivities?
Chapter 9. Centrifugal and Pressure Forces（2 hours）
9.1 Volumetric Properties
9.2 The Pressure Gradient
9.3 Gravitational Force
9.4 Centrifuges
9.5 Gas and Protein Centrifugation
9.6 Difference Equation for the Pressure Force
9.7 The Maxwell-Stefan Equations (again)
Chapter 10. Why we use the MS-equations（2 hours）
10.1 Three Ways
10.2 A Mixture of Three Gases
10.3 The Fick Description
10.4 Thermodynamics of Irreversible Processes
10.5 The Maxwell-Stefan Description
Chapter 11. Solid Matrices（3 hours）
11.1 The Applications
11.2 Membrane Processes
11.3 Adsorption and Chromatography
11.4 Heterogeneous Catalysis
11.5 Structured and Non-structured Matrices
11.6 Effects of a Matrix on Mass Transfer
11.7 Compositions with a Matrix
Chapter 12. Dialysis and Gas Separation（2 hours）
12.1 Dialysis
12.2 Gas Separation
Chapter 13. Pervaporation and Reverse Osmosis（2 hours）
13.1 Pervaporation
13.2 Reverse Osmosis
Chapter 14. Ion Exchange（2 hours）
14.1 Fixed-Bed Processes
14.2 Ion Exchange Equilibria
14.3 Linear Driving Force Model
14.4 Ion Exchange (Film Limited)
14.5 Ion Exchange (Particle Limited)
Chapter 15. Gas Permeation（2 hours）
15.1 Transport in Cylindrical Pores

15.2 The Diffusion Coefficients
15.3 Looking Back
15.4 Transport in a Bed of Spheres
15.5 The Dusty Gas Model
Chapter 16. In Porous Catalysts（2 hours）
16.1 Introduction
16.2 Pressure gradients inside a particle
16.3 Separate Transport Equations
16.4 Single-variable Pressure and Rate Expressions
16.5 Solution for a Slab
Chapter 17. In Adsorbents（2 hours）
17.1 Adsorption 1
17.2 Equilibria – Langmuir Isotherm 2
17.3 Maxwell-Stefan and Fick Diffusivities 4
17.4 Macropore Diffusion7
17.5 Transport Equations 8
17.6 Transient Adsorption of a Binary 8
17.7 Membrane Applications 9
Chapter 18. Ultrafiltration（2 hours）
18.1 The Module
18.2 Membrane and Permeants
18.3 Osmotic Pressure (No Ions, no Charge)
18.4 Size Exclusion
18.5 Polarisation
18.6 Transport Equations
18.7 Inside the Membrane
Class Discussions（2 hours）; Examination（4 hours）
Grading: Final Exam 60 %. Homework, Midterm test and Attendance 40 %.

- 教案 Teaching Plan
- 视频 Video