

**THE UNIVERSITY OF BRITISH COLUMBIA**  
**Department of Chemical and Biological Engineering**  
**Transport Phenomena (Momentum Heat and Mass Transfer)-CHBE**  
**554**  
**(January 2016)**

---

**TIME:** 3 hours/week, Tuesdays+Thursdays 8:00-9:30 am

**PLACE:** CHBE 102.

**LECTURER:** Anthony Wachs, Rm: CHBE 4.37, MATH236

TEL: (604) 822-4346

email: wachs@mail.ubc.ca

**WORKLOAD:** 2x1h30 lectures/week; 6 homeworks + article report;  
mid-term and final examinations

**TEXTBOOK:** R.B. Bird, W.E. Stewart, and E.N. Lightfoot, Transport Phenomena, 2<sup>nd</sup> Edition, John Wiley, NY 1960.

## COURSE OUTLINE

**Table 0.2-1** Organization of the Topics in This Book

Type of transport	Momentum	Energy	Mass
Transport by molecular motion	<b>1</b> Viscosity and the stress (momentum flux) tensor	<b>9</b> Thermal conductivity and the heat-flux vector	<b>17</b> Diffusivity and the mass-flux vectors
Transport in one dimension (shell-balance methods)	<b>2</b> Shell momentum balances and velocity distributions	<b>10</b> Shell energy balances and temperature distributions	<b>18</b> Shell mass balances and concentration distributions
Transport in arbitrary continua (use of general transport equations)	<b>3</b> Equations of change and their use [isothermal]	<b>11</b> Equations of change and their use [nonisothermal]	<b>19</b> Equations of change and their use [mixtures]
Transport with two independent variables (special methods)	<b>4</b> Momentum transport with two independent variables	<b>12</b> Energy transport with two independent variables	<b>20</b> Mass transport with two independent variables

1 Transport in turbulent flow, and eddy transport properties

5 Turbulent momentum transport; eddy viscosity

13 Turbulent energy transport; eddy thermal conductivity

21 Turbulent mass transport; eddy diffusivity

Transport across phase boundaries

6 Friction factors; use of empirical correlations

14 Heat-transfer coefficients; use of empirical correlations

22 Mass-transfer coefficients; use of empirical correlations

Transport in large systems, such as pieces of equipment or parts thereof

7 Macroscopic balances [isothermal]

15 Macroscopic balances [nonisothermal]

22 Macroscopic balances [mixtures]

Transport by other mechanisms

8 Momentum transport in polymeric liquids

16 Energy transport by radiation

24 Mass transport in multi-component systems; cross effects

## GRADING SCHEME

Assignments (4 x 5%)	20%
Midterm	20%
Article report + presentation	25%
Final	35%
<hr/>	
<b>Total</b>	<b>100%</b>