

# Mass Transfer Operations I - Video course

## COURSE OUTLINE

1. The general objectives of Mass Transfer Operations-I are to discuss the fundamental concepts of mass transfer principles and to apply those concepts to real engineering problems.
2. This course will provide an overview of mass transfer operations at basic to an intermediate level. Coverage will be relatively broad.
3. This course applies the concepts of diffusion mass transfer, mass transfer coefficients, convective mass transfer, interphase mass transfer, equipment for gas-liquid operations, absorption, and distillation.
4. Each topic will be covered in logical sequence with relevant examples.
5. The goal is to provide students with the theoretical/analytical background to understand mass transfer operations and to tackle the sort of complex problems.

### Contents:

#### Diffusion Mass Transfer:

Molecular diffusion in fluids, molecular diffusion in solids, Numerical methods for steady-state molecular diffusion.

#### Convective Mass Transfer and Mass Transfer Coefficients:

Mass transfer under laminar and turbulent flow past solids, boundary layers, theories of mass transfer and their applications, interphase mass transfer, material balances and stages.

#### Equipment for Gas-Liquid Operations:

Sparged and agitated vessels, venture scrubber, wetted wall towers, Tray and packed towers.

#### Absorption:

Theory and modeling of plate columns, nonisothermal operation (modeling of plate columns), modeling of packed columns, introduction to multicomponent absorption.

#### Distillation:

Flash distillation, differential distillation, continuous fractionation, modeling by method of McCabe & Thiele, introduction to multicomponent distillation, azeotropic distillation, extractive distillation.

## COURSE DETAIL

S.No	Topics	No. of Hours
1	<b>Diffusion Mass Transfer:</b> 1. Introduction to mass transfer and diffusion, molecular diffusion in gases, liquids, biological solutions and gels.	8



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## Chemical Engineering

### Coordinators:

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	<p>2. Diffusivity measurement and prediction , multicomponent diffusion, molecular diffusion in solids.</p> <p>3. Numerical methods for steady-state molecular diffusion in two dimension.</p>	
2	<p><b>Mass Transfer Coefficients:</b></p> <p>1. Concept of mass transfer coefficients, mass transfer under laminar and turbulent flow past solids.</p> <p>2. Boundary layers, theories of mass transfer and their applications, interphase mass transfer.</p> <p>3. Equilibrium and diffusion between phases.</p> <p>4. Use of mass transfer coefficients, mass transfer coefficients for different geometries, material balances and stages.</p>	6
3	<p><b>Equipment for Gas-Liquid Operations:</b></p> <p>1. Sparged and agitated vessels, venture scrubber, wetted wall towers.</p> <p>2. Tray and packed towers, mass transfer coefficients for packed towers.</p>	4
4	<p><b>Absorption:</b></p> <p>1. Theory and modeling of plate columns, non-isothermal operation (modeling of plate columns).</p> <p>2. Modeling of packed columns, introduction to multicomponent absorption.</p>	10
5	<p><b>Distillation:</b></p> <p>1. Flash distillation, differential distillation, continuous fractionation, modeling by method of McCabe &amp; Thiele.</p> <p>2. Introduction to multicomponent distillation, azeotropic distillation, extractive distillation.</p>	14
	<b>Total</b>	40

**References:**

1. Trebal, R.E., "Mass Transfer Operations", McGraw - Hill International Edition, 3rd Ed., 1981.
2. McCabe, W. L., Smith, J. and Harriot P., "Unit Operation of Chemical Engineering", McGraw - Hill International Edition, 6 th Ed., 2001.
3. Wankat, P.C., "Equilibrium Staged Separations", Prentice Hall, 1989.
4. Geankoplis, C.J., "Transport Process and Unit Operations", Prentice Hall, 3rd Ed., India, 1993.
5. Dutta, B. K., "Principles of Mass Transfer and Separation Processes", Prentice Hall, India, 2007.