



SARVAJANIK
UNIVERSITY

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SARVAJANIK UNIVERSITY
Sarvajnik College of Engineering and Technology



Bachelor of Technology (B.Tech)

B. Tech. Semester VII

Subject Name: Transport Phenomena

Subject Code: BTCH13701

Type of course: Professional Core Course

Prerequisite: Fluid flow operation, Heat & Mass transfer operations

Rationale: Transport phenomena offer the overall analogical application to Industrial process in terms Fluid, heat, mass and momentum transfer.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	100
3	0	0	3	60	15	25	00	00	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests CA2: Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems TEE: Term End Examination TEP: Term End Practical Exam (Performance and viva on practical skills learned in course) CA3: Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	Introduction to Transport Phenomenon: Classification of Transport Processes, Conservation Laws, Vector and Tensor Calculus	06	13%
2.	Principles of Momentum Transport: Concept of Viscosity, Newton's Law of Viscosity, Shell Momentum Balance, Application of Shell Momentum Balance: Flow of Falling Film, Flow Through Circular Pipe, Flow Through annulus, Flow Over Moving Plate, Couette Viscometer, Equation of Changes for isothermal system: Continuity Equation, Equation of Motion, Navier-Stokes Equation in Cartesian Co-ordinate's and Cylindrical Co-ordinate, Basics of Velocity Distribution	14	32%
3.	Principles of Heat Transport: Thermal conductivity and mechanism of energy transport, Steady State Condition and Fourier's Law, Shell Energy Balance and temperature distributions in solids and laminar flow, Applications of Shell Energy Balance: Heat Conduction with Electrical Source, Heat Conduction with Chemical Heat Source, Temperature Distribution in Two Concentric Cylinder's, Natural Convection Heat Transfer Governing Equation, Flow over Flat Plate	12	27%
4.	Principles of Mass Transport: Equation of Molecular Mass Transport, Molecular Diffusion in Gases, Equimolar Counter Diffusion, Diffusion of A through Non-Diffusing B, Mass and Molar Transport by Convection: Mass and Molar Concentrations, Mass Average and Molar Average Velocity, Molecular Mass and Molar Fluxes, Convective Mass and Molar Fluxes	12	27%



Approved Version from the Academic Year 2021-22

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Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	U Level	A Level	N Level	E Level	C Level
25	25	25	10	10	05

Legends: R: Remembrance, U: Understanding; A: Application, N: Analyze, E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1	Transport Phenomena	R. Byron Bird Warren E. Stewart Edwin N. Lightfoot	John Wiley & Sons (Asia) pvt. Ltd. ISBN 0-471-41077-2	2002	2nd Edition
2	Transport Processes and Separation Process Principles	Christie John Geankoplis	PHI Learning Private Limited., New Delhi, ISBN: 9788120326149 , 8120326148	2009	4th Edition
3	Fundamentals of Heat and Mass Transfer	Theodore L. Bergman, Adrienne S. Lavine, Frank P. Incropera, David P. DeWitt	John Wiley & Sons (Asia) pvt. Ltd. ISBN: ES8-1-119-32042-5	2007	6th Edition
4	Introduction to Transport Phenomena	W.J.Thomson	Pearson Education Asia, New Delhi. ISBN:978-0134548289	1999	1st

Course Outcome:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	Analyse the fundamental principles of the conservation law, along with flux expressions	15
CO-2	Establish boundary conditions for the large scale operation with Momentum, Heat and Mass Transport	25
CO-3	Set up shell balances and solve the equation of change to obtain velocity profile, concentration and temperature	25
CO-4	Analyze analogy among momentum, heat and mass transfer	15
CO-5	Evaluate transport properties of two phase systems	20





Mapping with Pos:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	2	2	2	2	2	3	3	3	2	3	3	2	2	2
CO-2	3	3	3	3	2	2	3	3	3	3	3	3	3	3	2
CO-3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	2
CO-4	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3
CO-5	3	3	3	3	2	2	3	3	3	3	3	3	3	3	3
Rationale*	15	14	14	14	12	11	15	15	15	14	15	15	13	14	12

Rationale*: Transport phenomena offer the overall analogical application to Industrial process in terms Fluid, heat, mass and momentum transfer.

LIST OF PRACTICALS: NIL

Major Equipment: NIL

List of Open Source/learning website:

- <https://nptel.ac.in/courses/103/105/103105128/>
 - Chapter-1,2,3 & 4
- <https://ocw.mit.edu/courses/materials-science-and-engineering/3-185-transport-phenomena-in-materials-engineering-fall-2003/>
 - Chapter-1,2,3 & 4
- <https://ocw.tudelft.nl/courses/advanced-transport-phenomena/>
 - Chapter-1,2,3 & 4
- <https://userpages.umbc.edu/~dfrey1/ench630/>
 - Chapter-1,2,3 & 4

List of Open Source Software:

- <https://userpages.umbc.edu/~dfrey1/ench630/>
- <https://alternativeto.net/software/comsol/?license=open-source>
- <https://sourceforge.net/projects/swash/>
- https://www.cocosimulator.org/index_disclaimer.html
- <https://github.com/FlowsheetSimulation/Dyssol-open/blob/53eb7b589ad03eb477d743ee6a90ee10297a9366/LICENSE>

