

COURSE TEMPLATE

1.	Department/Centre proposing the course	Chemical Engineering
2.	Course Title (<i>< 45 characters</i>)	TRANSPORT PHENOMENA
3.	L-T-P structure	3-1-0
4.	Credits	4
5.	Course number	CHL110
6.	Status (<i>category for program</i>)	Core for CH1 & CH7; PL ES for other programs.

7.	Pre-requisites (<i>course no./title</i>)	None
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8.	Status vis-à-vis other courses (<i>give course number/title</i>)	
8.1	Overlap with any UG/PG course of the Dept./Centre	None
8.2	Overlap with any UG/PG course of other Dept./Centre	None
8.3	Supersedes any existing course	None

9.	Not allowed for (<i>indicate program names</i>)	
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10.	Frequency of offering	☐ Every sem ☐ 1 st sem ☐ 2 nd sem ☒ Either sem
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11.	Faculty who will teach the course Faculty of Chemical Engineering Department	
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12.	Will the course require any visiting faculty?	No
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13.	Course objective (<i>about 50 words</i>): The course will deal with flow problems involving Newtonian and non-Newtonian fluids, solid-state heat conduction, forced & free convection, binary diffusion with or without chemical reaction. Course will highlight coupling between three transport phenomena with applications in various disciplines in engineering & science.	
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14.	Course contents (<i>about 100 words</i>) (<i>Include laboratory/design activities</i>): Vector and Tensor analysis; Euler/Lagrangian viewpoint of momentum transport, stress tensor and Newton's law of viscosity, shell momentum balances, derivation of equations of change for isothermal, non-isothermal, and multicomponent systems, Solution to 1D flow problems involving Newtonian or non-Newtonian fluids, friction factor, Mechanisms of energy transport, energy flux for conduction, convection & viscous dissipation, Solutions to 1D conduction and convection problems, Mechanisms of mass transport, mass and molar diffusion fluxes, derivation and application of	
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continuity equation to mass transfer in binary mixtures, dimensional analysis of equations of change to solve higher dimensional transport problems, unsteady-state momentum, heat, and mass transport.

15. Lecture Outline (with topics and number of lectures)

Module no.	Topic	No. of hours
1	Introduction to the subject of Transport Phenomena	1
2	Vector and Tensor Analysis	6
3	Basics of momentum transport	2
4	Shell momentum balances, equations of change, dimensional analysis and applications to isothermal flow problems.	10
5	Special topics: Non-Newtonian fluids	2
6	Basics of energy transport, conductive, convective & viscous dissipation energy fluxes	2
7	Equations of change for non-isothermal systems, dimensional analysis, and applications to steady-state conduction & convection.	8
8	Basics of mass transport, mechanisms, and mass & molar fluxes	2
9	Derivation of equation of continuity for a binary mixture and its application to convection-diffusion problems.	7
10	Unsteady-state momentum, heat and mass transport.	2
11		
12		
COURSE TOTAL (14 times 'L')		42

16. Brief description of tutorial activities

Tutorial sheets will be provided as homework assignments and will be discussed in the tutorials. This will also provide an opportunity to discuss concepts and solution techniques taught in the lecture. As this is a first course on transport processes for students, tutorials will enhance learning in the course and help this course serve as a platform for advanced concepts discussed in subsequent transport courses.

17. Brief description of laboratory activities

Module no.	Experiment description	No. of hours
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
COURSE TOTAL (14 times 'P')		

18. Suggested texts and reference materials

STYLE: Author name and initials, Title, Edition, Publisher, Year.

Text Book:

R. B. Bird, W. E. Stewart, and E. S. Lightfoot. Transport Phenomena, 2nd ed., Wiley India Pvt. Ltd., 2002

Reference Books:

W. M. Deen, Analysis of Transport Phenomena, Oxford University Press, 1998.

J. Welty, C. E. Wicks, R. E. Wilson, and G. L. Rorrer. Fundamentals of Momentum, Heat,

and Mass Transfer. 5th ed., Wiley India Pvt. Ltd..

19. Resources required for the course (*itemized & student access requirements, if any*)

19.1	Software	
19.2	Hardware	
19.3	Teaching aides (videos, etc.)	Microphone, projector and screen.
19.4	Laboratory	
19.5	Equipment	
19.6	Classroom infrastructure	Air-conditioning
19.7	Site visits	

20. Design content of the course (*Percent of student time with examples, if possible*)

20.1	Design-type problems	
20.2	Open-ended problems	
20.3	Project-type activity	
20.4	Open-ended laboratory work	
20.5	Others (please specify)	

Date:

25/2



(Signature of the Head of the Department)