

Chemical and Biochemical Engineering

Semester VII						
<u>S.No</u>	Course Code	Course Name	L	T	P	C
1		HSS Elective	3	0	0	6
2		Institute Elective-I	3	0	0	6
3		Institute Elective-II	3	0	0	6
4		Programme elective-V/ BTP-I	3	0	0	6
5		Programme elective-VI	3	0	0	6
6	CL403T	<u>Advanced Transport phenomena</u>	3	0	0	6
		Total Credits				24

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1	Title of the course (L-T-P-C)	Advanced Transport phenomena (3-0-0-6)
2	Pre-requisite courses(s)	Reaction Engineering
3	Course content	<p>Introduction: Review of Transport Equations, Scaling and Ordering analysis, Asymptotic solutions.</p> <p>Exact solutions: Pulsatile flow in circular tube, Creeping flows and stream function solutions.</p> <p>Motion of deformable and slender bodies: Conditions at a deformable interface, Creeping flow past a drop, Marangoni Effects, Flows past Sphere and Oblate Solid bodies, Slender-Body Theory.</p> <p>Asymptotic Approximations for simple flows: Pulsatile flow limiting cases, Motion of fluid through curved tube, Bubble growth in Quiescent fluid.</p> <p>Thin films and Lubrication: Eccentric Couette cylinder, Lubrication theory, Slider block, Cylinder and Plane.</p> <p>Convective Heat and Mass transfer: Heat transfer from sphere ($Pe \ll 1$) in uniform and shear flow, Low Re expansion for $Pe \ll 1$, $Pe \gg 1$ for low Re.</p> <p>Mass transfer from a Drop Laminar Boundary Layer Theory: Review of Boundary Layer Equations and Solution, Boundary layer separation, Approximate method to estimate shear stresses, Spherical bubble, Limiting cases of Thermal boundary layers.</p> <p>Natural convection: Boussines Equations, Combined forced and free convection, The Raleigh-Benard Problem.</p>
4	Texts/References	L. G. Leal, Laminar Flow and Convective Transport Processes, Butterworth-Heinemann, 1992.

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