

Year & Sem:E4S1	Course Code: CH3607	Course Name: Membrane Technology	No. of Credits: 4	L 2	T&PS 2	P 0
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UNIT I: Introduction: Separation process, Introduction to membrane processes, definition of a membrane, classifications membrane processes. Preparation of Synthetic membranes: Types of Membrane materials, preparation of Synthetic membranes, phase inversion membranes, preparation technique for immersion precipitation, and preparation technique for composite membranes.

UNIT II: Characterization of membranes; Introduction, membrane characterization, characterization of porous membranes, characterization of non-porous membranes. Transport in membranes: introduction, driving forces, non equilibrium thermodynamics, transport through porous, non-porous, and ion exchange membranes.

UNIT III: Membrane Processes: Introduction, osmosis, pressure driven membrane processes: Introduction, microfiltration, membranes for microfiltration, industrial applications, ultrafiltration: membranes for ultrafiltration, industrial applications, reverse Osmosis and nanofiltration: membranes for reverse osmosis and nanofiltration, industrial applications, Electrically Driven processes: Introduction, electrodialysis, Process parameters, membranes for electrodialysis, applications, Membrane electrolysis, Biopolar membranes, Fuel Cells

UNIT IV: Concentration driven membrane processes: gas separation: gas separation in porous and non porous membranes, membranes for gas separation, applications, pervaporation, membranes for pervaporation, applications, dialysis: membranes for dialysis, applications, liquid membranes: aspects, liquid membrane development, choice of the organic solvent and carrier, applications, introduction to membrane reactors

UNIT V: Polarization phenomenon and fouling: Introduction to concentration polarization, turbulence promoters, pressure drop, gel layer model, osmotic pressure model, boundary layer resistance model, concentration polarization in diffusive membrane separations and electro dialysis, membrane fouling, methods to reduce fouling, compaction. Module and process design: Introduction, plate and frame module, spiral wound module, tubular module, capillary module, hollow fiber module, comparison of module configurations.

References/Text Books:

1. Membrane Separations, M.H.V. Mulder, Springer Publications, 2007
2. Rate-Controlled Separations, P. C. Wanket, Elsevier Applied Science, London, 1994.
3. Membrane Technology in the Chemical Industry, S.P. Nunes, K.V. Peinemann, Wiley-VCH
4. Membrane Processes in Separation and Purification, J.G.Crespo, K.W.Bodekes, Kluwer Academic Publications.
5. Membrane Separation Processes, K. Nath, PHI Pvt. Ltd., New Delhi, 2008.

Lecture Plan: Unit-I & -II syllabus for MID-I, Unit-III & -IV syllabus for MID-II and Unit-V & -VI syllabus for MID-III examinations.