

CH 336 MEMBRANE TECHNOLOGY**Course Outcome:**

Membrane Technology is one of the unit processes in chemical industries. Through study of this subject students will get a thorough acquaintance of the separation process widely used in reverse osmosis, dialysis etc.

UNIT - I

Introduction: Separation process, Introduction to membrane processes, definition of a membrane, classification of membrane processes.

Preparation of Synthetic Membranes: Types of Membrane materials, preparation of Synthetic membranes, phase inversion membranes, preparation technique for immersion precipitation, 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.

TEXT BOOKS

1. M.H.V.Mulder, "Membrane Separations", Springer Publications, 2007.
2. R.Philip C.Wanket, "Rate-Controlled Separations", 1st ed., Springer, 2005.

REFERENCE BOOKS

1. S.P.Nunes, K.V.Peinemann, "Membrane Technology in the Chemical Industry", Wiley-VCH, 2nd ed., 2006.
2. Rautanbach and R. Albrecht, "Membrane Process", John Wiley & Sons, 1st ed., 1986.
3. J.G.Crespo, K.W.Bodekes, "Membrane Processes in Separation and Purification", Kluwer Academic Publications, 1st ed., 1994.
4. C .J. Geankoplis, "Transport Processes and Unit Operations", 3rd ed., PHI, 2003.