

1. Industrial Membrane Separation Technology

CHR (3-0)

Rationale

The goal of this course is to familiarize students with main membrane processes, principles, separation mechanisms and applications. To know the selection criteria for different membrane processes. Explain the principle of the most common membrane applications and further be able to carry out a concept to design project for a particular membrane technology application.

Course Objectives:

- Industrial Membrane Separation Technology is a course that intends to demonstrate to students how nature works (biological membranes).
- How such principles (membrane processes) can be used for medical, bioprocessing, water & wastewater processing and other industries by employing appropriate materials and systems.
- The course hence leads from biological science, natural science to material science and engineering.
- Fundamental transport principles to applications and process design with immediate relevance to the water treatment industry, food industry, dairy industry, pharmaceutical industry, where membrane are becoming a predominant process of choice worldwide.
- The course material is innovative and gives the students a very good start in a leading edge career in a membrane technology area from medicine to wastewater engineering.
- The variety of topics covered in the course brings together a number of approaches from biology, chemistry, mathematics, design software, water & wastewater engineering, sustainability, material science and is hence an ideal course to address numerous graduate attributes.

Course Contents:

- Introduction historical developments of membranes & membrane types
- Membrane Characterisation and Module Types
- Membrane principles and transport mechanisms
- Membrane fouling and control approaches

- Pressure Driven Membrane Processes (Microfiltration, Ultrafiltration, Nanofiltration, Reverse Osmosis, Forward Osmosis, Membrane distillation)
- Membrane bioreactor (MBR) principles and applications
- Membranes in Water and Wastewater treatment
- Electrodialysis Development, Principles, Industrial Applications and Membrane Performance Implications
- Membrane Applications in Chemical and Pharmaceutical Industries and in the Conservation of Natural Resources
- Membranes in Drug Delivery
- Membrane Applications in Biotechnology, Food Processing, Life Sciences, and Energy Conversion
- Applications of Membrane Technology in the Dairy Industry
- Membrane Applications in Industrial Waste Management
- Future Progress in Membrane Science & Engineering

Recommended Books:

- Baker, R.W., Membrane technology and applications, 2nd ed., John Wiley 2004
- Anil K. Pabby, Syed S.H. Rizvi, Ana Maria Sastre., Handbook of Membrane Separations: Chemical, Pharmaceutical, Food, and Biotechnological Applications, 2nd ed., Taylor and Francis
- Syed S. H. Rizvi., Separation, extraction and concentration processes in the food, beverage and nutraceutical industries., Published by Woodhead Publishing Limited,
- Handbook of Membrane Separation By A. Constantis, N. Moustafui