



Membrane Separations for The Desalination of Water: Materials, Processes, Applications and  
Transport Theory  
(October 29 – November 02, 2018)

Venue: Indian Institute of Technology Roorkee, Roorkee-247667, Uttarakhand, India

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## Overview

Public health and clean environment are two major issues in 21<sup>st</sup> Century. Both of these issues are related with water availability and its quality. With increase in population, pollution load on water bodies is increasing day by day, consequently the quality of water is also being degraded gradually. Further, due to climate change effect, the availability of water is also decreasing rapidly in many parts of the world. In India, number of places have been identified as water challenged sites and documented in Govt. record. In such water challenged sites contamination of groundwater by different type of pollutants like As, F, salinity, micro pollutant, heavy metals etc., have been identified. Non availability of water has also been reported in some sites and the area under this category is increasing day by day. It seems that desalination of sea water may be the only solution in future to meet the water requirement completely. Thus, extensive research is required to develop indigenous technologies for treating ground water with salinity and desalination of sea water. Out of different conventional technologies, membrane process alone or in hybrid form (including solar) seems more efficient and economic.

The present course will impart knowledge on the water quality issues in India, best available technologies for water desalination, membrane based technologies for desalination, membrane synthesis, materials and rejection mechanisms, design of membranes and specific modules including RO to meet different requirements etc., which will help the participants to enhance their knowledge and skill.

### Objective:

The primary objectives of the course are as follows:

- i) Exposing participants to the water quality issues in India with special emphasis on salinity problem and water scarcity as well as best available technologies for water desalination
- ii) Exposing participants to the fundamentals of membrane separations, membrane synthesis and rejection mechanism
- iii) Imparting knowledge on the design of membranes and different modules
- iv) Building confidence and capability amongst the participants in the application of membrane separation for water desalination

- v) Providing exposure to practical problems and their solutions, through case studies and live projects

<b>Course Information</b>	<b>Duration: Oct. 29 – Nov 02, 2018</b>
<b>Modules</b>	<p>Module 1: Water quality issues in India with special emphasis on salinity and scarcity of water: challenges and scopes for mitigation</p> <p>Module 2: Best available techniques for the desalination of water</p> <p>Module 3: Advanced desalination techniques such as absorption desalination and biological desalination</p> <p>Module 4: Membrane separations for desalination of saline ground water and sea water: Scopes and limitations</p> <p>Module 5: Membrane materials: polymer membranes, ceramic membranes, synthesis, structure, various geometries. Pressure-driven membrane processes in the liquid phase (MF, UF, NF, RO): principles, industrial applications.</p> <p>Module 6: Hydraulic permeability, rejection rate, mass transfer limitation, concentration polarization, osmotic pressure, fouling. Module design: various module geometries, advantages and drawbacks.</p> <p>Module 7: Rejection mechanisms (I), steric hindrance, Ferry’s model, Hydrodynamic theory, tools for the characterization of membrane structural features.</p> <p>Module 8: Rejection mechanisms (II), electrostatic interactions, Space charge theory, Donnan exclusion, Theorell-Meyer-Sievers (TMS) model.</p> <p>Module 9: Tools for the characterization of membrane zeta potential / surface charge, streaming potential, streaming current.</p> <p>Module 10: Electrokinetic theory and membrane design</p> <p><b>Number of participants for the course will be limited to fifty.</b></p>
<b>You Should Attend If...</b>	<ul style="list-style-type: none"> <li>▪ You are an engineer, executive or a research scientist interested in membrane separations for desalination of water.</li> <li>▪ You are manufacturer, service provider or Government officials involved in membrane separation for desalination.</li> <li>▪ You are a student or faculty member from academic institution interested in learning membrane separation for desalination.</li> <li>▪ You are engineer or research scientist interested in hands-on training in advanced membrane separation techniques</li> </ul>
<b>Fees</b>	<p>The participation fees for attending the course is as follows:</p> <ul style="list-style-type: none"> <li>• Participants from abroad: US \$500</li> <li>• Industry/ Research Organizations: Rs. 15000.00</li> <li>• Academic Institutions (Faculty): Rs. 7000.00</li> <li>• Academic Institutions (Students): Rs. 5000.00</li> </ul> <p>➤ Students have to show the proof of their full time student enrollment in</p>

academic institute.

The above fees include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, free internet facility.

**Fee does not include accommodation and food. On request basis, participants may be provided with accommodation on payment basis.**

**Note:**

**Accommodation:**

**1. The registration fee should be sent in advance through bank draft drawn in favor of "Dean SRIC, IIT Roorkee" and payable at Roorkee latest by Oct. 14, 2018.**

**2. The Complete form along with payment may please be sent to:**

**Dr. Prasenjit Mondal, Department of Chemical Engineering, IIT Roorkee, Roorkee-247667, Uttarakhand,**

**e-mail: pmondfch@iitr.ac.in, mondal2001@gmail.com**

# The Faculty

**Prof. Dr. Anthony SZYMCZYK**



Anthony Szymczyk received his PhD in Physical Chemistry in 1999 at the University of Franche-Comté (France). He is currently Full Professor of the University of Rennes 1 (France) where he teaches Thermodynamics and Membrane processes. Prof. Szymczyk is the head of the *Chemistry and Process Engineering* group of the Institute of Chemical Sciences of Rennes - UMR CNRS 6226 (<https://iscr.univ-rennes1.fr/cip/>).

His research lies at the interface of chemical engineering, chemistry of materials and physics of condensed matter. His main research activities focus on the modeling and simulation of membrane separations for desalination and water purification, and on the physico-chemical characterization of membrane materials with applications in functionalization, fouling, ageing. He has published about 130 peer-reviewed scientific papers and book chapters on these topics. In 2015, he has been appointed as Visiting Professor at the University Nicolaus Copernicus of Torun in Poland (Chair of Physical Chemistry and Physical Chemistry of Polymers). He was a member of the council of the *European Membrane Society* (2011-2014) and he served as Vice-President in 2013 and 2014. In 2013, he was the recipient of the *IUPAC distinguished Award for Novel Materials and their Synthesis* for his work on ion transport through nanoporous membranes.



Dr. Prasenjit Mondal, is presently working as Associate Professor in the Department of Chemical Engineering, Indian Institute of Technology Roorkee, India, since April 2014. He joined the institute in 2009 as Assistant Professor. He has also worked as Process Engineer in industry for two years; as scientist in Centre for Scientific and Industrial Research, India for three years before joining IIT Roorkee.

His area of research is Energy and Environmental Engineering (Water/wastewater treatment through physicochemical and biological routes, waste to energy conversion, oil from algae, energy from coal, biomass and wastes, life cycle assessment). He has handled number of R&D projects sponsored by Industry, Govt. of India and International Agencies. He is involved in two international projects under Australia India Strategic Research Fund and Indo-France Water Network Scheme. He has published two books and more than 150 papers in international journals and conference proceedings. He has offered an online course "Waste to Energy Conversion" under NPTEL, MHRD, Govt. of India. He is the recipient of NTSE scholarship, MHRD fellowship, Govt. of India and S.J. Jindal Trust's scholarship and 3-year membership award of American Chemical Society. He has been appointed as Visiting Professor at University of Saskatchewan, Canada in 2018. He is a reviewer for several international journals in energy and environmental area. He is a life member of the Indian Institute of Chemical Engineers.

## Course Co-ordinator

**Dr. Prasenjit Mondal**

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<http://www.gian.iitkgp.ac.in/GREGN>

Indian Institute of Technology Roorkee

Registration Form

**Membrane Separations for The Desalination of Water: Materials, Processes,  
Applications and Transport Theory**

**(MHRD Scheme on Global Initiative on Academic Network (GIAN))**

**October 29 – November 02, 2018**

- Name .....
- Designation .....
- Affiliation .....
- Address for Correspondence .....  
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- Email: .....
- Phone No: .....
- Accommodation required: **Yes / No**
- Type: Hotel/Hostel/Guest House (accommodation shared basis may be available @Rs. 500/  
per day)
- Cheque/DD No. ....
- Dated ..... for Rs. ....

Date

Signature of the participant

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e-mail: pmondch@iitr.ac.in, mondal2001@gmail.com**