

Desalination Technology

Module Code:	CPE7002-B
Academic Year:	2018-19
Credit Rating:	20
School:	Department of Chemical Engineering
Subject Area:	Chemical and Process Engineering
FHEQ Level:	FHEQ Level 7 (Masters)

Pre-requisites:

Co-requisites:

Contact Hours

Type	Hours
Independent Study	152
Lectures	36
Tutorials	12

Availability Periods

Occurrence	Location/Period
BDA	University of Bradford / Semester 1 (Sep - Jan)

Module Aims

The aim of this module is to provide you with a detailed technological understanding of strategically important issue of sustainable production of freshwater via different desalination methods.

Outline Syllabus

Water demand & supply, multistage flash desalination, evaporative desalination, reverse osmosis desalination, freeze desalination, solar desalination, fouling, non-condensable gases, scaling, energy recovery, environmental pollution, costing, modelling & optimisation.

Module Learning Outcomes

On successful completion of this module, students will be able to...

- 1 Explain the global water demand and supply
- 2 Critically evaluate the alternative technologies for sustainable fresh water production
- 3 Apply knowledge of mass and energy balance in modelling thermal and membrane based desalination processes
- 4 Apply the optimisation techniques to trade-off between design and operation of desalination processes with maximum energy recovery
- 5 Analyse and assess the effect of brine disposal on marine life
- 6 Develop skills in process modelling and optimisation

Learning, Teaching and Assessment Strategy

1. Interactive lectures to provide the state of the art knowledge on desalination technologies;
2. Directed learning-students will be referred to books, journals in each sub topics of desalination so that they can build up their knowledge to take part effectively in interactive lecture sessions. In the interactive sessions, students are paired up to discuss their understanding of the topics amongst themselves for 5 minutes and their learning with the rest of the class. They pair up again with different partner and do the same thing. Each 2 hrs lecture will have about 1 hr of interactive sessions.
3. Tutorial sessions are used to carry out hand calculations on reverse osmosis (RO) process and single stage flash (SSF) desalination process. The students analyse the system equations, degrees of freedom and specifications in an interactive mode (through peer support). Dynamic process models for the systems are developed in the classroom together with the students.
4. Laboratory experiments are carried out on reverse osmosis (RO) to learn and demonstrate (via the group report) the impact of design and operation parameters on the recovery of freshwater from saline water. In the computer lab sessions, the students will develop the mathematical model for the RO process. The model predictions are then compared with the experiments and they study the reasons for any plant-model mismatch in group. Through background reading (directed learning) and tutorial support during lab sessions the students learn how to mitigate plant-model mismatch.
5. The students develop SSF model using modelling software (gPROMS) check the model predictions against their hand calculations and then they extend the model for Multi Stage Flash (MSF) desalination process and study the interactions of design and operation parameters on the recovery of fresh water. These lab sessions are interactive where the tutor and the students support each other.

Coursework - Portfolio of Different Activities.

1. To write a group report (as part of the coursework) on water demand forecast, energy consumption and recovery. Formative assessment will be provided via classroom

discussions.10% Weighting. Feedback in Week 6 on the report. Assess LO1-2, LO5

2. Experimentation with RO based desalination process. Evaluation of water and salt permeability constants. To write a group lab report based on experimentation in Week 7 or 8. Submission of group Lab Report. Weighting 30%. Assess LO 3. Formative assessment will be carried out during the lab session.

3.10 minutes PowerPoint presentation on group/individual report (see item 1) and lab report (item 2). Weighting 15%. Feedback in Week 11. Assess LO1,2,3

3. To write a full report modelling, simulation, design and operation optimisation, fouling, energy consumption for both RO and MSF desalination processes. The report must contain critical analysis of your observations and findings. Weighting 45%. Submission in week 12. Feedback in week 2 Semester 2. Assess LO3-4,6. Formative assessment will be carried out during computer lab sessions.

Mode of Assessment

Type	Method	Description	Length	Weighting	Final Assess'
Summative	Presentation	Presentation on Tasks 1 and 2	10 minutes	15%	No
Summative	Coursework	Group Lab Report		30%	No
Summative	Coursework	Group Report		10%	No
Referral	Coursework	Individual Report	-4000 words	100%	Yes
Summative	Coursework	Individual Report 1500 words and computer models		45%	Yes

Legacy Code (if applicable)

ENG4105D

Reading List

To view Reading List, please go to [rebus:list](#).