UNIVERSITY of BRADFORD

Module Descriptor

Module Details	
Module Title	Mass Transfer Operations
Module Code	CPE5004-B
Academic Year	2020/1
Credits	20
School	Department of Chemical Engineering
Subject Area	Chemical and Process Engineering
FHEQ Level	FHEQ Level 5
Pre-requisites	N/A
Co-requisites	N/A

Contact Hours	
Type	Hours
Laboratories	6
Online Lecture (Synchronous)	42
Online Tutorials (Synchronous)	12
Directed Study	140

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Academic Year

Module Aims
To introduce the basic principles of chemical engineering separation processes and mass transfer and then proceed to study the design and operation of separation processes units operation such as distillation, gas-liquid absorption and stripping, liquid-liquid extraction, adsorption and crystallisation.

Outline Syllabus
Distillation (binary and multi-component). Calculation of number of plates, column height and diameter, heat transfer in condenser and reboiler. Crystallisation; application, theory, basic principles, super-saturation effects. Gas absorption including application, different types of equipment in industry, process design of a column to find the height and diameter of the column, required solvent flow rate. The concepts and procedure for their calculation of the number of theoretical stages, height of theoretical stages, number of theoretical and height of theoretical units will be explained. Liquid-solvent extraction when the phases are immiscible, including application, different types of equipment in industry, solvent selection, process design of a column to find the height and the diameter of the column and the required solvent flow rate. The concepts and procedure for their calculation of number of theoretical stages, height of theoretical stages, number of theoretical and height of theoretical units will be explained. Liquid-solvent extraction when the phases are miscible, including application, different types of equipment in industry, solvent selection, process design of counter-current and cross flow stage wise operations to find the number of stages to meet operation constraints.

Learning Outcomes	
Outcome Number	Description
01	Explain the physical phenomena, theoretical concepts and design aspects of mass transfer in separation processes, including distillation, gas-liquid absorption, gas-solid adsorption, liquid-liquid extraction and crystallisation.
02	Analyse the important separation processes of distillation, gas absorption, adsorption, liquid-liquid extraction and crystallisation and carry out design calculations appropriately of the above processes.
03	Apply simplifying assumptions to complex problems in order to gain useful design information individually and in a team.
04	Communicate (written and verbal) outcome of practical work.

Learning, Teaching and Assessment Strategy

BLENDED DELIVERY: Lectures and tutorials will be given online via zoom enabling interaction through the chat command, questions the instructors will answer. Students will also be encouraged to post questions on Canvas or by emails. Answers will be posted on Canvas together with copies of the presentation and recorded videos of the lectures/tutorials.

As the coursework is laboratory based, students will arrive to the lab in groups (no more than 4, social distanced appropriately) to observe the Distillation rig and Absorption rig in operation, explained by the Instructors who will show what manipulations normally are required to collect the readings as well as to carry out the risk assessment prior to operation. Videos of these sessions will be taken and posted together with the lab brief to guide the students in completing their reports. A quiz will be included in the package to ensure that the students have reviewed the videos. Different groups will have different quizzes.
Training in the use of software ASPEN will be carried out with the students at the university, space-grouped appropriately in our large IT rooms. This training will consist of 2 x 2hr sessions in Weeks 5 and 6 of the Semester.

Assessment will be by open book examination, online, undertaken under the conditions (start and submission time) as prescribed by the university, and group course work. The examination part weighting is 70% and the course work weighting is 30%.

Preparation for the examination will be conducted in Week 12 of the Semester via an online zoom session videoed and posted on Canvas together with past examination questions. Throughout the semester, solutions to tutorial examples will be explained and posted on Canvas.

The coursework consists of 2 critical reports of the group laboratory experiments one on Distillation and one on Gas Absorption. The reports must include design and operation elements as well critical evaluation of the data collected. The coursework is worth 30% and students will have two weeks to complete it. Summative peer evaluation will be taken into account when calculating the individual mark for the coursework. The average mark of the two reports will constitute the Course Work mark.

Mode of Assessment

Type	Method	Description	Length	Weighting
Summative	Examination - Open Book	Online examination. Students required to answer 3 questions from 4 on the entire curriculum	N/A	70%
Summative	Coursework	2 Written Report (1500 words); Supp Individual reports	N/A	30%

Reading List

To access the reading list for this module, please visit https://bradford.rl.talis.com/index.html

Please note:
This module descriptor has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but minor changes may occur given the interval between publishing and commencement of teaching. Upon commencement of the module, students will receive a handbook with further detail about the module and any changes will be discussed and/or communicated at this point.
