UNIVERSITY of BRADFORD

Module Descriptor

Module Details	
Module Title	Transport Processes
Module Code	CPE5008-B
Academic Year	2024/5
Credits	20
School	School of Engineering
FHEQ Level	FHEQ Level 5

Contact Hours	
Type	Hours
Lectures	42
Tutorials	12
Laboratories	6
Directed Study	140

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

Module Aims

This module provides an introduction to heat transfer, fluid flow and particle mechanics with an emphasis on the fundamentals. The objective is to cover the basic concepts and their applications in the process industries. Students will learn to design and analyse heat exchangers, fluid flow systems and equipment handling fluid-particle systems such as filters, gas cyclones, sedimentation tanks etc.

Outline Syllabus
1) Free settling of solid particles, cyclone separation. 2) Hindered settling of solid particles and applications to design of continuous thickeners. 3) Flow through porous media granular beds. 4) Mechanisms and analysis of heat transfer. 5) Analysis of convection. 6) Filtration and flow through filter media. 7) Gas Cyclone design and operation; design of mixing vessels. 8) Basic heat transfer mechanisms including conduction, convection and radiation 7) Thermal resistance, composite wall heat transfer and heat transfer in composite cylinders 8) Analysis of forced convection. 9) Heat transfer in boiling, evaporation and condensation. 10) Design of heat exchangers and HE networks

Learning Outcomes	
Outcome Number	Description
01	Explain the function of heat exchangers, fluid flow systems and equipment handling fluid-particle systems such as filters, gas cyclones, sedimentation tanks.
02	Apply the principles of heat transfer, fluid and particle design and be able to apply these principles to the design and analysis of simple processes.
03	Measure and critically evaluate heat transfer systems.
04	Analyse and solve problems related to design of heat transfer, fluid and particle flow equipment.
05	Interpret data, use scientific method to solve problems systematically.

Learning, Teaching and Assessment Strategy

Theory, implementation, application and critical analysis are gained through interactive lectures, tutorials, case studies (LOs 1,2,4) and practical laboratory and design experiments with additional input from guest industrial speakers. The learning materials (lecture notes, tutorial questions and laboratory experiments) are designed to provide a coherent path from fundamental engineering principles to applications and design of industrial processes. Face-to-face tutorial meetings with individual groups will be set up to provide further support and guidance, as appropriate.
Engineering application and evaluation is gained from laboratory practical sessions. (These will take place as demonstrations in small groups performed in small groups), with video recordings of each experiment provided online together with a sample data set for analysis. and the subsequent analysis and discussion of the recorded data will be assessed by group reports (LOs 3 & 5). Formative feedback will be provided during the practical laboratory sessions.
There will be regular online tutorial sessions and formative feedback will be provided during these sessions with the aid of worked example problems. An exam revision session will also be provided which will include model solutions of exam-style questions.
The directed study provides students with the opportunity to undertake guided reading and to develop their portfolio of learning to enhance transferable skills and knowledge relating to the evaluation of their role and subject provision.

Assessment of student's ability to explain and apply the principles of heat transfer and fluid and particle design, critically evaluate and predict the behaviour of flow and heat transfer in simple engineering applications and analyse and solve related problems will be assessed by a closed book examination at the end of the module.
The ability to collect, analyse and interpret scientific data, evaluate heat transfer and fluid and particle systems and relate findings to real engineering processes will be assessed by written laboratory group reports based on operations and design of heat exchangers, cooling towers, sedimentation and fluidised bed experiments. The expected length of each report is about 1,500 words and should include aspects of scale-up and applications in real engineering processes. Laboratory reports will be moderated by peer review.

Mode of Assessment

Type	Method	Description	Weighting
Summative	Laboratory Report	One group laboratory report based on sedimentation and one on fluidised beds. (operation and design)	15%
Summative	Laboratory Report	One group laboratory report based on cooling tower and one on heat exchangers. (operation and design)	15%
Summative	Examination - Closed Book	Students required to answer 3 questions from 5 (heat transfer) (1.5hours)	35%
Summative	Examination - Closed Book	Students required to answer 3 questions from 5 (fluid and particle mechanics) (1.5 hours)	35%

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.

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