School of Engineering

Division of Chemical and Energy Engineering (CEE)

Module Guide

Module title:

CHEMICAL ENGINEERING DESIGN AND PRACTICE
ENG_5_475

Level: 5

Module Leader: Dr Fatemeh Jahanzad
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Assessment of the module

The module is assessed by closed book examination 30% and coursework 70%.

Examination

The examination will be held in May 2020[1].

Coursework

Component	Hand out date	Hand in date	Feedback date
Heat Exchanger Design 20%	04/02/2020	03/03/2020	24/03/2020
Process Design 30%	04/03/2020	02/04/2020	27/04/2020
Process Simulation 20%	03/04/2020	14/05/2020	04/06/2020

Feedback guideline

Feedback will normally be given to students within 15 working days after the final submission of an assignment or as advised by their module leader.

General feedback, applying to all students, will also be placed on the module VLE site within 15 working days.

[1] The examination timetable will be circulated late in 2019 for January exams and around Easter 2020 for May exams.

What skills you will develop in this module

Knowledge and Understanding

- Understand the concept and principles of process design for chemical processes.

Intellectual Skills

- Apply the principles of process design to a specified plant design task.
- Analyse the project outputs, for example, for economic viability and process safety.

Practical Skills

- Apply a simulation computer package to simulate chemical processes.

Transferable Skills

- Exercise teamwork as a team member or leader.
- Enhance problem-solving and communication skills.

Short description of the module

In this module students learn and practice different aspects of process design, including flowsheets and associated calculations (mass and energy balances), methods of estimation of process costs (such as capital costs, operating costs, payback time and cash flow analysis), equipment design (heat exchanger), and pinch analysis.

Process simulation and optimisation using HYSYS software is exercised.

Basic concepts of project management is also introduced.

A visit to chemical plants will be arranged (subject to availability) to give the students an idea of how they work.

Evaluation of the module

This course is assessed using Module Evaluation Questionaires (MEQs). There is also the opportunity to provide feedback on the module at the student-staff course board meetings.

Learning resources

Reading List

1. R K Sinnott, Coulson & Richardson's Chemical Engineering, Volume 6 (Design), (4th Ed.), Butterworth-Heinemann, 2005.
2. Chemical Process Technology; Moulijn, Makkee, van Diepen; Wiley; 2001
3. R.M.Felder & R.W.Rousseau, Elementary Principles of Chemical Processes, (3rd Ed.), Wiley, 2000.
4. R Smith, Chemical Process Design and Integration, Wiley 2005
5. MS Peters, KD Timmerhaus, Process Design and Economics for Chemical Engineers (5th Ed.), McGraw-Hill, 2002.

ADDITIONAL INFORMATION

Module Title:	CHEMICAL ENGINEERING DESIGN AND PRACTICE
Module Level:	5
Module Reference Number:	ENG_5_475
Credit Value:	20
Student Study Hours:	132
Contact Hours:	68
Private Study Hours:	
Pre-requisite Learning:	Introduction to Chemical and Petroleum Engineering
Course(s):	MEng/BEng Chemical and Process Engineering
Year and Semester:	Year 2, Semester 2
Module Coordinator:	Dr Fatemeh Jahanzad
MC Contact Details:	jahanzaf@lsbu.ac.uk ; Room FW-303
Teaching Team & Contact Details:	Dr Anna Axelsson a.k.axelsson@lsbu.ac.uk ; Room FW-309 Dr Donglin Zhao zhaod2@lsbu.ac.uk ; Room FW-301
Subject Area:	Chemical Engineering
Summary of Assessment Method:	Unseen examination 30%; Coursework project reports 70%
External Examiner appointed for module:	Details of the external examiner appointed can be obtained from the course director.

Aims of the module

- To introduce the principles of the process design, flowsheeting and flowsheet calculations
- To introduce project management, process economics and concepts such as capital and operating costs, payback time and cash flow analysis
- To introduce heat exchanger design and application of pinch analysis in the process industries
- To introduce process simulation and optimisation using HYSYS software

Introduction to studying the module

Overview of the Main Content

- Process design; PFD development; Mass and energy calculations
- Introduction to P&ID
- Heat exchanger design and introduction to pinch analysis
- Process simulation using HYSYS software
- Process economics; Capital and operating costs, profit, payback time, cashflow analysis

Overview of Types of Classes

The module will be delivered by mixture of lectures, problem solving and computer practical classes.

Lecture notes will be disseminated via Moodle. Access to these notes will be staged through the semester.

Lectures on Process Design (Dr F Jahanzad): 1.5h/w, 9 weeks
Lectures on Heat Exchangers (Dr A Axelsson): 2h/w, 7 weeks
Lectures on Process Economics (Dr A Axelsson): 2h/w, 5 weeks
Workshop on Process Simulation (Dr D Zhao): 2h/w, 9 weeks

Coursework
1. Dr A Axelsson - Heat exchanger design (20%): Designing a shell and tube heat exchanger using given technical data and design specifications, and applying project management tools.
2. Dr F Jahanzad - Process design (30%): Designing the PFD for a simplified chemical process using given technical data and design specifications, carrying out mass and energy balances, degrees of freedom analysis, and control philosophy to design a simple P&ID, identifying main safety, health and environmental (SHE) hazards of major chemicals. Presenting a Power Point presentation.
3. Dr D Zhao - Process simulation (20%): Simulation of a given chemical process using HYSYS, optimisation and sensitivity analysis by case study.

Importance of Student Self-Managed Learning Time

- Student responsibility in the learning and development process will be emphasised.
- Students are required to undertake directed self-study and prepare solutions/discussions to questions relative to various topic areas.
- Students will be encouraged to identify for themselves particular problems of difficulty and to use seminar discussions, where appropriate, for the resolution of these.
- Students must regularly access the Moodle site for this module. They should download the class/lecture material from the Moodle site, and do the recommended reading, before each lecture/class.
- Where appropriate, students are also expected to download relevant questions and study them.

Employability

Chemical Industries.