Chemical and Biochemical Processes

Department of Chemical Engineering, School of Chemical Engineering

College of Engineering and Physical Sciences

Details

Code 17043

Level of study First Year

Credit value 10

Semester 2

Pre-requisite modules 03 17299 Chemistry for Engineers

Other pre-requisites None

Module description

This module introduces some fundamental aspects of chemical and biochemical processing, focusing on reactor design and phase behaviour. The content of the first part of the module concerns reaction engineering, including kinetics, reactor types, simple contacting schemes and how to create the right conditions for efficient conversion of reactants into products. Lectures are also given on the basic concepts and language of biology, to equip students with an understanding of biochemical, food and environmental engineering examples that are embedded later in this module and elsewhere in the programmes. The second part of the module focuses on biochemical reaction engineering and an introduction to vapour-liquid equilibria and phase diagrams.

Topics covered in this module are the fundamentals of microbiology, biological molecules, enzyme action, metabolism, and molecular biology; the kinetics of chemical and biochemical reactions (including reaction stoichiometry, conversion and yield; kinetics and equilibrium of reactions); the rate equation and kinetic equations for different reaction types (including enzyme catalysed systems); the sizing of simple reactors and reactors in series. The thermodynamic basis of binary component vapour-liquid equilibrium, equations of state and mixing rules are also covered. The phase diagram part includes physical transformation of substances, simple mixtures, temperature composition diagrams and liquid-solid phase diagrams. Examples will be drawn from a range of industrial applications including the manufacture of chemical and biological products.
The prerequisite for this module is Year 1 Chemistry for Engineers, as the thermodynamics and kinetics are developed from the physical chemistry presented in that module. The module complements material covered in the Transport Phenomena theme (Year 1 Fluid Flow, Thermodynamics and Heat Transfer), where thermodynamics is approached from an engineering standpoint. This module is a prerequisite for the following Year 2 modules: Mass, Heat and Momentum Transport, Reactors and Catalysis, and Process Integration and Unit Operations.

Teaching and learning methods

Lectures, problem solving classes and computer laboratories (including computer aided formative assessment), supplemented with guided learning of mathematics.

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