## Module Details

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<tr>
<th>Module Details</th>
<th>Module 2: Practical Fundamentals of Chemical Engineering (for non-Chemical Engineers)</th>
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<tr>
<td>Nominal duration</td>
<td>2 weeks (24 hours total time commitment)</td>
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<td>This time commitment includes the preparation reading, attendance at each webinar (1 hour plus 15-30 minutes for discussion), and the time necessary to complete the assignments and further study.</td>
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## Module Purpose

This module covers the fundamental concepts of chemical engineering and is aimed at providing non-chemical engineers with sufficient background to confidently converse with chemical engineers and work with process equipment.

## Pre-Requisites

- Module 1

## Assessment Strategy

To evaluate the achievement of the learning outcomes; written assignments, group projects and practical exercises are set.

## Summary of Learning Outcomes

1. Examine and illustrate the basics of:
   - (a) Process diagrams
   - (b) Stoichiometry
   - (c) Fluid mechanics
   - (d) Heat transfer
   - (e) Mass transfer and its applications
   - (f) Chemical Engineering Thermodynamics
   - (g) Chemical Kinetics
   - (h) Process equipment design
### Learning Outcome 1
Examine and illustrate the basics of:
(a) Process diagrams
(b) Stoichiometry
(c) Fluid mechanics
(d) Heat transfer
(e) Mass transfer and its applications
(f) Chemical Engineering Thermodynamics
(g) Chemical Kinetics
(h) Process equipment design

### Assessment Criteria

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<tr>
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<th>1.1</th>
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<tr>
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<td>Examine the following:</td>
<td>Examine and outline the basics of stoichiometry, with reference to:</td>
<td>Examine and outline the basics of fluid mechanics, with reference to:</td>
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<tr>
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<td>(a) Process Flow Diagrams (PFDs)</td>
<td>(a) Dimensions and legends</td>
<td>(a) Fluid statics</td>
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<td>(b) Piping and Instrumentation (P&amp;I) diagrams</td>
<td>(b) Processes and process legends</td>
<td>(b) Fluid flow equations</td>
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<td>(c) Flow sheet process legends</td>
<td>(c) Basic chemical calculations</td>
<td>(c) The flow of compressible fluids</td>
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<td>(d) Material balance</td>
<td>(d) Transporting and metering</td>
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<td>(e) Energy balance</td>
<td>(e) Agitation and mixing</td>
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| 1.4 | Examine and outline the basics of heat transfer, with reference to:  
- (a) Conduction in solids  
- (b) Heat flow in fluids  
- (c) Heat transfer to fluids  
- (d) Heat transfer by radiation  
- (e) Heat exchange  
- (f) Evaporation |
| 1.5 | Examine and outline the basics of mass transfer, with reference to:  
- (a) Distillation  
- (b) Leaching  
- (c) Extraction  
- (d) Diffusion  
- (e) Absorption  
- (f) The drying of solids |
| 1.6 | Examine the basics of Thermodynamics, with reference to:  
- (a) Fundamental quantities  
- (b) Volumetric properties of pure fluids  
- (c) Heat effects  
- (d) Phase equilibrium  
- (e) Chemical reaction equilibrium  
- (f) Conversion of heat into work by means of power cycles  
- (g) Refrigeration  
- (h) Liquefaction |
1.7 Examine and outline the basics of chemical kinetics, with reference to:
(a) Basic definitions
(b) Reactor design
(c) Mixing of fluids
(d) Fluid particle reactions
(e) Solid-catalyst reactions

1.8 Examine and outline the basics of process equipment design, with reference to:
(a) Vessels
(b) Heat exchangers
(c) Evaporators and crystallizers
(d) Agitators
(e) Filters
(f) Dryers
(g) Safety issues
(h) Instrumentation
(i) Control

**Delivery mode**

A combination of asynchronous and synchronous e-learning delivery comprising a judicious mix of interactive online web conferencing, simulation (virtual labs) software, remote online labs, online videos, PowerPoint slides, notes, reading and study materials (in PDF, HTML and Word format) accessed through the Moodle Learning Management System (LMS).