

| Module Details |                                    |
|----------------|------------------------------------|
| Module Title   | Reaction Engineering               |
| Module Code    | CPE5005-B                          |
| Academic Year  | 2021/2                             |
| Credits        | 20                                 |
| School         | Department of Chemical Engineering |
| FHEQ Level     | FHEQ Level 5                       |

| Contact Hours                  |       |
|--------------------------------|-------|
| Type                           | Hours |
| Lectures                       | 36    |
| Tutorials                      | 18    |
| Laboratories                   | 6     |
| Practical Classes or Workshops | 2     |
| Directed Study                 | 138   |

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

| Module Aims                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| To deliver a comprehensive understanding of the methodology of linking chemical kinetics with material and energy conservation in the design of idealised homogeneous and heterogeneous chemical reactors operating both in batch and continuous modes and under both isothermal and non-isothermal conditions. |

| Outline Syllabus                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Chemical Kinetics: rate equations and reaction rate constant; activation energy, its determination and interpretation; Arrhenius law; reaction kinetics of complex heterogeneous reactions; consecutive and competing reactions and rate determining steps; catalysis.</p> <p>Reactors: Modelling of basic reactor types; derivation of mass and energy equations for batch, tubular and continuous flow stirred tank reactors under isothermal and non-isothermal conditions; heterogeneous reactors including basic principles of packed bed and fluidised bed catalytic reactors, reactors in series; transient operations of continuous stirred tank reactors; non-ideal flow behaviour; resident time distributions and their interactions with reaction kinetics.</p> |

| Learning Outcomes |                                                                                                                                                                       |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Outcome Number    | Description                                                                                                                                                           |
| 01                | Apply knowledge of reaction engineering and reactor types.                                                                                                            |
| 02                | Apply the principles of reaction engineering and mass and energy balances to the design and analysis of simple reactor system.                                        |
| 03                | Measure and critically evaluate reactor design and systems; predict the conversion, temperature dependency, behaviour of reactors in simple engineering applications. |
| 04                | Develop analytical skills, problems solving skills and design skills related to reaction engineering.                                                                 |

| Learning, Teaching and Assessment Strategy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Theory, implementation, application, critical analysis is gained through lectures, tutorials, Aspen Hysys computer workshop, e-learning, peer feedback (lab session), case studies and directed study. Engineering application and evaluation is gained from three separate lab sessions.</p> <p>Both formative and summative assessment. Formative assessment using online quizzes mainly on of understanding and application. Summative assessment on critical analysis by examination; assessment of engineering application assessed by two separate laboratory coursework. The laboratory reports will be moderated by peer review.</p> <p>Note that due to current COVID19 pandemic, the module uses a blended approach to support learning and achievement. These will include attending lab activity in a shorter time, i.e. 1 hour, short video records that address key concepts, supplementary learning materials. Online tutorials will also be used to support learning and monitor progress as student move through the curriculum. Several online quizzes through the year and one formative assessment at the end of sem1.</p> <p>Supplementary assessment as original.</p> |

| Mode of Assessment |                           |                                                                                                          |           |
|--------------------|---------------------------|----------------------------------------------------------------------------------------------------------|-----------|
| Type               | Method                    | Description                                                                                              | Weighting |
| Summative          | Examination - Closed Book | Students required to answer questions by showing detailed calculations (2 Hrs)                           | 70%       |
| Summative          | Laboratory Report         | Two separate group laboratory report of 1500 words excluding tables, figures, appendices and references. | 30%       |
| Formative          | Examination - MCQ         | Minimum 4 quizzes (online) or paper based (formative)                                                    | N/A       |
| Formative          | Examination - MCQ         | Minimum 4 quizzes (online) or paper based (formative)                                                    | N/A       |

| Reading List                                                                                                                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| To access the reading list for this module, please visit <a href="https://bradford.rl.talis.com/index.html">https://bradford.rl.talis.com/index.html</a> |

*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.*

---

© University of Bradford 2021

<https://bradford.ac.uk>