Proposed New Unit:  
ENSC3006 Chemical Process Thermodynamics and Kinetics

Please note that this unit is not yet approved.

Unit Information

Title: Chemical Process Thermodynamics and Kinetics  
Level: 3  
Type: Undergraduate in major(s)  
Faculty: Engineering, Computing and Mathematics
Contact: Associate Professor Hong Yang (hyang@mech.uwa.edu.au)
Proposed: 14/12/2011

Code alpha prefix: ENSC  
First year of offer: 2013
Credit points: 6  
Workload hours: 150

Broadening categories:  
☐ Broadening Category A  
☐ LOTE  
☑ Study Abroad

☒ Broadening Category B

☒ Elective

Academic information

Unit Content: This unit will provide the cornerstone and foundational materials needed for a robust and solid Chemical Engineering Program. Upon completion of this unit, students will be well placed to take higher level advanced units. Specifically students will be trained in the equation of state of real gases, Maxwell relations, Phase equilibria: Problem formulation, Fugacity, Phase diagrams, Chemical reaction equilibria, Reaction kinetics and mechanisms, and Introductory reactor designs

Outcomes: On Completion of this unit students will be able to:  
1. Use the equations of state for real gases to obtain thermodynamic properties.  
2. Understand the interrelationship between thermodynamic properties.  
3. Determine the thermodynamic properties of species in mixtures, the criteria for phase and chemical reaction equilibrium and chemical reaction equilibrium, how species distribute among phases, and extent of product syntheses in a chemical reaction.  
4. Develop a good understanding of the theory and fundamental governing chemical reaction processes.  
5. Appreciate the virtues of different reactor design.

Assessment items: Two Laboratory classes, two assignments and a final examination  
Each of the two laboratory classes will carry 10% of the total marks. Each of the two assignments will also carry 10% of the total marks. The final 2 hour open book examination will carry 60% of the total marks.

Assessments tied to outcomes: Two formative assignments, one for the Thermodynamic aspect and another for the Kinetic and Reactor Design aspect, will be meted out to strengthen students' understanding. Two laboratory classes, one on Thermodynamic and one on Kinetic, will be arranged. Students are required to submit formal reports to deepen their understanding and to hone their professional communication skills, following IChemE stipulations.

Teaching and Learning Practices: Lectures, tutorials and laboratory classes

Curriculum from existing units

Unit codes: CHPR2431 Chemical Engineering Thermodynamics and CHPR3432 Chemical Kinetics and Reactor Design
Details: CHPR2431 Chemical Engineering Thermodynamics and CHPR3432 Chemical Kinetics and Reactor Design are no longer being offered

Offerings

Quota: No quota proposed.
### Prerequisites

### Corequisites
- Nil.

### Incompatibilities
- CHPR2431 Chemical Engineering Thermodynamics

### Teaching Responsibilities

### Accommodation requirements

**Summary:**
- Central Teaching Spaces; Spaces currently controlled by the Faculty/School;

**Further details:**

### Funding

**Source:** Faculty/School funds

**Details:** No details provided.

### Units to be rescinded to provide resources for this one:
- Library Form Approved
  - Included in the spreadsheet summarising library requirements for ECM undergraduate units forwarded to Sciences Library November 2011

### Consultations

### Committee endorsements and approvals
Proposed New Unit:
ENSC3019 Unit Operations and Unit Processes

Please note that this unit is not yet approved.

<table>
<thead>
<tr>
<th>Unit Information</th>
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</thead>
<tbody>
<tr>
<td><strong>Title:</strong> Unit Operations and Unit Processes</td>
</tr>
<tr>
<td><strong>Level:</strong> 3</td>
</tr>
<tr>
<td><strong>Type:</strong> Undergraduate in major(s)</td>
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<tr>
<td><strong>Faculty:</strong> Engineering, Computing and Mathematics</td>
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<tr>
<td><strong>Resp. Org. Entity:</strong> ECM Office (00609)</td>
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<tr>
<td><strong>Contact:</strong> Assistant Professor John Boxall and Assistant Professor Thomas Rufford (<a href="mailto:john.boxall@uwa.edu.au">john.boxall@uwa.edu.au</a>)</td>
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<tr>
<td><strong>Proposed:</strong> 14/12/2011</td>
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<td><strong>Code alpha prefix:</strong> ENSC</td>
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<td><strong>Broadening categories:</strong> Broadening Category A, LOTE, Study Abroad, Broadening Category B, Elective</td>
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</tbody>
</table>

**Academic information**

**Unit Content:** This unit covers the introduction of the mass and heat transfer principles as it applies to typical unit operations. The topics will include: (1) heat exchangers, (2) distillation, (3) multi-effect evaporators, (4) liquid-liquid and gas-liquid extraction, (5) solid-liquid separation, (6) refrigeration, (7) dehydration, and (8) cooling towers. It also includes applications of the unit operations in the process of LNG production and re-gasification.

**Outcomes:** On completion of this unit, students will be able to:

- Explain the basic science and working principles of unit operations.
- Apply the basic knowledge and skills for designing various mass and heat transfer operation units.
- Perform quantitative analysis of the process operation units including scaling up/down for different applications.
- Perform basic simulations of unit operations using commercial software packages.
- Conduct diagnosis and trouble-shooting of operation units.

**Assessment items:** This comprises two laboratory reports, two equipment sizing assignments with a related in-class quiz, and a final examination.

**Assessments tied to outcomes:** Two laboratory reports two equipment sizing assignments with a related in-class quiz (40%), A final examination (60%)

**Teaching and Learning Practices:** 1 x 3hr lecture per week per semester 2 x 1.5hr labs

**Technologies:**

**Curriculum from existing units**

<table>
<thead>
<tr>
<th>Unit codes</th>
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<tbody>
<tr>
<td>CHPR3530 Process Modules</td>
<td>CHPR3530 Process Modules is being replaced by Unit Operations and Unit Processes</td>
</tr>
</tbody>
</table>

**Offerings**

**Quota:** No quota proposed.

**Unit rules**

**Prerequisites:** ENSC3005 Mass and Energy Balances or CHPR2530 Process Fundamentals

**Corequisites:** ENSC3006 Chemical Process Thermodynamics and Kinetics
### Incompatibilities:
- CHPR3530 Process Modules

### Teaching Responsibilities

### Accommodation requirements

<table>
<thead>
<tr>
<th>Summary</th>
<th>Lecture theatre and dedicated laboratories.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types</td>
<td>Central Teaching Spaces; Spaces currently controlled by the Faculty/School;</td>
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<tr>
<td>Further details</td>
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### Funding

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<td>CHPR3530</td>
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</table>

### Consultations

- Library: ✔️ Library Form Approved
  - Included in the spreadsheet summarising library requirements for ECM undergraduate units forwarded to Sciences Library November 2011

### Committee endorsements and approvals
18 April 2011

W/Prof Grady Venville
Chair, Interim Board of Studies for Science

Dear Grady

PROPOSED CHANGES TO THE PATHWAY TO CHEMICAL ENGINEERING IN THE ENGINEERING SCIENCE MAJOR AND UNATTACHED ELECTIVES

After extensive stakeholder consultation the Discipline Leader for Chemical and Process Engineering has proposed the following changes to the pathway to Chemical Engineering:

1. That the complementary unit CHEM1001 Chemistry - Properties and Energetics be replaced with the complementary unit CHEM1002 Chemistry - Structure and Reactivity.

2. That a new Level 3 core unit Chemical Process Thermodynamics and Kinetics be introduced.

3. That the core unit Introduction to Reaction Engineering be replaced by a new Level 3 unattached elective unit entitled Unit Operations and Unit Processes.

4. That the Level 3 unit entitled Process Design and Synthesis be renamed as Process Synthesis and Design and made an unattached elective unit.

The following table summarises the proposed changes.

<table>
<thead>
<tr>
<th>Original</th>
<th>Proposed</th>
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<tbody>
<tr>
<td>Core Units</td>
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<tr>
<td>Fluid Mechanics</td>
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<tr>
<td>Mass and Energy Balances</td>
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<tr>
<td>Heat and Mass Transfer</td>
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<tr>
<td>Introduction to Reaction Engineering</td>
<td>Chemical Process Thermodynamics and Kinetics</td>
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<td>Chemistry - Properties and Energetics</td>
<td>Chemistry - Structure and Reactivity</td>
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<table>
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<tr>
<th>Unattached Electives</th>
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<td>Process Design and Synthesis</td>
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<td>Unit Operations and Unit Processes</td>
<td></td>
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</tbody>
</table>

I have included a letter from the Discipline Leader providing the rationale for the changes. When interpreting this letter please note that the unattached electives, while not required to complete the major, are required before a student can complete the Masters programme. If the student does not
pick these up as electives during their undergraduate programme they will be required to take them as part of a Masters Prelim.

While understanding the urgency of stabilising the 2012 offerings, I would be grateful if the Board would give consideration to these proposed changes.

Sincerely

Prof Cara MacNish
Deputy Dean (Education)