# CHEN20011 Chemical Process Analysis

**Credit Points:** 12.5

**Level:** 2 (Undergraduate)

**Dates & Locations:**

2016, Parkville

This subject commences in the following study period/s:
Semester 2, Parkville - Taught on campus.

**Time Commitment:** Contact Hours: 24 x 1 hour lectures + 11 x 3 hour tutorials/workshops + 1 x 3 hour laboratory classes + 1 x 6 hour tools training workshop Total Time Commitment: 170 hours

**Prerequisites:**

ONE OF:

| Subject | Study Period Commencement: | Credit Points: |
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| MAST10006 Calculus 2 | Semester 1, Semester 2 | 12.50 |
| MAST10009 Accelerated Mathematics 2 | Semester 2 | 12.50 |

and ONE OF:

| Subject | Study Period Commencement: | Credit Points: |
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| CHEM10003 Chemistry 1 | Semester 1, Semester 2 | 12.50 |
| CHEM10006 Chemistry for Biomedicine | Semester 1 | 12.50 |

OR

Admission into one of the following:

MC-ENG Master of Engineering (Biochemical)
MC-ENG Master of Engineering (Chemical)
MC-ENG Master of Engineering (Chemical with Business)

**Corequisites:** None

**Recommended Background Knowledge:** Students should have completed Material and Energy Balances or be enrolled in it.

**Non Allowed Subjects:**

| Subject | Study Period Commencement: | Credit Points: |
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| CHEN20007 Chemical Process Analysis 1 | Semester 2 | 12.50 |
| CHEN20008 Chemical Process Analysis 2 | Semester 2 | 12.50 |

**Core Participation Requirements:** For the purposes of considering request for Reasonable Adjustments under the Disability Standards for Education (Cwth 2005), and Student Support and Engagement Policy, academic requirements for this subject are articulated in the Subject Overview, Learning Outcomes, Assessment and Generic Skills sections of this entry. It is University policy to take all reasonable steps to minimise the impact of disability upon academic study, and reasonable adjustments will be made to enhance a student's participation in the University's programs. Students who feel their disability may impact on meeting the requirements of this subject are encouraged to discuss this matter with a Faculty Student Adviser and Student Equity and Disability Support: <a href="http://services.unimelb.edu.au/disability">http://services.unimelb.edu.au/disability</a>

**Coordinator:** Dr Christopher Honig

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| **Contact:** | Dr Christopher Honig<br>Email: **christopher.honig@unimelb.edu.au (mailto:christopher.honig@unimelb.edu.au)** |
| **Subject Overview:** | **AIMS**<br>This subject introduces students to important chemical engineering processes both on the large plant-wide scale and at the single unit operation scale. Students learn how to read, process flow diagrams and process and instrumentation diagrams. Process measurement and instrumentation is also covered.<br>Chemical engineering thermodynamics is introduced through some of the most common quantities of temperature, pressure, enthalpy and entropy. Industrially important thermodynamic cycles are included. The importance of phase behaviour and the ability to predict the behaviour of real gases is covered as are the properties of humid air as an example.<br>Students are also introduced to steady-state and unsteady-state process simulations using simple spreadsheet packages and commercial-scale simulation packages. Being able to stimulate simple material and energy balances allows the students to optimally design processes to meet safety and sustainablility requirements. The subject will include exercises in process optimisation and the solution of ill-defined process problems.<br>This subject together with Material and Energy Balances provides the basis for all the chemical engineering subjects that follow. The calculations introduced in these subjects are the most common type of calculations performed by professional chemical engineers working in all sectors of industry.<br>**INDICATIVE CONTENT**<br>Important industry processes and unit operations. Interpretation of process flow diagrams, process and instrumentation diagrams. Commonly used process instrumentation and basic process control.<br>Thermodynamic topics include definitions of important quantities including temperature, pressure, enthalpy and entropy, thermodynamic cycles, phase behaviour, gases, liquids and vapours, P-V-T diagrams of pure substances, ideal and real gas behaviour, use of compressibility factor and generalized compressibility factor charts, equations of state, physical property estimation including vapour pressure and humidity.<br>Training in the use of a commercially-available process simulation package to perform simple material and energy balance calculations.<br>Designing for process safety and sustainability. |
| **Learning Outcomes:** | **INTENDED LEARNING OUTCOMES (ILOs)**<br>On completion of this subject the student is expected to:<br>1 Be able to model material and energy flows around reacting chemical systems using an appropriate modelling software package<br>2 Define and scope engineering problems and formulate suitable strategies for problem solution<br>3 Model real gas behaviour<br>4 Be able to develop and interpret process flow diagrams, process and instrumentation diagrams<br>5 Be able to apply basic thermodynamic relationships to real problems<br>6 Be able to discuss the principles of sustainable design and development<br>7 Be able to recognize the difference between safe and unsafe industrial practices. |
| **Assessment:** | One team based presentation with 3 to 5 team members of approximately 15 to 25 minutes, requiring 8 to 10 hours of work (5%) . ILO's 1 to 7 are addressed in this activity. Assessed in weeks 5 to 7. One written computer simulation assignments of approximately 1000 words each. Time commitment of approximately 25 - 30 hours of work including preparation (25%). ILO's 1 to 7 are addressed in these activities. Assessed in weeks 5 to 12 Attendance and participation in one laboratory classes each with a written assignment. Total time commitment of approximately 10 - 13 hours of work including preparation (10%). ILO's 1 to 5 and 7 are addressed in this activity. Assessed in weeks 6 to 11 Attendance and successful completion in MSE tools training workshop. Total time commitment of 6 hours (10%). ILO 7 addressed in this activity. One written 2-hours closed book examination (50%). Held in the end-of-semester examination period. ILO's 1 to 5 are addressed in the exam. Hurdle requirement: The examination must be passed to pass the subject. |

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| **Prescribed Texts:** | Shallcross D.C., “Physical Property Data Book for Engineers and Scientists”, IChemE, London, 2004 |
| **Breadth Options:** | This subject potentially can be taken as a breadth subject component for the following courses:<br># **Bachelor of Arts (https://handbook.unimelb.edu.au/view/2016/B-ARTS)**<br># **Bachelor of Commerce (https://handbook.unimelb.edu.au/view/2016/B-COM)**<br># **Bachelor of Environments (https://handbook.unimelb.edu.au/view/2016/B-ENVS)**<br># **Bachelor of Music (https://handbook.unimelb.edu.au/view/2016/B-MUS)**<br>You should visit **learn more about breadth subjects (http://breadth.unimelb.edu.au/breadth/info/index.html)** and read the breadth requirements for your degree, and should discuss your choice with your student adviser, before deciding on your subjects. |
| **Fees Information:** | Subject EFTSL, Level, Discipline & Census Date, http://enrolment.unimelb.edu.au/fees |
| **Generic Skills:** | # Ability to apply knowledge of basic science and engineering fundamentals<br># Ability to undertake problem identification, formulation and solution<br># Ability to utilise a systems approach to design and operational performance<br># Understand the principles of sustainable design and development. |
| **Related Majors/Minors/ Specialisations:** | Master of Engineering (Biochemical)<br>Master of Engineering (Chemical with Business)<br>Master of Engineering (Chemical)<br>Science-credited subjects - new generation B-SCI and B-ENG. |