CHEN20007 Chemical Process Analysis 1

Credit Points:	12.5
Level:	2 (Undergraduate)
Dates & Locations:	2015, Parkville This subject commences in the following study period/s: Semester 2, Parkville - Taught on campus.
Time Commitment:	Contact Hours: 36 x 1-hour lectures, 11 x 2-hour tutorials/workshops and 2 x 3-hour laboratory classes Total Time Commitment: 170 hours
Prerequisites:	Students must have completed the following subject prior to enrolling in this subject:

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

AND ONE OF the following subjects:

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

OR

Be enrolled in one of the following courses:

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

Corequisites:	None
Recommended Background Knowledge:	None
Non Allowed Subjects:	

Subject	Study Period Commencement:	Credit Points:
CHEN20010 Material and Energy Balances	Semester 1, Semester 2	12.50
CHEN20011 Chemical Process Analysis	Semester 2	12.50

Core Participation Requirements:	For the purposes of considering applications for Reasonable Adjustments under the Disability Standards for Education (Cwth 2005) and Students Experiencing Academic Disadvantage Policy, this subject requires all students to actively and safely participate in laboratory activities. Students who feel their disability may impact upon their participation are encouraged to discuss this with the Subject Co-ordinator and the Disability Liaison Unit http://www.services.unimelb.edu.au/disability/
Coordinator:	Prof David Shallcross
Contact:	Email: **dcshal@unimelb.edu.au (mailto:dcshal@unimelb.edu.au)**

Subject Overview:	**AIMS** This subject introduces chemical engineering flow sheet calculations, including material balances, energy balances and compositions of mixtures. The concept of conversion of mass is developed as the basis for determining mass flows in chemical processing systems involving chemical reactions and separation systems. Then the concept of conservation of energy is developed as the basis for determining energy flows in and around chemical processing systems, evaluation of enthalpy changes with and without phase change, simplified energy balances for batch, steady-state and adiabatic systems, estimation of heats of reaction, combustion, solution and dilution, energy balances in reacting systems, simultaneous material and energy balances. This subject together with CHEN20008 Chemical Process Analysis 2 provides the basis for all the chemical engineering subjects that follow. The calculations introduced in this subject are the most common type of calculations performed by professional chemical engineers working in all sectors of industry. The teaching of process safety is critical to any undergraduate chemical engineering program. Students need to understand their responsibilities to themselves, their work colleagues and the wider community. They need to be aware of safe practices and also the consequences that may arise when those safe practices are not followed. This subject introduces students to concepts of process safety and the consequences when safety management systems fail. **INDICATIVE CONTENT** Topics covered include material balances around single process units and groups of units, involving simple systems and recycle streams, and non-reacting and reacting systems. Total, component, and elemental balances are covered. Other topics include systems of units and unit conversion, and compositions of mixtures. Energy balances: The concepts of energy, work and heat, the units of energy, internal energy, enthalpy, heat capacity, latent heat, evaluation of enthalpy changes. The general energy balance equation, enthalpy balances, system boundaries. Enthalpies of pure components and selection of enthalpy data conditions. Energy balances and chemical reactions: Heat of reaction, definitions of standard heat of reaction, standard heat of formation, standard heat of combustion. Hess' Law of adding stoichiometric equations. Adiabatic reaction temperature. Heats of solutions and dilution, and use of enthalpy-concentration charts. Simultaneous material and energy balances. Safety case studies, safe practices, personal and process safety.
Learning Outcomes:	**INTENDED LEARNING OUTCOMES (ILO)** On completion of this subject the student is expected to: 1. Apply knowledge of basic science and engineering fundamentals to solve material and energy balances 2. Be able to model material and energy flows around reacting chemical systems 3. Define and scope engineering problems and formulate suitable strategies for problem solution 4. Have developed an appreciation for the importance of safety in the process industries.
Assessment:	Four assignments; each consisting of no more than 750 words (40% total, 10% each). Two of these assignments are associated with the laboratory experiments. Overall time commitment of 40-45 hours (10-13 hours per assignment). Assessed throughout the semester – week 3, 6, 9 and 13 respectively. Intended Learning Outcomes (ILOs) 1 to 4 and 6 are addressed in three of the four assignments. ILO 5 is addressed in one of the four assignments One written two hour end-of semester examination (60%). ILOs 1 to 4 and 6 are addressed in the examination. The examination paper will consist of problems designed to test whether the student has acquired the ability to apply fundamental principles to the solutions of problems involving material balances and real gas behaviour. The problems set for the exam will be similar to those undertaken in the tutorial classes. Hurdle requirement: A pass in the end of semester examination is required to pass the subject.
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:

	# **Bachelor of Arts (https://handbook.unimelb.edu.au/view/2015/B-ARTS)** # **Bachelor of Commerce (https://handbook.unimelb.edu.au/view/2015/B-COM)** # **Bachelor of Music (https://handbook.unimelb.edu.au/view/2015/B-MUS)** 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 # Ability to undertake problem identification, formulation and solution # Ability to utilise a systems approach to design and operational performance.
Related Majors/Minors/ Specialisations:	B-ENG Chemical Engineering stream B-ENG Chemical and Biomolecular Engineering stream Science-credited subjects - new generation B-SCI and B-ENG. Selective subjects for B-BMED