CHEN90007 Advanced Thermo & Reactor Engineering

Credit Points:	12.50
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	This subject is not offered in 2013.
Time Commitment:	Contact Hours: 1 x two hour lecture + 2 x one hour lecture + 1 x one hour tutorial per week Total Time Commitment: Estimated 120 hours
Prerequisites:	Students must have completed the following subject prior to enrolling in this subject: **Subject** / **Study Period Commencement:** / **Credit Points:** CHEN30001 Reactor Engineering / Not offered 2013 / 12.50 (Prior to 2010 CHEN40003 Reactor Engineering) As well as ONE OF the following subjects: **Subject** / **Study Period Commencement:** / **Credit Points:** ENGR30002 Fluid Mechanics / Not offered 2013 / 12.50 ENGR30001 Fluid Mechanics and Thermodynamics (prior to 2013)
Corequisites:	None
Recommended Background Knowledge:	None
Non Allowed Subjects:	None
Core Participation Requirements:	For the purposes of considering request for Reasonable Adjustments under the Disability Standards for Education (Cwth 2005), and Students Experiencing Academic Disadvantage Policy, academic requirements for this subject are articulated in the Subject Description, Subject Objectives, Generic Skills and Assessment Requirements of this entry.The University is dedicated to provide support to those with special requirements. Further details on the disability support scheme can be found at the Disability Liaison Unit website: http://www.services.unimelb.edu.au/disability/
Contact:	Email: **stad@unimelb.edu.au (mailto:stad@unimelb.edu.au)**
Subject Overview:	The thermodynamics component focuses on the implications of entropy and equilibrium on phases, mixtures and reactions. The reactor engineering component focuses on mass-transfer limitations in multi-phase chemical reactions and reactor design. 1st Law of Thermodynamics (Closed and open systems, Unit operations, Thermodynamic cycles), 2nd Law of Thermodynamics (Entropy, Reversibility and Spontaneity, Gibb's Equations, Thermodynamic Identities and Maxwell Relations), Phase Equilibria of Pure Substances (Equilibrium Criteria, Fugacity), Mixtures and Phase Equilibria of Mixtures (Partial Molar Properties, Gibbs-Duhem equation, Chemical Potential, Species Fugacity, Activity Coefficients, Vapour-Liquid equilibrium, Colligative Properties, Liquid-Liquid equilibrium), Chemical Reactions and Reaction Equilibria (Equilibrium Constant, Species Activity), Interfacial Thermodynamics (Surface Tension, Adsorption Isotherms). Non-ideal flow in reactors, Rate controlling mechanisms (film resistance control, chemical reaction control, surface and pore diffusion control, ash layer diffusion, shrinking core mechanisms, effectiveness factors and Thiele modulus), Kinetic regimes for fluid-fluid and gas-fluid reactions, Fluid-particle reaction design, Catalytic reactor systems.

Objectives:	On completion of this subject students should be able to: # Discuss a range of approaches to estimate fluid phase equilibria in one and two component systems # Estimate the physical properties of mixtures # Understand different rate controlling mechanisms in reactor design # Solve problems in the design of solid/fluid reacting systems and in particular catalytic reactor systems
Assessment:	One written three hour end-of-semester examination (70%) A written one hour mid-semester test (10%) Written assignments during the semester (20%) An overall mark of 50% and a mark of 40% or more in the end-of-semester examination is required to pass the subject
Prescribed Texts:	Sandler, S.I., Chemical, Biochemical, and Engineering Thermodynamics, 4th Edition, 2006, WileyLevenspiel, O., Chemical Reaction Engineering, 3rd Edition, 1999, Wiley
Breadth Options:	This subject is not available as a breadth subject.
Fees Information:	Subject EFTSL, Level, Discipline & Census Date, http://enrolment.unimelb.edu.au/fees
Generic Skills:	• In-depth technical competence in at least one engineering discipline • Ability to undertake problem identification, formulation, and solution • Ability to utilise a systems approach to design and operational performance • Capacity for lifelong learning and professional development
Related Course(s):	Master of Philosophy - Engineering Ph.D.- Engineering
Related Majors/Minors/ Specialisations:	B-ENG Chemical Engineering stream B-ENG Chemical and Biomolecular Engineering stream Master of Engineering (Biomolecular) Master of Engineering (Chemical)