411-331 Heat and Mass Transport Processes 1

Credit Points:	12.500
Level:	Undergraduate
Dates & Locations:	2008, This subject commences in the following study period/s: Semester 1, - Taught on campus.
Time Commitment:	Contact Hours: Fifty-five hours Total Time Commitment: Not available
Prerequisites:	411-102 Chemical Process Analysis, 411-201 Introduction to Transport Processes, 411-203 Fluid Mechanics, 411-204 Chemical Engineering Thermodynamics and 431-202 Engineering Analysis B (prior to 2001, 421-205 Engineering Analysis B), or equivalent, 610-211 Light, Matter and Chemical Change.
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 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: http://services.unimelb.edu.au/disability
Coordinator:	Dr S Kentish
Subject Overview:	Students successfully completing this subject will be able to apply the principles of heat transfer to convective heat transfer problems, heat exchanger and evaporator designs, and to analyse and design equilibrium stage and continuous contactor separation operations including simple distillation, gas absorption and liquid extraction. Heat Transport Processes Convection: use of heat transfer correlations to predict coefficients; concept of an overall heat transfer coefficient, fouling factors; determination of the area required for a given heat duty. Use of simulation packages such as HYSYS and ASPEN. Free convection: discussion and application of Grashof Number and other dimensionless groups. Heat exchanger design. Basics of condensation and boiling. Evaporation: various evaporator types and their advantages and disadvantages (forced circulation, film types); multiple and single effects; backward and forward feed; boiling point elevation; mechanical recompression; evaporator energy Âbalances. Mass Transport Processes: Unsteady state mass transfer and Fick's Second Law; prediction of diffusivity; dimensional analysis and equations of change for mass transfer. Definition of separation processes, separating agents, separation factors, equilibrium and rate type processes, equilibrium stage, non-equilibrium performance. Equilibrium stage processes - Distillation: single-stage separations, equilibrium flash, differential distillation; multistage separations, operating lines, reflux; binary distillation, varying reflux ratio, minimum reflux, total reflux, optimum reflux, feed plate location, side streams, open steam; tray efficiency via overall and Murphree efficiencies. Use of simulation packages such as DISTIL- Gas absorption: basic mass transfer mechanism; material balances, co-current and countercurrent flow, limiting L/G ratio; multistage absorption and the absorption factor method; continuous contact, transfer units, height of a transfer unit, calculation of number of transfer units. Humidification and cooling tower height calculation.Liquid Extraction: applications of liquid extraction, liquid-liquid equilibria; single-stage extraction, choice of solvent/feed ratio; multistage cross-current extraction; continuous counter-current multistage extraction. Continuous contact operations.

Assessment:	One written 3-hour end-of-semester examination (70%); a 90-minute written class test one third of the way through the semester (20%); and an assignment expected to take about 10 hours due two thirds of the way through the semester (10%). An overall mark of 50% and a mark of 40% or more in the end of semester examination are needed to pass the subject.
Prescribed Texts:	None
Recommended Texts:	Information Not Available
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:	# ability to apply knowledge of basic science and engineering fundamentals # 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
Related Course(s):	Bachelor of Engineering (Chemical Engineering) Bachelor of Engineering (Chemical and Biomolecular Engineering) Bachelor of Engineering (Chemical) and Bachelor of Arts Bachelor of Engineering (Chemical) and Bachelor of Commerce Bachelor of Engineering (Chemical) and Bachelor of Laws Bachelor of Engineering (Chemical) and Bachelor of Science Bachelor of Engineering (EngineeringManagement) Chemical Bachelor of Engineering(Biochemical Engineering)and Bachelor of Science