CHEN90018 Particle Mechanics and Processing

Credit Points:	12.50
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	This subject is not offered in 2014.
Time Commitment:	Contact Hours: 1 x two hour lecture and 2 x one hour lectures + 1 x one hour tutorial per week Total Time Commitment: Estimated 200 hours
Prerequisites:	Students must have completed one the following subject prior to enrolling in this subject: **Subject** | **Study Period Commencement:** | **Credit Points:** ENGR30002 Fluid Mechanics | Semester 1, Semester 2 | 12.50 OR ENGR30001 Fluid Mechanics and Thermodynamics (Prior to 2013) As well as ONE OF the following subjects (or an equivalent): **Subject** | **Study Period Commencement:** | **Credit Points:** MAST20029 Engineering Mathematics | Summer Term, Semester 1, Semester 2 | 12.50 MAST20009 Vector Calculus | Semester 1, Semester 2 | 12.50
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:	**AIMS** This subject covers many of the aspects related to powder and suspension processing. Initially, the student learns with how to describe particles and systems of particles in terms of size, shape and distribution, followed by understanding the basic mechanics of fluid flow around particles. This knowledge is used as the basis for designing unit operations associated with powders and suspensions, including particle classification, particle breakage (comminution) and agglomeration, solid-liquid separation through filtration, centrifugation and thickening, packed beds and fluidisation, flotation and powder storage in hoppers. The combination and variety of topics in this subject provides students with an appreciation of particulate processing. This knowledge is vital for numerous industries including (but not limited to) mineral processing, potable water treatment, wastewater treatment, food and pharmaceuticals. **INDICATIVE CONTENT**

	# Particle size and measurement of particle size, shape factors, differential and cumulative distributions, mean size, median size and surface area. # Generalised description of separation and classification efficiency based on particle size, density and composition. Hydrocyclones, screens and data reconciliation for particulate separators, including the two product formula. # Comminution, Bond work index, matrix description of size reduction and milling circuit simulation, comminution circuits and liberation of particles from composite particles. # Flow properties of solids, design of bins and hoppers, mass and channel flow. # Solid-liquid separation including flocculation processes, gravity sedimentation, clarification, thickening and pressure filtration. # Motion of particles in fluids, fluidisation, minimum fluidisation velocity and bed expansion, flow of fluids through granular beds.
Learning Outcomes:	**INTENDED LEARNING OUTCOMES (ILOs)** On completion of this subject the student is expected to: 1 Be able to describe particles and systems of particles 2 Appreciate the flow behaviour of particulate materials 3 Design unit operations associated with particulate powders and slurries common to the materials, food, water, pharmaceuticals and minerals processing industries 4 Be familiar with the unit operations in comminution and particle liberation, particle separation, hopper flow, solid-liquid separation and fluidisation and flow through packed beds
Assessment:	A written 1 hour mid-semester test (15%) A written assignment in weeks 7 and 8 not exceeding 1500 words (15%) One written 3 hour end-of-semester examination (70%). Hurdle requirement: A mark of 40% or more in the end of semester examination is required to pass the subject
Prescribed Texts:	None
Recommended Texts:	None
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 undertake problem identification, formulation and solution through application of knowledge of basic science and engineering fundamentals # Capacity for independent thought # Awareness of advanced technologies in the discipline # Ability and self confidence to comprehend complex concepts, to express them lucidly and to confront unfamiliar problems
Notes:	**LEARNING AND TEACHING METHODS** The subject is delivered through a combination of lectures and tutorials. The tutorials include aspects of student-centred learning. Regular online quizzes are used to assist student progress and understanding. Students also complete an assignment which reinforces the material covered in lectures. **INDICATIVE KEY LEARNING RESOURCES** Students have online access to lecture slides and lecture recordings through the subject LMS site. The site also contains tutorials and worked solutions. The key texts for the subject are: # Rhodes MJ, Introduction to Particle Technology, 1998, Wiley, Chichester # Coulson JM and Richardson JF, Chemical Engineering, vol 2, 4th Ed, Particle Technology and Separation Processes, 1991, Pergamon Press, Oxford # Kelly EG and Spottiswood DJ, Introduction to Mineral Processing, 1989, John Wiley and Sons

	CAREERS / INDUSTRY LINKS The knowledge gained through this subject is crucial to the career of a process engineer since 75% of chemical manufacturing processes involve small particles at some point in the process. This subject is vital for students wishing to progress to jobs in engineering design offices and in operational roles within a wide range of industries including minerals processing, water and wastewater treatment, paints and coatings, food processing and ceramics to name just a few.
Related Majors/Minors/ Specialisations:	B-ENG Chemical Engineering stream B-ENG Chemical and Biomolecular Engineering stream Master of Engineering (Biochemical) Master of Engineering (Chemical with Business) Master of Engineering (Chemical)