BMEN90012 Soft Matter Engineering

Credit Points:	12.5
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	2015, Parkville This subject commences in the following study period/s: Semester 1, Parkville - Taught on campus.
Time Commitment:	Contact Hours: 3 x one hour lectures + 1 x one hour tutorial per week Total Time Commitment: Estimated 200 Hours
Prerequisites:	Students must have completed ONE OF the following subjects (or equivalent) prior to enrolling in this subject:

Subject	Study Period Commencement:	Credit Points:
CHEM20018 Chemistry: Reactions and Synthesis	Semester 1	12.50
BMEN30007 Biotransport Processes	Semester 2	12.50

AND ONE OF the following subjects:

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:	BIEN30001 Bionanoengineering
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/
Coordinator:	Prof David Dunstan
Contact:	Email:**davided@unimelb.edu.au (mailto:davided@unimelb.edu.au)**
Subject Overview:	**AIMS** Introduction to soft condensed matter: range of applications and products including foods, cosmetics, pharmaceuticals, ceramics, suspensions, minerals and detergents. The course covers the fundamental structure-function and material properties of these complex systems. **INDICATIVE CONTENT** The colloidal domain: brownian motion and the Stokes-Einstein equation. Suspension viscosity. Interparticle forces: dispersion forces, electrostatic forces (Poisson-Boltzmann), double layer theory and solvation forces. The role of surface forces in colloidal stability. Electrokinetic characterization of nano-particles and the relationship to colloidal stability and suspension

	rheology. Suspension rheology, measurement, viscoelasticity and the colloidal state. Polymer physics. Polymers as random walks, ideal and real chains scaling concepts and the size of the random walk. Entropy and Elasticity, the Hookean spring. Viscoelastic behaviour of polymer solutions and melts. Gels, sols and gelation including the concept of percolation. The theory of rubber elasticity. Adsorption of polymers to surfaces. Surfactants and self assembly. Micelles, vesicles and hexagonal phases. Aggregation numbers and packing parameters. Lipid bilayers. A review of several papers in biotechnology and nanotechnology.
Learning Outcomes:	**INTENDED LEARNING OUTCOMES (ILO)** On completion of this subject the student is expected to: 1 Describe and analyse the flow behaviour of particulate materials and the influence of surface chemistry, additives and processing history on the behaviour of fine solid and liquid particle slurries 2 Apply the physical concepts to product formulation with required material attributes 3 Apply the physical concepts to processes in the minerals, ceramics, pigment, food and pharmaceuticals industries 4 Apply these concepts to the manufacture and characteristics of ceramic, cemented and geopolymerised materials and a range of plastic and filled plastic materials.
Assessment:	One written 3-hour end-of-semester examination. Intended Learning Outcomes (ILOs) 1 to 4 are addressed in the exam (80%) One assignment of at least 3000 words (not including appendices and diagrams and tables). Time commitment of 25-30 hours. Due in the second half of the semester. Intended Learning Outcomes (ILOs) 1 to 4 are addressed in this assignment (20%). Hurdle requirement: A grade of greater than 50% in the exam is required to pass the subject.
Prescribed Texts:	Larson R.G. The Structure and Rheology of Complex Fluids, Oxford University Press, NY 1999
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 fundamental science and engineering knowledge # Capacity for independent thought # Ability to analyse and solve open-ended problems # Ability to comprehend complex concepts and communicate lucidly this understanding # Awareness of advanced technologies in the discipline # Ability to work in a team (practical work component) # Ability to write a technical report.
Notes:	**LEARNING AND TEACHING METHODS** The subject will be delivered through a combination of lectures and tutorials. **INDICATIVE KEY LEARNING RESOURCES** Students will have access to lecture notes and lecture slides. **CAREERS / INDUSTRY LINKS** The knowledge gained in this subject are important to the career of an engineer in the biomedical or chemical fields.
Related Course(s):	Master of Biomedical Engineering 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 (Biochemical) Master of Engineering (Biomedical with Business) Master of Engineering (Biomedical)

	Master of Engineering (Chemical)