BMEN30007 Biotransport Processes

Credit Points:	12.5
Level:	3 (Undergraduate)
Dates & Locations:	2015, Parkville This subject commences in the following study period/s: Semester 2, Parkville - Taught on campus.
Time Commitment:	Contact Hours: 3 x one hour lectures + 1 x one hour tutorial per week + 2 x 90 minutes of laboratory work per semester Total Time Commitment: Estimated 170 hours
Prerequisites:	**Undergraduate Students:** Students must have completed the following subjects (or equivalent) prior to enrolling in this subject: One of the following:

Subject	Study Period Commencement:	Credit Points:
BIOL10004 Biology of Cells and Organisms	Semester 1	12.50
BIOL10002 Biomolecules and Cells	Semester 1	12.50

AND

One of the following:

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

AND

One of the following:

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:

Subject	Study Period Commencement:	Credit Points:
MAST10007 Linear Algebra	Summer Term, Semester 1, Semester 2	12.50
MAST10008 Accelerated Mathematics 1	Semester 1	12.50

Postgraduate students:

Admission to the MC-ENG Master of Engineering (Biomedical) or (Biomedical with Business)

Corequisites:	None

Recommended Background Knowledge:	None
Non Allowed Subjects:	

Subject	Study Period Commencement:	Credit Points:
CHEN20009 Transport Processes	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:	Assoc Prof Andrea O'Connor
Contact:	Email: **a.oconnor@unimelb.edu.au (mailto:a.oconnor@unimelb.edu.au)**
Subject Overview:	**AIMS** This subject introduces transport processes in biomedical systems, complementing and reinforcing material learned in related biology subjects. Students will be introduced to the process of developing engineering models and simple conceptual designs in the context of biological systems. The subject covers fundamental concepts of diffusion and conservation within momentum, heat and mass transport. Within momentum transport, specific topics include Newton's law of viscosity, viscosity of gases and liquids, conservation of momentum, velocity distributions in simple laminar flows, boundary layer concepts and turbulence and the Reynolds number. Within heat transport, Fourier's law of conduction is covered. Within mass transport, specific topics include Fick's first and second laws of diffusion, diffusivities of gases, liquids and solids, binary mixture diffusion and conservation of mass, concentration distributions in simple binary systems including identifying appropriate boundary conditions, concentration boundary layer concepts, Schmidt and Sherwood numbers, definition and use of mass transfer coefficients. Students will examine transport of molecules and cells in biological systems to describe various key processes, such as cell migration and provision of cell nutrition. The role of transport processes in biological systems and employed in clinical applications, such as dialysis, will be described using simple engineering models. **INDICATIVE CONTENT** Topics covered include momentum transport, viscosity, turbulence, heat transport, mass transport, diffusion in binary systems, unsteady state mass transfer, and modelling biological transport processes.
Learning Outcomes:	**INTENDED LEARNING OUTCOMES (ILO)** On completion of this subject the student is expected to: 1 Describe the fundamental concepts of momentum, heat and mass transfer 2 Understand the roles of transport processes in the cells, tissues and organ systems of the human body. 3 Formulate problems in chemical and biological systems, identifying fundamental transport processes and the equations that describe these systems 4 Apply these principles to the solution of problems in process and biomedical engineering 5 Perform simple laboratory experiments that deepen and amplify theoretical concepts.
Assessment:	Attendance and participation in two laboratory classes (10% total, 5% each) each with a written assignment of approximately 250 words (not including equations, graphs and diagrams) in Weeks 3 to 11 each requiring 5 to 7 hours of work including preparation. Intended Learning Outcome (ILO) 5 is addressed in these laboratory classes Five written assignments (5% total, 1% each) each of approximately 100 words (not including equations, graphs and diagrams) due between weeks 2 to 12, each requiring 1 to 2 hours of work. ILOs 1 to 4 are addressed

	in the assignments One written 90-minute test (15%) held in Weeks 5 to 7. ILOs 1 and 3 are addressed in the test One written 3-hour closed book end-of-semester examination (70%). ILOs 1 to 4 are addressed in the exam. Hurdle requirement: The examination is a hurdle and a mark of 40% or more in the examination is required to pass the subject.
Prescribed Texts:	None
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 science and engineering fundamentals # Ability to undertake problem identification, formulation and solution # Ability to communicate effectively, with the engineering team and with the community at large # Ability to function effectively as an individual and in multidisciplinary and multicultural teams, as a team leader or manager as well as an effective team member # Capacity for lifelong learning and professional development.
Notes:	**LEARNING AND TEACHING METHODS** The subject will be delivered through a combination of lectures and tutorials. Students will also complete two experiments which will reinforce the material covered in lectures. **INDICATIVE KEY LEARNING RESOURCES** Students will have access to lecture notes and tutorial problem sheets with solution guides for tutorial problems provided after the tutorials.
Related Majors/Minors/ Specialisations:	Bioengineering Systems Master of Engineering (Biomedical with Business) Master of Engineering (Biomedical) Science-credited subjects - new generation B-SCI and B-ENG. Selective subjects for B-BMED