# CHEN90031 Bioprocess Engineering

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| **Credit Points:** | 12.5 |
| **Level:** | 9 (Graduate/Postgraduate) |
| **Dates & Locations:** | 2016, Parkville<br>This subject commences in the following study period/s:<br>Semester 1, Parkville - Taught on campus. |
| **Time Commitment:** | Contact Hours: 3 x 1 hour lectures + 1 x 1 hour tutorial per week + 2 x 2 hour practical work sessions per semester Total Time Commitment: Estimated 200 hours |
| **Prerequisites:** | **Subject** / **Study Period Commencement:** / **Credit Points:**<br>CHEN30001 Reactor Engineering / Semester 1 / 12.50<br>(Prior to 2010 CHEN40003 Reactor Engineering)<br>CHEN30001 may also be taken concurrently |
| **Corequisites:** | None |
| **Recommended Background Knowledge:** | None |
| **Non Allowed Subjects:** | Credit will not be given for this subject and the following subjects:<br>CHEN90009 Fermentation Processes<br>BTCH90006 Bioprocess Engineering<br>CHEN30014 Bioprocess Engineering |
| **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:** | Prof David Dunstan |
| **Contact:** | Prof David Dunstan<br>Email: **davided@unimelb.edu.au (mailto:davided@unimelb.edu.au)** |
| **Subject Overview:** | **AIMS**<br>Develop an basic microbiology, cell structure and nutritional requirements. Products from microbes and bioprocesses, enzyme kinetics, cell growth kinetics and product formation. Product separation methods.<br>This subject introduces students to the area of bioprocessing, an area growing in importance in the process industries.<br>**INDICATIVE CONTENT**<br>Enzymic process. Michaelis-Menten approach. Kinetics of enzyme inhibition. Immobilised enzymes. Batch microbial growth and product formation. Continuous culture. Microbial growth kinetics. Application of Monod model to batch and chemostat culture. Kinetics of product formation. Maintenance energy and endogenous respiration. Design of fermentation processes. Bioreactor design and kinetics. Industrial sterilisation processes. Calculation of sterility level. HTST sterilisation. Design of continuous sterilisers. Air sterilisation. Vessel design for aseptic operation. Fermenter design configurations. Mixing in fermenters. Biochemical separation processes. |

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| | Practical work (Microbiology laboratory). |
| **Learning Outcomes:** | **INTENDED LEARNING OUTCOMES (ILO)**<br>On completion of this subject the student is expected to:<br>1 Describe the biological and kinetic concepts underlying bioprocesses engineering.<br>2 Describe procedures for the design and control of industrial scale fermentation and biological waste treatment processes. |
| **Assessment:** | One three-hour examination at the end of semester (70%). Intended Learning Outcomes (ILOs) 1 and 2 are addressed in the examination. The examination paper will consist of problems designed to test whether the student has acquired the ability to apply fundamental principles to the solutions of problems involving bioprocesses. The problems set for the exam will be similar in style to those undertaken in the tutorial classes, but will require the student to show that they can extend themselves beyond the level of the simpler tutorial problems One written assignment of no more than 2000 words (20%). Time commitment of approximately 25 -30 hours of work. ILOs 1 and 2 are addressed in the written assessment Two practical work assignments not exceeding a total of 1000 words. (10% total - 5% each). Total time commitment of approximately 13 - 15 hours of work. ILO 1 is assessed in the practical work. Hurdle requirement: A grade greater than 50% in the exam is required to pass the subject |
| **Prescribed Texts:** | None |
| **Recommended Texts:** | Schuler, M.L. ,2002 , and Kargi F. *Bioprocess Engineering – Basic Concepts*, 2nd edition, Prentice hall PTD, Upper Saddle River NY<br>Bailey J.E. and Ollis, D.F., 1986, *Biochemical Engineering Fundamentals*, 2nd edition, McGraw-Hill NY |
| **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:** | # Capacity for independent thought<br># The ability to analyse and solve open-ended problems<br># The ability to comprehend complex concepts and communicate lucidly this understanding<br># Awareness of advanced technologies in the discipline<br># Ability to work in a team (practical work component)<br># Understand key separation processes<br># Develop capability to review literature. |
| **Notes:** | **LEARNING AND TEACHING METHODS**<br>The subject will be delivered through a combination of lectures and tutorials. Students will also complete experiments which will reinforce the material covered in lectures.<br>**INDICATIVE KEY LEARNING RESOURCES**<br>Students will have access to lecture notes and lecture slides.<br>**CAREERS / INDUSTRY LINKS**<br>The skills gained in this subject are crucial to the career of a process engineer. They will be important for students wishing to progress to jobs in engineering design offices and in operational roles within a wide range of industries including petrochemicals, food processing, wastewater treatment and pulp and paper manufacture. |
| **Related Course(s):** | Doctor of Philosophy - Engineering<br>Master of Biotechnology<br>Master of Philosophy - Engineering |

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| **Related Majors/Minors/ Specialisations:** | B-ENG Chemical Engineering stream<br>B-ENG Chemical and Biomolecular Engineering stream<br>Master of Engineering (Biochemical)<br>Master of Engineering (Chemical with Business)<br>Master of Engineering (Chemical) |