CHEN30009 Process Dynamics and Control

Credit Points:	12.50
Level:	3 (Undergraduate)
Dates & Locations:	2011, Parkville This subject commences in the following study period/s: Semester 2, Parkville - Taught on campus.
Time Commitment:	Contact Hours: An average of 2.5 hours of lectures per week + 1 x one hour tutorial per week + 1 x three hours of laboratory work per semester Total Time Commitment: Estimated 120 hours
Prerequisites:	Students must have taken the following subjects (or equivalent) prior to enrolling in this subject:

Subject	Study Period Commencement:	Credit Points:
MAST20029 Engineering Mathematics	Summer Term, Semester 1, Semester 2	12.50
CHEN20008 Chemical Process Analysis 2	Semester 2	12.50

Note: CHEN20008 (411-257) Chemical Process Analysis 2 may be taken concurrently for students admitted to the Master of Engineering.

Corequisites:	None
Recommended Background Knowledge:	Students undertaking this subject will be expected to be competent in the use of Matlab and Microsoft Excel.
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/
Coordinator:	Dr Gabriel Da Silva
Contact:	Email: **gdasilva@unimelb.edu.au (mailto:gdasilva@unimelb.edu.au)**
Subject Overview:	This subject covers the dynamics and control of process systems. Students are introduced to the concept of feedback control, with examples of controlled and manipulated variables and control schemes in process plants. Time domain analysis of process dynamics is performed using linear ordinary differential equations, Laplace transforms, and transfer functions. The dynamic response of complex process plants, described using first and second order differential equations and time delays, are investigated. Students are introduced to frequency response analysis and Bode plots. The development of empirical dynamic models, and numerical simulation using MATLAB, is also covered. The process control component of the subject introduces the concept of closed loop transfer functions and the PID controller. Dynamic process simulation is performed using analytical techniques and with the numerical simulation capabilities of the MATLAB Simulink software package. The stability of closed loop systems is analysed using techniques such as Routh stability analysis, the Bode stability criterion, and gain and phase margins. The effect of controller tuning constants (proportional gain, integral time, derivative time) on control system response is investigated, along with the Ziegler-Nichols and other tuning methods. Advanced control strategies including cascade control, time-delay compensation, feedforward control, and model-based control are developed, as well as techniques to control multi-loop systems. Digital control systems and control system instrumentation are also covered. Case studies illustrate how concepts covered in this subject can be applied to, for example, plantwide control.
Objectives:	On completion of this subject students should be able to:

	• Understand the factors influencing the dynamic response of chemical processes to process system changes • Analyse and implement effective and efficient process control strategies for chemical processes.
Assessment:	Three assignments spread throughout the semester (30% of total mark). One three hour written examination at the end of semester (70% of total mark).
Prescribed Texts:	None
Recommended Texts:	Process Dynamics and Control, Second Edition. D. E. Seborg, T. F. Edgar, D. A. Mellichamp
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/2011/B-ARTS)** # **Bachelor of Commerce (https://handbook.unimelb.edu.au/view/2011/B-COM)** # **Bachelor of Environments (https://handbook.unimelb.edu.au/view/2011/B-ENVS)** # **Bachelor of Music (https://handbook.unimelb.edu.au/view/2011/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:	On completion of this subject students should be able to demonstrate an: • 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 use a systems approach to design and operational performance.
Related Course(s):	Bachelor of Science
Related Majors/Minors/ Specialisations:	B-ENG Chemical Engineering stream B-ENG Chemical and Biomolecular Engineering stream Chemical Systems Master of Engineering (Biomolecular) Master of Engineering (Chemical)