CHEN90032 Process Dynamics And Control

Credit Points:	12.50
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	2012, 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 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 completed 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

CHEN20008 Chemical Process Analysis 2 may be taken concurrently by 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:	CHEN30009 Process Dynamics and Control
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/Contact
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%)One three hour written examination at the end of semester (70%)
Prescribed Texts:	None
Recommended Texts:	Process Dynamics and Control, Third Edition. Seborg, Edgar, Mellichamp, Doyle, 2011, Wiley.
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:	On completion of this subject students should be able to demonstrate the following skills: # 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 Majors/Minors/ Specialisations:	B-ENG Chemical Engineering stream B-ENG Chemical and Biomolecular Engineering stream Master of Engineering (Biomolecular) Master of Engineering (Chemical)