**Liverpool** John Moores University

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| Title: | PROCESS CONTROL |
| Status: | Definitive |
| Code: | **6023ENG** (106360) |
| Version Start Date: | 01-08-2016 |
| Owning School/Faculty: | Electronics and Electrical Engineering |
| Teaching School/Faculty: | Electronics and Electrical Engineering |

| Team | Leader |
|---|---|
| Dingli Yu | Y |

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| **Academic Level:** | FHEQ6 | **Credit Value:** | 12 | **Total Delivered Hours:** | 38 |
| **Total Learning Hours:** | 120 | **Private Study:** | 82 | | |

**Delivery Options**
Course typically offered: Summer

| Component | Contact Hours |
|---|---|
| Lecture | 24 |
| Practical | 6 |
| Tutorial | 6 |

**Grading Basis:** 40 %

**Assessment Details**

| Category | Short Description | Description | Weighting (%) | Exam Duration |
|---|---|---|---|---|
| Exam | AS1 | Exam | 50 | 2 |
| Report | AS2 | Coursework : Formal lab report | 50 | |

**Aims**

*To appreciate the problems associated with the design of closed-loop control of process systems. To understand the principles of cascade, feed forward and ratio control. To analyse non-linear process systems, systems containing large dead-time and coupled multi-loop systems.*

## Learning Outcomes

After completing the module the student should be able to:

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|---|---|
| 1 | Design process control systems using the principles of cascade, feed forward and ratio control of process plants, with typical applications. |
| 2 | Formulate the system equations of certain processes using large scale and linearised, deviation variable analysis. |
| 3 | Appreciate the strategies for controlling systems possessing dead-time, inverse response and interaction properties. |

## Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

| | | | |
|---|---|---|---|
| EXAM | 1 | 2 | 3 |
| Formal lab report | 1 | 3 | |

## Outline Syllabus

*System equations for a number of unit processes, e.g. temperature, level, flow, chemical reaction.*
*Analysis of multiple feedback loops. Disturbance transfer function. Signal flow, Mason's Rule. State variable formulation. Types of control strategy and their relative merits: cascade, split-range, feed forward and ratio control.*
*Feedback control of systems with large dead-time and inverse response; Smith prediction. PID control, frequency response stability criteria; Nichol's charts. Interaction and decoupling of control loops.*
*The analysis of non-linear process systems e.g. liquid-level. Use of linearisation and deviation variables in deriving transfer functions. Effect of choice of system elements (e.g. control valve characteristics) on system performance.*
*Case studies such as distillation, fermentation, pH systems.*

## Learning Activities

Lectures supported by handouts and tutorials where appropriate.
Practical sessions will make use of software packages where appropriate.

## Notes

This Level 3 module describes the analysis and design principles of closed-loop control of process systems.