The University Of Sheffield.

Electronic & Electrical Engineering.

ACS342 FEEDBACK SYSTEMS DESIGN

Credits: 10

Course Description including Aims

The course will give students an introduction to the analysis and modelling of systems: continuous (linear) and discrete.

Outline Syllabus

This section of the course will be simple linear control theory looking at 1st and 2nd order systems, Bode plots, Nyquist diagram, Nichols charts, feedback, stability, simple compensation, etc. with examples drawn from the electrical rather than mechanical area.

An introduction/overview to digital control looking at the similarities and differences (i.e. limitations and flexibility). A brief introduction would also be given to modelling discrete systems (rather than continuous, linear systems).

Time Allocation

24 lectures and 12 problem solving classes.

Recommended Previous Courses

EEE201 “Signals and Systems”

Assessment

2 hour examination; answer 3 questions from 4

Recommended Books

Ogata, K	*Modern Control Engineering*	Prentice-Hall
Nise	*Control Systems Engineering*	Benjamin Cummings
Bissell, C.C	*Control Engineering*	Chapman & Hall
Franklin,G, Powell,J & Nacini,A.E.	*Feedback Control of Dynamic Systems*	Addison Wesley
Dorf, R.C. & Bishop	*Modern Control Systems*	Addison Wesley

Objectives

By the end of the module successful students will be able to

1. manipulate system block diagrams to simplify complex systems.
2. relate the second order transient response to natural frequency and damping factor of a system, and in the AC response.
3. identify if a linear system is stable or unstable, and quantify the stability in terms of gain and phase margins.
4. manipulate bode plots of a system to achieve system stability.
5. perform phase lag/phase lead or velocity compensation on open-loop systems.
6. tune a PID control loop.
7. design a digital control scheme to satisfy given rise-time and settling time specifications.