

ELE3105 Computer Controlled Systems

## Course Overview

### Overview

- We want to be able to *control* things:
  - Industrial - process control (pressure, temperature, etc)
  - Robotics - eg velocity, positioning
  - Automotive - eg engine Electronic Fuel Injection (EFI), Antilock Braking Systems (ABS)
  - Aviation - eg flight control, navigation
  - + lots, lots more
- Often electro-mechanical devices (electric/electronic actuation + mechanism)
- Modern techniques - use a computer!
- ⇒ gives other possibilities (monitoring, “learning”)

### Overview

- Several questions then:
  - How to interface the computer ?
  - How to design the control software ?
  - How to test our design ?
- Some extensions of the computer-control concept:
- We could control *several* things at once, for better overall performance - eg engine+transmission
- We can *simulate* the performance on a computer, before actually testing it out on real hardware.
- The computer could *learn* the dynamics of the thing we are trying to control (the “control object”).

### Overview

- Analog-to-Digital and Digital-to-Analog conversion (conversion numbers in computer to voltage levels (D/A) and voltage levels to numbers (A/D))
- Difference equations to *model* the control object. (computer then has a model of how the control object should behave, and can predict what will happen in the future in response to various inputs).
- The control software - *accuracy* and *timing* need special attention.
- How to *model* control objects.
- How to design the controller itself.
- How to use a computer to help us do the design work (simulation).