Tutorial sheets – weeks 1 – 4 inclusive

Green – background material which may be useful
Amber – important material to be consolidated
Red – vital material for your project

Week 1 – Dynamics Tutorial Sheet 1 – useful revision to underline some terminology and basic concepts.

Week 1 – Control Systems Tutorial Sheet 1 – conceptual systems and block diagrams – useful revision to get you thinking about relationships between problem-setting objectives and block diagram functionality.

Week 2 – Control Systems Tutorial Sheet 2 – armature-controlled DC motor – a good multi-physics example.

Week 2 – Routh-Hurwitz Array Calculations – calculations & arc welder vision system stability problem – useful example to show the practical use of criteria for stability.

Week 2 – Arc welder vision system stability problem – including overshoot calculation – useful reminder of the overshoot parameter.

Week 3 – Closed loop system with non-unity feedback and torque disturbance – useful example of further real-world issues when trying to get good control (torque disturbance).

Week 3 – Closed loop system with non-unity feedback and measurement noise – another useful example of real-world problems when trying to get good control (measurement noise).

Week 4 – Routh-Hurwitz calculation for magnetic tape drive showing effect of gain on roots of characteristic equation – good example linking back to underlying dynamics (see Lecture 4 – Part 1).

Lectures – weeks 1 – 4 inclusive

Lecture 1 – Part 1 – introduction.

Lecture 1 – Part 2 – Math modelling.

Lecture 2 – Part 1 – Math modelling (LTs & TFs).

Lecture 2 – Part 2 – Math modelling, DC electric motor field voltage control.

Lecture 3 – Part 1 – Block Diagrams.

Lecture 3 – Part 2 – Block Diagram Reduction & Train Traction Motor Armature Control.

Lecture 4 – Part 1 – 2nd Order ODE Performance and Stability (ref dynamics of such systems) & Routh-Hurwitz Stability Criterion.

Lecture 4 – Part 2 – More Routh-Hurwitz stability.

Lecture 5 – Part 1 – Routh-Hurwitz examples.

Lecture 5 – Part 2 – Routh-Hurwitz example with steady-state tracking error and parameter selection.

Lecture 6 – Stability theory, Root Locus intro.

Lecture 7 – Part 1 – Root Locus theory development.

Lecture 7 – Part 2 – Sensitivity of controllers to parameter variation.

Lecture 8 – Calculating the Root Locus.

Lecture 9 – Plotting the Root Locus.