# AE 308: Control Theory
# &
# AE 775: System Modelling, Dynamics & Control

Course **Review**

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# *Objectives of the Course*

**To provide exposure** to techniques/methodologies for creating **good models** of engineering systems.

**To familiarize** with methods to **characterize the dynamical** behaviour using the **models.**

**To provide** a good **understanding** of basic concepts of **control theory**, along with the various **control structures** & **elements**.

**To describe** a few **basic techniques** for **designing** control systems.

# *Modelling, Response & Stability*

**Introduction to Modelling:** Objective, basic modelling concepts & model types, including mathematical models, their linearization and role of LTI forms.

**Response Basics:** I/O form, block diagram representation and manipulation, test signals, Laplace transform and transfer function concepts, basic response analyses, frequency response & its representation using bode', Nyquist plots.

**Stability: S**tability & response connection, asymptotic/ BIBO stability, Routh's & Nyquist stability analyses.

# *Control Analysis & Design*

**Introduction to Control:** Control objectives, open/ closed loop control structures, unity negative feedback systems, basic control actions, transient & steady-state responses, tracking/transient specifications.

**Typical Control Systems:** P control action and concept of root locus, PD, PI, and PID control actions.

**Design Procedures**: Specifications in Time / frequency domains, design rules & methodologies for P, PI, PD and PID control systems.

# *What Next?*

**Topics** covered as **part** of this **course** aim to provide only a **basic** foundation in **control** analysis & design.

There are many **aspects** of control e.g. **multi-loop** structure, non-unity feedback, **robustness**, optimality, **nonlinear** plants etc. which need to be examined.

Also, the **specifications** can be made more **accurate** by bringing in the **non-dominant** dynamics.

Lastly, the **design** can be practiced in **time domain** through **vector-matrix** approach i.e. state-space.