# MECH70022 Advanced Control

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### Chapter 1

### **Analogue Control Systems**

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- 1.1.1 System Models Using Differential Equations
- 1.1.2 Signal Representation in the Frequency Domain & Transfer Functions

### 1.2 Frequency Response Analysis & Design

- 1.2.1 System Models Using Differential Equations
- 1.2.2 Signal Representation in the Frequency Domain & Transfer Functions
- 1.2.3 Bode Diagrams
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### 1.3 Complex Frequency Analysis & Design

- 1.3.1 Laplace Transforms & Complex Frequency Concepts
- 1.3.2 Signal Representation in the Frequency Domain & Transfer Functions
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### Chapter 2

# **Digital Control Systems**

- 2.1 Design of a Digital Controller Using Continuous System Theory
- 2.1.1 CNC System Modelling
- 2.1.2 CNC Controller Design for Transients, Disturbance Rejection & Multi-Axis Contouring
- 2.1.3 Effects of Sampling

#### 2.2 Discrete System Analysis Using Z-Transforms

- 2.2.1 Z-Transforms of Sampled Data Signals, Modified Z-Transforms & Fractional Time Delays
- 2.2.2 Discrete Transfer Function
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### Chapter 3

# State Variable Analysis

#### 3.1 State Variable Analysis of Continuous Systems

- 3.1.1 State Variable Modelling in Relation to Block Diagrams
- 3.1.2 Eigenvalues, Eigenvectors & Characteristic Equation, Stability of State Variable Models
- 3.1.3 Conversion Between Transfer Function & State Variable Models
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### 3.2 State Variable Representation of Discrete Systems

- 3.2.1 Discrete State Variable Model from the Time Response of the Continuous Model
- 3.2.2 Discrete State Variable Model from Discrete Transfer Function G(z)

### 3.3 Non-examinable Material

- 3.3.1 Kalman Filtering
- 3.3.2 Optimal Control