Digital Control (SC42095)

Course assessment demands

The depth of knowledge required for each course item below is indicated as follows:

1 Overview: gives the background for the theory or extra information.
2 Facts: know or understand concepts, notations, definitions, schemes, methods.
3 Working knowledge: be able to use definitions, formulas and theorems on given problems. Be able to solve problems of the same kind as in the lectures and exercises.
4 Derivation: know and/or be able to derive formulas.

Chapters in the course book by Åström and Wittenmark

1.	Computer Control	1,2
2.	Discrete-time Systems	
	Sampling continuous time statespace models	4
	Sampling continuous time statespace models with delays	3
	Solution of state-space equations	3
	Coordinate transform in statespace models	4
	Pulse response	3
	Shift operator calculus	4
	From state space to pulse transfer function	4
	Z-transform, definition and properties	3
	Poles and zeros	3
	Selection of sampling interval	3
3.	Analysis of Discrete-Time Systems	
	Stability definitions	3
	Nyquist criterion and bode diagrams	2
	Lyapunov method	4
	Sensitivity and robustness	2
	Controllability and reachability	3
	Analysis of simple feedback loops	3
4.	Pole-Placement Design: a State-Space Approach	
	Control System Design	3
	Regulation by State Feedback	3,4
	Observers	3,4
	Output feedback	3,4
	Servo problem	3
5.	Pole-Placement Design: a Polynomial Approach	
	A simple design problem	4
	Diophantine equation	2
	The rest of this chapter	1

6.	Design: an Overview	1
7.	Process-Oriented Models	
	Computer-controlled systems	3
	Sampling and reconstruction	2,3
	Aliasing	3
	Predictive first-order hold	2
	Modulation model	2
	Frequency response	1
	Pulse-transfer-function formalism	1,2
	Multirate sampling	1
8.	Approximation of Continuous-Time Controllers	
	Approximation based on transfer functions	3,4
	Approximation based on state models	1
	Frequency-response design methods	1
	Digital PID controllers	3,4
9.	Implementation of Digital Controllers	2
11.	Optimal Design Methods: a state-space approach	
	Linear Quadratic control	3
	Prediction and filtering theory	3
	Linear Quadratic Gaussian control	3