

EE3114: SYSTEMS AND CONTROL

Effective Term

Semester A 2025/26

Part I Course Overview

Course Title

Systems and Control

Subject Code

EE - Electrical Engineering

Course Number

3114

Academic Unit

Electrical Engineering (EE)

College/School

College of Engineering (EG)

Course Duration

One Semester

Credit Units

3

Level

B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

MA1201 Calculus and Basic Linear Algebra II

Or

MA1301 Enhanced Calculus and Linear Algebra II

Precursors

Nil

Equivalent Courses

Nil

Exclusive Courses

Nil

Part II Course Details

Abstract

The aim of this course is to provide students with an understanding of the concepts/techniques/basic principles of classical and modern linear feedback systems to enable them to specialize in diverse areas like communication systems, control systems, power systems and signal processing within the disciplines of electronic engineering. Elementary analytical and design techniques for control systems are introduced.

Course Intended Learning Outcomes (CILOs)

CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe basic linear feedback system properties and the application of CAD tools for analysis and design	x	x	
2	Analyze feedback system behaviors in terms of frequency-domain methods	x	x	
3	Analyze feedback systems via state-space methods with the use of CAD tools	x	x	
4	Analyze and derive system models/equations for continuous-time feedback systems	x	x	
5	Design basic feedback control systems	x	x	

A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

LTAs	Brief Description	CILO No.	Hours/week (if applicable)	
1	Lectures	Students will engage in formal lectures to gain knowledge of key concepts and techniques on feedback systems.	1, 2, 3, 4, 5	3 hrs/wk
2	Labs	Students will consolidate their knowledge and understanding by conducting laboratory experiments.	1, 2, 3, 4, 5	3 hrs/wk (4 weeks)
3	Assignments, self-study	Students will participate in tutorials and work on exercise problems.	1, 2, 3, 4, 5	NA

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("- " for nil entry)	Allow Use of GenAI?
1	Tests (1)	1, 2, 3, 4, 5	25	-	No
2	#Assignments (min: 3)	1, 2, 3, 4, 5	15	-	No
3	Lab Exercises/ Reports	1, 2, 3, 4, 5	10	-	Yes

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

30

Minimum Examination Passing Requirement (%)

30

Additional Information for ATs

Remarks: To pass the course, students are required to achieve at least 30% in coursework and 30% in the examination. Also, 75% laboratory attendance rate must be obtained. # may include homework, tutorial exercise, project/mini-project, presentation

Assessment Rubrics (AR)**Assessment Task**

Examination

Criterion

Achievements in CILOs

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not even reaching marginal levels

Assessment Task

Coursework

Criterion

Achievements in CILOs

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not even reaching marginal levels

Part III Other Information

Keyword SyllabusIntroduction to Linear Time-Invariant (LTI) Systems

Basic mathematical tools and transforms. Modelling of linear dynamical systems by differential equations; Solution of linear differential equations; Block diagrams, Signal flow graphs and transfer functions; System simulations with CAD tools; Concept of feedback systems.

Analysis of Linear Feedback Systems

Frequency-domain Approach: Bode analysis, root locus, Nyquist technique; Stability analysis, Routh technique, stability margins; System performance analysis, steady state responses; Feedback and disturbance; Some practical issues.

State-space Approach: Concept of state, state-space modelling, solution of state equations, state transition equations, relationship between transfer functions and state equations, characteristic polynomials, eigenvalues and eigenvectors, stability, controllability and observability, state feedback design, closed-loop system characteristics.

Basic of Linear Feedback System Designs

Basic PID control schemes, designs and simulations; Frequency- and time-domain design schemes; System discretisation and digital implementation.

Reading List**Compulsory Readings**

Title	
1	Nil

Additional Readings

Title	
1	K Ogata, Modern Control Engineering (5th edition, Prentice-Hall, 2010), available in CityU Library
2	B C Kuo, Automatic Control Systems (8th edition, Wiley, 2003), available in CityU Library