City University of Hong Kong

Information on a Course
offered by Department of Electronic Engineering
with effect from Semester B in 2014/2015

Part I

Course Title:	Systems and Control
Course Code:	EE3114
Course Duration:	One Semester (13 Weeks)
No. of credits:	3
Level:	B3
Medium of Instruction:	English
Prerequisites *(Course Code and Title)*:	EE3118 Linear Systems and Signal Analysis or EE3210 Signals and Systems
Precursors *(Course Code and Title)*:	Nil
Equivalent Course *(Course Code and Title)* :	Nil
Exclusive Courses: *(Course Code and Title)*:	Nil

Part II

1. Course Aims:

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 and signals to students in such a way as 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.

2. Course Intended Learning Outcomes (CILOs)

Upon successful completion of this course, students should be able to:

No.	CILOs
1.	Describe basic linear feedback system properties and the application of CAD tools for analysis and design.
2.	Analyze feedback system behaviours in terms of frequency domain methods
3.	Analyze feedback systems via state-space method with the use of CAD tools.
4.	Analyze and derive system models/equations for continuous and discrete feedback system.
5.	Design basic feedback control systems .

3. Teaching and Learning Activities (TLAs)

CILO 1	*Possible activities:* lectures supplemented with some basic examples for the demonstration of the basic skills. Problems are given to students for practising and further discussion is carried out in tutorials. Short quiz is also given to students to allow them for practising the skills independently.
CILO 2	*Possible activities:* lectures with examples for illustration. Problems are then given to students for practising and further discussion, *short writes, brainstorming, Jigsaw techniques, pause procedures, think-pair-share, self-study, on-line learning*
CILO 3	*Possible activities:* lectures with examples for illustration. Problems are then given to students for practising and further discussion, *short writes, brainstorming, Jigsaw techniques, pause procedures, think-pair-share, self-study, on-line learning.* Laboratory/Project works allow student to visualize the dynamical behaviour of some representative feedback control systems using numerical simulations/experiments, and compare the results with the calculated ones.
CILO 4	*Possible activities:* lectures with examples provided. Problems are given to students for practising and further discussion is carried out in tutorials. Assignment is given to students for practising their own skill.
CILO 5	*Possible activities* : lectures with examples for the demonstration of basic skills. Practical problems are given to students for practising and further discussion is carried out in tutorials and assignment is also given. Laboratory works are designed to allow student to practising the design method of some representative feedback systems, *short writes, brainstorming, Jigsaw techniques, pause procedures, think-pair-share, self-study, on-line learning*

Timetabling Information

Pattern	Hours
Lecture:	*26*
Tutorials:	*13*
Laboratory:	*9*
Other activities:	

4. Assessment Tasks/Activities

	Type of assessment tasks	Weighting (if applicable)
Continuous Assessment	Assignments, Quizzes, Tests, Laboratory/project	40%
Examination	Written exam	60% 2 hours

Remarks: To pass the course, students are required to achieve at least 35% in the course work and 35% in the examination. Also, 75% laboratory attendance rate must be obtained.

5. Grading of Student Achievement:

Refer to Grading of Courses in the Academic Regulations.

Letter Grade	Grade Point	Grade Definitions
A+	4.3	Excellent
A	4.0	
A-	3.7	
B+	3.3	Good
B	3.0	
B-	2.7	
C+	2.3	Adequate
C	2.0	
C-	1.7	
D	1.0	Marginal
F	0.0	Failure

6. Constructive Alignment with Major Outcomes

Please state how the course contribute to the specific MILO(s)

MILO	How the course contribute to the specific MILO(s)
1, 2, 5	The use of mathematical and engineering techniques is central to the aims of this course with ample opportunity to apply these techniques for solving some engineering problems in class and in the laboratory.
4, 7, 10	A three-session laboratory/project is scheduled to allow students to practice this type of work which is directly linked to the skills learnt during the lectures. Students can adopt their learnt engineering tools in solving the designed laboratory tasks and practise their communication skills in report writing and demonstrations.

Part III

Keyword Syllabus

Introduction 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 states, state space model, solution of state equations, state transition equation, relationship between transfer function and state equations, characteristic polynomials, eigenvalues and eigenvectors, stability, controllability and observability, state feedback, closed loop system characteristic.

Introduction to Discrete Systems

Sampled-data systems and z-transforms, transfer functions; transformation between continuous and digital systems; system modelling and analysis, system stability and structures.

Basic of Linear Feedback System Designs

Basic PID control scheme, designs and simulations; Various frequency and time domain design schemes; System discretisation and digital implementation.

Recommended Reading

B C Kuo Automatic Control Systems, (Eighth Edition, John Wiley, 2003), (also Seventh Edition, Prentice-Hall International 1997)

K Ogata Modern Control Engineering, (Prentice Hall, 2000)

K Ogata Discrete-time Control Systems, (Prentice-Hall International, 1987)

R E Ziemer, W H Tranter and D R Fannin Signals and Systems, Continuous and Discrete, (MacMillan, 1994)

G F Franklin, J D Powell and A Emami-Naeini Feedback Control of Dynamic Systems, (Prentice Hall, 2002)

R C Dorf Modern Control, Systems, (6th Edition, Addison Wesley, 1992)

H Kwakerneek and R Sivan Modern Signals and Systems, (Prentice Hall, 1991)

L Jackson Signals, Systems, and Transform, (Addison Wesley, 1991)

R A Gabel and R A Roberts Signals and Linear Systems, (3rd Edition, Wiley 1987)

D Wiberg State Space and Linear Systems, Schaum's Outline Series, (McGraw-Hill, 1971)

Online Resources (if any)

LabView Programming http//www.ni.com/academic/lv_training/how_learn_lv.htm
MATLAB Programming