

國立中正大學機械工程學系 115 學年度第一學期教學大綱表

課程名稱：(中文) 自動控制(一) (英文) Automatic Control (I)					開課單位	機械系
					課程代碼	4223701 4213505
授課教師	陳世樂	學分數	3	必修	開課年級	大三
全英文授課 EMI	☒ 是(02 班) ☐ 否(01 班)					
課程類別 course type	☐ 人文關懷課程 ☐ 競賽專題課程 ☒ 問題導向課程 ☒ 專題導向課程 ☐ 總整課程 ☐ 實作課程 ☐ 實習 ☐ 其他					
先修科目或先備能力：工程數學						
課程概述：The class is divided into the following parts. - Part 0. Introduction - In this introduction, we will contemplate on what design requirements we should impose on practical controls. - The class is designed for general mechanical engineering students; selection of control subjects for the class will be based on their usefulness to the general ME students; those with interest towards only control oriented students will be skipped and introduced at the later class, Automatic Control (II). - Part I. Transfer Functions of Physical Systems - Laplace Transform Review - Transfer Function - Part II. State Equations for Physical systems - General State-Space Representation - Conversion between State Space and Transfer Function - Linearization - Part III. Transient Response - Poles, Zeros, and System Response - First-Order System - Second-Order System - System Response with zeros and poles - Laplace Transform Solution of State Equations - Part IV. Transient Response Stability - Routh-Hurwitz Criterion - Stability in State Space - Part V. Forced Response Errors - Steady-State Error for Unity Feedback Systems - Static Error Constants and System Type - Sensitivity - Part VI. A Graphical Tool - Root Locus - Transient Response Design via Gain Adjustment. - Pole Sensitivity 目標： - The students are expected to learn how to analyze and predict the dynamic behavior, i.e., the response, of an LTI system. The analysis will be conducted in both time- and frequency-domains.						

教科書	- 自編講義 - Norman S. Nise, Control Systems Engineering, 8th ed., John Wiley & Sons, Inc. 「請尊重智慧財產權，不得非法影印教師指定之教科書籍」					
教學要點概述						
教材編選 teaching materials	☐ 自製簡報(ppt) ☒ 課程講義 ☐ 自編教科書 ☐ 教學程式 ☐ 自製教學影片 ☐ 其他					
教學方法 teaching methods	☒ 講述 ☐ 小組討論 ☐ 學生口頭報告 ☐ 問題導向學習 ☐ 個案研究 ☐ 其他					
評量工具 Evaluation tools	☒ 期中考 ☒ 期末考 ☒ 隨堂測驗 ☐ 隨堂作業 ☐ 課後作業 ☐ 期中報告 ☐ 期末報告 ☐ 專題報告 ☐ 評量尺規 ☐ 其他					
教學資源 teaching resources	☒ 課程網站 ☐ 教材電子檔供下載 ☐ 實習網站					
教師相關訊息 instructor's information						
課程大綱		分配時數				可達成核心能力
單元主題	內容綱要	講授	示範	習作	其他 ¹	
Introduction	The control systems	1				B1, B2, B3, B5, B6
Transfer Functions of Physical Systems	- Laplace Transform Review - Transfer Function	8				B1, B2, B3, B5, B6
Equilibrium	- Equilibrium of a Particle - Equilibrium of a Rigid Body	8				B1, B2, B3, B5, B6
State Equations for Physical systems	- General State-Space Representation - Conversion between State Space and Transfer Function - Linearization	8				B1, B2, B3, B5, B6
Transient Response	- Routh-Hurwitz Criterion - Stability in State Space	17				B1, B2, B3, B5, B6

Forced Response Errors	- Steady-State Error for Unity Feedback Systems - Static Error Constants and System Type - Sensitivity	8				B1, B2, B3, B5, B6
A Graphical Tool	- Root Locus - Transient Response Design via Gain Adjustment. - Pole Sensitivity	9				B1, B2, B3, B5, B6

可達成核心能力		核心能力達成指標				
B01	具備基本工程數學、固體力學、熱流力學、自動控制及材料科學分析的能力	具備基礎工程數學、自動控制分析的能力				
B02	吸收與整合跨領域知識的能力	吸收與整合跨領域知識的能力				
B03	執行固力實驗、熱流實驗、自動控制實驗、電子學實驗和分析數據的能力	具備基礎分析自動控制相關數據的能力				
B05	機械系統、元件設計與製程規劃的能力	具備初步機械控制系統設計的能力				
B06	發掘、分析及解決專業問題的能力	具備發掘、分析及解決自動控制相關問題的基本能力				

教學要點概述:

上課時間	上課地點	學習成果評量方式	Office hour	教學品質評量方式
01 班：二 B 四 B 02 班：二 C 四 C	工學院二館 214 左	3 exams (2 midterms 50% + 1 final 30%) - Homework 20% (The above items may be subject to change)		教學意見調查核心能力重要性及達成度分析問卷
週次	教 學 與 作 業 進 度			備 註
1	Class introduction			
2	Laplace Transform Review			
3	Transfer Function			
4	General State-Space Representation			
5	Conversion between State Space and Transfer Function			
6	Linearization			
7	Poles, Zeros, and System Response			
8	First-Order and Second-Order System			
9	System Response with zeros and poles			

10	Midterm Exam	
11	Laplace Transform Solution of State Equations	
12	Routh-Hurwitz Criterion	
13	Stability in State Space	
14	Steady-State Error for Unity Feedback Systems	
15	Static Error Constants and System Type	
16	Root Locus	
17	Transient Response Design via Gain Adjustment.	
18	Final Exam	
其他: The schedule may be subject to change.		