# 國立台灣科技大學 114學年 第2學期　課程大綱

## Spring 2026 NTUST Course Outline

授課教師：魏榮宗

Instructor:Jung-Tzung Wei

課程名稱：控制系統合成

Course Title：Control System Synthesis

2026/11/3

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| 課程代號： ES5116701<br>Course Code<br>學分數： 3<br>Credits | 必選修：選修/半學年<br>Required/Electve:Elective/Half Yr.<br>先修課程：<br>Prerequisites |
| 節次教室：<br>Time/Location | T6(EE-503) T7(EE-503) T8(EE-503) |
| 專業核心能力：<br>Core Professional Competencies | 1. 應用進階電子領域知識之能力<br>2. 研讀及撰寫專業論文之能力<br>3. 評估分析與獨立解決問題之能力<br>4. 設計規劃與執行專題及系統整合之能力<br>5. 研究結果分析與表達之能力<br>6. 具國際觀及終身學習之能力 |
| 課程網址：<br>Course Website | |
| 課程宗旨：<br>Course Objectives | 本課程透過回顧Laplace轉換，依序介紹物理系統及狀態變數建模技巧，並進行系統穩定性分析，再者進階學習回授控制系統、可變結構控制系統、模糊控制系統及類神經網路控制系統於實務系統設計，並以馬達驅動系統為例進行課堂數值模擬比對控制性能，最終各小組(至多三人為一組)以有興趣主題研讀論文並應用所學設計其對應控制系統，專案報告發表設計成效。<br>Through the review of Laplace transformation, this course introduces the modeling techniques of physical systems and state variables in sequence, and conducts system stability analysis. Then, this course further introduces practical system design including feedback control systems, variable-structure control systems, fuzzy control systems and neural-network control systems. The control system is designed in practice, and the numerical simulation of a motor driving system is used as an example to compare individual control performance. Finally, one paper should be studied by one course group (up to three people) on the topic of interest, and the corresponding control system is designed by applying what has been learned. Each course group should publish the design results in the project report. |
| 課程大綱：<br>Outline of Lectures | 1.回顧Laplace轉換(Review of Laplace Transform)<br>2.物理系統模型(Models of Physical Systems)<br>3.狀態變數模型(State-Variable Models)<br>4.穩定度分析(Stability Analysis)<br>5.回授控制系統設計(Design of Feedback Control System)<br>6.可變結構控制系統設計(Design of Variable Structure Control)<br>7.模糊控制系統設計(Design of Fuzzy Control System)<br>8.類神經網路控制系統設計(Design of Neural Network Control System)<br>9.論文導讀及專題執行(Project Implementation) |
| 授課方式：<br>Method of Instruction | 講授 Lecture：70%<br>分組討論 Group discussion：10%<br>案例研討 Case study：0%<br>操做練習 Practical exercises：20%<br>講授 Lecture：% |

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| 教科書：<br>Textbooks | Feedback Control Systems (5e), Charles L. Phillips/John M. Parr, 高立圖書代理 |
| 參考書目：<br>References | 1.Delta MOOCx-Training Course: Electric Control; https://univ.deltamoocx.net/<br>2.An Overview of Artificial Intelligence Applications for Power Electronics, IEEE Trans. Power Electronics, vol. 36, no. 4, pp. 4633-4657, April 2021.<br>3.Design of voltage tracking control for DC-DC boost converter via total sliding-mode technique, IEEE Trans. Industrial Electronics, vol. 58, no. 6, pp. 2502-2511, June 2011.<br>4.Adaptive fuzzy-neural-network design for voltage tracking control of a dc-dc boost converter |
| 修課須知：<br>Notice | 安排助教TA一名 |
| 評量方式：<br>Grading | 1.點名成績5%(一次不到且未請假扣1點；扣滿五次該項無得分)<br>2.程式作業成績40%<br>3.期中考(25%)及期末報告(30%)共佔55%<br>1. 5% of the roll call score (1 point will be deducted for less than one time and no leave; no points will be deducted for five times)<br>2. Program homework grade 40%<br>3. Mid-term exam (25%) and final report (30%) account for 55% |
| 備註說明：<br>Notes | 先修課程(Advanced Placement): 控制系統 (Control System), 數值模擬 (Matlab) |