

Tamkang University Academic Year 110, 1st Semester Course Syllabus

Course Title	ADVANCED PROCESS ANALYSIS AND SIMULATION	Instructor	YANG, YAN-LING
Course Class	TEDXM1A MASTER'S PROGRAM, DEPARTMENT OF CHEMICAL AND MATERIALS ENGINEERING, 1A	Details	<ul style="list-style-type: none"> ◆ Blended Course ◆ Selective ◆ One Semester ◆ 3 Credits
Relevance to SDGs	SDG8 Decent work and economic growth		
Departmental Aim of Education			
Education Objectives: Cultivation of chemical/materials engineering experts with professional knowledge and high research-and-development capability.			
Subject Departmental core competences			
<p>A. Possess the advanced knowledge of chemical/material engineering and to be able to use it. (ratio:50.00)</p> <p>B. Capable to plan and execute the chemical/material engineering projects.(ratio:25.00)</p> <p>D. Capable of creative thinking and solving problem independently.(ratio:25.00)</p>			
Subject Schoolwide essential virtues			
<p>3. A vision for the future. (ratio:10.00)</p> <p>5. Independent thinking. (ratio:90.00)</p>			
Course Introduction	<p>This course focuses on a complete start to finish process of physics-based modeling, data driven methods, and controller design. Although some knowledge of computer programming is required, students are led through several introductory topics that develop an understanding of numerical methods in process control.</p>		

The correspondences between the course's instructional objectives and the cognitive, affective, and psychomotor objectives.

Differentiate the various objective methods among the cognitive, affective and psychomotor domains of the course's instructional objectives.

I. Cognitive : Emphasis upon the study of various kinds of knowledge in the cognition of the course's veracity, conception, procedures, outcomes, etc.

II.Affective : Emphasis upon the study of various kinds of knowledge in the course's appeal, morals, attitude, conviction, values, etc.

III.Psychomotor: Emphasis upon the study of the course's physical activity and technical manipulation.

No.	Teaching Objectives	objective methods
1	Students will be able to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. Students will be able to applying engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. Students will be able to acquire and apply new knowledge as needed.	Cognitive

The correspondences of teaching objectives : core competences, essential virtues, teaching methods, and assessment

No.	Core Competences	Essential Virtues	Teaching Methods	Assessment
1	ABD	35	Lecture, Discussion	Study Assignments, Discussion(including classroom and online), Practicum, Report(including oral and written)

Course Schedule

Note for Blended Course : When utilizing weekly digital instruction, please fill in "Online Asynchronous Instruction".

Week	Date	Course Contents	Note
1	110/09/22~ 110/09/28	Course Introduction & Simulate Dynamics with Python	
2	110/09/29~ 110/10/05	Physics-based Dynamic Modeling & Transient Balance Equations	
3	110/10/06~ 110/10/12	Linearize Balance Equations & First-Order Linear Dynamics with Dead Time using Graphical Fitting Methods	線上非同步教學
4	110/10/13~ 110/10/19	Optimize Model Parameter Fit & Control Design	
5	110/10/20~ 110/10/26	Proportional-only (P-only) Control & Proportional Integral (PI) Control	

6	110/10/27 ~ 110/11/02	Proportional Integral Derivative (PID) Control & Case Study: Level Control	
7	110/11/03 ~ 110/11/09	Case Study: Nonlinear System Control & Case Study: Disturbances	
8	110/11/10 ~ 110/11/16	Valve Design Principles & Sensors and Data Acquisition	
9	110/11/17 ~ 110/11/23	Temperature Modeling & Temperature Regression	
10	110/11/24 ~ 110/11/30	Temperature Control & Laplace Transforms	
11	110/12/01 ~ 110/12/07	Transfer Functions & State Space Models	
12	110/12/08 ~ 110/12/14	Second Order Systems with Graphical Fitting & Second Order Optimization	
13	110/12/15 ~ 110/12/21	Simulation of FOPDT, SOPDT, and Higher Order Systems & Stability Analysis	
14	110/12/22 ~ 110/12/28	Cascade Control and Feedforward Control & Control Project Introduction	
15	110/12/29 ~ 111/01/04	Optimization Introduction & Linear Programming	
16	111/01/05 ~ 111/01/11	Scheduling Optimization & Nonlinear Programming	線上非同步教學
17	111/01/12 ~ 111/01/18	Model Predictive Control & Machine Learning	
18	111/01/19 ~ 111/01/25	Deep Learning	
Requirement			
Teaching Facility	Computer, Projector		
Textbooks and Teaching Materials	There will be no official textbook. Reading material will be provided on occasion and students are encouraged to explore related material.		
References	D.M. Himmelblau and K.B. Bischoff, "Process Analysis and Simulation"		
Number of Assignment(s)	18 (Filled in by assignment instructor only)		
Grading Policy	◆ Attendance : % ◆ Mark of Usual : % ◆ Midterm Exam : % ◆ Final Exam : % ◆ Other (Assignment) : 100.0 %		

Note	<ol style="list-style-type: none">1. This syllabus may be uploaded at the website of the Course Syllabus Management System at https://info.ais.tku.edu.tw/csp or through the link of the Course Syllabus Upload posted on the home page of the TKU Office of Academic Affairs http://www.acad.tku.edu.tw/CS/main.php2. According to the Implementation regulations of distance education for junior college and above are prescribed pursuant to Article 2, "The distance learning course referred to in these Measures refers to more than one-half of the teaching hours in each subject."3. According to the regulations of Tamkang University Enforcement Rules for digital teaching, Paragraph 2 and Article 3, the distance learning course of our school must be "The course of digital teaching with distance learning platform or synchronous video system in our school. Teaching Hours include course lectures, teacher-student interaction discussions, quizzes and other learning activities."4. If there are any temporary course changes (including time changes and classroom changes of distance learning courses, blended courses), please make out an application according to regulations to the Office of Academic Affairs. <p>※ Unauthorized photocopying is illegal. Using original textbooks is advised. It is a crime to improperly photocopy others' publications.</p>
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