Tamkang University Academic Year 104, 1st Semester Course Syllabus

Course Title	DIGITAL CONTROL SYSTEM	Instructor	TYAN FENG
Course Class	TENXM1A MASTER'S PROGRAM, DEPARTMENT OF AEROSPACE ENGINEERING, 1A	Details	◆ Selective ◆ One Semester ◆ 3 Credits

Departmental Aim of Education

Ⅰ. To lay down a concrete foundation of professional ethics in aerospace and aeronautical engineering, and to cultivate the students' ability in multidisciplinary expertise and continuous learning.

Ⅱ. To setup the students' hands-on ability of and the ability in resolving problem, so that both practical implementations and theories can be emphasized.

Ⅲ. To foster students with diligent and sociable attitude in work, and broadeded international perspective.

Departmental core competences

A. To equip with specific aerospace engineering knowledge and expertise.

B. Be able to master information, capable of utilizing computer to assist solving problems, and possess the ability of conducting learning new knowledge.

C. Be able to design and conduct experiments as well as to analyze, and to solve practical aerospace related engineering problems.

D. Be able to write professional research papers in the field of aerospace engineering.

E. Have a creative thinking, complete analyzing, effective communication, the spirit of teamwork and the ability to solve industrial problems.

Course Introduction	Digital control system provides the insight, knowledge, and understanding required to analyze and design computer-controlled systems, from theory to practical implementation. This course includes an introduction to sampled-data control systems, discretization of analog systems, discrete-time systems, time-invariance, Z-transforms, stability, state-space models, pole assignment, deadbeat control. In particular, students will learn about modelling and analyzing feedback control systems in which the plant is an analogue, continuous-time system, but where the controller is a digital computer.

The Relevance among Teaching Objectives, Objective Levels and Departmental core competences

I.Objective Levels (select applicable ones) :

(i) Cognitive Domain : C1-Remembering, C2-Understanding, C3-Applying, C4-Analyzing, C5-Evaluating, C6-Creating

(ii) Psychomotor Domain : P1-Imitation, P2-Mechanism, P3-Independent Operation, P4-Linked Operation, P5-Automation, P6-Origination

(iii) Affective Domain : A1-Receiving, A2-Responding, A3-Valuing, A4-Organizing, A5-Charaterizing, A6-Implementing

II.The Relevance among Teaching Objectives, Objective Levels and Departmental core competences :

(i) Determine the objective level(s) in any one of the three learning domains (cognitive, psychomotor, and affective) corresponding to the teaching objective. Each objective should correspond to the objective level(s) of ONLY ONE of the three domains.

(ii) If more than one objective levels are applicable for each learning domain, select the highest one only. (For example, if the objective levels for Cognitive Domain include C3,C5,and C6, select C6 only and fill it in the boxes below. The same rule applies to Psychomotor Domain and Affective Domain.)

(iii) Determine the Departmental core competences that correspond to each teaching objective. Each objective may correspond to one or more Departmental core competences at a time. (For example, if one objective corresponds to three Departmental core competences: A,AD, and BEF, list all of the three in the box.)

No.	Teaching Objectives	Relevance	
		Objective Levels	Departmental core competences
1	Introductory of Digital Control	P3	ABCDE
2	familiar with Discrete system analysis, discrete equvalents, Z-transform	P3	ABCDE
3	Design using state-space method, multivariable and optimal control	P3	ABCDE
4	System identification, nonlinear control and case study	P3	ABCDE

Teaching Objectives, Teaching Methods and Assessment

No.	Teaching Objectives	Teaching Methods	Assessment
1	Introductory of Digital Control	Lecture, Discussion, Problem solving	Written test, homework
2	familiar with Discrete system analysis, discrete equvalents, Z-transform	Lecture, Discussion	Written test, homework
3	Design using state-space method, multivariable and optimal control	Lecture, Discussion	Written test, homework
4	System identification, nonlinear control and case study	Lecture, Discussion	Written test, homework

This course has been designed to cultivate the following essential qualities in TKU students

Essential Qualities of TKU Students	Description
◇ A global perspective	Helping students develop a broader perspective from which to understand international affairs and global development.
◆ Information literacy	Becoming adept at using information technology and learning the proper way to process information.
◆ A vision for the future	Understanding self-growth, social change, and technological development so as to gain the skills necessary to bring about one's future vision.
◇ Moral integrity	Learning how to interact with others, practicing empathy and caring for others, and constructing moral principles with which to solve ethical problems.
◆ Independent thinking	Encouraging students to keenly observe and seek out the source of their problems, and to think logically and critically.
◇ A cheerful attitude and healthy lifestyle	Raising an awareness of the fine balance between one's body and soul and the environment; helping students live a meaningful life.
◇ A spirit of teamwork and dedication	Improving one's ability to communicate and cooperate so as to integrate resources, collaborate with others, and solve problems.
◇ A sense of aesthetic appreciation	Equipping students with the ability to sense and appreciate aesthetic beauty, to express themselves clearly, and to enjoy the creative process.

Course Schedule

Week	Date	Subject/Topics	Note
1	104/09/14 ~ 104/09/20	Introduction, Review of Continuous Time System	
2	104/09/21 ~ 104/09/27	Introductory of Digital Control	
3	104/09/28 ~ 104/10/04	Discrete System Analysis	
4	104/10/05 ~ 104/10/11	Sampled-Data Systems	
5	104/10/12 ~ 104/10/18	Discrete Equivalents	
6	104/10/19 ~ 104/10/25	Design Using Transform Techniques	
7	104/10/26 ~ 104/11/01	Design Using State-Space Methods	
8	104/11/02 ~ 104/11/08	Design Using State-Space Methods	
9	104/11/09 ~ 104/11/15	Midterm Exam	
10	104/11/16 ~ 104/11/22	Multivariable and Optimal Control	
11	104/11/23 ~ 104/11/29	Multivariable and Optimal Control	
12	104/11/30 ~ 104/12/06	Quantization Effects, Sample Rate Selection	

13	104/12/07 ~ 104/12/13	System Identification	
14	104/12/14 ~ 104/12/20	System Identification	
15	104/12/21 ~ 104/12/27	Nonlinear Control	
16	104/12/28 ~ 105/01/03	Nonlinear Control	
17	105/01/04 ~ 105/01/10	case study	
18	105/01/11 ~ 105/01/17	Final Exam	

Requirement	Work Hard
Teaching Facility	Computer, Projector, Other (MATLAB)
Textbook(s)	T.B.D.
Reference(s)	G. F. Franklin, J. D. Powell and M. Workman, "Digital Control of Dynamic Systems," 3rd ed, Addision Wesley, 1998
Number of Assignment(s)	6 (Filled in by assignment instructor only)
Grading Policy	◆ Attendance： % ◆ Mark of Usual：35.0 % ◆ Midterm Exam： 50.0 % ◆ Final Exam： 15.0 % ◆ Other〈 〉： %
Note	This syllabus may be uploaded at the website of Course Syllabus Management System at http://info.ais.tku.edu.tw/csp or through the link of Course Syllabus Upload posted on the home page of TKU Office of Academic Affairs at http://www.acad.tku.edu.tw/CS/main.php . **※ Unauthorized photocopying is illegal. Using original textbooks is advised. It is a crime to improperly photocopy others' publications.**