SYLLABUS

1. **Course name:** Automatic Control Systems
2. **Course code:** ACSY330346
3. **Credits:** 3 (3/0/6)
   Duration: 15 weeks (45h main course and 90h self-study)
4. **Instructors:**
   1- Nguyen Minh Tam, PhD
   2- Truong Dinh Nhon, PhD
   3- Nguyen Tran Minh Nguyet, MEng
   4- Nguyen Thị Yen Tuyet, Eng
   5- Nguyen Phong Luu, MEng
5. **Course conditions**
   Prerequisites: Basic electronics
   Corequisites: N/A
6. **Course description**

This course equips students the contents of the components of an automated control system of linear continuity, the construction methods of mathematical models of automatic control systems including transfer function , graph signal and equation of state, the issue of control and observation, survey methods stability of automatic control systems, methods for assessing the quality of the control system: accuracy determination, time domain, frequency domain and the design method of automatic control system so that system stability and achieve the quality targets set.

7. **Course Goals**

Goals	***Goal description*** *(This course provides students:)*	**ELOs**
G1	Basic knowledge and capable of analyzing the stability of the object, evaluate the quality of the automated control system.	01 (H)
G2	Having the ability to calculate and design the controller for an automatic control system for linear invariant system continuously.	02 (H)
G3	Ability to read and understand technical documents in English.	05 (L)
G4	Having the ability to calculate and design a controller for the automatic control system in practice.	07 (L)

** Note: High: H; Medium: M; Low: L*

8. **Course Learning Outcomes (CLOs)**

CLOs		***Description*** *(After completing this course, students can have:)*	**Outcome**
	G1.1	Presented by function, role and basic components of the control system.	01

	G1.2	Determine the composition and function of the components of the actual control system.	01
	G1.3	Presented are principles of design and working principle of the controller include early-phase controller, the controller lag, lag controllers soon, a PD controller, PID.	01
	G1.4	Analyze the stability of a specific object.	01
	G1.5	Assess the quality of the system.	01
	G2.1	Analyze and evaluate the application of the matching controller object.	02
	G2.2	Calculating the parameters of the controller for each specific audience.	02
	G3.1	Understand the English term for automatic control systems.	05
	G3.2	Having the ability to search documents and research.	05
	G4.1	Build mathematical models for some simple object in the field of automatic control.	02 07
	G4.2	Having the ability to calculate and design a controller for the automatic control system in practice.	02 07

9. Study materials

- Textbooks:

[1] Nguyen Thi Phuong Ha – Huynh Thai Hoang, *Ly thuyet dieu khien tu dong*, NXB KH & KT, Hà Nội, 2007.

- References:

[2] Tran Sum, *Giao Trinh Tu Dong Dieu Khien*, NXB Thống Kê, 1999.

[3] Nguyen Thi Phuong Ha, *Bai tap Dieu khien tu dong*, NXB KH & KT, Hà Nội, 1996.

10. Sudent Assessments

- Grading points: 10

- Planning for students assessment is followed:

Type	Contents	Linetime	Assessment techniques	CLOs	Rates (%)
Midterms					**50**
Exercise 01	Find the equivalent transfer function of the system based on the block diagram and signal graph.	Weeks 3	Quizes	G1.1, G1.2	2.5
Exercise 02	Find equation of state described the object is the engine independent DC excitation.	week 5	Quizes	G1.1, G1.2	2.5
Exercise 03	For a specific object in a control block diagram, analysis of system stability.	week 10	Quizes	G2.1, G2.2	2.5

Exercise 04	For specific objects is controlled furnace, designed PID controller.	Week 14	Quizes	G1.3	2.5
Exam 01	Find the transfer function, equation of state for plotting Bode assigned specific audience.	Week 6	Individual paper assessment in class	G1.1, G1.2	20
Exam 02	Stability Survey, assessing the quality of specific systems.	Week 12	Individual paper assessment in class	G2.1, G2.2	20
Final exam					**50**
Final Exam	- The exam covers all contents related to the expected learning outcomes of the course.		Individual paper assessment in class	G1.3, G1.4, G1.5, G2.1, G2.2	

11. Course details:

Weeks	Contents	CLOs
	Chapter 1: **< A ROUGH OUTLINE OF THE AUTOMATIC CONTROL SYSTEM >** *(3/0/6)*	
	A/ **Contents and teaching methods***: (3)* **Contents:** 1.1 The basic concepts. 1.2 The principles of control. 1.3 Elements automatically. 1.4 Classification of automatic control systems. **Teaching methods**: + Traditional lectures using powerpoint to review basic knowledges of steel structures course, to demonstrate large applications of these structures in different buidings. A series of diagnostic questions will be also used to estimate students knowledges. + Questions	G1.1, G1.2
	B/ **Self-study contents**: *(6)* + Exercise: find on the Internet the automated production line and shows the basic components of automatic control systems.	G3.1 G3.2
	Chapter 2: **< SYSTEM MATHEMATICAL DESCRIPTION >** *(12/0/24)*	
	A/ **Contents and teaching methods***: (12)* **Contents:** 2.1 Concept. 2.2 communication and algebraic function block diagram. 2.3 Graph signals. 2.4 Performance by transfer function Bode diagram. 2.5 Method of state space. 2.6 The relationship between differential equations, state equations.	G1.2

	and transfer function. **Teaching methods**: + Theoretical lectures. + Questions.	
	***B/* Self-study contents**: *(24)* + Construction of the transfer function of the controller is used in the field of electricity - electronics (Op-amp, RLC). + Graph performance as signal for the object is represented by the block diagram in the previous article. + Find the transfer function from the equation of state. Exercise: Find the transfer function of RLC circuit?	G4.1
	***Chapter 3:* < SURVEYS OF SYSTEM STABILITY >** *(9/0/18)*	
	A/* Contents and teaching methods:(9)* **Contents:** 3.1 The concept of stability. 3.2 Algebraic stability criteria Routh-Hurwith. 3.3 Standard Bode stability – Nyquist. **Teaching methods**: + Theoretical lectures. + Questions.	G1.4 G1.5 G2.3
	***B/* Self- study contents**: *(18)* + Operations on matrices. + Properties of dynamical systems. + The complex numbers and complex numbers represented; complex plane.	G3.2
	***Chapter 4:* < ASSESSING THE QUALITY CONTROL SYSTEM >** *(9/0/18)*	
	A/* Contents and teaching methods: (9)* **Contents:** 4.1 Concept. 4.2 Quality Criteria in the time domain in setting mode - setting error. 4.3 Quality Criteria in the time domain transient mode. 4.4 Specification of the oscillations of level 2 systems. 4.5 The quality standards in the frequency domain. **Teaching methods**: + Theoretical lectures. + Questions.	G1.5 G2.3
	***B/* Self- study contents**: *(18)* + The quality standards in the time domain. + Quality indicators of level 2 vibrating system. + The quality standards in the frequency domain.	G3.2

	+ The optimization criteria Transient response.	
	Chapter 5: **< DESIGNING CONTINUOUS LINEAR SYSTEMS >** *(12/0/24)*	
	A/ **Contents and teaching methods***: (12)* **Contents:** 5.1 Concept. 5.2 controller design phase early, late phan, early - late phase locus method number. 5.3 Design early phase controller schema using Bode. 5.4 Design phase delay controller using Bode diagrams. 5.5 PID controller design. 5.6 Design status feedback. **Teaching methods**: + Theoretical lectures. + Question.	G1.3 G2.1 G2.2
	B/ **Self- study contents**: *(24)* + Using Matlab software to examine the locus of the system. + Using the software Matlab for plotting Bode and evaluation of system stability. + Work in groups to design the PID controller for thermal furnaces. + As controls, the system observed. + Exercises.	G4.2

12. Learning ethics:

- Home assignments and projects must be done by the students themselves. Plagiarism found in the assessments will get zero point

13. First approved date: August 01 2012

14. Approval level:

Dean **Department** **Instructor**

15. Syllabus updated process

1st time: Updated content dated	Instructors
2st time: Updated content dated	Head of department