Akashi College			Year 2022			Course : Title		System Control Engineering		
Course	Informat	tion	•			•				
Course Code 4016				Course Categor	У	1 '	ed / Elective			
Class Format Lecture				Credits		Academi	Credit: 2			
Department Mechanica Engineerii			al and Electronic System ng		Student Grade	Grade Adv. 1st				
Term First Seme					Classes per Week 2		2			
Textbook Teaching										
Instructor		KAMI Yas	sushi							
	Objective		343111							
1. Can de 2. Can de 3. Can ca 4. Can ca 5. Can ex	rive the statermine the lculate state lculate observation contress.	ate-space r e stability c te feedback erver gains ol performa	gains to achieve to achieve the s ance that can be	variant system us the specified pole pecified pole arrar achieved (adjuste onditions of the co	e position through ngement using a d) using an optin	h conv dual s nal rec	ersion to a ystem gulator	a controllable canonical form		
Rubric										
			Ideal Level		Standard Level			Unacceptable Level		
Achievement 1			Can derive the state-space representation for any linear time-invariant system		Can derive the state-space representation for some typical system examples			Do not know the definition of the state-space representation		
Achievement 2			Can determine the stability based on the determination procedure in Lyapunov's stability determination method		Can explain the determination procedure in Lyapunov's stability determination method		v's	Do not know Lyapunov's stability determination method		
Achievement 3			Can calculate the desired state feedback gains by converting to a controllable canonical form			Can explain the matrix to be stabilized in state feedback control		Do not know the state feedbac control rule		
			Can calculate t observer gains system		Can explain the matrix to be stabilized in the observer design		x to be rver desig	Do not know the observer		
			performance tradeoffs that can be achieved with an optimal		Can explain the control performance that can be achieved with an optimal regulator		be	Do not know the optimal regulator		
			conditions base	Can explain the stability conditions based on the composition of the aggregation system's poles Can explain the of the composition of the composition system's poles			the	Do not know the characteristics of the composition of the aggregation system's poles		
	d Depart g Metho	ment Ob	jectives							
In classica for which Outline on a state			al control, the transmission function that focuses only on input and output relationships is the basis a control system is designed in the frequency domain. By contrast, modern control theory is based e-space representation that use variables (state variables) that represent the internal state of a design a control system in a time domain. This course will cover the basic contents of modern neory.							
Students method, o			will learn about topics such as the derivation of state equations, Lyapunov's stability determination controllability and observability, and how to design state feedback controllers and observers. every class, after the content of the lesson is explained, there will be exercises to review the							
Notice		This cour guarante assignme Laplace t There wi Students	eed in classes and ent reports. Furth cransform, transfo Il be no makeup o who miss 1/3 or	the standard self termore, the courser functions, and exams to cover por more of classes v	f-study time requise assumes that seigenvalues and report performance.	iired fo studer matrix	or pre-stud nts have a inversion	include the learning time dy / review, and completing basic knowledge of topics such a (the very basics of matrix theory trade.		
Charact	eristics c	of Class /	Division in Le	arning	T					
☑ Active Learning			☐ Aided by IC	☑ Applicable to Remote Class			☐ Instructor Professionally Experienced			
Course	Plan									
		Гћете			Goals					
	1st Quarter		An introduction to state-space representation			Can write the expression for state-space representation Can explain the process for deriving a state-space representation				
1st Semeste r		2nd	Solutions for equ	olutions for equations of state			Can derive the solution for an equation of state Can explain the meaning of a state-transition matrix Can calculate a state-transition matrix			
			delationship between an equation of state and a ransfer function, and the stability condition				Can calculate a transfer function from the state- space matrix Can explain the stable conditions of a system represented by a state-space representation			

		4th	Similarity conversion invariants and transfer functions			Can explain the formula for a similarity transformation Can similarly transform states using the given similarity transformation matrix				
		5th	Concept of stability and Lyapunov's stability determination method (1)			Can explain the relationship between stability and convergence values of state variables Can explain Lyapunov's stability determination method				
		6th	Lyapunov's stability determination method (2) Exercise			Can determine the stability of the linear time- invariant system given by a state-space representation, based on Lyapunov's stability determination method				
		7th				Do exercises to review content from lectures in the first semester.				
		8th	Midterm exam							
		9th	State feedback and controllability			Can explain state feedback control rules Can determine controllability based on control conditions				
		10th	The nature of a co	ontrollable canoni ntrol system	cal form and	Can explain the characteristics of the system matrix in controllable canonical form and their correspondence with a transfer function Can calculate the state feedback gain that achieves the specified pole position through conversion to a controllable canonical form				
	2nd Quarter	11th	Observers and observability			Can explain the configuration of an observer Can determine observability based on the observation conditions				
		12th	The nature of observable canonical form and the design of observers using a dual system			Can explain the characteristics of the system matrix in observable canonical form and the correspondence with a transfer function Can calculate observer gain to achieve the specified pole arrangement using a dual system				
		13th	Pole-zero offset, controllability / observability, optimal regulators, and the Kalman filter			Can explain the relationship between pole-zero offset and the establishing controllability and observability Can explain the control implications for optimal regulators and the Kalman filter				
		14th	State feedback co instruments (aggr		observation	Can explain the composition of the aggregation system's poles Can explain the stability conditions of the aggregation system				
		15th	Exercise			Do exercises to review content from lectures in the second semester.				
		16th	Final exam		·					
Evaluati	on Met	hod and '	Weight (%)							
	Ex		Exercise	Mutual Evaluations between students	Behavior	Portfolio	Other	Total		
Subtotal 80)	20	0	0	0	0	100		
Basic Proficiency 0			0	0	0	0 0		0		
Specialize Proficiency)	20	0	0	0	0	100		
Cross Area Proficiency 0			0	0	0	0	0	0		