

Tsuyama College		Year	2021		Course Title	Instrumentation Engineering
Course Information						
Course Code	0093		Course Category	Specialized / Elective		
Class Format	Lecture		Credits	Academic Credit: 2		
Department	Department of Integrated Science and Technology Electrical and Electronic Systems Program		Student Grade	4th		
Term	Second Semester		Classes per Week	2		
Textbook and/or Teaching Materials	Textbooks : "INTRODUCTION TO MEASUREMENT ENGINEERING"(Morikita Publishing Co., LTD.)					
Instructor	NOMURA Kensaku					
Course Objectives						
Learning purposes : To gain a basic understanding of measurement engineering. Learn the definition of the International System of Units, the uncertainty that appears in measurements, and how to reduce errors.						
Course Objectives : 1. To understand the types and definitions of measurements. 2. To understand the causes, types and accuracy of measurement errors. 3. To understand SI units and SI prefixes. 4. To understand the length measurement method and measuring equipments.						
Rubric						
	Excellent	Good	Acceptable	Not acceptable		
Achievement 1	Students can use SI units and SI prefixes correctly.	Students have a correct understanding of SI units and SI prefixes.	Students know SI units and SI prefixes.	Students are not satisfied with the evaluation on the left.		
Achievement 2	Students can choose the appropriate measurement method according to the situation.	Students can explain the definition and type of measurement.	Students know the definition and type of measurement.	Students are not satisfied with the evaluation on the left.		
Achievement 3	Students can evaluate the causes and types of measurement errors, accuracy and uncertainty, and composite errors.	Students can explain the causes and types of measurement errors, accuracy and uncertainty, and composite errors.	Students are aware of the causes and types of measurement errors, accuracy and uncertainty, and composite errors.	Students are not satisfied with the evaluation on the left.		
Achievement 4	Students can create instrument specifications and students can select the appropriate instrument.	Students can explain how to measure various physical quantities, and students can select measuring instruments.	Students know the relationship between measuring methods and measuring instruments for various physical quantities.	Students are not satisfied with the evaluation on the left.		
Assigned Department Objectives						
Teaching Method						
Outline	General or Specialized :Specialized Field of learning : Measurement and Control,Energy Foundational academic disciplines : Engineering / Electrical and electronic engineering / Measurement engineering  Relationship with Educational Objectives : This class is equivalent to "(3) Acquire deep foundation knowledge of the major subject area".  Relationship with JABEE programs : The main goal of learning / education in this class are"(A)", A-2.  Course outline : Lectures on measurement methods compared to the standard (unit system) are conducted. Explains how to handle the uncertainty that appears in the measurements. The precautions for accurate measurement are explained.					
Style	Course method : Classes are mainly conducted on the blackboard.Exercises will be given as appropriate.  Grade evaluation method : Exams ( 60%) +Practice problems ( 40%). Examinations will be conducted a total of 4 times, and the evaluation ratios will be the same. Retaking an exam will be conducted as needed.Evaluation of retaken exam will be explain on the class.You will be instructed if you can bring your textbooks and notebooks to the exam each time.					
Notice	Precautions on the enrollment : This is a "class that requires study outside of class hours". Classes are offered for 15 hours per credit, but 30 credit hours are required in addition to this. Follow the instructions of your instructor for these studies.  Course advice : In experiments and graduation thesis, it is also a subject to learn measurement engineering practically, so take it while paying attention to the measurement technology.  Foundational subjects :Fundamentals of Integrated Science and Technology(1st year), Mechatronics I (3rd) Related subjects :Graduation Thesis(5th year)  Attendance advice : Task will be conducted at the beginning of the class. If you are late for the start time, you will not be able to work on the task.					

Characteristics of Class / Division in Learning							
<input type="checkbox"/> Active Learning		<input type="checkbox"/> Aided by ICT		<input type="checkbox"/> Applicable to Remote Class			
<input type="checkbox"/> Instructor Professionally Experienced							
Elective must complete subjects							
Course Plan							
			Theme	Goals			
2nd Semester r	3rd Quarter	1st	Guidance.Basics of measurement [Handling uncertainty] Statistical treatment of uncertainty	Explain the cause and type of measurement error, accuracy and uncertainty.			
		2nd	Basics of measurement [Handling uncertainty] Statistical treatment of uncertainty	Draw a histogram from the measurement data to find the standard deviation.			
		3rd	Basics of measurement [Handling uncertainty] Measurement errors of the direct measurements	Uncertainty in the direct measurement can be estimated.			
		4th	Basics of measurement [Handling uncertainty] Measurement errors of the indirect measurements	Uncertainty in the indirect measurement can be estimated.			
		5th	Basics of measurement [Handling uncertainty]Least squares	Understand the outline of Least squares.			
		6th	Basics of measurement [Handling uncertainty]Least squares	Linearly approximate the measured data using the method of Least squares.			
		7th	Basics of measurement [Measurement system configuration]Deviation method and zero method	Explain the deviation method and the zero method.			
		8th	2nd semester mid-term exam				
	4th Quarter	9th	Return and commentary of exam answers				
		10th	Basics of measurement [Measurement system configuration]Transmission	Understand impedance matching and voltage follower circuits.			
		11th	Basics of measurement [Measurement system configuration]AD converter	Understand the conversion algorithm of AD converter.			
		12th	Basics of measurement [Measurement system configuration]DA converter	Understand the conversion algorithm of DA converter.			
		13th	Length and angle measurement[Length standard]	Understand the measurement method in length measurement.			
		14th	Length and angle measurement[Uncertainty in length measurement]	Explain the uncertainty in length measurement.			
		15th	(2nd semester final exam)				
		16th	Return and commentary of exam answers				
Evaluation Method and Weight (%)							
	Examination	Presentation	Mutual Evaluations between students	Behavior	Portfolio	Other	Total
Subtotal	60	0	0	0	40	0	100
Basic Proficiency	0	0	0	0	0	0	0
Specialized Proficiency	60	0	0	0	40	0	100
Cross Area Proficiency	0	0	0	0	0	0	0