

Anan College		Year	2024		Course Title	Experiments in Mechanical Engineering 3	
Course Information							
Course Code		1214T02		Course Category		Specialized / Compulsory	
Class Format		Experiment / Practical training		Credits		Academic Credit: 4	
Department		Course of Mechanical Engineering		Student Grade		4th	
Term		Year-round		Classes per Week		前期:4 後期:4	
Textbook and/or Teaching Materials		Distribute materials as required for each experimental theme.					
Instructor		Nakaoka Nobushi,Okumoto Yoshihiro,Okita Yuji,Matsuura Fuminori,Kawabata Nariyuki,Itami Shin					
Course Objectives							
1. Understand the purpose and principles of the experiment and be able to carry out the experiment based on the guided experimental method. 2. Understand the principles of the experimental apparatus and be able to handle it correctly and make appropriate measurements. 3. Be able to organise and analyse the results of experiments and summarise them in a report using a PC. 4. Have an autonomous robotic car assembled and driven using mechatronic technology, and summarise the results in a report using a PC.							
Rubric							
		Ideal Level		Standard Level		Unacceptable Level	
Achievement 1		Understand the purpose and principles of the experiment and be able to carry out the experiment based on the guided experimental method, considering the implications of the procedure.		Understand the purpose and principles of the experiment and be able to carry out the experiment based on the guided experimental method.		Understand the purpose and principles of the experiment through one-to-one guidance and be able to carry out the experiment based on the guided experimental method.	
Achievement 2		Understand the principles of the experimental apparatus and be able to make the correct handling and appropriate measurements while summarising the results.		Understand the principles of the experimental apparatus and be able to handle it correctly and make appropriate measurements.		Understand the principles of laboratory equipment and be able to handle it correctly and make appropriate measurements through one-to-one instruction.	
Achievement 3		Be able to organise and analyse the results of experiments and compile them into a well-designed report using a PC.		Be able to organise and analyse the results of experiments and summarise them in a report using a PC.		Be able to organise and analyse the results of experiments and summarise them in a report using a PC, with one-to-one guidance.	
Achievement 4		Have an autonomous robotic car assembled and driven, which can be summarised in a report by the individual.		Have the team assemble and drive an autonomous robotic car and summarise it as a team in a report.		To have an autonomous robot car assembled and driven, which can be summarised in a report with one-to-one guidance.	
Assigned Department Objectives							
学習・教育到達度目標 D-2 学習・教育到達度目標 D-3 学習・教育到達度目標 D-4 学習・教育到達度目標 E-1 学習・教育到達度目標 E-2							
Teaching Method							
Outline		The students confirm the theory of each field of mechanical engineering through experiments, understand the necessity of the theory and learn the measurement principles for obtaining experimental values (physical quantity to be measured). They also acquire general technical writing skills. Using mechatronics technology, have each group assemble and drive an autonomous robot car and write a report on it. In the power transmission experiment, teachers who were in charge of snowmobile engine design use their experience to teach the power transmission performance evaluation method of gears and belt drives and the transmission characteristics of gears and belt drives through experiments.					
Style		A proficiency test will be given at the end of the previous semester, so students should familiarise themselves with the content of each experimental topic. As this is a credit course, students are required to submit reports as pre- and post-learning. In addition, an assignment for CAD/CAM is due each week. [121 class hours + 60 self-study hours]					
Notice		Failure to submit an experimental report will be treated as an absence, and even one absence from each experimental topic will, in principle, be treated as a failing grade. If you are going to be absent for special or unavoidable reasons, you must inform us in advance. In the event of an unauthorised absence, strict instructions will be given. Please note that the attire and preparations are different for each theme.					
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 checked="" type="checkbox"/> Instructor Professionally Experienced	
Course Plan							
			Theme		Goals		
1st Semester	1st Quarter	1st	Mechatronics 1 & 2		The characteristics of the photosensor can be measured and the measurement results can be summarised.		
		2nd	Mechatronics 1 & 2		Measure the characteristics of ultrasonic sensors and summarise the measurement results.		
		3rd	Mechatronics 1 & 2		Programmes can be written that use motor drivers to control the motors and to move forward and rotate the autonomous robotic car.		

2nd Semester		4th	Fluid engineering	Experiments measuring the flow coefficient of a 60° triangular sceptor can explain how flow is measured by the sceptor.
		5th	Fluid engineering	From experiments measuring the coefficient of friction of circular tubes, learn about the pressure drop in circular tubes and explain the differences in the coefficients of friction.
		6th	Fluid engineering	Conduct flow measurement experiments with pipelines having an aperture mechanism and explain the relationship between the structure of the aperture mechanism and the flow coefficient. Based on the results of flow measurement experiments with aperture mechanisms, be able to explain the flow behaviour of various aperture mechanisms and predict the results.
		7th	Power transmission (gear)	The effect of speed and torque on transmission efficiency is investigated by spur gear testing using the step-load method.
		8th	Power transmission (gear)	From the results of the spur gear test, the transmission efficiency due to speed and torque is discussed in terms of P-V value and film pressure ratio.
	2nd Quarter	9th	Power transmission (magnetic gear)	The mechanism of magnetic gears that can transmit power without contact compared to conventional gears is explained, the effects of rotation speed and torque on transmission efficiency are investigated, and the advantages of magnetic gears compared to conventional gears are understood.
		10th	Material strength (tensile test)	Perform tensile tests on steel materials and explain yield stress, tensile strength, elongation, drawing and stress-strain relationships.
		11th	Material strength (impact test)	Perform impact tests and explain impact values, surface failure rates and transition temperatures.
		12th	Material strength (hardness and fatigue tests)	Perform Vickers, Rockwell and Shore hardness tests and evaluate the hardness of steel materials. Perform cyclic bending tests on metallic materials and explain fatigue strength.
		13th	CAD/CAM	Be able to explain the features and types of NC machine tools, principles of control, NC methods and programme flow. Be able to learn the basic operation of 2DCAM and create machining processes.
		14th	CAD/CAM	Acquire basic 3DCAM operations and be able to create machining processes. Acquire basic NC machining set-up and be able to perform NC machining.
		15th	CAD/CAM	Acquire basic 3DCAM operations and be able to create machining processes. Acquire basic NC machining set-up and be able to perform NC machining.
		16th	Return of final exam answers for the second semester	
2nd Semester	3rd Quarter	1st	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		2nd	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		3rd	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		4th	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		5th	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		6th	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		7th	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		8th	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
	4th Quarter	9th	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		10th	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.

		11th	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		12th	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		13th	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		14th	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		15th	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		16th		

Evaluation Method and Weight (%)

	Midterm/Final exam	Quiz	Portfolio	Presentation/Attitude	Other	Total
Subtotal	10	0	90	0	0	100
Basic Proficiency	0	0	0	0	0	0
Specialized Proficiency	10	0	90	0	0	100
Cross Area Proficiency	0	0	0	0	0	0