

Anan College		Year	2024	Course Title	Civil Engineering Experiment 3
Course Information					
Course Code	1815T05		Course Category	Specialized / Compulsory	
Class Format			Credits	Academic Credit: 2	
Department	Course of Civil Engineering		Student Grade	5th	
Term	Year-round		Classes per Week	前期:4 後期:4	
Textbook and/or Teaching Materials	The teachers distribute documents.				
Instructor	Osada Kengo, Kagemasa Shuka				
Course Objectives					
1. Able to observe a pipeline's laminar and turbulent flow and understand each flow's characteristics. Able to measure a pipeline discharge and calculate the Reynolds number from experimental data. 2. Able to understand measurement methods of discharge in an open channel. Able to measure velocities and water depths using some instruments and estimate discharge using these data. 3. Able to understand each phenomenon of open channel flow: subcritical flow, supercritical flow, and hydraulic jump, and conduct flume experiments. 4. Understand and conduct experiments related to dissolved oxygen (DO) and biochemical oxygen demand (BOD). 5. Understand and conduct experiments related to pH.					
Rubric					
	Ideal Level		Standard Level		Minimum Level
Course Objective 1	Able to observe a pipeline's laminar and turbulent flow and understand enough each flow's characteristics. Able to measure a pipeline discharge and calculate the Reynolds number from experimental data.		Able to observe a pipeline's laminar and turbulent flow and understand each flow's characteristics. Able to measure a pipeline discharge and calculate the Reynolds number from experimental data.		Able to observe a pipeline's laminar and turbulent flow and understand each flow's characteristics. Able to measure a pipeline discharge and calculate the Reynolds number from experimental data with help from other group members.
Course Objective 2	Able to understand enough measurement methods of discharge in an open channel. Able to measure velocities and water depths using some instruments and estimate discharge using these data.		Able to understand measurement methods of discharge in an open channel. Able to measure velocities and water depths using some instruments and estimate discharge using these data.		Able to understand measurement methods of discharge in an open channel. Able to measure velocities and water depths using some instruments and estimate discharge using these data with help from other group members.
Course Objective 3	Able to understand enough each phenomenon of open channel flow: subcritical flow, supercritical flow, and hydraulic jump, and conduct flume experiments.		Able to understand each phenomenon of open channel flow: subcritical flow, supercritical flow, and hydraulic jump, and conduct flume experiments.		Able to slightly understand each phenomenon of open channel flow: subcritical flow, supercritical flow, and hydraulic jump, and conduct flume experiments.
Course Objective 4	Understand the principles and significance of DO and BOD experiments and perform them.		Understand the principles of DO and BOD experiments and perform them.		Able to perform DO and BOD experiments.
Course Objective 5	Understand the principles and significance of pH experiments and experiment with pH.		Understand the principle of pH experiments and experiment with pH.		Able to perform pH experiments.
Assigned Department Objectives					
学習・教育到達度目標 D-2 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	In the first semester, learners conduct flume experiments using knowledge learned in each Hydraulics and Hydraulic Engineering class. Learners aim to obtain knowledge and techniques of flow patterns, some methods of flow measurement by using instruments, and some calculation methods. In the second semester, learners conduct experiments on water quality using knowledge learned in Environmental Engineering class. Learners will understand deeply techniques that help environmental protection by obtaining knowledge of methods for understanding a water quality environment quantitatively through experiments.				
Style	Step 1: The teachers explain the outline of each experiment. Step 2: The teachers give the pre-investigation items. Learners investigate these items and write a report with students of the same group. Learners obtain knowledge and techniques of essential measurement and calculation methods through these tasks before conducting experiments. Step 3: Learners conduct experiments in a group. Step 4: Learners take the final examinations of each semester to confirm the achievement level of the course objectives. (The learning time: 60 hours, The self-study time: 30 hours)				
Notice	Wear suitable clothing and shoes for the experiment. Although learners will not handle dangerous things, please be careful during experiments. Moreover, learners have to handle experimental instruments carefully. Please bring a calculator to every class because learners will conduct many calculations to prepare reports. Learners have to observe the deadline for submitting the reports.				
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	
Course Plan					
		Theme	Goals		

1st Semester	1st Quarter	1st	Class guidance. Pre-investigation on the estimation of a discharge coefficient of a triangular weir (investigation of experiment and calculation methods). Pre-investigation on the measurement method of water depth in a complex open channel flow which includes subcritical, supercritical, and hydraulic jump.	Able to investigate measurement and calculation methods for estimating a discharge coefficient of a triangular weir and understand experimental objectives. Able to investigate the measurement of water depth and calculation methods on a complex open channel flow and understand experimental objectives.
		2nd	Pre-investigation on the estimation of a discharge coefficient of a triangular weir (investigation of experiment and calculation methods). Pre-investigation on the measurement method of water depth in a complex open channel flow which includes subcritical, supercritical, and hydraulic jump.	Able to investigate measurement and calculation methods for estimating a discharge coefficient of a triangular weir and understand experimental objectives. Able to investigate the measurement of water depth and calculation methods on a complex open channel flow and understand experimental objectives.
		3rd	Pre-investigation on the estimation of a discharge coefficient of a triangular weir (investigation of experiment and calculation methods). Pre-investigation on the measurement method of water depth in a complex open channel flow which includes subcritical, supercritical, and hydraulic jump.	Able to investigate measurement and calculation methods for estimating a discharge coefficient of a triangular weir and understand experimental objectives. Able to investigate the measurement of water depth and calculation methods on a complex open channel flow and understand experimental objectives.
		4th	Pre-investigation on the estimation of a discharge coefficient of a triangular weir (investigation of experiment and calculation methods). Pre-investigation on the measurement method of water depth in a complex open channel flow which includes subcritical, supercritical, and hydraulic jump.	Able to investigate measurement and calculation methods for estimating a discharge coefficient of a triangular weir and understand experimental objectives. Able to investigate the measurement of water depth and calculation methods on a complex open channel flow and understand experimental objectives.
		5th	Experiment on the estimation of a discharge coefficient of a triangular weir. Experiment on the measurement of the water surface profile in a complex open channel flow.	Able to understand the estimation method of the discharge coefficient of a triangular weir Able to understand each phenomenon of open channel flow: subcritical flow, supercritical flow, and hydraulic jump, and conduct flume experiments.
		6th	Experiment on the estimation of a discharge coefficient of a triangular weir. Experiment on the measurement of the water surface profile in a complex open channel flow.	Able to understand the estimation method of the discharge coefficient of a triangular weir Able to understand each phenomenon of open channel flow: subcritical flow, supercritical flow, and hydraulic jump, and conduct flume experiments.
		7th	Pre-investigation on the measurement and calculation method of discharge of an open channel (investigation of methods used in real rivers). Pre-investigation of pipeline experiment (investigation of measurement and calculation methods).	Able to investigate some methods for estimating a discharge in real rivers and understand experimental objectives. Able to investigate the observation of a pipeline's laminar and turbulent flow and calculation methods of the Reynolds number and friction loss and understand experimental objectives.
		8th	Pre-investigation on the measurement and calculation method of discharge of an open channel (investigation of methods used in real rivers). Pre-investigation of pipeline experiment (investigation of measurement and calculation methods).	Able to investigate some methods for estimating a discharge in real rivers and understand experimental objectives. Able to investigate the observation of a pipeline's laminar and turbulent flow and calculation methods of the Reynolds number and friction loss and understand experimental objectives.
	2nd Quarter	9th	Pre-investigation on the measurement and calculation method of discharge of an open channel (investigation of methods used in real rivers). Pre-investigation of pipeline experiment (investigation of measurement and calculation methods).	Able to investigate some methods for estimating a discharge in real rivers and understand experimental objectives. Able to investigate the observation of a pipeline's laminar and turbulent flow and calculation methods of the Reynolds number and friction loss and understand experimental objectives.
		10th	Pre-investigation on the measurement and calculation method of discharge of an open channel (investigation of methods used in real rivers). Pre-investigation of pipeline experiment (investigation of measurement and calculation methods).	Able to investigate some methods for estimating a discharge in real rivers and understand experimental objectives. Able to investigate the observation of a pipeline's laminar and turbulent flow and calculation methods of the Reynolds number and friction loss and understand experimental objectives.
		11th	Experiment on the estimation of a discharge in an open channel. Experiment on the observation and measurement of a pipeline flow.	Able to understand measurement methods of discharge in an open channel. Able to measure velocities and water depths using some instruments and estimate discharge using these data. Able to observe a pipeline's laminar and turbulent flow and understand each flow's characteristics. Able to measure a pipeline discharge and calculate the Reynolds number and friction loss from experimental data.

2nd Semester		12th	Experiment on the estimation of a discharge in an open channel. Experiment on the observation and measurement of a pipeline flow.	Able to understand measurement methods of discharge in an open channel. Able to measure velocities and water depths using some instruments and estimate discharge using these data. Able to observe a pipeline's laminar and turbulent flow and understand each flow's characteristics. Able to measure a pipeline discharge and calculate the Reynolds number and friction loss from experimental data.
		13th	Experiment on the estimation of a discharge in an open channel. Experiment on the observation and measurement of a pipeline flow.	Able to understand measurement methods of discharge in an open channel. Able to measure velocities and water depths using some instruments and estimate discharge using these data. Able to observe a pipeline's laminar and turbulent flow and understand each flow's characteristics. Able to measure a pipeline discharge and calculate the Reynolds number and friction loss from experimental data.
		14th	Experiment on the estimation of a discharge in an open channel. Experiment on the observation and measurement of a pipeline flow.	Able to understand measurement methods of discharge in an open channel. Able to measure velocities and water depths using some instruments and estimate discharge using these data. Able to observe a pipeline's laminar and turbulent flow and understand each flow's characteristics. Able to measure a pipeline discharge and calculate the Reynolds number and friction loss from experimental data.
		15th	Calculate using experimental data and prepare reports.	Able to calculate using experimental data and prepare reports.
		16th	Calculate using experimental data and prepare reports.	Able to calculate using experimental data and prepare reports.
	3rd Quarter	1st	Guidance Preliminary study of river water quality experiment	Able to study the specified items and understand their purpose concerning river water quality experiments.
		2nd	Preliminary study of river water quality experiment	Able to study the specified items and understand their purpose concerning river water quality experiments.
		3rd	River water quality experiment	Able to experiment with water quality parameters (pH, DO, BOD, etc.).
		4th	River water quality experiment	Able to experiment with water quality parameters (pH, DO, BOD, etc.).
		5th	Organize the experimental data and prepare a report	Able to organize the experimental data and prepare a report based on them.
		6th	Organize the experimental data and prepare a report	Able to organize the experimental data and prepare a report based on them.
		7th	Organize the experimental data and prepare a report	Able to organize the experimental data and prepare a report based on them.
		8th	Organize the experimental data and prepare a report	Able to organize the experimental data and prepare a report based on them.
	4th Quarter	9th	Preliminary study of wastewater treatment experiment	Able to study the specified items and understand their purpose concerning wastewater treatment experiments.
		10th	Preliminary study of wastewater treatment experiment	Able to study the specified items and understand their purpose concerning wastewater treatment experiments.
		11th	Wastewater treatment experiment	Able to reproduce organic matter removal by the activated sludge process at the laboratory level.
		12th	Wastewater treatment experiment	Able to reproduce organic matter removal by the activated sludge process at the laboratory level.
		13th	Organize the experimental data and prepare a report	Able to organize the experimental data and prepare a report based on them.
		14th	Organize the experimental data and prepare a report	Able to organize the experimental data and prepare a report based on them.
		15th	Organize the experimental data and prepare a report	Able to organize the experimental data and prepare a report based on them.
		16th	Organize the experimental data and prepare a report	Able to organize the experimental data and prepare a report based on them.

Evaluation Method and Weight (%)

	Midterm/final Exam	Quiz	Portfolio	Presentation/Attitude	Other	Total
Subtotal	20	0	80	0	0	100
Basic Proficiency	5	0	20	0	0	25
Specialized Proficiency	15	0	60	0	0	75
Cross Area Proficiency	0	0	0	0	0	0