Anan College		Year	2024		Course Title	ivil Engineering xperiment 3		
Course Information	on	I	1		. 16.0			
Course Code 1815T05 Course Category Specialized / Compulsory								
Class Format				Credits		Credit: 2		
Department	Course of Ci	vil Engineering]	Student Grade	5th			
Term	Year-round			Classes per Week	前期:4 後			
Textbook and/or Teaching Materials	The teachers distribute documents.							
Instructor	Osada Keng	o,Kagemasa S	huka					
Course Objectives	5							
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								
	I	Ideal Level Star		Standard Level		Minimum Level		
Course Objective 1		Able to observe aminar and tur understand end haracteristics. upipeline disch	bulent flow and ough each flow's Able to measure arge and evnolds number	Able to observe a laminar and turbu understand each characteristics. Al a pipeline dischar calculate the Reyn from experimenta	ılent flow and flow's ole to measure ge and nolds number	Able to observe a pipeline's laminar and turbulent flow and understand each flow's characteristics. Able to measure		
Course Objective 2		measurement methods of discharge in an open channel. Able to measure velocities and water depths using some instruments and estimate measurements and estimate measurements and estimate measurements.		Able to understan measurement me discharge in an op Able to measure water depths usin instruments and edischarge using the	thods of pen channel. velocities and ig some estimate	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 enough phenomenon of flow: subcritical flow supercritical flow pump, and conduct flume experiments.		pen channel ow, and hydraulio	Able to slightly understand each phenomenon of open channel flow: subcritical flow, supercritical flow, and hydraulic jump, and conduct flume experiments.			
Course Objective 4		ignificance of I	e principles and DO and BOD ad perform them.	Understand the p and BOD experim 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 experiments and with pH.			Able to perfor pH experiments.			
Assigned Departn	nent Objec	ctives						
学習・教育到達度目標[)-2 学習・教	育到達度目標 D	-4 学習・教育到達原	度目標 E-1 学習・教	育到達度目標 E			
Teaching Method								
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. Outline Outline 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.								
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)								
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								
☐ Active Learning		Aided by IC	<u> </u>	☐ Applicable to F	Remote Class	☐ Instructor Professionally Experienced		
Course Plan								
	The	eme		Go	oals			

1st Semeste r	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.

Preliminary study of wastewater treatment experiments. Preliminary study of wastewater treatment experiments.											
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