Akashi College	Year	2022	Course Title	Hydraulics Ⅲ

Course Information

Course Code	4418	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	Academic Credit: 2
Department	Civil Engineering	Student Grade	4th
Term	First Semester	Classes per Week	2
Textbook and/or Teaching Materials			
Instructor	KANDA Keiichi		

Course Objectives

1) Can explain the classification and basic characteristics of open channel flow.
2) Can explain the transition of flows, such as of subcritical flow, supercritical flow, critical depth, hydraulic jump, etc.
3) Understand the uniform and non-uniform flow, and can conduct various water surface profile calculation

Rubric

	Ideal Level	Standard Level	Unacceptable Level
Achievement 1	Can confidently explain the classification and basic characteristics of open channel flow.	Can explain the classification and basic characteristics of open channel flow.	Cannot explain the classification and basic characteristics of open channel flow.
Achievement 2	Can confidently explain the transition of flows, such as of subcritical flow, supercritical flow, critical depth, hydraulic jump, etc.	Can explain the transition of flows, such as of subcritical flow, supercritical flow, critical depth, hydraulic jump, etc.	Cannot explain the transition of flows, such as of subcritical flow, supercritical flow, critical depth, hydraulic jump, etc.
Achievement 3	Fully understand the uniform and non-uniform flow, and can confidently conduct various water surface profile calculation.	Understand the uniform and non-uniform flow, and can conduct various water surface profile calculation.	Do not understand the uniform and non-uniform flow. Cannot conduct various water surface profile calculation.

Assigned Department Objectives

Teaching Method

Outline	To know the nature of the flow of water and to control and use it is a technology that began with the development of civilization. The importance of water and its flow will not change in any way today. Hydraulics systemizes techniques and knowledge of such flow of water. Hydraulics is the foundation for studying river engineering, hydrology, coastal engineering, port engineering, groundwater engineering, and water resource engineering. It is also a basic subject on water environment, which has been of great importance in recent years. This course follows Hydraulics I and Hydraulics II, and will teach students on open channel flow, etc.
Style	Classes will be mainly conducted through lectures. Handouts will be distributed and projectors will be used as appropriate. In addition, questions will be given in class that are related to the basic aspects as a way of review and to retain knowledge. Report assignments will be given as appropriate.
Notice	Students should understand the content of the class fully by solving many exercise problems, etc. Notes should be taken in detail. Students should bring a calculator with them. Find flow of water around you of interest, and make effort to discover the uniqueness of the flow. This course's content will amount to 90 hours of study in total. These hours include the learning time guaranteed in classes and the standard self-study time required for pre-study / review, and completing assignment reports. Students who miss 1/3 or more of classes will not be eligible for a passing grade. Contact: kanda@akashi.ac.jp

Characteristics of Class / Division in Learning

☑ Active Learning	☐ Aided by ICT	☑ Applicable to Remote Class	☐ Instructor Professionally Experienced

Course Plan

			Theme	Goals
1st Semester	1st Quarter	1st	Specific energy, and the classification of open channel flow (1) Learn the classification of open channel flows, specific energy, subcritical and supercritical flow, and the definition of critical depth, etc.	Understand the classification of open channel flows Understand the definition of specific energy and critical depth, and the calculations
		2nd	Specific energy, and the classification of open channel flow (2) Learn the classification of open channel flows, specific energy, subcritical and supercritical flow, and the definition of critical depth, etc.	Understand the relationship between specific energy and critical and alternative depth
		3rd	Subcritical flow and supercritical flow (1) Learn the definition of Froude number, subcritical flow and supercritical flow, critical depth, etc.	Understand the Froude number, subcritical flow, and supercritical flow.
		4th	Subcritical flow and supercritical flow (2) Learn the definition of Froude number, subcritical flow and supercritical flow, critical depth, etc.	Can calculate critical depth of various sections
		5th	Flow transition (1) (transition from a supercritical flow to a subcritical flow, control section) Learn the transition from a supercritical flow to a subcritical flow, using an overflow of water at a dam as an example.	Can explain the changes in water surface profile with the application of the specific energy to water flow that flows over hillslopes

		6th	Flow transition (2) (transition from a supercritical flow to a subcritical flow, control section) Learn the transition from a supercritical flow to a subcritical flow, using an overflow of water at a dam as an example.	Can explain the transition from a supercritical flow to a subcritical flow
		7th	Flow transition (3) (transition from a supercritical flow to a subcritical flow, control section) Learn the transition from a supercritical flow to a subcritical flow, using an overflow of water at a dam as an example.	Can explain the transition (hydraulic jump) from a subcritical flow to a supercritical flow
		8th	Midterm exam	
	2nd Quarter	9th	Uniform flow in open channels (1) Learn about uniform flow. Learn the mean velocity formula, coefficient of roughness, and the normal depth.	Can explain what a uniform flow is.
		10th	Uniform flow in open channels (2) Learn about uniform flow. Learn the mean velocity formula, coefficient of roughness, and the normal depth.	Can determine the coefficient of roughness and normal depth with the application of mean velocity formula
		11th	Uniform flow in open channels (3) Learn the hydraulic characteristic curves. Learn the composite roughness coefficient, and about sections that are advantageous in hydraulics.	Can explain the hydraulic characteristic curves, composite roughness coefficient, and about sections that are advantageous in hydraulics
		12th	Non-uniform flow in open channels (1) (Classification of basic formula and water surface profile 1) Using the basic formula of non-uniform flow of wide rectangular cross-sectional channels, make a classification of water surface profile into gentle and steep slopes.	Can explain what a non-uniform flow is Can make a classification of water surface profile using non-uniform flow basic formula
		13th	Non-uniform flow in open channels (2) (Classification of water surface profile 2 and water surface profile calculation) Learn where the classified water surface profile is found in the actual open channels.	Can explain where the classified water surface profile is found in the actual open channels.
		14th	Non-uniform flow in open channels (3) (Water surface profile calculation) Conduct water surface profile calculation for various conditions.	Can determine water surface profile of non-uniform flow calculated using successive approximations method
		15th	Unsteady flow in open water channel Learn about the unsteady flow, such as bores and flood waves that occur at the front and behind the gates when the gates are opened or closed suddenly.	Can explain bores and flood waves Can determine the velocity of propagation
		16th	Final exam	

Evaluation Method and Weight (%)

	Exams	Reports	Mutual Evaluations	Attitude	Portfolio	Other	Total
Subtotal	90	10	0	0	0	0	100
Basic Proficiency	30	0	0	0	0	0	30
Specialized Proficiency	60	10	0	0	0	0	70
Cross-Disciplinary Proficiency	0	0	0	0	0	0	0