Akashi College	Year	2024	Course Title	Special Problems in Structural Theory and Design B

Course Information

Course Code	6525	Course Category	Specialized / Elective
Class Format	Lecture	Credits	School Credit: 1
Department	Architecture	Student Grade	5th
Term	Second Semester	Classes per Week	2
Textbook and/or Teaching Materials	Hand outs (Reference books) AIJ Standard for Structural Design and Construction of Prestressed Concrete Structures		
Instructor	ICHISAWA Yuhiko		

Course Objectives

(1) To understand the positioning, design methods, and construction methods of Prestressed concrete structures in a concrete-based structure, and to explain the fundamental concepts of PC structures.
(2) To understand the structural design methods for PC structures and to perform cross-sectional calculations and structural designs for simple PC structures.

Rubric

	Excellent	Good	Insufficient
Achievement 1	The student can perfectly understand the positioning, design methods, and construction methods of PC structures in a concrete-based structure, and to explain the fundamental concepts of PC structures.	The student can understand the positioning, design methods, and construction methods of PC structures in a concrete-based structure, and to explain the fundamental concepts of PC structures.	The student can not understand the positioning, design methods, and construction methods of PC structures in a concrete-based structure.
Achievement 2	The student can perfectly understand the structural design methods for PC structures and to perform cross-sectional calculations and structural designs for simple PC structures.	The student can understand the structural design methods for PC structures and to perform cross-sectional calculations and structural designs for simple PC structures.	The student can not understand the structural design methods for PC structures.

Assigned Department Objectives

Teaching Method

Outline	This course explains the basic principles, structural design methods, and construction methods of Prestressed Concrete structures (PC structures), which enable the construction of long span structure buildings that are difficult to achieve with RC structures and allows for numerical control of bending crack widths. The instructor (Ichisawa) is in charge of the structural design of the PC structure in a company, and making use of their experiences will inform the students in the form of lectures on the latest the structural design methods.
Style	This course primarily consists of lectures and exercises using handouts and slides. Additionally, exercises and assignments will be conducted as appropriate.
Notice	The course requires fundamental knowledge in architectural building dynamics, reinforced concrete structures, and steel structures from year 4th and below, the students should sufficiently revise these topics. Students attendance is required, and only a maximum of 5 absences is excused. Students who miss 1/3 or more of classes will not be eligible for evaluation.

Characteristics of Class / Division in Learning

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

Course Plan

			Theme	Goals
2nd Semester	3rd Quarter	1st	Introduction to overview, history, and examples of PC structures Outline the advantages of PC structure and introduce examples of PC structure design and construction buildings presented with slides.	Can understand the history of PC structures and can explain examples of design and construction of PC buildings.
		2nd	Characteristics, regulations, and technical standards of PC structures Explains the characteristics of PC structures compared to RC structures. Additionally, explains the laws and technical standards that must be complied with in PC structures.	Can understand the characteristics of PC structures while comparing them with RC structures.
		3rd	Principle of the PC structures and prestress introduction method to concrete Explains the basic principles of PC structures using models. additionally, a detailed explanation of prestress introduction method using photographs.	Can understand the basic principles of PC structures and the prestress introduction method into concrete.
		4th	Types of materials used in PC structure, PC steel materials, and PC anchorage devices Explains the materials used in PC structures.Additionally, explanation of PC steel and PC anchoring devices, which are the main materials for introducing prestress into concrete.	Can understand the types of PC steel materials and PC anchorage devices.

		5th	Material characteristics and allowable stress of PC steel materials Explains the material characteristics of PC steel materials while comparing them with reinforcement. Additionally, explanation the allowable tensile stress level of PC steel materials.	Can understand the material characteristics and the allowable tensile stress level of PC steel materials.
		6th	Specified design strength and allowable stress of concrete Explains the specified design strength of concrete applicable to PC structures, the necessary compressive strength when introducing prestress, and the allowable stress level of concrete (compressive and tensile).	Can understand the specified design strength and the allowable stress level of concrete applied in PC structures.
		7th	Structural design of PC structure (1) Explains the stress considered at PC structures and the edge stress generated in the PC member cross-section. Additionally, explanation the basic principles of structural design for PC members.	Can understand the basic principles of structural design for PC members.
		8th	Structural design exercise of PC Structure (1) Conducts exercises on the structural design of PC beams when a vertical load is applied and explain the process of the long-term allowable stress design for PC members.	Can perform a simple structural design when a vertical load is applied to a simple PC beam.
	4th Quarter	9th	Relationship between PC Structure, PRC Structure, and RC Structure Compares PC structures (Full PC, Partial PC), PRC structures, and RC structures, which are concrete-based structure, and explain the structural features of each structure.	Can understand the structural features of PC structure (Full PC, Partial PC), PRC structure, and RC structure respectively.
		10th	Secondary statically indeterminate stress caused by prestress introduction Explains the secondary statically indeterminate stress specific to the PC structures caused by prestress introduction. Additionally, introduce efficient methods for applying secondary stress.	Can understand the secondary statically indeterminate stress specific to the PC structures caused by prestress introduction.
		11th	Loss of the prestress Explains the factors by which the prestressing introduced into concrete decreases within a certain range over time.	Can understand the factors by which the prestressing introduced into concrete decreases within a certain range over time.
		12th	Effective prestress and calculation exercise for loss of the prestress Explains the application method of loss of the prestress in structural calculation. Additionally, conduct computational exercises and explain the method for calculating prestress considering loss.	Can understand the application method of loss of the prestress in structural calculation.
		13th	Structural design of PC structure (2) Explains the structural calculation route of PC structure while comparing it with RC structure. Additionally, explains the structural design methods for vertical loads and seismic loads in actual structural calculations.	Can understand the structural calculation route of PC structure.
		14th	Structural design exercise of PC Structure (2) Conducts exercises in structural design of PC members for stress generated during horizontal loading and explain the ultimate strength design method applied to seismic loading design for frames or members of PC structures.	Can perform the ultimate strength design for simple frames or members of PC structures.
		15th	End-term Exam	Can understand the contents from week1 to 15 through the exam.
		16th	No end-term Exam	

Evaluation Method and Weight (%)

	Examination	Assignments	Total
Subtotal	70	30	100
Basic Proficiency	0	0	0
Specialized Proficiency	70	30	100
Cross Area Proficiency	0	0	0