Akashi College	Year	2023	Course Title	Disaster Prevention System I

Course Information

Course Code	5033	Course Category	Specialized / Elective
Class Format	Lecture	Credits	Academic Credit: 2
Department	Architecture and Civil Engineering	Student Grade	Adv. 2nd
Term	First Semester	Classes per Week	2
Textbook and/or Teaching Materials	I. Hirai and Y. Mizuta : Introduction to seismic engineering (3rd rivision ed.), Morikita Publishing Co. Ltd. (as a designated textbook), Handouts are distributed as necessary in a class.		
Instructor	MIYOSHI Takao		

Course Objectives

(1) Can explain free vibration of single degree of freedom system and its solve natural frequency and logarithmic decrement factor.
(2) Can solve free vibration of multi degree of freedom system and solve its natural frequency and mode of vibration.

Rubric

	Ideal Level	Standard Level	Unacceptable Level
Achievement 1	Can sufficiently explain free vibration of single degree of freedom system and solve its natural frequency and logarithmic decrement factor.	Can explain free vibration of single degree of freedom system and solve its natural frequency and logarithmic decrement factor.	Cannot explain free vibration of single degree of freedom system and solve its natural frequency and logarithmic decrement factor.
Achievement 2	Can sufficiently explain free vibration of multi degree of freedom system and solve its natural frequency and mode of vibration.	Can sxplain free vibration of multi degree of freedom system and solve its natural frequency and mode of vibration.	Cannot explain free vibration of multi degree of freedom system and solve its natural frequency and mode of vibration.

Assigned Department Objectives

Teaching Method

Outline	Lectures will be conducted concerning the essentials of vibration engineering, which is indispensable for the seismic and wind resistant design of buildings and bridges. In addition, a professor, who has experience as an engineer of bridge fabricator and has engaged in the design of steel bridges and steel structures, will conduct a lecture-style class on the essentials of vibration engineering, by using his experiences.
Style	Classes will be conducted using handouts, slides, and note-taking.
Notice	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. The course is open to students from any department. Students should write on the board in class and should not miss the review of the lecture. Students who miss 1/3 or more of classes will not be eligible for evaluation. The minimum score for a pass will be 60% based on the following performance evaluation methods. Miyoshi: Evaluations will be based on : 1. Exams (70%) 2. Reports (30%)

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	Introduction to vibration engineering Learn concerning the necessity of vibration engineering in the design of structures and how to model to consider their dynamic response mathematically	Can explain the necessity of vibration engineering in the design of structures and how to model to consider their dynamic response mathematically
		2nd	Free vibration of single degree of freedom system (1) Learn concerning equation of motion and eigenfrequency and how to find the displacement response by solving an equation of motion	Can find the eigenfrequency in free vibration of single degree of freedom system and the displacement response by solving an equation of motion
		3rd	Free vibration of single degree of freedom system (2) Learn concerning damping model, equation of motion with damping, damping coefficient, overdamping, critical damping, and damped vibration	Can explain that vibration with damping is classified into overdamping, critical damping, and damping vibration using damping coefficient
		4th	Free vibration of single degree of freedom system (3) Learn concerning logarithmic decrement and how to find it and eigenfrequency by solving the equation of motion	Can explain logarithmic decrement and calculate it and eigenfrequency by solving the equation of motion
		5th	Steady-state vibration of single degree of freedom system (1) Learn concerning steady-state vibration, transient vibration, and sympathetic vibration	Can explain concerning steady-state vibration, transient vibration, and sympathetic vibration
		6th	Steady-state vibration of single degree of freedom system (2) Find resonance curve by solving the equation of motion in steady-state vibration and learn concerning phase and amplitude characteristics of steady-state vibration	Can explain concerning the process for generating resonance phenomena by solving the equation of motion in steady-state vibration

		7th	Steady-state vibration of single degree of freedom system (3) Learn concerning forced vibration caused by displacement and external force	Can find resonance curve and amplitude by solving the equation of motion in forced vibration
		8th	Steady-state vibration of single degree of freedom system (4) Learn concerning the principle of accelerometer and displacement gage using the equation of motion in forced vibration	Can explain concerning the principle of accelerometer and displacement gage
	2nd Quarter	9th	Vibration of single degree of freedom system under random external force (1) Learn concerning impulse and indicial responses of single degree of freedom system	Can find displacement response and amplitude of single degree of freedom system caused by instantaneous action and explain concerning impulse and indicial responses
		10th	Vibration of single degree of freedom system under random external force (2) Learn how to find the response of a single degree of freedom system under random external force using impulse response and direct integration method	Can find the response of a single degree of freedom system under random external force using impulse response and direct integration method
		11th	Free vibration of multi degree of freedom system (1) Learn concerning vibration model, equation of motion, and frequency equation in two degree of freedom system	Can explain concerning vibration model and frequency equation in two degree of freedom system and find eigenfrequency and vibration mode by solving frequency equation
		12th	Free vibration of multi degree of freedom system (2) Learn concerning normalized mode and its characteristics of two degree of freedom system	Can explain concerning normalized mode and its characteristics of two degree of freedom system
		13th	Free vibration of multi degree of freedom system (3) Learn how to find free vibration of two degree of freedom system using normalized mode under given initial conditions	Can find free vibration of two degree of freedom system using normalized mode under given initial conditions
		14th	Free vibration of multi degree of freedom system (4) Learn how to extend from free vibration of two degree of freedom system to that of multi one	Can explain how to extend from free vibration of two degree of freedom system to that of multi one
		15th	Modal analysis Learn concerning outline of modal analysis	Can explain concerning outline of modal analysis
		16th	Final exam	

Evaluation Method and Weight (%)

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