

Akashi College		Year	2022		Course Title	Strength and Fracture of Materials	
Course Information							
Course Code		4034		Course Category		Specialized / Elective	
Class Format		Lecture		Credits		Academic Credit: 2	
Department		Mechanical and Electronic System Engineering		Student Grade		Adv. 2nd	
Term		Second Semester		Classes per Week		2	
Textbook and/or Teaching Materials							
Instructor		SAKAIDA Akiyoshi					
Course Objectives							
1) Learn the appropriate application of fracture mechanic methodology for material strength assessment (Learning and educational goals [D and F]). (2) Understand the statistical properties of material strength and learn about reliability engineering handling (Learning and education goal [D]). (3) Understand the effects of various factors on material strength and acquire the ability to explain them to others (Learning and educational goal [H]).							
Rubric							
		Ideal Level		Standard Level		Unacceptable Level	
Achievement 1		Can specifically explain the appropriate application of fracture mechanic methodology for material strength assessment.		Can explain the appropriate application of fracture mechanic methodology for material strength assessment.		Cannot explain the appropriate application of fracture mechanic methodology for material strength assessment.	
Achievement 2		Understand the statistical properties of material strength and can specifically explain reliability engineering handling.		Understand the statistical properties of material strength and can explain reliability engineering handling.		Understand the statistical properties of material strength and can explain reliability engineering handling.	
Achievement 3		Can specifically explain the effects of various factors on material strength.		Can explain the effects of various factors on material strength.		Cannot explain the effects of various factors on material strength.	
Assigned Department Objectives							
Teaching Method							
Outline		Strength and fracture of materials is a field that deals with the mechanical behavior of materials, such as deformation and destruction, which occur when external forces are applied to solid materials. It is related to other fields, including engineering materials like metal structure, the strength of materials and continuum mechanics, and reliability engineering. The aim of this course is to understand the effects of microscopic structures and various factors on various strength properties, and to learn about material selection and strength design methods for various machinery and structures.					
Style		Classes will be held in a lecture style.					
Notice		While it is preferable if students have completed Engineering Materials and Strength of Materials offered at Akashi Kosen Mechanical Engineering Department and other related subjects, classes will be taught from the basics as much as possible. 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					
Characteristics of Class / Division in Learning							
<input type="checkbox"/> Active Learning		<input type="checkbox"/> Aided by ICT		<input checked="" type="checkbox"/> Applicable to Remote Class		<input type="checkbox"/> Instructor Professionally Experienced	
Course Plan							
			Theme		Goals		
2nd Semester r	3rd Quarter	1st	Introduction to strength and fracture of materials Learn about basic concepts and contents of strength and fracture of materials and the items necessary to study it.		Can explain the basic concepts and topics of strength and fracture of materials.		
		2nd	Deformation, strength, and fracture under static loads (1) Learn about the static strength and sliding and plastic deformation of metal materials.		Can explain the static strength and sliding and plastic deformation of metal materials.		
		3rd	Deformation, strength, and fracture under static loads (2) Learn how to strengthen metal materials and how they work.		Can explain how to strengthen metal materials and how they work.		
		4th	Deformation, strength, and fracture under static loads (3) Learn about types of fractures in metal materials and fracture mechanisms.		Can explain types of fractures in metal materials and fracture mechanisms.		
		5th	An overview of fracture mechanics (1) Learn about the basics of mechanics of elasticity, stress fields at crack tips, and the stress intensity factor.		Can explain the basics of mechanics of elasticity, stress fields at crack tips, and the stress intensity factor.		
		6th	An overview of fracture mechanics (2) Learn about the crack tip's plastic zone and the energy release rate.		Can explain the crack tip's plastic zone and the energy release rate.		
		7th	An overview of fracture mechanics (3) Learn about plane strain fracture toughness.		Can explain plane strain fracture toughness.		

		8th	Fatigue (1) Learn about the basics of fatigue.	Can explain the basics of fatigue.
	4th Quarter	9th	Fatigue (2) Learn about various fatigue test methods and fatigue characteristics.	Can explain various fatigue test methods and fatigue characteristics.
		10th	Fatigue (3) Learn about the characteristics of fatigue crack propagation.	Can explain the characteristics of fatigue crack propagation.
		11th	High temperature strength and environmental strength Learn about creep deformation, creep fracture, and corrosion.	Can explain creep deformation, creep fracture and corrosion.
		12th	Statistical properties of material strength (1) Learn about the fundamental topics such as probability distribution that become necessary upon considering the statistical properties of material strength.	Can explain the fundamental topics such as probability distribution that become necessary upon considering the statistical properties of material strength.
		13th	Statistical properties of material strength (2) Learn about various types of probability paper and their uses.	Can explain various types of probability paper and their uses.
		14th	Statistical properties of material strength (3) Learn about the statistical properties of the static strength for metal materials, etc.	Can explain the statistical properties of the static strength for metal materials, etc.
		15th	Statistical properties of material strength (4) Learn about the statistical properties of the fatigue strength for metal materials, etc.	Can explain the statistical properties of the fatigue strength for metal materials, etc.
		16th	Final exam	

Evaluation Method and Weight (%)

	Examination	Report	Mutual Evaluations between students	Behavior	Portfolio	Other	Total
Subtotal	80	20	0	0	0	0	100
Basic Proficiency	40	20	0	0	0	0	60
Specialized Proficiency	40	0	0	0	0	0	40
Cross Area Proficiency	0	0	0	0	0	0	0