

阿南工業高等専門学校		開講年度	令和05年度 (2023年度)	授業科目	材料強度学
科目基礎情報					
科目番号	5597M02		科目区分	専門 / 選択	
授業形態	講義		単位の種別と単位数	学修単位: 2	
開設学科	応用化学コース		対象学年	専2	
開設期	前期		週時間数	2	
教科書/教材	Strength and Fracture of Metals POD version (Morikita Publishing) / Million People's Metallurgy (Agne Technology Center), Materials Science and Engineering 1-4 (Baifukan)				
担当教員	奥本 良博				
到達目標					
1. Distinguish and explain elastic deformation and plastic deformation. 2. It is possible to roughly estimate the theoretical strength of metals. 3. Be able to explain the phenomenon of metal destruction.					
ルーブリック					
	Ideal Level		Standard Level		Unacceptable Level
Achievement 1	Distinguish between elastic deformation and plastic deformation, and create diagrams and explanations.		Distinguish between elastic and plastic deformation and explain verbally.		A distinction can be made between elastic deformation and plastic deformation.
Achievement 2	Understand modeling when considering the theoretical strength of metals and be able to make approximate estimates.		Understand modeling when considering the theoretical strength of metals and be able to explain it verbally.		Understand modeling when considering the theoretical strength of metals.
Achievement 3	Can analyze metal fracture phenomena when given concrete examples.		Understand and be able to classify and explain metal fracture phenomena.		Understand the phenomenon of metal destruction.
学科の到達目標項目との関係					
教育方法等					
概要	In this lecture, we will focus on the strength of materials and develop the ability to read the fracture phenomena of materials from a microscopic perspective at the atomic level. Please note that the materials covered in this lecture are limited to metals.				
授業の進め方・方法	The lecture will proceed according to the textbook. I will add any necessary calculation problems, etc. We will use manaba to communicate the content that we were not able to cover in the lecture. [30 hours of class time + 60 hours of self-study time]				
注意点	Having studied mechanical engineering until now, I may not have had the opportunity to think about the connection between materials science and material mechanics. Learning about the principles of material failure by taking into account the microscopic structure of the material is sure to be useful when designing structures. In addition, we will proceed with the basic mechanical items as those learned in the main course				
授業の属性・履修上の区分					
<input type="checkbox"/> アクティブラーニング		<input type="checkbox"/> ICT 利用		<input checked="" type="checkbox"/> 遠隔授業対応	<input type="checkbox"/> 実務経験のある教員による授業
授業計画					
		週	授業内容	週ごとの到達目標	
前期	1stQ	1週	0.Lecture guidance	You can organize what you have learned so far about metals.	
		2週	1. Elastic deformation seen from atomic bonds	Understand microscopic models of elastic deformation.	
		3週	2. Overview of fracture mechanics Theoretical tensile strength	Understand the process of deriving theoretical tensile strength.	
		4週	2. Overview of fracture mechanics Fracture toughness (1)	Understand the concept of fracture toughness.	
		5週	2. Overview of fracture mechanics Fracture toughness (2)	Understand the concept of fracture toughness.	
		6週	2. Overview of fracture mechanics Fracture toughness (3)	Understand how to measure fracture toughness.	
		7週	3.Fatigue failure	You can understand fatigue fracture phenomena in BCC metals.	
		8週	midterm exam		
	2ndQ	9週	4. Plastic deformation of metals Theoretical shear strength	Understand the process of deriving theoretical shear strength.	
		10週	4. Plastic deformation of metals: Introduction of dislocation theory	The existence of dislocations can be understood.	
		11週	5. Effect of temperature on plastic deformation (1)	Understand the concept of activation energy.	
		12週	5. Effect of temperature on plastic deformation (2)	Creep life can be calculated.	
		13週	6. Diffusion in solids	Ability to perform calculations based on the law of diffusion.	
		14週	7. Metal strengthening mechanism (1)	Understand work hardening and solid solution strengthening.	
		15週	7. Metal strengthening mechanism (2)	Martensitic metamorphosis reinforcement can be understood.	
		16週	Final exam/return of answers		

モデルコアカリキュラムの学習内容と到達目標							
分類	分野	学習内容	学習内容の到達目標	到達レベル	授業週		
評価割合							
	Examination	Presentation	Mutual Evaluations between students	Behavior	Portfolio	Other	合計
総合評価割合	70	0	0	0	0	30	100
Basic Proficiency	0	0	0	0	0	0	0
Specialized Proficiency	70	0	0	0	0	30	100
Cross Area Proficiency	0	0	0	0	0	0	0