

Toyama College		Year	2022		Course Title	Advanced Polymer Materials
Course Information						
Course Code		0047		Course Category	Specialized / Elective	
Class Format		Lecture		Credits	Academic Credit: 2	
Department		ECOdesign Engineering Course		Student Grade	Adv. 1st	
Term		Second Semester		Classes per Week	2	
Textbook and/or Teaching Materials		none				
Instructor		Mori Yasutaka				
Course Objectives						
1. To explain mathematically mechanical behavior of viscoelastic materials 2. To understand elasticity of rubber thermodynamically. 3. To explain effects of structure of polymer on its rheology 4. To understand about related papers.						
Rubric						
		Ideal Level of Achievement (Very Good)	Standard Level of Achievement (Good)		Unacceptable Level of Achievement (Fail)	
Mathematical expression of mechanical behavior of viscoelastic materials		You can explain mathematically mechanical behavior of viscoelastic materials.	You understand mathematically mechanical behavior of viscoelastic materials.		You don't understand mathematically mechanical behavior of viscoelastic materials.	
Thermodynamically understanding of elasticity of rubber		You understand thermodynamically elasticity of rubber	You understand elasticity of rubber.		You don't understand elasticity of rubber.	
Effects of structure of polymer on its rheology		You can explain effects of structure of polymer on its rheology.	You understand effects of structure of polymer on its rheology.		You don't understand effects of structure of polymer on its rheology.	
Reading of related papers		You can understand about related papers.	You partially understand related papers.		You don't understand about related papers.	
Assigned Department Objectives						
学習・教育到達度目標 A-6 JABEE 1(2)(d)(1) JABEE 1(2)(e)						
Teaching Method						
Outline		Polymeric materials are widely used in from daily life to advanced technology. Rheology, the mechanical study of the flow of liquid and soft solid materials, is essential for understanding functionality of their materials. In first part of the lecture, you learn about mechanical behavior of viscoelastic materials and relationship between rheology and functionality of polymeric materials. In latter part of the lecture, you read technical papers related to rheology of polymeric materials by seminar-style lecture to understand actual application of rheology and to build up your reading skill for technical papers. The lecturer teaches about rheology of soft-materials based on his practical experience in Aeromedical Laboratory, JASDF.				
Style		Lecture and seminar on related papers.				
Notice		Review related subjects previously learned by yourself. Don't hesitate to ask questions about lecture. Lecture schedule may be changed when your understanding doesn't match it.				
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	Guidance of this lecture			
		2nd	Molecular weight of polymers		To understand molecular weight of polymers.	
		3rd	Hookean elastic material and Newtonian fluid		To understand stress-strain responses of Hookean elastic material and Newtonian fluid.	
		4th	Mechanical models of viscoelastic materials		To understand typical mechanical models of viscoelastic materials (such as Maxwell model and Kelvin-Voigt model).	
		5th	Oscillatory stress		To understand oscillatory stress against strain response on viscoelastic materials.	
		6th	Stress-strain responses on complex mechanical models		To calculate Stress-strain responses on complex mechanical models, such as 3-element and 4-element models.	
		7th	Elasticity of rubber (1)		To understand elasticity of rubber	
		8th	Elasticity of rubber (2)		To understand elasticity of rubber	
	4th Quarter	9th	Measurement methods of viscoelasticity		To understand measurement methods of viscoelasticity	
		10th	Viscoelasticity of polymer solutions (1)		To understand viscoelasticity of polymer solutions	
		11th	Viscoelasticity of polymer solutions (2)		To understand viscoelasticity of polymer solutions	
		12th	Exam.			
		13th	Explanation of exam.			
		14th	Seminar on related paper (1)			
		15th	Seminar on related paper (2)			

		16th	Seminar on related paper (3)	
Evaluation Method and Weight (%)				
	Examination	Report	Total	
Subtotal	50	50	100	
Basic Ability	30	0	30	
Technical Ability	20	20	40	
Interdisciplinary Ability	0	30	30	