Tsuyama College	Year	2021	Course Title	Physical Chemistry

Course Information

Course Code	0118	Course Category	Specialized / Elective
Class Format	Lecture	Credits	Academic Credit: 2
Department	Department of Integrated Science and Technology Advanced Science Program	Student Grade	5th
Term	First Semester	Classes per Week	2
Textbook and/or Teaching Materials	Chemical Kinetics (F. Mafune, A. Hrokawa)		
Instructor	MORITOMO Hiroki		

Course Objectives

Learning purposes : To understand reaction kinetics and learn how to handle and analyze the reaction mechanisms of various chemical reactions.

Course Objectives :
1. To understand how to express the reaction rate equation.
2. To be able to analyze various reactions using steady-state approximation.
3. To understand the mechanism of solid surface reactions.
4. To understand photochemical reactions.

Rubric

	Excellent	Good	Acceptable	Not acceptable
Achievement 1	Students can explain the meaning of the reaction rate equation in their own words, using specific reactions.	The student can explain what it means with respect to the reaction rate equation in his or her own words.	Students can write a reaction rate equation.	Students cannot write a reaction rate equation.
Achievement 2	Students can explain the meaning of the steady-state approximation and use it to quantitatively analyze the reactions of various reactions by themselves.	Students can explain the meaning of the steady-state approximation and use it to analyze the reactions of various reactions.	The student can analyze the reaction by steady state approximation.	The student cannot analyze the reaction by steady state approximation.
Achievement 3	The students can explain the meaning of the reaction rate equation in their own words, using specific reactions.	The students can explain the characteristics of solid surface reactions in their own words and give concrete reaction examples.	The students can describe the characteristics of solid surface reactions in their own words.	Students will not understand the characteristics of solid surface reactions.
Achievement 4	The students can explain the characteristics of photochemical reactions quantitatively in their own words, giving specific examples of reactions.	The students can explain the characteristics of a photochemical reaction in their own words, giving specific reaction examples.	The students can explain the characteristics of a photochemical reaction in their own words.	The students will not understand the characteristics of photochemical reactions.

Assigned Department Objectives

Teaching Method

Outline	General or Specialized : Specialized Required, Elective, etc. :Must complete subjects Foundational academic disciplines : Inorganic chemistry, physical chemistry, organic chemistry Relationship with Educational Objectives : This class is equivalent to (3) Acquire deep foundation knowledge of the major subject area Course outline : Chemical reactions are thermodynamically and kinetically controlled. In this course, we will learn about reaction kinetics and aim to acquire methods for quantitative analysis of chemical reactions.
Style	Course method : All lectures will be given using a projector. It is planned that the lectures will proceed at a pace of approximately one chapter per week. Grade evaluation method : Evaluation will be based on the examinations only. A simple average of the midterm and final examinations will be the grade point. Resits will be announced as soon as possible, and students should follow the instructions.

Notice	Precautions on the enrollment : Students must take this class (no more than one-fifth of the required number of class hours may be missed) and earn the credit in order to complete the 5th year course. This is a "class that requires study outside of class hours". Classes are offered for 15 hours per credit, but 30 credit hours are required in addition to this. Follow the instructions of your instructor for these extra studies. Course advice : This is a specialized subject. Students will not learn anything if they attend lectures with a passive attitude. Students are required to read the designated sections of the textbook before each lecture. Do not rely on rote memorization. Students are encouraged to think logically in order to understand the essence of chemistry. Related subjects : Organic chemistry I (4th year), Organic chemistry II (5th), Experiments in Chemistry(4th) Foundational subjects : Chemistry I (2nd year), Chemistry II (3rd), General chemistry (3rd), Differential and integral I and II (2nd, 3rd) Attendance advice : ・This is a subject related to the development of human resources for the environment and energy. ・Students are expected to have basic knowledge of differential and integral calculus and differential equations. ・Students are expected to read at least three textbooks on the same subject in order to learn the subject. ・Students are expected to read at least three textbooks describing the same thing in order to learn aspects. ・Students will be considered absent 15 minutes after the start of class.

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	Guidance, Reaction Rates and Kinetic Equations	To understand the definition of reaction rate and how to express the reaction rate equation.
		2nd	Elemental and complex reactions	To understand the mechanisms of elementary, reversible, parallel and sequential reactions.
		3rd	Steady State Approximation and its Applications	To be able to analyze reaction equations for various reactions using the steady-state approximation.
		4th	Catalytic reaction	To understand the mechanism of catalysis.
		5th	Method for analyzing the reaction rate	To understand the differential method, integral method, separation method, initial velocity method and relaxation method.
		6th	Collisions and reactions	To be able to quantitatively explain reactions based on collision theory.
		7th	Reactions on a solid surface	To understand the mechanism of solid surface reactions.
		8th	【Mid-term exam】	
	2nd Quarter	9th	Reaction in solution	To understand the diffusion of substances in solution.
		10th	Photochemical reaction	To understand the characteristics of photochemical reactions.
		11th	Introduction to statistical thermodynamics	To be able to understand the concept of the distribution function intuitively.
		12th	Same as above	Same as above
		13th	Transition state theory	To be able to quantitatively analyze reactions based on transition state theory.
		14th	Same as above	Same as above
		15th	【Final exam】	
		16th	Return and commentary of exam answers	

Evaluation Method and Weight (%)

	Examination	Presentation	Mutual Evaluations between students	Behavior	Portfolio	Other	Total
Subtotal	100	0	0	0	0	0	100
Basic Proficiency	0	0	0	0	0	0	0
Specialized Proficiency	100	0	0	0	0	0	100
Cross Area Proficiency	0	0	0	0	0	0	0