

Tsuyama College		Year	2021	Course Title	Experiments in Science
Course Information					
Course Code	0037		Course Category	Specialized / Compulsory	
Class Format	Experiment		Credits	School Credit: 2	
Department	Department of Integrated Science and Technology Advanced Science Program		Student Grade	2nd	
Term	Year-round		Classes per Week	2	
Textbook and/or Teaching Materials	Reference books : "Basic Physics", "Physics", "Basic Chemistry", "Chemistry", "Basic Biology", "Biology" Tokyo Shoseki				
Instructor	MAEZAWA Takanobu				
Course Objectives					
Learning purposes : Students will take physics, chemistry, and biology experiments to establish basic experimental skills and basic knowledge of physics, chemistry, and biology learned in the lectures. Course Objectives : 1. Get used to the scientific viewpoints and ways of thinking to scientifically elucidate natural phenomena. 2. Learn the basic processing method of measurement data.					
Rubric					
	Excellent	Good	Acceptable	Not acceptable	
Achievement 1	The student can measure according to the situation in consideration of the error of the measuring instrument	The student can measure according to the situation	The student can measure typologically	The student can not measure typologically	
Achievement 2	The student can explain the basic concept from the experimental results. Or the student can logically explain the experimental and observation results from the basic concept.	The student can explain the results of experiments and observations by quoting the learning content	The student can explain the results of experiments and observations correctly	The student can't explain the results of experiments and observations	
Achievement 3	The student can draw conclusions by logically processing experimental / observation data	The student can process experimental / observation data scientifically correctly	The student can process experimental / observation data correctly	The student can't explain the results of experiments and observations	
Assigned Department Objectives					
Teaching Method					
Outline	General or Specialized : Specialized				
	Fields of learning : Experiments, practical training, etc.				
	Required, Elective, etc. : Required				
	Foundational academic disciplines : Mathematical science / physics / general physics, chemistry / inorganic / organic chemistry, biology / basic biology				
	Relationship with Educational Objectives : This subject is equivalent to "(3) Acquire deep foundation knowledge of the major subject area" and "(6) Develop problem solving ability".				
Style	Relationship with JABEE programs : The main goal of this subject is "(A) Deepening of basic knowledge about technology".				
	Course outline : Learn the basics of observation, measurement, and data processing methods through basic experiments in science (physics, chemistry, and biology).				
Notice	Course method : The whole year is divided into three periods to work on physics, chemistry, and biology experiments. In the experiment, everyone will carry out the same theme at the same time. Divide into groups of 5 to 6 people to work on the experiment. Guidance will guide you on themes and weekly allocations.				
	Grade evaluation method : In the report submitted on the experimental theme, evaluate the data processing, conclusion derivation assumptions, and how to proceed with the consideration, and score on a scale of 100 points, and the average is the final grade. The evaluation criteria of the report will be presented in rubrics at the time of guidance, so please refer to it.				
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	Biological experiment guidance	Understand the laws and regulations in animal experiments and DNA recombination experiments.	
		2nd	Structure of microscope and its usage, observation and sketch of biological samples	Understand the structure and usage of stereomicroscopes and upright microscopes.	

2nd Semester	1st Quarter	3rd	Structure of microscope and its usage, observation and sketch of biological samples	Observe and sketch the sample using microscopes.
		4th	Experiments of E. coli culture and plasmid DNA purification	Understanding E. coli transformation with plasmid DNA and liquid culture of E. coli
		5th	Experiments of E. coli culture and plasmid DNA purification	Can extract plasmid DNA from E. coli by the alkaline SDS method.
		6th	Experiments of newt and planarian regeneration	Plan and implement of newt regeneration experiments.
		7th	Experiments of newt and planarian regeneration	Observe and record the newt regeneration process.
		8th	Experiments of newt and planarian regeneration	Observe and record the newt regeneration process Plan and implement of planarian regeneration experiments.
	2nd Quarter	9th	Experiments of newt and planarian regeneration	Observe and record the regeneration processes of newts and planarians.
		10th	Occasional date	
		11th	Physics experiment guidance, basics of measurement (how to use calipers and micrometer)	Understand the reading and uncertainty of the instrument.
		12th	Basics of data processing (uncertainty, how to draw a graph, estimation of uncertainty)	Obtain the uncertainty of the measured value from the graphed data.
		13th	Basics of data processing (uncertainty, how to draw a graph, estimation of uncertainty)	Estimate mean and uncertainty from data containing uncertainty.
		14th	First theme experiment (measurement of sound velocity by air column resonance)	Understand the contents of the experiment, carry out a preliminary experiment, and make an experimental plan for this experiment.
		15th	First theme experiment	Collect all the data needed to answer the question. Process the data, graph it, and answer the requested questions.
		16th		
2nd Semester	3rd Quarter	1st	Second theme experiment (confirmation of Boyle's law and measurement of atmospheric pressure)	Understand the contents of the experiment, carry out a preliminary experiment, and make an experimental plan for this experiment.
		2nd	Second theme experiment	Collect all the data needed to answer the question. Data is processed and graphed, and answer the requested questions.
		3rd	Third theme experiment (measurement of moment of inertia and confirmation of rotational stability)	Understand the contents of the experiment, carry out a preliminary experiment, and make an experimental plan for this experiment.
		4th	Third theme experiment	Collect all the data needed to answer the question. Data is processed and graphed, and answer the requested questions.
		5th	Occasional date	
		6th	Chemical experiment guidance, basic operation / cleaning method	Learn how to use glassware properly and how to clean it.
		7th	Inorganic synthesis; synthesis of molle salt ①	Through the synthesis of molle salts, acquire the basic knowledge necessary for compound synthesis such as recrystallization method and yield calculation.
		8th	Inorganic synthesis; synthesis of molle salt ②	Same as above
	4th Quarter	9th	Volumetric analysis; neutralization titration ①	Prepare a standard solution for neutralization titration.
		10th	Volumetric analysis; neutralization titration ②	The acid concentration of the unknown sample is determined by neutralization titration.
		11th	Volumetric analysis; neutralization titration ③	Same as above
		12th	Instrumental analysis; UV-visible absorption spectrum ①	Learn how to use the UV-visible spectrophotometer.
		13th	Instrumental analysis; UV-visible absorption spectrum ②	A calibration curve is prepared from the absorbance of a solution of known concentration.
		14th	Instrumental analysis; UV-visible absorption spectrum ③	Analyze an unknown sample using a calibration curve.
		15th	General cleaning / Summary/ Occasional date	
		16th		

Evaluation Method and Weight (%)

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