Tsuyama College	Year	2021	Course Title	Analysis

Course Information

Course Code	0157	Course Category	Specialized / Elective
Class Format	Lecture	Credits	Academic Credit: 2
Department	Department of Integrated Science and Technology Communication and Informations System Program	Student Grade	5th
Term	Year-round	Classes per Week	1
Textbook and/or Teaching Materials	Textbook: "Kyokusen to Kyokume no kikagaku" (Syoukabou)		
Instructor	YOSHIDA Eiji		

Course Objectives

Learning purpose :
Understand the basics of differential geometry tht is a field in modern mathematics.

Course Objectives :
1. To apply mathematical methods to solve problems in your area of expertise.
2. To understand the basic concept of differential geometry, and can calculate the basic form and curvature of concrete curves and curved surfaces.

Rubric

	Excellent	Good	Acceptable	Not acceptable
Achievement 1	The student can find various curvatures.	The student can find about 70% of various curvatures.	The student can find about 60% of various curvatures.	The student can not find about 60% of various curvatures.
Achievement 2	The student can find basic forms.	The student can find about 70% of basic forms.	The student can find about 60% of basic forms.	The student can not find about 60% of basic forms.
Achievement 3	The student can find Riemannian metrics.	The student can find about 70% of Riemannian metrics.	The student can find about 60% of Riemannian metrics.	The student can not find about 60% of Riemannian metrics.

Assigned Department Objectives

Teaching Method

Outline	General or Specialized : Specialized Field of learning : Mathematics / Physics Required, Elective, etc. : Elective must complete subjects Foundational academic disciplines : Mathematical science / Mathematics / Analysis basics Relationship with Educational Objectives : This class is equivalent to "(3) Acquire deep foundation knowledge of the major subject area". Relationship with JABEE programs : The main goal of learning / education in this class are "(A), and A-1". Course outline : It deals with the basics of Differential Geometry, using Curves and Curved Surfaces as subjects.
Style	Course method : Lectures are basically given, but exercises are also given to deepen understanding. Grade evaluation method : Exams [60%] + Others (exercises, reports, lessons, etc.)[40%]. Regular examinations will be conducted a total of 2 times, and the evaluation ratios will be the same. Depending on the grade, the student may be required to retake the exam or submit additional report.
Notice	Precautions on the enrollment : This course is an elective course. In addition, this subject is a "subject that requires study outside of class hours". Classes are offered for 15 credit hours per credit, but 30 credit hours are required in addition to this. Follow the instructions of your instructor for these studies. Course advice : Make sure to check what you have learned in Mathematics up to the 4th year, such as Trigonometric functions, Vectors, Matrices, One-variable and Multi-variable Differential Equations, Ordinary Differential Equations, and Vector Analysis. Foundational subjects : Fundamental Mathematics (1st year), Fundamental Linear Algebra (2nd), Differential and Integral I and II (2nd and 3rd), Fundamental Differential Equations (3rd), Applied Mathematics (4th) Related subjects : Physics after 4th year, specialized subjects Attendance advice : If you are late a lot, you may be treated as absent after giving a warning.

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		
		2nd		
		3rd		
		4th		
		5th		
		6th		
		7th		
		8th		
	2nd Quarter	9th		
		10th		
		11th		
		12th		
		13th		
		14th		
		15th		
		16th		
2nd Semester	3rd Quarter	1st	Guidance, Plane curve and its curvature / rotation speed Learning content outside class hours: Distribution assignment	Students can find the curvature and rotation speed of a plane curve.
		2nd	Spatial curve and Frenet-Serret formula Learning content outside class hours: Distribution assignment	Students can find the curvature and torsion of the space curve.
		3rd	Curved surface and tangent plane Learning content outside class hours: Distribution assignment	Students can find the tangent plane.
		4th	First basic form, second basic form Learning content outside class hours: Distribution assignment	Students can find first and second fundamental forms.
		5th	Legal curvature, principal curvature Learning content outside class hours: Distribution assignment	Students can find the law curvature and the principal curvature.
		6th	Gaussian curvature, mean curvature Learning content outside class hours: Distribution assignment	Students can find Gaussian curvature and mean curvature.
		7th	Specific examples of basic form and curvature Learning content outside class hours: Distribution assignment	Confirmation of basic matters so far through concrete examples
		8th	2nd semester mid-term exam	
	4th Quarter	9th	How to use an orthonormal system Learning content outside class hours: Distribution assignment	Students can use the orthonormal system to represent the various basic quantities they have learned so far.
		10th	Two-variable differential form Learning content outside class hours: Distribution assignment	Students can calculate the differential form of two variables.
		11th	Riemannian metric and structural equations on curved surfaces Learning content outside class hours: Distribution assignment	Students can find Riemannian metric on curved surfaces.
		12th	Vector field and covariant derivative Learning content outside class hours: Distribution assignment	Students can find parallel vector fields along a curve.
		13th	Geodesic Learning content outside class hours: Distribution assignment	Students can find the geodesic equation.
		14th	Gauss-Bonnet theorem Learning content outside class hours: Distribution assignment	Students can use Gauss-Bonnet's theorem.
		15th	2nd semester final exam	
		16th	Return and commentary of exam answers	Confirmation of basic matters

Evaluation Method and Weight (%)

	Examination	Presentation	Mutual Evaluations between students	Behavior	Portfolio	Other	Total
Subtotal	60	0	0	0	0	40	100
Basic Proficiency	30	0	0	0	0	20	50
Specialized Proficiency	30	0	0	0	0	20	50
Cross Area Proficiency	0	0	0	0	0	0	0