Tsuyama College	Year	2020		Course Title	Differential and Integral Ⅱ

Course Information

Course Code	0052		Course Category	General / Compulsory
Class Format	Lecture		Credits	School Credit: 2
Department	Department of Integrated Science and Technology Electrical and Electronic Systems Program		Student Grade	3rd
Term	Year-round		Classes per Week	2
Textbook and/or Teaching Materials	Textbook : "Shin bibunsekibun II" (Dainippontosyo)			
Instructor	YAMANAKA Satoshi			

Course Objectives

Learning purpose :
By studying the series and the differentiation and integration of two-variable functions, you will acquire the mathematical knowledge and calculation techniques necessary to solve basic engineering problems.

Course Objectives :
1. To expand various functions into power series.
2. To understand the concept of partial differential and be able to obtain the extremal value of two-variable functions and the equation of the tangent plane of surfaces.
3. To understand the concept of double integrals and be able to find the volume of a basic solid.

Rubric

	Excellent	Good	Acceptable	Not acceptable
Achievement 1	The student can find the McLaughlin expansion of functions.	The student can find the linear and quadratic approximations of the basic function. In addition, be can find the McLaughlin expansion of basic functions.	The student can find the linear and quadratic approximations of the basic function.	The student can not find the linear and quadratic approximations of the basic function.
Achievement 2	The student can find the extremal value of various functions. In addition, can find the conditional extremal value and the envelope.	The student can find the extremal value of basic functions. In addition, can find the envelope.	The student can find the extremal value of basic functions.	The student can not find the extremal value of basic functions.
Achievement 3	The student can calculate double integrals, and can exchange the integral order.	The student can understand the repeated integral, and can find the double integral of basic functions using it.	The student can find the double integral of basic functions by using the iterated integral.	The student can not find the double integral of basic functions by using the iterated integral.
Achievement 4	The student can calculate double integrals by applying change of variables using Jacobian.	The student can calculate double integrals using the conversion from rectangular to polar coordinates. In addition, understand the meaning of polar transformation.	The student can calculate the double integral by using the polar transformation.	The student can not calculate the double integral by using the polar transformation.

Assigned Department Objectives

Teaching Method

Outline	General or Specialized : General
	Field of learning : natural science, common and basics
	Required, Elective, etc. : Must complete subjects
	Foundational academic disciplines : Mathematical science / mathematics / Basic analysis
	Relationship with Educational Objectives : This class is equivalent to "(2) Acquire basic science and technical knowledge".
	Relationship with JABEE programs : The main goal of learning / education in this class are "(A), and A-1".
	Course outline : Start by understanding the concept of series and the power series expansion of functions. Next, we will develop the differentiation and integration of one-variable functions learned in the second grade, and learn about the differentiation of two-variable functions (partial differentiation) and the integration of two-variable functions (double-integral).
Style	Course method : Classes centered on board writing, and emphasize intuitive understanding of content without being biased toward rigor as much as possible. In addition, a lot of exercise time will be provided to deepen the understanding.
	Grade evaluation method : Exams [60%] + Others (exercises, reports, lessons, etc.)[40%]. Regular examinations will be conducted a total of 4 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.

			Theme	Goals
Notice			Precautions on the enrollment : It is necessary to take this course in order to complete the course of the academic year. Course advice : Classes will be conducted while reviewing, but review mathematics (especially differentiation and integration) up to the 2nd year each time. Foundational subjects : Fundamental Mathematics (1st year), Fundamental Mathematics Practice (1st), Differential and Integral I (2nd), Fundamental Linear Algebra (2nd) Related subjects : Applied Mathematics I and II (4th year) Attendance advice : It is important to understand the content of the lecture well and solve the problem by yourself. It is important for students to find solutions on their own. If you are significantly late for class, treat it as absent. If you are late a lot, you may be treated as absent after giving a warning.	

Course Plan

			Theme	Goals
1st Semester	1st Quarter	1st	Guidance, Polynomial approximation (1)	Students can find the linear approximation and the quadratic approximation of functions.
		2nd	Polynomial approximation (2)	Students can find the n-th approximation of functions, and can determine the extremal value of functions.
		3rd	Limit of sequences	Students can find the limit of various sequences including indeterminate forms.
		4th	Series	Students can judge the convergence and the divergence of a series.
		5th	Power series and McLaughlin expansion	Students can find the McLaughlin expansion of a function.
		6th	Euler's formula	Students can calculate complex numbers using Euler's formula.
		7th	Function of two variables	Students can draw a graph of a simple two-variable function.
		8th	1st semester mid-term exam	
	2nd Quarter	9th	Return and commentary of exam answers, partial derivative	Students can find the partial derivative of two-variable functions.
		10th	Total differential and tangent plane	Students can find the tangent plane equation
		11th	Differential calculus of composite function	Students can find the partial derivative using the derivative of the composite function.
		12th	Higher-order partial derivative	Students can find the higher derivative.
		13th	Maximal value and minimal value	Studentscan find maximal values and minimal values of two-variable functions.
		14th	Exercise	
		15th	1st semester final exam	
		16th	Return and commentary of exam answers	
2nd Semester	3rd Quarter	1st	Guidance, Differential of implicit function	Students can find the derivative using the differential of implicit function.
		2nd	Conditional extremum problem	Students can find conditional extrema.
		3rd	Envelope	Students can find the envelope equation.
		4th	Definition of double integral	Students can understand the definition of double integrals, and can express the volume of solids using double integrals.
		5th	Calculation of double integral (1)	Students can calculate the repeated integral.
		6th	Calculation of double integral (2)	Students can calculate the volume of solids using the change of integration order.
		7th	Exercise	
		8th	2nd semester mid-term exam	
	4th Quarter	9th	Return and commentary of exam answers, Multiple integral in polar coordinates	Studentscan find the double integral by converting it to polar coordinates.
		10th	Change of variables and multiple integrals	Students can calculate the double integral using the general change of variables.
		11th	Improper integral	Students can calculate the improper integral.
		12th	Various applications of double integrals (1)	Students can find the area of the curved surface.
		13th	Various applications of double integrals (2)	Students can find the barycenter of the figure.
		14th	Exercise	
		15th	2nd semester final exam	
		16th	Return and commentary of exam answers	

Evaluation Method and Weight (%)

	Examination	Presentation	Mutual Evaluations between students	Behavior	Portfolio	Other	Total
Subtotal	60	0	0	0	0	40	100

Basic Proficiency	60	0	0	0	0	40	100
Specialized Proficiency	0	0	0	0	0	0	0
Cross Area Proficiency	0	0	0	0	0	0	0