Tsuyama College	Year	2021	Course Title	Applied Mathematics Ⅱ

Course Information

Course Code	0089	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	4th
Term	Year-round	Classes per Week	2
Textbook and/or Teaching Materials	Textbook : "Ouyousuugaku" (Morikitasyuppan)		
Instructor	SAEKI Fumihiro,KATO Manabu,SHIMADA Takao,MIYASHITA Takuya,SHIMADA Hirohiko		

Course Objectives

Learning purposes :
Students will acquire the mathematical knowledge, calculation techniques, and applied abilities necessary to solve basic engineering problems through Laplace transform, vector analysis, Fourier series, and Fourier transform.

Course Objectives :
1. To understand the concepts of the Laplace transform and apply them to the solution of differential equations.
2. To understand the concepts of Fourier series and Fourier transform, and be able to find the Fourier transform of basic functions.
3. To understand the basic concepts of vector analysis such as gradient, divergence, rotation, line integral, and surface integral, and be able to solve problems related to them.

Rubric

	Excellent	Good	Acceptable	Not acceptable
Achievement 1	The student can solve applied problems related to Laplace transform	The student an solve about 70% of the basic problems related to Laplace transform.	The student can solve about 60% of the basic problems related to Laplace transform.	The student can not solve about 60% of the basic problems related to Laplace transform.
Achievement 2	The student can solve applied problems related to Fourier series and Fourier transform.	The student can solve about 70% of basic problems related to Fourier series and Fourier transform	The student can solve about 60% of basic problems related to Fourier series and Fourier transform.	The student can not solve about 60% of basic problems related to Fourier series and Fourier transform.
Achievement 3	The student can solve applied problems related to vector analysis.	The student can solve about 70% of basic problems related to vector analysis.	The student can solve about 60% of basic problems related to vector analysis.	The student can not solve about 60% of basic problems related to vector analysis.

Assigned Department Objectives

Teaching Method

Outline	General or Specialized : General Field of learning : Natural sciences, Common and basic Foundational academic disciplines : Mathematical science / mathematics / analysis basics 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 : The 1st semester deals with Laplace transform, Fourier series, and Fourier transform. The 2nd semester deals with vector analysis.
Style	Course method : The course is based on lectures with exercises given to further deepen understanding. Grade evaluation method : Exams [60%] + Others (exercises, reports, etc.)[40%]. Regular examinations will be conducted a total of 4 times, and the evaluation ratios will be the same. Additional assignments may be given depending on grades. Re-examinations, in principle, will not be conducted.
Notice	Precautions on the enrollment : Students must take courses to complete the course of the academic year (the number of absence hours must be less than one-third of the class hours). Course advice : Review and confirm the contents of mathematics up to the third grade, especially trigonometric functions, space vectors, determinants, differential calculus (including partial derivatives), and integral calculus (including multiple integrals). As a preparatory study, review the integration by parts in Differential and Integral I. Foundational subjects : Fundamental mathematics (1st year), Fundamental Linear Algebra (2nd), Differential and Integral I, II (2nd, 3rd), Fundamental Differential Equations (3rd) Related subjects : Physics after 4th year, specialized subjects Attendance advice : Students who join the class after the attendance verification are marked as tardy. Three tardy arrivals count as one absence.

Characteristics of Class / Division in Learning			
☐ Active Learning	☐ Aided by ICT	☑ Applicable to Remote Class	☐ Instructor Professionally Experienced

Must complete subjects

Course Plan

			Theme	Goals
1st Semester	1st Quarter	1st	Guidance, Laplace transform	Students can find the Laplace transform of basic functions.
		2nd	Inverse Laplace transform	Students can find the inverse Laplace transform of the basic function.
		3rd	Differentiation formulas and solutions for differential equations	Students can use the Laplace transform to solve basic differential equations.
		4th	Exercise	Confirm basic matters
		5th	Unit step function and delta function	Students can find the Laplace transform of the unit step function and the delta function.
		6th	Convolution	Students can calculate the convolution of basic functions.
		7th	Linear system	For linear systems, students can find the response to the basic input.
		8th	1st semester mid-term exam	
	2nd Quarter	9th	Return and commentary of exam answers, periodic function	Students can find the integral of the period of the periodic function and the basic trigonometric function.
		10th	Fourier series	Students can find the Fourier series of the basic periodic function.
		11th	Complex Fourier series	Students can find the complex Fourier series of the basic periodic functions.
		12th	Fourier transform	Students can find the Fourier transform of the basic function.
		13th	Fourier integral theorem	Students can solve problems that apply the Fourier integral theorem.
		14th	Exercise	Confirm basic matters
		15th	1st semester final exam	
		16th	Return and commentary of exam answers	Confirm basic matters
2nd Semester	3rd Quarter	1st	Guidance, Vector and its dot product	Students can calculate the dot product of vectors.
		2nd	Vector cross product	Students can calculate the cross product of vectors.
		3rd	Scalar field and vector field, gradient	Studentsan find the gradient of the scalar field.
		4th	Divergence	Students can find the divergence of the scalar field.
		5th	Rotation	Students can find the rotation of the vector field.
		6th	Curve, scalar field line integral	Students can find the line integral of the scalar field.
		7th	Line integral of vector field	Students can find the line integral of the vector field.
		8th	2nd semester final exam	
	4th Quarter	9th	Return and commentary of exam answers, Surface parameter display, curved surface tangent vector and normal vector	Students can find the parametric representation of the surface, the tangent vector and the normal vector of the surface.
		10th	Surface integral of scalar field	Students can find the surface integral of the scalar field.
		11th	Surface integral of vector field	Students can find the surface integral of the vector field.
		12th	Exercise	Confirm basic matters
		13th	Gauss's divergence theorem, Green's theorem	Students can use Gauss's divergence theorem to find the surface integral on the surface of solids.
		14th	Stokes' theorem	Using Stokes' theorem, students can find the line integral along the boundary of a curved surface.
		15th	2nd semester final exam	
		16th	Return and commentary of exam answers	Confirm basic matters

Evaluation Method and Weight (%)

	Examination	Reports	Total
Subtotal	70	30	100
Basic Proficiency	70	30	100
Specialized Proficiency	0	0	0
Cross Area Proficiency	0	0	0