Anan College			Course of Electronics and Information Engineering			Year	2024								
Department Goals															
Course Category		Course Title	Course Code	Credit Type	Credits	Class Hours per Week								Instructor	Division in Learning
						Adv. 1st Y				Adv. 2nd Y					
						1st		2nd		1st		2nd			
						1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q		
AE	Compulsory	Electronic Device Engineering	5316E01	Academic Credit	2			2						Hasegawa Tatsuo	
AE	Elective	Disaster Prevention Engineering	5396C02	Academic Credit	2	2								Osada Kengo,Inoue Takafumi	
AE	Elective	Electrical Circuits and Analysis	5396E03	Academic Credit	2	2								Nakamura Yuichi	
AE	Elective	Material Processing	5396M03	Academic Credit	2	2								Yasuda Takeshi	
AE	Elective	Simulation Engineering	5396M04	Academic Credit	2			2						Matsura Fuminori	
AE	Elective	Instrumental Analysis	5396Z01	Academic Credit	2	2								Yamada Yohei	
Specialized	Compulsory	Sequence Control	5316I02	Academic Credit	2			2						Fukuda Koji	
Specialized	Elective	Mechanics of Fluid	5396M01	Academic Credit	2	2								Okita Yuji	
Specialized	Compulsory	Mathematics of Electronics and Information	5317E02	Academic Credit	2					2				Sugino Ryuzaburo	
Specialized	Compulsory	Electronics and Information Engineering Experiments	5317J01	Academic Credit	2					6				Yasuno Emiko,Matsumoto Takashi,Park Youngsoo,Hasegawa Tatsuo,Okamoto Hiroyuki	
Specialized	Elective	Applied Structural Mechanics	5397C03	Academic Credit	2							2		Moriyama Takuro	
Specialized	Elective	Semiconductor Material Properties	5397E04	Academic Credit	2							2		Hasegawa Tatsuo	
Specialized	Elective	Electric Measurement	5397E05	Academic Credit	2							2		Matsumoto Takashi	
Specialized	Elective	Signal Processing Engineering	5397I03	Academic Credit	2					2				Yasuno Emiko	

Specialized	Elective	Modern Control Engineering	5397I04	Academic Credit	2					2			Fukumi Junji	

Anan College	Year	2024	Course Title	Electronic Device Engineering

Course Information

Course Code	5316E01	Course Category	AE / Compulsory
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Electronics and Information Engineering	Student Grade	Adv. 1st
Term	Second Semester	Classes per Week	後期:2
Textbook and/or Teaching Materials	基礎から学ぶ半導体電子デバイス（森北出版）		
Instructor	Hasegawa Tatsuo		

Course Objectives

1. 半導体のエネルギーバンド図を説明でき、キャリア密度に関する諸式を導出できる。
2. pn接合ダイオードの特性をエネルギーバンド図を用いて説明でき、動作に関わる諸量を求めることができる。
3. 金属と半導体の接合の特性をエネルギーバンド図を用いて説明でき、動作に関わる諸量を求めることができる。
4. トランジスタ、サイリスタの動作原理をエネルギーバンド図を用いて説明できる。
5. JFET、MOSFETの動作原理をエネルギーバンド図を用いて説明できる。

Rubric

	理想的な到達レベルの目安	標準的な到達レベルの目安	最低限の到達レベルの目安(不可)
到達目標1	半導体のエネルギーバンド図を説明でき、キャリア密度に関する諸式を導出できる。	半導体のエネルギーバンド図を説明でき、キャリア密度について説明できる。	半導体のエネルギーバンド図を説明できる。
到達目標2	pn接合ダイオードの特性をエネルギーバンド図を用いて説明でき、動作に関わる諸量を求めることができる。	pn接合ダイオードの特性をエネルギーバンド図を用いて説明できる。	pn接合ダイオードの特性を説明できる。
到達目標3	金属と半導体の接合の特性をエネルギーバンド図を用いて説明でき、動作に関わる諸量を求めることができる。	金属と半導体の接合の特性をエネルギーバンド図を用いて説明できる。	金属と半導体の接合の特性を説明できる。
到達目標4	トランジスタ、サイリスタの動作原理をエネルギーバンド図を用いて説明できる。	トランジスタ、サイリスタの動作原理を説明できる。	トランジスタ、サイリスタの基本特性を説明できる。
到達目標5	JFET、MOSFETの動作原理をエネルギーバンド図を用いて説明できる。	JFET、MOSFETの動作原理を説明できる。	JFET、MOSFETの基本特性を説明できる。

Assigned Department Objectives

B-3

Teaching Method

Outline	半導体の基本的性質およびキャリア輸送についてエネルギーバンドモデルを用いて学習し、pn接合ダイオード、ショットキー接合ダイオード、バイポーラトランジスタ、サイリスタ、電界効果トランジスタなど、さまざまな電子デバイスの構造・特性・動作原理について理解することを目的とする。
Style	講義形式を中心に授業を進める。 【授業時間30時間＋自学自習時間60時間】
Notice	

Characteristics of Class / Division in Learning

☐ Active Learning	☑ Aided by ICT	☐ Applicable to Remote Class	☐ Instructor Professionally Experienced

Course Plan

			Theme	Goals
2nd Semester	3rd Quarter	1st	半導体の基礎	半導体の定義を説明できる。 孤立原子、結晶のエネルギー構造を説明できる。
		2nd	半導体の基礎	真性半導体、p型・n型の不純物半導体について説明できる。
		3rd	半導体中のキャリア密度	真性半導体のキャリア密度に関する諸式を導出できる。 真性、不純物半導体のキャリア密度の図を説明できる。
		4th	半導体中のキャリア密度 半導体中のキャリア輸送現象	絶縁体、半導体、導体のエネルギーバンドを説明できる。 ドリフト電流と拡散電流を説明できる。
		5th	pn接合ダイオード	pn接合ダイオードの特性をエネルギーバンド図を用いて説明できる。
		6th	pn接合ダイオード	pn接合ダイオードの特性に関する諸式をポアソン方程式より導出できる。
		7th	pn接合ダイオード	pn接合ダイオードの電圧-電流特性の式を導出できる。
		8th	【中間試験】	
	4th Quarter	9th	金属と半導体の接合による整流特性	金属と半導体の接合の特性をエネルギーバンド図を用いて説明できる。
		10th	金属と半導体の接合による整流特性	金属と半導体の接合の特性をエネルギーバンド図を用いて説明できる。

		11th	金属と半導体の接合による整流特性	pn接合ダイオードの特性に関する諸式をポアソン方程式より導出できる。
		12th	バイポーラトランジスタ	バイポーラトランジスタの特性をエネルギーバンド図を用いて説明できる。
		13th	バイポーラトランジスタ	サイリスタの特性をエネルギーバンド図を用いて説明できる。
		14th	接合型電界効果トランジスタ（JFET）	接合型FETの特性を構造図を用いて説明できる。
		15th	MOS型電界効果トランジスタ（MOSFET）	MOS形FETの特性を構造図とエネルギーバンド図を用いて説明できる。
		16th	【学年末試験、答案返却】	

Evaluation Method and Weight (%)

	定期試験	小テスト	ポートフォリオ	発表・取り組み姿勢	その他	Total
Subtotal	80	0	20	0	0	100
基礎的能力	40	0	10	0	0	50
専門的能力	40	0	10	0	0	50
分野横断的能力	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Disaster Prevention Engineering

Course Information

Course Code	5396C02	Course Category	AE / Elective
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Electronics and Information Engineering	Student Grade	Adv. 1st
Term	First Semester	Classes per Week	前期:2
Textbook and/or Teaching Materials	Fuchida et al. : kankyo・toshi system kyoukasyo series 20 bousaikougaku, korona sha		
Instructor	Osada Kengo,Inoue Takafumi		

Course Objectives

1. Able to explain earthquake disasters and their countermeasures.
2. Able to explain geological disasters and their countermeasures.
3. Able to explain volcanic disasters and their countermeasures.
4. Able to explain disasters regarding river and debris flow and these countermeasures.
5. Able to explain coastal disasters and these countermeasures.
6. Able to explain recovery and reconstruction from disaster.

Rubric

	Ideal Level	Standard Level	Minimum Level
Course Objective 1	Able to give detailed explanations about earthquake disasters and their countermeasures with concrete examples.	Able to give explanations about earthquake disasters and their countermeasures with examples.	Able to mention examples of earthquake disasters. However, not able to explain the countermeasures sufficiently.
Course Objective 2	Able to give detailed explanations about geological disasters and their countermeasures with concrete examples.	Able to give explanations about geological disasters and their countermeasures with examples.	Able to mention examples of geological disasters. However, not able to explain the countermeasures sufficiently.
Course Objective 3	Able to give detailed explanations about volcanic disasters and their countermeasures with concrete examples.	Able to give explanations about volcanic disasters and their countermeasures with examples.	Able to mention examples of volcanic disasters. However, not able to explain the countermeasures sufficiently.
Course Objective 4	Able to thoroughly explain disasters regarding river and debris flow and these countermeasures.	Able to explain disasters regarding river and debris flow and these countermeasures.	Able to slightly explain disasters regarding river and debris flow and these countermeasures.
Course Objective 5	Able to thoroughly explain coastal disasters and these countermeasures.	Able to explain coastal disasters and these countermeasures.	Able to slightly explain coastal disasters and these countermeasures.
Course Objective 6	Able to thoroughly explain recovery and reconstruction from disaster.	Able to explain recovery and reconstruction from disaster.	Able to slightly explain recovery and reconstruction from disaster.

Assigned Department Objectives

Teaching Method

Outline	In recent years, many large disasters have been occurring. A learner studies disasters regarding earthquakes, rivers, and coastal and these countermeasures.
Style	In the first quarter, you will learn about countermeasures against earthquake disasters, geological disasters, and volcanic disasters, including basic matters such as the mechanism of earthquakes. In the second quarter of this class, students learn countermeasures against disasters regarding water: flood flow, inundation flow, debris flow, tsunamis, and high tides. (The learning time: 30 hours, The self-study time: 60 hours)
Notice	

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	Earthquake disaster	Able to explain the characteristics of direct damage and secondary disasters caused by earthquakes. Able to explain the damage of various structures due to earthquakes and countermeasures.
		2nd	Earthquake disaster	Able to explain the basic concept of the seismic design method for structures.
		3rd	Earthquake disaster	Able to explain the characteristics of direct damage and secondary disasters caused by earthquakes. Able to explain the damage of various structures due to earthquakes and countermeasures.
		4th	Earthquake disaster	Able to explain the basic concept of the seismic design method for structures.
		5th	Geological disaster	Able to explain ground subsidence and slope disasters.

		6th	Geological disaster	Able to explain ground subsidence and slope disasters.
		7th	Volcanic disaster	Able to explain volcanic disasters.
		8th	Midterm examination	
	2nd Quarter	9th	Flood flow disaster	Able to explain flood flow disaster.
		10th	Flood flow disaster	Able to explain flood flow disaster.
		11th	Urban disasters by flood and inundation	Able to explain urban disasters by flood and inundation flow.
		12th	Debris flow	Able to explain the disaster of debris flow.
		13th	Coastal disaster	Able to explain coastal disasters: high tides, tsunamis, and coast erosion and deposition disasters.
		14th	Disaster countermeasure and disaster prevention planning	Able to understand disaster countermeasures and explain disaster prevention planning.
		15th	Recovery and reconstruction from disaster	Able to explain recovery and reconstruction from a huge disaster.
		16th	Return of the final examination result	

Evaluation Method and Weight (%)

	Midterm/Final Exam	Quiz	Portfolio	Presentation/Attitude	Other	Total
Subtotal	70	0	30	0	0	100
Basic Proficiency	20	0	10	0	0	30
Specialized Proficiency	50	0	20	0	0	70
Cross Area Proficiency	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Electrical Circuits and Analysis

Course Information

Course Code	5396E03	Course Category	AE / Elective
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Electronics and Information Engineering	Student Grade	Adv. 1st
Term	First Semester	Classes per Week	前期:2
Textbook and/or Teaching Materials			
Instructor	Nakamura Yuichi		

Course Objectives

1. Able to explain the characteristics and functions of basic elements.
2. Able to derive circuit equations for basic circuits and explain dynamic characteristics.
3. Can explain how to derive and solve circuit equations for circuits containing L and C.
4. Understand the concept of system equations and be able to express system equations corresponding to circuits.
5. Able to solve system equations and explain the dynamic characteristics of circuits.

Rubric

	Ideal Level	Standard Level	Minimum achievement level
Achievement 1	Able to explain in detail the characteristics and effects of basic elements using mathematical formulas, etc.	Able to explain the characteristics and effects of basic elements using formulas.	Able to explain the characteristics and actions of basic elements.
Achievement 2	Ableto systematically derive circuit equations for basic circuits. Also, be able to solve it and explain its dynamic characteristics.	Able to derive circuit equations for basic circuits. Also, be able to explain the steps to solve an equation.	Able to derive circuit equations for simple circuits.
Achievement 3	Abley to derive circuit equations expressed as higher-order differentials. Also, be able to concretely solve the problem.	Able to derive circuit equations expressed up to second-order differentials. Also, be able to explain the solution.	Able to derive circuit equations expressed as first-order differentials. Also, be able to explain the solution.
Achievement 4	Understand the concept of system equations and be able to express system equations corresponding to various circuits.	Understand the concept of system equations and be able to express system equations that correspond to basic circuits.	Understand the concept of system equations and be able to express system equations that correspond to simple circuits.
Achievement 5	Able to solve various system equations and explain the dynamic characteristics of circuits in detail.	Able to solve basic system equations and outline the dynamic characteristics of a circuit.	Able to solve simple system equations and provide an overview of the dynamic characteristics of a circuit.

Assigned Department Objectives

Teaching Method

Outline	Transient phenomena for circuits with various configurations are analyzed using system state equations. The goal is to learn about multiple types of analysis methods and understand the characteristics and methods of each, so that you can select the most suitable method for your purpose.
Style	Learn about the concepts and methods for analyzing the dynamic characteristics of electrical circuits. Exercises and report assignments will also be conducted to help students understand the content of the class.
Notice	The content of this lecture is a method that can be commonly applied to the analysis of linear dynamical systems. By becoming familiar with the notation and analysis procedures used here, students will develop skills that can be applied to more practical system analysis.

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	1. Dynamic characteristics of basic circuits (1) Dynamic element	Able to derive circuit equations for basic circuits and explain dynamic characteristics. - Able to explain the individual characteristics and actions of dynamic elements.
		2nd	1. Dynamic characteristics of basic circuits (2) Circuit equation	Able to derive circuit equations for basic circuits and explain dynamic characteristics. - Circuit equations can be found for basic circuits.
		3rd	1. Dynamic characteristics of basic circuits (3) Dynamic characteristics	Able to derive circuit equations for basic circuits and explain dynamic characteristics. - Able to solve circuit equations of basic circuits and explain dynamic characteristics.
		4th	1. Dynamic characteristics of basic circuits (3) Dynamic characteristics	Able to derive circuit equations for basic circuits and explain dynamic characteristics. - Able to solve circuit equations of basic circuits and explain dynamic characteristics.

		5th	2. Dynamic analysis method (1) Ordinary differential equations and their solutions	Able to explain how to derive and solve circuit equations for circuits containing L and C. - Understand constant coefficient ordinary differential equations and be able to explain the steps to solve them.
		6th	2. Dynamic analysis method (1) Ordinary differential equations and their solutions	Able to explain how to derive and solve circuit equations for circuits containing L and C. - Understand constant coefficient ordinary differential equations and be able to explain the steps to solve them.
		7th	2. Dynamic analysis method (1) Ordinary differential equations and their solutions	Able to explain how to derive and solve circuit equations for circuits containing L and C. - Understand constant coefficient ordinary differential equations and be able to explain the steps to solve them.
		8th	[Midterm Exam]	Check your understanding of the lesson content up to the midterm exam.
	2nd Quarter	9th	3. System equations and their solutions (1) Representation of system equations	Understand the concept of system equations and be able to specifically derive and solve them. - Understand the concept of system equations and be able to derive them for a given circuit.
		10th	3. System equations and their solutions (1) Representation of system equations	Understand the concept of system equations and be able to specifically derive and solve them. - Understand the concept of system equations and be able to derive them for a given circuit.
		11th	3. System equations and their solutions (2) Exponential function of matrix and its properties	Understand the concept of system equations and be able to specifically derive and solve them. - Able to explain the exponential function of the matrix used to solve system equations and its properties.
		12th	3. System equations and their solutions (2) Exponential function of matrix and its properties	Understand the concept of system equations and be able to specifically derive and solve them. - Able to explain the exponential function of the matrix used to solve system equations and its properties.
		13th	3. System equations and their solutions (3) Solution of system equations	Understand the concept of system equations and be able to specifically derive and solve them. - Able to specifically derive the derived system equation.
		14th	3. System equations and their solutions (3) Solution of system equations	Understand the concept of system equations and be able to specifically derive and solve them. - Able to specifically derive the derived system equation.
		15th	3. System equations and their solutions (3) Solution of system equations	Understand the concept of system equations and be able to specifically derive and solve them. - Able to specifically derive the derived system equation.
		16th	[Final exam] [Answer return time]	Check your understanding of the lesson content.

Evaluation Method and Weight (%)

	Examination	Report/Assignment	Total
Subtotal	80	20	100
Basic Proficiency	30	5	35
Specialized Proficiency	40	10	50
Cross Area Proficiency	10	5	15

Anan College	Year	2024	Course Title	Material Processing

Course Information

Course Code	5396M03	Course Category	AE / Elective
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Electronics and Information Engineering	Student Grade	Adv. 1st
Term	First Semester	Classes per Week	前期:2
Textbook and/or Teaching Materials	Materials will be distributed as needed.		
Instructor	Yasuda Takeshi		

Course Objectives

1. Student be able to understand and explain various processing methods for metallic materials and their characteristics and relevance.
2. Student be able to understand and explain various molding methods for ceramics, resins, and composite materials, and their characteristics.
3. Student be able to understand and explain heat treatment and surface treatment, their necessity and effects.
4. Student be able to understand and explain various joining methods and their characteristics.

Rubric

	Ideal Level	Standard Level	Minimum Level
Achievement 1	Student be able to understand and explain various processing methods of metallic materials and their characteristics and relevance.	Student be able to understand and explain various processing methods for metallic materials.	Student understand various processing methods for metal materials.
Achievement 2	Student be able to understand and explain various molding methods for ceramics and resins/composites and their characteristics.	Student be able to understand and explain various forming methods for ceramics and resins/composites.	Student understand various molding methods for ceramics, resins and composites.
Achievement 3	Student be able to understand and explain the necessity and effects of heat treatment and surface treatment.	Student be able to understand and explain heat treatment and surface treatment.	Student understand heat treatment and surface treatment heat treatments.
Achievement 4	Student be able to understand and explain various joining methods and their characteristics.	Student be able to understand and explain various joining methods.	Student understand various joining methods.

Assigned Department Objectives

Teaching Method

Outline	Metallic materials (especially steel), ceramics, and resins, which are widely utilized in industrial products, are processed into various shapes according to their applications. As engineers and designers involved in manufacturing, it is necessary to understand the phenomena and characteristics of various materials during processing in order to select appropriate material processing methods. In this course, students will acquire basic knowledge of various processing and forming methods for metallic materials, ceramics, and resins, as well as heat treatment and surface treatment of some materials.
Style	Classes will be conducted in a lecture style. Reports will be required as pre- and post-assessments. [30 hours of class time + 60 hours of self-study]
Notice	

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	Overall view of material processing methods	Student be able to explain an overview of this course and an view overall how materials are processed.
		2nd	Processing methods for metallic materials	Student be able to explain various processing methods for metallic materials.
		3rd	Processing methods for metallic materials	Student be able to explain various processing methods for metallic materials.
		4th	Ceramics forming methods	Student be able to explain ceramics forming methods.
		5th	Molding methods for resins and composites	Student be able to explain molding methods for resins and composites.
		6th	Basics of heat treatment	Student be able to explain the basics of heat treatment of steel materials.
		7th	Basics of heat treatment	Student be able to explain the basics of heat treatment of steel materials.
		8th	Heat treatment in actual	Student be able to explain heat treatment in actual.
	2nd Quarter	9th	Midterm examination	
		10th	Surface Treatment	Student be able to explain various surface treatment methods.

		11th	Surface Treatment	Student be able to explain various surface treatment methods.
		12th	Mechanical bonding	Student be able to explain various mechanical bonding.
		13th	Adhesion	Student be able to explain about adhesion.
		14th	Liquid phase bonding and solid phase bonding	Student be able to explain various methods of liquid-phase bonding and solid-phase bonding.
		15th	Liquid phase bonding and solid phase bonding	Student be able to explain various methods of liquid-phase bonding and solid-phase bonding.
		16th	Final examination and return exam. paper	

Evaluation Method and Weight (%)

	Midterm/Final exam	Quiz	Portfolio	Presentation/Attitude	Portfolio	Other	Total
Subtotal	80	0	20	0	0	0	100
Basic Proficiency	0	0	0	0	0	0	0
Specialized Proficiency	60	0	20	0	0	0	80
Cross Area Proficiency	20	0	0	0	0	0	20

Anan College	Year	2024	Course Title	Simulation Engineering

Course Information

Course Code	5396M04	Course Category	AE / Elective
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Electronics and Information Engineering	Student Grade	Adv. 1st
Term	Second Semester	Classes per Week	後期:2
Textbook and/or Teaching Materials	Pythonによる数値計算とシミュレーション（オーム社）		
Instructor	Matsuura Fuminori		

Course Objectives

1. Can perform modeling with 3D CAD and carry out linear stress analysis, fluid analysis, and heat transfer analysis.
2. Can create a program that simulates the motion of a particle based on ordinary differential equations.

Rubric

	Ideal Level	Standard Level	Unacceptable Level
SolidWorks Simulation	Can perform element division considering analysis accuracy and conduct linear stress, fluid, and heat transfer analyses.	Can model complex parts with 3D-CAD and perform linear stress, fluid, and heat transfer analyses.	Can model simple parts with 3D-CAD and perform linear stress, fluid, and heat transfer analyses.
Creating Own Numerical Simulation Code	Can add additional features to the code listed in the textbook.	Can create simulation code with functions equivalent to the code listed in the textbook.	Cannot implement functions equivalent to the code listed in the textbook.

Assigned Department Objectives

B-4

Teaching Method

Outline	Numerical analysis methods such as the finite element method have become powerful tools for all engineering fields. In this lecture, we utilize analysis software linked with 3D CAD to perform stress analysis, heat transfer analysis, and fluid analysis. In the latter part, students will acquire the basics of computational mechanics and learn about physical simulations based on ordinary differential equations, simulations using cellular automata, and stochastic simulations using random numbers.
Style	The first half of the course focuses on learning what can be simulated with analysis using 3D CAD software. In the second half, students create programs for numerical calculation. Although program examples are provided in Python 3, students are allowed to implement in any programming language they are proficient in. As this course offers academic credits, submission of reports as pre- and post-study activities is mandatory. 【Lecture hours: 31 hours + Self-study hours: 60 hours】
Notice	Proficiency in operating 3D CAD software and programming languages is desirable.

Characteristics of Class / Division in Learning

☐ Active Learning	☐ Aided by ICT	☐ Applicable to Remote Class	☐ Instructor Professionally Experienced

Course Plan

			Theme	Goals
2nd Semester	3rd Quarter	1st	Model Creation and Mass Properties	Can model a member, apply materials, and investigate mass properties.
		2nd	Stress Analysis	Able to perform linear stress analysis.
		3rd	Heat Transfer Analysis	Can calculate the steady-state temperature distribution of a member.
		4th	Heat Transfer Analysis	Can calculate the transient temperature distribution of a member.
		5th	Fluid Analysis	Can calculate the velocity and pressure distribution of an external flow fluid.
		6th	Fluid Analysis	Can calculate the velocity and pressure distribution of an internal flow fluid.
		7th	Midterm Exam	Practical exam using SolidWorks.
		8th	Fundamentals of Numerical Calculation	Can perform square root calculations through numerical calculation and explain numerical calculation and errors.
	4th Quarter	9th	Physical Simulation Based on Ordinary Differential Equations	Can create simulation code for free fall and landing spacecraft using Euler's method.
		10th	Physical Simulation Based on Ordinary Differential Equations	Can create simulation code for 2D motion based on potential.
		11th	Simulation Using Cellular Automata	Can create simulation code using 1D cellular automata.
		12th	Simulation Using Cellular Automata	Can create simulation code for traffic flow and the Game of Life.
		13th	Stochastic Simulation Using Random Numbers	Can explain pseudo-random numbers and numerical integration. Can create simulation code for the knapsack problem.
		14th	Stochastic Simulation Using Random Numbers	Can create simulation code for a random walk.
		15th	Final Exam	
		16th		

Evaluation Method and Weight (%)							
	Examination	Presentation	Mutual Evaluations between students	Behavior	Portfolio	Other	Total
Subtotal	10	0	0	0	90	0	100
Basic Proficiency	0	0	0	0	0	0	0
Specialized Proficiency	10	0	0	0	90	0	100
Cross Area Proficiency	0	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Instrumental Analysis

Course Information

Course Code	5396Z01	Course Category	AE / Elective
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Electronics and Information Engineering	Student Grade	Adv. 1st
Term	First Semester	Classes per Week	前期:2
Textbook and/or Teaching Materials	エキスパート応用化学テキストシリーズ　機器分析　大谷肇 編　講談社（ISBN978-4-06-156807-5）		
Instructor	Yamada Yohei		

Course Objectives

After taking this course, you will be able to
1. explain the interaction between electromagnetic waves and materials.
2. explain the measurement principles of the analytical instruments covered in the lecture.
3. discuss and devise analytical methods according to the sample to be measured and the information to be obtained.
4. explain to others the principles of the instruments used in one's own research and the information obtained.

Rubric

	Ideal Level	Standard Level	Unacceptable Level
1. Explain the interaction between electromagnetic waves and matter	You are able to use the equations relating wavelength, frequency, and energy of electromagnetic waves, accurately. You are able to explain at least three specific examples of interactions between electromagnetic waves and matter (electronic transitions, vibrational transitions, etc.).	You are able to use the equations relating wavelength, frequency, and energy of electromagnetic waves. You are able to explain at least two specific examples of interactions between electromagnetic waves and matter (electronic transitions, vibrational transitions, etc.).	If you read textbooks, you are able to use the equations relating wavelength, frequency, and energy of electromagnetic waves. You are able to explain at least two specific examples of interactions between electromagnetic waves and matter (electronic transitions, vibrational transitions, etc.).
2. To be able to explain the measurement principles of the analytical instruments covered in the lecture.	You are able to explain at least six measurement principles of various analytical instruments covered in the textbook. You are able to explain the characteristics of each instrument and how to use them.	You are able to explain at least four measurement principles of various analytical instruments covered in the textbook. You are able to explain the characteristics of each instrument and how to use them.	If you read textbooks, you are able to explain at least four measurement principles of various analytical instruments covered in the textbook. You are able to explain the characteristics of each instrument and how to use them.
3. Discuss and devise analytical methods according to the sample to be measured and the information to be obtained.	You are able to suggest analytical methods according to the sample and the information to be obtained. You are able to image sample preparation.	You are able to suggest analytical methods according to the sample and the information to be obtained.	If you read textbooks, You are able to suggest analytical methods according to the sample and the information to be obtained.
4. Be able to explain to others the principles of the equipment used in his/her research and the information obtained.	You are able to do presentation of your research and explain analytical instruments using in your research. Also, you are able to ask question for research of others, at good pace.	You are able to do presentation of your research and explain analytical instruments using in your research. Also, you are able to ask question for research of others.	You are able to do presentation of your research and explain analytical instruments using in your research.

Assigned Department Objectives

Teaching Method

Outline	Analytical chemistry is the study of the composition and content of samples and the analysis of their chemical state and existence. Instrumental analysis plays a central role in analytical chemistry and is indispensable in all human activities, including substance development, quality control, environmental investigation, and medical care. In general, analytical instruments are classified based on their principles into electromagnetic analysis, electrical analysis, separation analysis, and others (thermal analysis, mass spectrometry). First, students will learn about the principles and equipment configuration of these analytical instruments. Students will also learn what kind of information can be obtained from the results obtained from these analytical instruments.
Style	Basically classroom learning, but there are also laboratory exercises.
Notice	

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	Introduction to Instrumental Analysis, Interaction of Electromagnetic Waves and Materials	You are able to explain the principles of the equipment, how to prepare samples, and how to view the data obtained.
		2nd	Interaction of electromagnetic waves with matter, UV-Vis	You are able to explain the principles of the equipment, how to prepare samples, and how to view the data obtained.
		3rd	fluorospectrophotometer	You are able to explain the principles of the equipment, how to prepare samples, and how to view the data obtained.

		4th	AAS	You are able to explain the principles of the equipment, how to prepare samples, and how to view the data obtained.
		5th	ICP-AES, ICP-MS	You are able to explain the principles of the equipment, how to prepare samples, and how to view the data obtained.
		6th	experimental design for analysis of mineral water by using ICP-AES	experimental design for analysis of mineral water by using ICP-AES.
		7th	Experiment	preparation of standard solution for analysis of mineral water.
		8th	Experiment	ICP-AES measurement
	2nd Quarter	9th	Data handling of the experiment by Excel	Data handling of the experiment by Excel
		10th	FT-IR	You are able to explain the principles of the equipment, how to prepare samples, and how to view the data obtained.
		11th	FT-IR, Raman spectrometry	You are able to explain the principles of the equipment, how to prepare samples, and how to view the data obtained.
		12th	XRD, XRF	You are able to explain the principles of the equipment, how to prepare samples, and how to view the data obtained.
		13th	Presentation of the students	Students will present their own research and the analytical instruments they use.
		14th	Presentation of the students	Students will present their own research and the analytical instruments they use.
		15th	Presentation of the students	Students will present their own research and the analytical instruments they use.
		16th	final exam	final exam

Evaluation Method and Weight (%)

	Examination	Presentation	reports	Total
Subtotal	50	20	30	100
Basic Proficiency	50	20	30	100
Specialized Proficiency	0	0	0	0
Cross Area Proficiency	0	0	0	0

Anan College	Year	2024	Course Title	Sequence Control

Course Information

Course Code	5316I02	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Electronics and Information Engineering	Student Grade	Adv. 1st
Term	Second Semester	Classes per Week	後期:2
Textbook and/or Teaching Materials	（プリント配布による）		
Instructor	Fukuda Koji		

Course Objectives

１．シーケンス制御，PLCについてその概要を説明できる。
２．自己保持，インターロック，優先回路の構成方法がわかる。
３、メモリ，タイマ，カウンタを利用した回路の構成方法がわかる。
４．レジスタ，四則演算，比較などの応用命令を利用した回路の構成方法がわかる。

Rubric

	理想的な到達レベルの目安	標準的な到達レベルの目安	未到達レベルの目安
評価項目1	シーケンス制御と他制御と違いを説明でき，PLCのハードウェア面や機能面の説明ができる。	産業界等でシーケンス制御が利用されている例を列挙でき，PLCの機能を説明できる。	シーケンス制御の必要性が説明できない。
評価項目2	自己保持やインターロックを含む回路を構成できる。	自己保持回路やインターロックを説明できる。	自己保持やインターロックの説明ができない。
評価項目3	メモリ，タイマ，カウンタを含む回路を構成できる。	メモリ，タイマ，カウンタの機能や記述方法がわかる。	メモリ，タイマ，カウンタの機能や記述方法が説明できない。
評価項目４	レジスタ，四則演算，比較を含む回路を構成できる。	レジスタ，四則演算，比較などの機能を説明でき，記述の方法がわかる。	レジスタ，四則演算，比較の機能や記述方法がわからない。

Assigned Department Objectives

Teaching Method

Outline	工場などの生産ラインで一般的に使用されている制御方式であるシーケンス制御に関する知識を身につけるとともに，制御に用いられる基本的なデバイスについても把握する。そして，ラダー図による制御プログラム構成演習を通して，プログラムを構成するのに必要な基本的な機能やそれらの記述方法を把握・理解するとともに，それらの各種機能を用いて基本的なシーケンス制御プログラムが作成できるようにする。
Style	授業は，必要に応じてプリントを準備します。基本的に1回の授業でラダー図を構成する基本要素や特定の役割を果たす機能について，１つもしくは２つ学び，基本的な演習に取り組みます。そして，数回に1回程度の頻度で「まとめと演習」を実施します。ここでは，それまでの授業内容をまとめて簡単に説明したうえで，学習した範囲の知識を組み合わせて園主課題に取り組んでもらいます。基本課題は授業時間でも取り組みますが，説明も含めて授業時間では不足するようにしてあります。このため，これを基本的に自学自習課題とします。まとめ・演習の課題は，およそ授業時間内に解答できるようにしていますが，時間の過不足に関係なく提出課題とします。
Notice	本講義は後期後半からの１回４時間のクオータ講義から，1回2時間の通常の授業形態に変更されています。

Characteristics of Class / Division in Learning

☐ Active Learning	☐ Aided by ICT	☐ Applicable to Remote Class	☐ Instructor Professionally Experienced

Course Plan

			Theme	Goals
2nd Semester	3rd Quarter	1st	シーケンス制御の基本	シーケンス制御とはどのような制御かわかる。
		2nd	ＰＬＣの基本	ＰＬＣとは何か説明できる。ＰＬＣの基本的な構成がわかり，接続する各種部品とその基本的な動作が説明できる。
		3rd	ラダー図	ラダー図の基本的な記述方法がわかる。ＰＬＣの回路接続と，ラダー図との関係が説明できる。また，ラダー図の基本的な入出力要素を示すことができ，それを用いたラダー図を作成できる。
		4th	自己保持・インターロック	自己保持，インターロックの機能や動作を説明できる。また，設問に応じてこれらの構成を適切に用いてラダー図を作成することができる。
		5th	メモリ	メモリの機能や動作を説明できる。メモリを用いたラダー図を作成できる。
		6th	まとめ・演習01	学習した内容をまとめて確認する。そして，設問に応じて適切にラダー図を作成することができる。
		7th	タイマ	タイマの機能や動作を理解し説明できる。タイマを用いたラダー図を適切に作成することができる。
		8th	中間試験	
	4th Quarter	9th	点滅動作	タイマを用いた点滅動作するラダー図を理解し，動作を説明できる。また，設問に応じて点滅動作するラダー図を作成することができる。
		10th	カウンタ	カウンタの機能や動作を理解し説明できる。カウンタを用いたラダー図を適切に作成することができる。
		11th	まとめ・演習02	学習した内容をまとめて確認する。そして，設問に応じて適切にラダー図を作成することができる。

		12th	レジスタ・代入	レジスタ・代入の機能や動作を説明できる。入力，出力とレジスタとの対応が分かる。単発動作を把握し，設問に応じて適切にラダー図を作成することができる。
		13th	四則演算	四則演算による動作を理解し説明できる。設問に応じて適切にラダー図を作成することができる。
		14th	比較	比較による動作を把握し，説明できる。設問に応じて適切にラダー図を作成することができる。
		15th	まとめ・演習3	学習した内容をまとめて確認する。そして，設問に応じて適切にラダー図を作成することができる。
		16th	試験返却	

Evaluation Method and Weight (%)

	試験	レポート			Total
Subtotal	60	40	0	0	100
基礎的能力	20	10	0	0	30
専門的能力	40	30	0	0	70
分野横断的能力	0	0	0	0	0

Anan College	Year	2024	Course Title	Mechanics of Fluid

Course Information

Course Code	5396M01	Course Category	Specialized / Elective
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Electronics and Information Engineering	Student Grade	Adv. 1st
Term	First Semester	Classes per Week	前期:2
Textbook and/or Teaching Materials	SI版　流体力学（基礎と演習）（パワー社）		
Instructor	Okita Yuji		

Course Objectives

1．流体運動の基礎方程式を理解し、ポテンシャル流れの計算ができる。
2．直交座標系におけるナビエ・ストークス方程式からクエット流れの厳密解を求めることができる。
3．円筒座標系におけるナビエ・ストークス方程式からハーゲン・ポアズイユ流れの厳密解を求めることができる。
4．層流境界層と乱流境界層の違いについて説明できる。
5．層流境界層の基礎式を理解し、運動方程式の無次元について説明できる。

Rubric

	理想的な到達レベル	標準的な到達レベル	最低限の到達のレベル
到達目標1	流体運動の基礎方程式を理解し、ポテンシャル流れの条件、および解法について説明できる。	流体運動の基礎方程式を理解し、ポテンシャル流れの計算ができる。	流体運動の基礎方程式を理解し、問題ををを解くことができる。
到達目標2	直交座標系のナビエ・ストークス方程式からクエット流れやそれ以外の流れの厳密解を求めることができる。	直交座標系におけるナビエ・ストークス方程式からクエット流れの厳密解を求めることができる。	直交座標系におけるナビエ・ストークス方程式からクエット流れの微分方程式ををを導出できる。
到達目標3	円筒座標系のナビエ・ストークス方程式からハーゲン・ポアズイユ流れや他の流れの厳密解を求めることができる。	円筒座標系のナビエ・ストークス方程式からハーゲン・ポアズイユ流れの厳密解を求めることができる。	円筒座標系のナビエ・ストークス方程式からハーゲン・ポアズイユ流れの美部分方程式を導出できる。
到達目標4	層流境界層と乱流境界層の違いについて説明でき、実際の問題に適用できる。	層流境界層と乱流境界層の違いについて説明できる。	層流境界層と乱流境界層について説明できる。
到達目標5	層流境界層の基礎式について理解し、運動方程式の無次元およびその導出について説明できる。	層流境界層の基礎式について理解し、運動方程式の無次元について説明できる。	層流境界層の基礎式について理解し問題を解くことができる。

Assigned Department Objectives

B-3 C-1

Teaching Method

Outline	本講義では、流体運動の理論的な取り扱いについて学ぶことを主な内容とする。流体は、固体と違って、自由に変形することを大きな特徴としている。流体運動の取り扱いには、その流体の変形を詳しく記述することが重要であり、流体運動を理論的に表すための基礎となる。そのため、まずは完全流体での「流体運動の基礎方程式」を取り上げる。その後、粘性のある流体の運動方程式である「ナビエ・ストークス方程式」について説明し、種々の厳密解について理解することを目的とする。また、層流境界層と乱流境界層の違いについて理解し、層流境界層の基礎式について理解することを目的とする。
Style	講義形式を主体とし、適宜演習問題を解きながら授業を行う。
Notice	主として二次元流れを理論的に解析する「流体の力学」と、主として一次元流れを経験的に取り扱う「水力学」や「水理学」との相違点に着目して欲しい。レポートの提出が遅れた場合，減点となるので注意して下さい。 参考書：道具としての流体力学（日本実業出版社）　平総書店

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	流体運動の基礎方程式	連続の式について説明できる。
		2nd	流体運動の基礎方程式	渦無しの条件について説明できる。
		3rd	流体運動の基礎方程式	非圧縮非粘性流体の運動方程式について説明できる。
		4th	流体運動の基礎方程式	非圧縮非粘性流体に関するベルヌーイの定理を導出することができる。
		5th	ナビエ・ストークス方程式（直交座標系）	ナビエ・ストークス方程式からクエット流れの厳密解を求めることができる。
		6th	ナビエ・ストークス方程式（直交座標系）	クエット流れについて、種々の条件による速度分布を求めることができる。
		7th	ナビエ・ストークス方程式（直交座標系）	ナビエ・ストークス方程式からレイリー問題について微分方程式を誘導できる。
		8th	ナビエ・ストークス方程式（直交座標系）	ナビエ・ストークス方程式からレイリー問題の厳密解を求めることができる。
	2nd Quarter	9th	中間試験	
		10th	ナビエ・ストークス方程式（円筒座標系）	ナビエ・ストークス方程式からハーゲン・ポアズイユ流れの厳密解を求めることができる。
		11th	境界層	層流境界層と乱流境界層について説明できる。
		12th	境界層	層流境界層の連続の式を導出することができる。

		13th	境界層	層流境界層の運動方程式を導出することができる。
		14th	境界層	ナビエ･ストークス方程式を無次元化しレイノルズ数を導出することができる。
		15th	境界層	オーダー評価を用いて層流境界層の運動方程式を導出することができる。
		16th	期末試験	

Evaluation Method and Weight (%)

	定期試験	小テスト	レポート・課題	発表	その他	Total
Subtotal	70	0	30	0	0	100
基礎的能力	0	0	0	0	0	0
専門的能力	70	0	30	0	0	100
分野横断的能力	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Mathematics of Electronics and Information

Course Information

Course Code	5317E02	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Electronics and Information Engineering	Student Grade	Adv. 2nd
Term	First Semester	Classes per Week	前期:2
Textbook and/or Teaching Materials	Enshu to Ouyo Bibunhouteishiki, Saiensu Sha		
Instructor	Sugino Ryuzaburo		

Course Objectives

1. We can understand Furier series and its transformation, and compute of its fundamental computation.
2. We can understand Laplace transformation and operational calsulus, and compute of its fundamental computaion.
3. We can understand the construction method of differental equation , and compute of its fundamental problems.

Rubric

	Ideal Level	Standard Level	Unacceptable Level
Achievement 1	We can understand Fourier series an its tranformations and apply these for the various problems.	We can understand Fourier series an its tranformations and compute these for the fundamental problems.	We can understand Fourier series an its tranformations, and compute of its elementary problems.
Achievement 2	We can understand Laplace transformations and the operation method and apply these for the fundamental problems.	We can understand Laplace transformations and the operation method and compute the fundamental problems.	We can understand understand Laplace transformations and the operation method and compute of its elementary problems.
Achievement 3	We can understand the construction method of differentail equation and apply these for the fundamental problems.	We can understand the construction method of differentail equation and compute the fundamental problems.	We can understand the construction method of differentail equation and compute of its elementary problems.

Assigned Department Objectives

B-2

Teaching Method

Outline	We are to make a concentration for our class and use the knowledges and techniques about basic mathematics to construction of understanding of Fourier and Laplace transeformation and building up the solutions of ordinary and partial differential equations.
Style	Our class is construction of the next three phases. 1. Review the important facts from the previous class. 2. Lecture about the new section. 3. Short exercises.
Notice	Please make a good preparation and self-review. You will build up the good style to do homework of the previous 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	Fourier Series	We can understand Fourier series and compute its fundamental problems.
		2nd	Fourier Series	We can understand the applications of Fourier series and compute its fundamental problems.
		3rd	Fourier Series	We can understand complex Fourier series and compute its fundamental problems.
		4th	Fourier Series	We can understand Fourier transeformation and compute its fundamental problems.
		5th	Fourier Series	We can understand Fourier intergrals and compute its fundamental problems.
		6th	Fourier Analysis	We can understand the frequency analysis using Fourier transeformation and compute its fundamental problems.
		7th	Fourier Analysis	We can understand the Fourier analysis of differential equation and compute its fundamental problems.
		8th	Mid-term examination	
	2nd Quarter	9th	Laplace Transeformation	We can understand Laplace transeformation and compute its fundamental problems.
		10th	Laplace Transeformation	We can understand the applications of Laplace transformation and compute its fundamental problems.
		11th	Laplace Transeformation	We can understand the basis and dimension of subspace and compute its fundamental problems.
		12th	Differential Equation and Its Function Space	We can understand the linear mapping of vector space and compute its fundamental problems.

		13th	Differential Equation and Its Function Space	We can understand the change of basis and representation matrix and compute its fundamental problems.
		14th	The Solutions of Partial Differential Equation	We can understand the construction method of partial differentail equation and explain of it.
		15th	The Solutions of Partial Differential Equation	We can compute the fundamental applicated problems using construction method of partial differential equation's solutions.
		16th	Final examination	

Evaluation Method and Weight (%)

	Examination	Presentation	Mutual Evaluations between students	Behavior	Portfolio	Other	Total
Subtotal	60	0	0	0	40	0	100
Basic Proficiency	30	0	0	0	20	0	50
Specialized Proficiency	20	0	0	0	10	0	30
Cross Area Proficiency	10	0	0	0	10	0	20

Anan College	Year	2024	Course Title	Electronics and Information Engineering Experiments

Course Information

Course Code	5317J01	Course Category	Specialized / Compulsory
Class Format	Experiment / Practical training	Credits	Academic Credit: 2
Department	Course of Electronics and Information Engineering	Student Grade	Adv. 2nd
Term	First Semester	Classes per Week	前期:6
Textbook and/or Teaching Materials	Reference documents specified by each instructors		
Instructor	Yasuno Emiko,Matsumoto Takashi,Park Youngsoo,Hasegawa Tatsuo,Okamoto Hiroyuki		

Course Objectives

1. Able to learn basic experimental techniques according to the purpose of the experiment and carry out experiments.
2. Able to consider experimental results from an engineering perspective and solve problems.

Rubric

	Ideal Level	Standard Level	Unacceptable Level
Achievement 1	Able to carry out experiments efficiently by learning the basic experimental techniques for each theme and applying unique ideas.	Able to carry out experiments and learn basic experimental techniques for each theme.	Able to carry out experiments and learn the minimum basic experimental techniques for each theme.
Achievement 2	Able to consider experimental results from an engineering perspective and solve not only problems given to them but also problems they have discovered themselves.	Able to consider experimental results from an engineering perspective and understand and solve a given problem.	Able to consider experimental results from an engineering perspective and somehow solve a given problem.

Assigned Department Objectives

C-2 E-2

Teaching Method

Outline	The purpose of this course is to develop creative thinking skills, the ability to discover and solve practical problems, and the ability to proceed with complex technological development, which are connected to "manufacturing."
Style	
Notice	One theme is implemented over three weeks (18 hours). At the discretion of the instructor in charge of the theme, a paper test may be conducted to check the level of understanding. During experiments, pay close attention to safety and follow the instructions of the instructor in charge.

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	Logic circuit design using FPGA	Able to design simple logic circuits using a hardware description language.
		2nd	Logic circuit design using FPGA	Able to design logic circuits using a hardware description language.
		3rd	Logic circuit design using FPGA	Able to evaluate logic circuit designs devised by oneself using FPGA.
		4th	Line sensor circuit design and manufacturing training	Able to select and arrange the components necessary for the circuit according to the purpose.
		5th	Line sensor circuit design and manufacturing training	Able to design appropriately for light sensor circuits for line tracing robots
		6th	Line sensor circuit design and manufacturing training	Able to appropriately manufacture a light sensor circuit for a line tracing robot
		7th	PLC control	Able to understand the basic principles of PLC control and be able to create programs using basic instructions.
		8th	PLC control	Able to create programs for applied tasks by combining basic instructions and applied instructions.
	2nd Quarter	9th	PLC control	Able to imagine control objects around you and create control programs, and give presentations.
		10th	GPIB control with LabVIEW	Able to create block diagrams using LabVIEW basic structures.
		11th	GPIB control with LabVIEW	Able to create block diagrams that control devices from a PC through a GPIB connection.
		12th	GPIB control with LabVIEW	Able to automatically measure LED current-voltage characteristicsusing GPIB control.
		13th	Process automation using collaborative robots and laser microprocessing using remote control	Able collaborative robots to teach using a teaching pendant and AR goggles.

		14th	Process automation using collaborative robots and laser microprocessing using remote control	Able to automate Laser microprocessing and observation processes using collaborative robots. Able to design Laser processing drawings using 3D CAD software.
		15th	Process automation using collaborative robots and laser microprocessing using remote control	Able to operate the laser microprocessing machine using remote control, change processing parameters, and repeat processing and evaluation to find the optimal processing conditions.
		16th		

Evaluation Method and Weight (%)

	Examination	Quiz	Portfolio	Behavior	Other	Total
Subtotal	0	0	100	0	0	100
Basic Proficiency	0	0	0	0	0	0
Specialized Proficiency	0	0	80	0	0	80
Cross Area Proficiency	0	0	20	0	0	20

Anan College	Year	2024	Course Title	Applied Structural Mechanics

Course Information

Course Code	5397C03	Course Category	Specialized / Elective
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Electronics and Information Engineering	Student Grade	Adv. 2nd
Term	Second Semester	Classes per Week	後期:2
Textbook and/or Teaching Materials	Sakimoto Tatsuro : Kouzou Rikigaku [Dai 2 han・Shinsouban] Ge －Fuseiteihen－ (Morikita Shuppan)		
Instructor	Moriyama Takuro		

Course Objectives

1. The deflection of beam and the displacement of truss can be calculated by using the energy method.
2. The reaction force of statically indeterminate beam with low degree of indeterminacy can be calculated.
3. The displacement of point and the force of member on truss can be calculated by using matrix structural analysis.
4. The method for calculating the deflection and the reaction force of beam by using matrix structural analysis can be understood.

Rubric

	Ideal Level	Standard Level	Unacceptable Level
Achievement 1	The deflection of beam and the displacement of truss can be accurately calculated by using the energy method.	The deflection of beam and the displacement of truss can be almost calculated by using the energy method.	The overview of the method for calculating the deflection of beam and the displacement of truss by using the energy method can be understood.
Achievement 2	The reaction force of statically indeterminate beam with low degree of indeterminacy can be accurately calculated.	The reaction force of statically indeterminate beam with low degree of indeterminacy can be almost calculated.	The overview of the method for calculating the reaction force of statically indeterminate beam with low degree of indeterminacy can be understood.
Achievement 3	The displacement of point and the force of member on indeterminate truss can be accurately calculated by using matrix structural analysis.	The displacement of point and the force of member on static truss can be accurately calculated by using matrix structural analysis.	The overview of method for calculating the displacement of point and the force of member on static truss by using matrix structural analysis can be understood.
Achievement 4	The method for calculating the deflection and the reaction force of beam by using matrix structural analysis can be accurately understood.	The method for calculating the deflection and the reaction force of beam by using matrix structural analysis can be almost understood.	The overview of method for calculating the deflection of beam and the reaction force on beam by using matrix structural analysis can be understood.

Assigned Department Objectives

B-3 C-1

Teaching Method

Outline	The concept of structural mechanics, which considers the deformation of an object when a load is applied, is important in the design of any structure. In this lecture, the first half of this lecture explains the energy method and the static structure as an application of the mechanics of materials and structural mechanics of this course, and the second half explains the matrix structure analysis method. The goal of this course is to deepen the understanding of these applied concepts of structural mechanics.
Style	In class, we will explain as many examples as possible for each content, and we will give them exercises as homework as a review. [30 hours of class time + 60 hours of self-study time]
Notice	In class, we will explain as many examples as possible for each content, and we will give them exercises as homework as a review. [30 hours of class time + 60 hours of self-study time]

Characteristics of Class / Division in Learning

☐ Active Learning	☐ Aided by ICT	☐ Applicable to Remote Class	☐ Instructor Professionally Experienced

Course Plan

			Theme	Goals
2nd Semester	3rd Quarter	1st	Calculation of deflection on beam by using the energy method	Able to understand the concepts of work and strain energy, as well as solutions using the law of conservation of energy.
		2nd	Calculation of deflection on beam by using the energy method	Able to understand the principles of virtual work.
		3rd	Calculation of deflection on beam by using the energy method	Able to understand the unit load method.
		4th	Calculation of deflection on beam by using the energy method	Able to understand Castigliano's theorem and reciprocity theorem.
		5th	Solution of statically indeterminate structure	Able to understand the overview and simple solutions of statically indeterminate structures.
		6th	Solution of statically indeterminate structure	Able to understand simple solutions of statically indeterminate structures.
		7th	Solution of statically indeterminate structure	Able to understand the deflection angle method and the triple moments method .
		8th	【Midterm examination】	

	4th Quarter	9th	Matrix structural analysis of truss	Able to construct the stiffness equation of static truss.
		10th	Matrix structural analysis of truss	Able to solve the stiffness equation of static truss and to calculate unknown displacements and forces.
		11th	Matrix structural analysis of truss	Able to solve the stiffness equation of static truss and to calculate the elongation and strain of members.
		12th	Matrix structural analysis of truss	Able to construct stiffness equations of statically indeterminate trusses.
		13th	Matrix structural analysis of truss	Able to solve the stiffness equation and to calculate unknown displacements and forces of statically indeterminate truss.
		14th	Matrix structural analysis of beam	Able to construct the stiffness equation of beam.
		15th	Matrix structural analysis of beam	Able to solve the stiffness equation of beam, and to calculate unknown displacements and forces.
		16th	【Final examination】	【Final examination】

Evaluation Method and Weight (%)

	Examination	Presentation	Mutual Evaluations between students	Behavior	Portfolio	Other	Total
Subtotal	80	0	0	0	20	0	100
Basic Proficiency	40	0	0	0	10	0	50
Specialized Proficiency	40	0	0	0	10	0	50
Cross Area Proficiency	0	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Semiconductor Material Properties

Course Information

Course Code	5397E04	Course Category	Specialized / Elective
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Electronics and Information Engineering	Student Grade	Adv. 2nd
Term	Second Semester	Classes per Week	後期:2
Textbook and/or Teaching Materials	電子物性　松澤・高橋・斉藤　共著（森北出版）		
Instructor	Hasegawa Tatsuo		

Course Objectives

１．固体のバンド構造について説明できる。
２．半導体中のキャリア密度の温度変化について説明できる。
３．３種類の電気分極の機構について説明できる。
４．磁性の発現機構について説明できる。

Rubric

	理想的な到達レベル(優)	標準的な到達レベル(良)	最低限の到達レベル(可)
到達目標1	固体のバンド構造について説明でき、ブロッホの定理を用いてその電子状態を記述することができる。	固体のバンド構造を、周期ポテンシャルと関連付けて説明できる。	固体のバンド構造に関する考え方を理解することができる。
到達目標2	真性半導体と不純物半導体のキャリア密度の温度変化について、フェルミ分布関数を用いて説明できる。	真性半導体と不純物半導体のキャリア密度の温度変化について、定性的な説明をすることができる。	半導体中のキャリアに関する考え方を理解することができる。
到達目標3	３種類の電気分極の機構について、定量的な説明をすることができる。	３種類の電気分極の機構について、定性的な説明をすることができる。	電気分極に関する考え方を理解することができる。
到達目標4	原子の磁気モーメントや伝導電子を考慮して、磁性の発現機構について定量的に説明できる。	磁性の発現機構について、定性的な説明をすることができる。	磁性に関する考え方を理解することができる。

Assigned Department Objectives

C-1

Teaching Method

Outline	身の回りの様々な物質、また製造業で使われる材料が示す物理的・化学的な諸物性のほとんどは、物質中の電子の振る舞いに起因したものである。本講義は量子力学を出発点として、最も基本的な性質について述べていき、将来のより発展した学修のための基礎を身に着けることを目的としている。
Style	講義形式で授業を行っていく。内容としては、先ず量子力学の基礎的な事柄を学んだ後、エネルギーバンド構造と半導体を学び、その後誘電体、磁性体へと進んでいく。この科目は学修単位科目のため、事前事後学習としてレポート等を実施します。【授業時間３０時間＋自学自習時間６０時間】
Notice	本講義を履修するためには、微分方程式や線形代数に関する知識が不可欠です。また、内容が多いため、講義中に演習問題を解く時間が無く、演習は課題として提出してもらいます。

Characteristics of Class / Division in Learning

☐ Active Learning	☐ Aided by ICT	☐ Applicable to Remote Class	☐ Instructor Professionally Experienced

Course Plan

			Theme	Goals
2nd Semester	3rd Quarter	1st	物質の粒子性と波動性、不確定性原理	物質の粒子性と波動性、及び不確定性原理について説明できる。
		2nd	井戸型ポテンシャルの波動関数	１次元井戸型ポテンシャルにおけるシュレーディンガー方程式の解を求めることができる。
		3rd	トンネル効果	１次元系において、矩形のポテンシャル障壁におけるトンネル確率を求めることができる。
		4th	水素原子のエネルギー準位	クーロンポテンシャルにおけるシュレーディンガー方程式の解が、３つの量子数で表されることを理解できる。
		5th	金属の自由電子論	変数分離法により、３次元系の自由電子の波動関数、及び状態密度を求めることができる。
		6th	フェルミ・ディラック分布関数	フェルミ・ディラック分布関数について説明できる。
		7th	金属の電子密度分布とフェルミレベル	電子密度とフェルミレベル、フェルミ波数、フェルミ温度との関係を導くことができる。
		8th	中間試験	
	4th Quarter	9th	周期ポテンシャルにおけるエネルギー分散	クローニッヒ・ペニーのモデルにおけるエネルギー分散の様子について理解できる。
		10th	結晶内における電子の運動とバンド理論	効質量、及びバンド理論の考え方について理解できる。
		11th	真性半導体	電子密度・正孔密度の温度依存性を導出できる。
		12th	不純物半導体	n型・p型半導体の特徴について説明できる。
		13th	誘電体	電子分極、イオン分極、配向分極について理解できる。

		14th	原子の磁気モーメント	軌道磁気モーメントとスピン磁気モーメントについて説明できる。
		15th	磁性体の分類	常磁性、反磁性、強磁性、反強磁性の特徴について理解できる。
		16th	期末試験返却	

Evaluation Method and Weight (%)

	定期試験	小テスト	ポートフォリオ	発表・取り組み姿勢	その他	Total
Subtotal	80	0	20	0	0	100
基礎的能力	30	0	10	0	0	40
専門的能力	50	0	10	0	0	60
分野横断的能力	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Electric Measurement

Course Information

Course Code	5397E05	Course Category	Specialized / Elective
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Electronics and Information Engineering	Student Grade	Adv. 2nd
Term	Second Semester	Classes per Week	後期:2
Textbook and/or Teaching Materials	新版 電気・電子計測入門(実教出版)/電子計測 基礎と応用(培風館)		
Instructor	Matsumoto Takashi		

Course Objectives

1.測定データの統計的取り扱いを理解し、説明できる。
2.ディジタル量の扱いを理解し、AD変換、DA変換を説明できる。
3.様々な電気量の測定方法と各種計測器の計測原理を説明できる。
4.計測システムについて説明できる。

Rubric

	理想的な到達レベルの目安	標準的な到達レベルの目安	最低限の到達レベルの目安
測定データの統計的取り扱いを理解し、説明できる。	測定データの統計的取り扱いを理解し、すべて説明できる。	測定データの統計的取り扱いを理解し、概要を説明できる。	測定データの統計的取り扱いを理解できる。
ディジタル量の扱いを理解し、AD変換、DA変換を説明できる。	ディジタル量の扱いを理解し、AD変換、DA変換、ディジタル量の伝送を説明できる。	ディジタル量の扱いを理解し、AD変換、DA変換の概要を説明できる。	ディジタル量の扱い、AD変換、DA変換を理解できる。
様々な電気量の測定方法と各種計測器の計測原理を説明できる。	様々な電気量の測定方法と各種計測器の計測原理をすべて説明できる。	様々な電気量の測定方法と各種計測器の計測原理について概要を説明できる。	様々な電気量の測定方法と各種計測器の計測原理を理解できる。
計測システムについて説明できる。	複数の計測システムの仕組みを説明できる。	計測システムの仕組みについて概要を説明できる。	計測システムについて理解できる。

Assigned Department Objectives

Teaching Method

Outline	計測分野でもディジタル化が著しく、測定器はコンピュータとともに用いられ、測定データをコンピュータに取り込んで解析することが一般的である。本講義では、計測の基礎から電子計測システムの手法までを習得することを目的とする。 この科目は、企業で電気計装設備の導入・管理を担当していた教員が、その経験を活かし、電子計測の基礎、様々な電気量の測定と計測器、計測システムについて講義形式で授業を行うものである。
Style	・座学形式で授業を進めるが、ペアやグループでの学び合いも行う。 ・この科目は学修単位のため、事前・事後学習としてレポートを実施する。
Notice	予習を十分に行い問題意識を持って授業に臨むとともに、授業後は速やかに自学自習課題に取り組み、理解を深めて欲しい。

Characteristics of Class / Division in Learning

☐ Active Learning	☐ Aided by ICT	☐ Applicable to Remote Class	☐ Instructor Professionally Experienced

Course Plan

			Theme	Goals
2nd Semester	3rd Quarter	1st	電子計測の基礎	(1)各種測定方式について説明できる。
		2nd	電子計測の基礎	(2)測定誤差について説明できる。
		3rd	電子計測の基礎	(3)測定データの統計的取り扱いを説明できる。
		4th	ディジタル量の扱い	(1)2進法と10進法を説明できる。
		5th	ディジタル量の扱い	(2)アナログ・ディジタル変換を説明できる。
		6th	ディジタル量の扱い	(3)ディジタル・アナログ変換を説明できる。
		7th	ディジタル量の扱い	(4)ディジタル量の伝送を説明できる。
		8th	中間試験	
	4th Quarter	9th	様々な電気量の測定と計測器	(1)電圧・電流の測定とディジタルマルチメータについて説明できる。
		10th	様々な電気量の測定と計測器	(2)電力の測定について説明できる。
		11th	様々な電気量の測定と計測器	(3)抵抗・インピーダンスの測定とネットワークアナライザについて説明できる。
		12th	様々な電気量の測定と計測器	(4)周波数と位相の測定について説明できる。
		13th	計測システム	(1)各種センサーの仕組みを説明できる。
		14th	計測システム	(2)各種計測システムについて説明できる。
		15th	計測システム	(3)オシロスコープ、ロジックアナライザ、スペクトラムアナライザについて説明できる。
		16th	期末試験 答案返却	

Evaluation Method and Weight (%)

	試験	発表	相互評価	態度	ポートフォリオ	その他	Total
Subtotal	70	0	0	0	30	0	100
基礎的能力	10	0	0	0	0	0	10
専門的能力	60	0	0	0	30	0	90

分野横断的能力	0	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Signal Processing Engineering

Course Information

Course Code	5397I03	Course Category	Specialized / Elective
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Electronics and Information Engineering	Student Grade	Adv. 2nd
Term	First Semester	Classes per Week	前期:2
Textbook and/or Teaching Materials	信号処理入門（オーム社）		
Instructor	Yasuno Emiko		

Course Objectives

1. Understand and explain the basics of analog and digital signals.
2. Understand the definition of correlation function and be able to perform simple calculations.
3. Understand the basics of Fourier series expansion and be able to perform Fourier series expansion of basic functions.
4. Understand and explain the definition of Fourier transform.

Rubric

	Ideal Level	Standard Level	Minimum Level
Achievement 1	Able to explain analog and digital signals and apply them to practical problems.	Able to explain analog and digital signals.	Understand and explain the basics of analog and digital signals.
Achievement 2	Understand the definition of correlation functions, be able to perform simple calculations, and apply them to problem solving.	Understand the definition of correlation functions and be able to calculate them.	Understand the definition of correlation functions and be able to perform simple calculations.
Achievement 3	Understand Fourier series expansion and be able to perform Fourier series expansion.	Understand Fourier series expansion and be able to perform Fourier series expansion of basic functions.	Understand the basics of Fourier series expansion and be able to perform Fourier series expansion of basic functions.
Achievement 4	Understand the definition of Fourier transform and apply it to problem solving.	Understand and explain the definition of Fourier transform.	Explain the definition of Fourier transform.

Assigned Department Objectives

B-4

Teaching Method

Outline	There are many natural phenomena that fluctuate irregularly. The objective of this lecture is to master basic signal processing techniques for analyzing and extracting the nature of the signals buried in them.
Style	Classes are conducted in a lecture format. 31 hours of class time + 60 hours of self-study In order to understand the lectures and to obtain the credit, it is required to attend every class after self-studying 2 hours for preparation and 2 hours for review.
Notice	Students are expected to not only attend lectures but also actively engage in reports and other exercises.

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	What is Signal Processing? Types of Signals Analog and Digital Signals Sampling Problem	Able to explain analog and digital signals
		2nd	Examples of Signal Processing Waveform smoothing Noise compression	Able to explain waveform smoothing and noise compression
		3rd	Math Preparation Representation of signals	Understand the orthonormal basis correctly and be able to find their values by calculation
		4th	From multidimensional vector space to function space	Understand the extension from multidimensional vector spaces to function spaces
		5th	Orthonormal system	Understand the orthonormal function form correctly and be able to find the value by calculation
		6th	Correlation Functions Similarity of orthonormal functions Cross-correlation functions	Understand the cross-correlation function correctly and be able to obtain its value by calculation
		7th	Autocorrelation function	Understand the autocorrelation function correctly and be able to obtain its value by calculation
		8th	Exercises	Able to solve exercises
	2nd Quarter	9th	Midterm examination	
		10th	Fourier Series Expansion What is Fourier Series Expansion?	Understand Fourier series expansion and be able to expand a given expression
		11th	Even functions and odd functions When the period is not 2π	Able to explain even functions and odd functions

		12th	Derive complex Fourier series expansion	Derive complex Fourier series expansions
		13th	Examples of Fourier Series Expansion Percival's theorem	Understand, explain, and compute an example of Fourier series expansions
		14th	Important properties of Fourier series expansion	Understand and explain important properties of Fourier series expansion
		15th	Fourier Transform From Fourier Series Expansion to Fourier Transform Properties of Fourier Transform	Understand and explain the properties of the Fourier transform
		16th	Return of answer sheet	

Evaluation Method and Weight (%)

	Examination	Presentation	Mutual Evaluations between students	Behavior	Portfolio	Other	Total
Subtotal	70	0	0	0	30	0	100
Basic Proficiency	30	0	0	0	15	0	45
Specialized Proficiency	40	0	0	0	15	0	55
Cross Area Proficiency	0	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Modern Control Engineering

Course Information

Course Code	5397I04	Course Category	Specialized / Elective
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Electronics and Information Engineering	Student Grade	Adv. 2nd
Term	First Semester	Classes per Week	前期:2
Textbook and/or Teaching Materials	Gendai seigyo no kiso （MORIKITA PUBLISHING CO., LTD）		
Instructor	Fukumi Junji		

Course Objectives

1.Able to understand the state space method and perform calculations related to state transition matrices.
2.Able to understand and determine the controllability and observability of a system.
3.Able to solve basic problems about state feedback and observers.

Rubric

	Ideal Level	Standard Level	Minimum Level
Achievement 1	Able to solve state transition matrices and state equations for physical systems.	Able to represent a simple system in terms of state equations and to find its state transition matrix.	Able to represent simple systems in terms of state equations.
Achievement 2	Able to determine controllability and observability of physical systems and convert them to controllable and observable canonical forms. Also, be able to apply it to the design of control systems.	Able to determine controllability and observability of simple systems and convert them to controllable and observable canonical forms.	Able to determine controllability and observability of simple systems.
Achievement 3	Able to design state feedback control systems and observers and their combined systems for physical systems.	Able to design basic state feedback control systems and observers, and their combined systems.	Able to design basic state feedback control systems and observers.

Assigned Department Objectives

Teaching Method

Outline	The goal of this course is to provide students with a mathematical treatment of systems using the state space method and to understand the most fundamental concepts in modern control theory, such as stability, controllability/observability, state feedback, etc. The course will also cover the relationship between the state equation and transfer function, solving the state equation using the state transition matrix, and controllability/observability of systems. To this end, the course will cover the relationship between the state equation and transfer function, the solution of the state equation using the state transition matrix, and controllability and observability of the system. In addition, state feedback and observers will be lectured as examples of control system design.
Style	In this lecture, students are expected to become familiar with the equation-of-state treatment of systems. For this reason, the course will include not only lectures but also a lot of exercises, so students are expected to submit reports and other documents properly. Since this course is a credit course, students will be required to submit reports as pre- and post-learning.
Notice	In this course, students learn modern control theory on the assumption that they have acquired knowledge of classical control theory. Therefore, it is desirable for students to have taken control engineering courses related to classical control theory in this course.

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	State space method	Able to explain the state space representation.
		2nd	State space method	Able to represent a physical system in terms of an equation of state.
		3rd	State transition matrix	Able to derive the transfer function from the equation of state.
		4th	State transition matrix	Able to calculate the state transition matrix of a basic system.
		5th	State transition matrix	Able to explain the solution of the equation of state.
		6th	Controllability and observability	Able to explain the controllability and observability of the system.
		7th	Controllability and observability	Able to determine the controllability and observability of the system.
		8th	Controllability and observability	Able to calculate controllable and observable canonical forms.
	2nd Quarter	9th	Midterm examination	
		10th	State Feedback	Able to explain state feedback and pole assignment.
		11th	State Feedback	Able to design simple control systems using state feedback.

		12th	State Feedback	Able to design simple control systems using direct feedback, etc.
		13th	Observer	Able to explain about same dimensional observers.
		14th	Observer	Able to design same dimensional observers.
		15th	Observer	Able to design a state feedback control system using an observer.
		16th	Return of final exam papers	

Evaluation Method and Weight (%)

	midterm/final exam	quiz	portfolio	presentation/attitude	other	Total
Subtotal	70	0	30	0	0	100
Basic Proficiency	0	0	0	0	0	0
Specialized Proficiency	70	0	30	0	0	100
Cross Area Proficiency	0	0	0	0	0	0