Anan College	Course of Mechanical Engineering	Year	2024

Department Goals

Course Category		Course Title	Course Code	Credit Type	Credits	Class Hours per Week																Instructor	Division in Learning
						1st Year				2nd Year				3rd Year				4th Year				5th Year			
						1st		2nd		1st		2nd		1st		2nd		1st		2nd		1st		2nd	
						1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q		
Specialized	Compulsory	Engineering Drawing	1212A01	School Credit	2					2	2															Nakaoka Nobushi	
Specialized	Compulsory	Manufacturing Process 1	1212E01	School Credit	2					2	2															Itami Shin	
Specialized	Compulsory	Mechanical Materials 1	1212F01	School Credit	2					2	2															Nishimoto Koji	
Specialized	Compulsory	Experiments in Mechanical Engineering 1	1212T02	School Credit	4					4	4															Nishimoto Koji,Itami Shin	
Specialized	Elective	3D Computer Aided Design	1213101	School Credit	1									2												Nakaoka Nobushi	
Specialized	Compulsory	Machine Design and Drawing 1	1213A01	School Credit	2									2	2											Yasuda Takeshi	
Specialized	Compulsory	Mathmatics for Mechanical Engineering	1213A02	School Credit	1											2										Kawabata Nariyuki,Matsuura Fuminori,Okumoto Yoshihiro,Okita Yuji	
Specialized	Compulsory	Design of Machine Elements	1213B01	School Credit	1											2										Okumoto Yoshihiro	
Specialized	Compulsory	Mechanism	1213B03	School Credit	1									2												Kawabata Nariyuki	
Specialized	Compulsory	Strength of Materials 1	1213C03	School Credit	2									2	2											Okumoto Yoshihiro	
Specialized	Compulsory	Fundamentals of Machinery Dynamics 1	1213C04	School Credit	1									2												Kawabata Nariyuki	
Specialized	Compulsory	Fundamentals of Machinery Dynamics 2	1213C05	School Credit	1											2										Kawabata Nariyuki	
Specialized	Compulsory	Manufacturing Process 2	1213E01	School Credit	1											2										Yasuda Takeshi	

Specialized	Compulsory	Mechanical Materials 2	1213F01	School Credit	1									2									Nishimoto Koji	
Specialized	Compulsory	Computer Programming Exercises	1213G02	School Credit	2								2	2									Matsuura Fuminori	
Specialized	Compulsory	Experiments in Mechanical Engineering 2	1213T02	School Credit	4								4	4									Yasuda Takeshi,Itami Shin,Okita Yuji	
Specialized	Compulsory	Machine Design and Drawing 2	1214A01	Academic Credit	2											4							Itami Shin	
Specialized	Compulsory	Machine Design and Drawing 3	1214A11	Academic Credit	2													4					Okita Yuji,Nishino Seiichi	
Specialized	Compulsory	Machine Dynamics 2	1214C01	Academic Credit	2													2					Kawabata Nariyuki	
Specialized	Compulsory	Strength of Materials 2	1214C03	Academic Credit	2											2							Okumoto Yoshihiro	
Specialized	Compulsory	Strength of Materials 3	1214C13	Academic Credit	2													2					Okumoto Yoshihiro	
Specialized	Compulsory	Hydrodynamics 1	1214D01	Academic Credit	2											2							Okita Yuji	
Specialized	Compulsory	Thermodynamics 1	1214D03	Academic Credit	2											2							Matsuura Fuminori	
Specialized	Compulsory	Hydrodynamics 2	1214D11	Academic Credit	2													2					Okita Yuji	
Specialized	Compulsory	Thermodynamics 2	1214D13	Academic Credit	2													4					Kusano Koji,Nishimoto Koji	
Specialized	Compulsory	Instrumentaion Engineering	1214H01	Academic Credit	2													2					Itami Shin	
Specialized	Compulsory	Experiments in Mechanical Engineering 3	1214T02	Academic Credit	4											4	4						Nakaoka Nobushi,Okumoto Yoshihiro,Okita Yuji,Matsuura Fuminori,Kawabata Nariyuki,Itami Shin	

Specialized	Elective	Seminar of Mechanical Engineering	1294201	School Credit	1											2	2					Okumoto Yoshihiro,Okita Yuji,Kawabata Nariyuki,Nishimoto Koji,Matsuura Fuminori,Yasuda Takeshi,Itami Shin	
Specialized	Elective	Mechatronics	1294301	Academic Credit	2											2						Matsuura Fuminori	
Specialized	Elective	Internship	1294R11	School Credit	1											2	2					Kawabata Nariyuki	
Specialized	Compulsory	Probability and Statistics	1514A01	Academic Credit	2												2					Sakaguchi Hideo, Sugino Ryuzaburo	
Specialized	Compulsory	Engineering Mechanics	1514B01	Academic Credit	2											2						Kawabata Nariyuki	
Specialized	Compulsory	Research for Graduation Thesis	1215000	School Credit	10															10	10	Okumoto Yoshihiro,Nishimoto Koji,Okita Yuji,Kawabata Nariyuki,Matsuura Fuminori,Itami Shin,Yasuda Takeshi	
Specialized	Compulsory	Technology Mechanics	1215501	Academic Credit	2															2		Yasuda Takeshi	
Specialized	Compulsory	Automatic Control 1	1215H02	Academic Credit	2															2		Kawabata Nariyuki	
Specialized	Elective	Automatic Control 2	1215H03	School Credit	1																2	Kawabata Nariyuki	

Specialized	Compulsory	Experiments in Mechanixal Engineering 4	1215T02	Academic Credit	2	4	Nishino Seiichi,Nishimoto Koji,Kawabata Nariyuki,Matsuura Fuminori,Nakaoka Nobushi	
Specialized	Elective	Fluid Dynamics	1295401	Academic Credit	2	2	Okita Yuji	
Specialized	Elective	Science of Material Selection	1295601	Academic Credit	2	2	Okumoto Yoshihiro	
Specialized	Elective	Environmental Engineering	1295701	Academic Credit	2	2	Sakamoto Mariko	
Specialized	Elective	Information Processing 2	1295801	Academic Credit	2	2	Matsuura Fuminori	
Specialized	Elective	Heat Transfer Engineering	1295D03	Academic Credit	2	4	Kusano Koji,Nishimoto Koji	

Anan College	Year	2024	Course Title	Engineering Drawing

Course Information

Course Code	1212A01	Course Category	Specialized / Compulsory
Class Format	Seminar	Credits	School Credit: 2
Department	Course of Mechanical Engineering	Student Grade	2nd
Term	Year-round	Classes per Week	前期:2 後期:2
Textbook and/or Teaching Materials	Mechanical Drawing for Beginners 5th Edition, Morikita Publishing Co., Ltd.		
Instructor	Nakaoka Nobushi		

Course Objectives

1. To be able to draw a 3-view (or 2-view) drawing of a simple machine part using CAD.
2. To be able to draw an assembly drawing consisting of several machine parts using CAD.
3. Can give simple drawing instructions using dimensional tolerances, fits, surface roughness, geometric tolerances, and welding symbols.
4. Materials can be described in the title block using material symbols.

Rubric

	Ideal Level	Standard Level	Unacceptable Level
Achievement 1	CAD can be used to draw 3-view (or 2-view) drawings of mechanical parts with complex shapes.	CAD can be used to draw 3-view (or 2-view) drawings for simple machine parts.	CAD can be used to draw 3-view (or 2-view) views of simple shaped parts.
Achievement 2	CAD can be used to create an assembly drawing that consists of a large number of parts.	Using CAD, an assembly drawing consisting of 5 parts can be drawn.	Using CAD, you can draw an assembly drawing that consists of two parts.
Achievement 3	It is possible to provide drawing instructions that consider functions, processing, and assembly using dimensional tolerances, fits, surface roughness, geometric tolerances, and welding symbols.	Simple drawing instructions using dimensional tolerances, fits, surface roughness, and welding symbols are possible.	Able to give simple drawing instructions using dimensional tolerances and surface roughness.
Achievement 4	It is possible to indicate in the title column using material symbols that consider cost, workability, strength of parts, etc.	After understanding the meaning of the material symbol, you can describe the material in the title column.	Material symbols can be used to describe materials in the title block.

Assigned Department Objectives

学習・教育到達度目標 D-1

Teaching Method

Outline	In this subject, the instructor who was in charge of mechanical design at companies, makes use of his experience and teaches the significance of the mechanical drawing rules necessary for manufacturing machine parts and the instruction method, the main mechanical drawing instruction method by CAD, is a lecture (class) and exercises.
Style	The drafting rules will be explained using Manaba content, and an active learning class will be developed in which the team will complete the printing task each time. CAD assignments aim to acquire CAD skills by performing assignments based on questions in the CAD Engineer Examination. Furthermore, by utilizing the learned drafting rules and CAD skills, the team considers the drafting instructions necessary for the parts of the Stirling engine and accomplishes the assignment of CAD drafting of the parts. [Class time 60 hours]
Notice	Since most of this lecture is knowledge of mechanical drawings that determine the dimensional and shape accuracy of machine parts and their assembly, the lecture content should not be limited to mere knowledge, but should be conducted in conjunction with lecture content and CAD drawing exercises. In addition, students are asked to submit assignments through exercises related to drafting knowledge during class, and a CAD practical test is imposed as a regular examination. CAD assignments will be submitted to Manaba, so make sure that there is no delay in submission. Reference book: Detailed mechanical drawing 3rd edition (Jikkyo Publishing) Hiraso Shoten

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	1st grade review 1 (three-dimensional and three-sided drawing)	3-sided view can be placed from 3D
		2nd	1st grade review 2 (placement of three views)	Able to arrange 3-sided views and cross-sectional views with consideration for processing
		3rd	1st grade review 3 (dimension placement)	Able to create three-dimensional drawings (including cross-sectional views, etc.) that consider processing from three-dimensional objects, and to efficiently measure them.
		4th	Significance of dimensional tolerance	Can explain the significance of specifying dimensional tolerances
		5th	Dimensional Tolerance Exercise	Dimensional tolerance can be specified
		6th	Significance of fit	Can explain fit symbols and tolerance indications
		7th	Practice of fitting instructions	You can indicate the fit symbol and its tolerance.

		8th	Midterm exam	Drawing rule confirmation test for 3-sided drawing, dimensional tolerance, and fitting
	2nd Quarter	9th	Surface raghness	Can specify surface texture (surface roughness)
		10th	Significance of geometric tolerance	Can explain the significance of specifying geometric tolerances
		11th	Geometric tolerance exercises	Geometric tolerance can be specified
		12th	Welding symbol/Material symbol	Simple material symbols and welding symbols can be specified.
		13th	Mechanical drawing practice using CAD (basic operation)	Can perform basic drawing operations using CAD. (Construction line, line segment, OSNAP, move, trim, layout, title block entry, submission method)Comply with intellectual property and information security in CAD data.
		14th	Mechanical drawing practice using CAD (drawing submission)	You can create mirrors, chamfers, and R using CAD and submit drawings to LMS.
		15th	Machine parts CAD basic practice (CAD 1st grade)	Rotation copy, mirror, divider, rotation (reference) Can perform basic operations of 2D CAD figures.
		16th		Return of answers
2nd Semester	3rd Quarter	1st	Mechanical drawing practice using CAD (dimensional tolerance, processing instructions, notes)	Appropriate dimensions, tolerances (fits), and notes can be indicated on three-sided drawings.
		2nd	Mechanical drawing practice using CAD (section drawing drawing)	Appropriately indicate dimensions, tolerances (fits), etc. on three-sided drawings including cross-sectional views.
		3rd	Mechanical drawing practice using CAD (geometric tolerance)	Appropriate dimensions, tolerances, and fits (geometric tolerances) can be indicated on a three-sided drawing.
		4th	Mini vise parts CAD drawing	It is possible to draft the components of a mini-vice.
		5th		Ditto
		6th	Mini vise assembly drawing CAD drafting	You can draw an assembly drawing using the parts drawing of the mini vise.
		7th		Ditto
		8th	midterm exam	Practical test of three-sided drawing including fit, surface roughness, and geometric tolerance
	4th Quarter	9th	Stirling engine explanation and disassembly training	Each team can disassemble a Stirling engine and understand the engine's function and structure.
		10th	Stirling engine parts sketch drawing and assembly training	Each team can sketch the main parts disassembled, taking into account fit, geometric tolerances, processing methods, roughness, etc. Each team can assemble a Stirling engine.
		11th	Stirling engine parts drawing CAD drawing	Based on the sketch drawings of the main parts disassembled within the team, dimensions can be specified while taking into account fit, geometric tolerances, processing methods, roughness, etc.
		12th		Ditto
		13th		Ditto
		14th	Stirling engine assembly drawing CAD drafting	Draw the assembly drawing of the Stirling engine from the parts drawing, and understand the function and structure.
		15th		Ditto
		16th		Return of answers

Evaluation Method and Weight (%)

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

Anan College	Year	2024	Course Title	Manufacturing Process 1

Course Information

Course Code	1212E01	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	School Credit: 2
Department	Course of Mechanical Engineering	Student Grade	2nd
Term	Year-round	Classes per Week	前期:2 後期:2
Textbook and/or Teaching Materials	Machining Technology(CORONA PUBLISHING CO., LTD.)		
Instructor	Itami Shin		

Course Objectives

1. Able to explain about casting manufacturing methods, mold structures and types, and special castings.
2. Able to explain about outlines and characteristics of various welding methods, as well as welding equipment and welding rods.
3. Able to explain about outline of cutting, form of chips, and built-up edge.
4. Able to explain about types and structures of various cutting machines.
5. Able to explain about outline of grinding process and three elements of grinding wheel.

Rubric

	Ideal Level	Standard Level	Minimum Level
Achievement 1	Able to explain about casting methods, structures and types of molds, and special castings.	Able to explain about casting manufacturing method.	Able to recognize how to make castings.
Achievement 2	Able to select and explain welding methods according to joint materials and joint styles.	Able to explain outline and characteristics of various welding methods and welding rods.	Able to recognize classification of welding methods.
Achievement 3	Able to understand relationship between chip morphology, work material, and cutting conditions, and explain appropriate cutting conditions.	Able to explain outline of cutting, form of chips, and the built-up edge.	Able to recognize outline of cutting machining.
Achievement 4	Able to understand and explain types and structures of various cutting machines.	Able to explain types of various cutting machines.	Able to recognize various cutting machines.
Achievement 5	Able to understand and explain outline of grinding and three elements of grinding wheels.	Able to explain outline of grinding process and three elements of the grinding wheel.	Able to recognize outline of grinding process and three elements of grinding wheel.

Assigned Department Objectives

学習・教育到達度目標 D-1

Teaching Method

Outline	Processing methods for metal materials are classified into melt processing, removal processing, plastic processing. Various machine parts are manufactured by selecting the most suitable materials and processing methods. In this lecture, you will acquire basic knowledge of metal materials and learn about melting processing and removal processing. In addition, the purpose is to develop the ability to select the most suitable machining method for the workpiece by understanding the basics of various machining methods and machine tools.
Style	In principle, classes are conducted in lecture format. Before the regular exam, we will conduct a summary practice problem. A quiz may be conducted to check understanding. 【60 class hours】
Notice	The content of the class and the content of Machine Tool Experiment Practical Training 1 are closely related. Deepen your understanding in relation to lathe machining, milling machine machining, drilling machine machining, arc welding, etc. performed in practical training.

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	Outline of various processing methods	Able to explain about classification of processing methods.
		2nd	Outline of casting methods	Able to explain about outline of casting.
		3rd	How to make castings	Able to explain about how to make castings.
		4th	Requirements, structures and types of molds	Able to explain about the requirements, structures and types of molds.
		5th	Various casting methods	Able to explain about types and applications of various casting methods.
		6th	Defects and inspection methods of casting	Able to explain about the types and causes of casting defects, and inspection method.
		7th	Exercise 1	Able to solve practice problems related to the range of midterm exam for the first semester.
		8th	First semester midterm exam	
	2nd Quarter	9th	Outline of welding	Able to explain about classification of welding.
		10th	Arc welding Ⅰ (shielded metal arc welding)	Able to explain about outline of shielded arc welding, role of welding rods and flux.

		11th	Arc welding Ⅰ&Ⅱ (shielded metal arc welding, gas welding)	Able to explain about outline of shielded arc welding, role of welding rods and flux. Able to explain about submerged arc, inert gas arc and gas welding.
		12th	Arc welding Ⅱ (gas welding)	Able to explain about submerged arc, inert gas arc and gas welding.
		13th	Other welding methods	Able to explain about outline of spot welding and brazing.
		14th	Properties of welds	Able to explain about deterioration of base material and defects in weld.
		15th	Exercise 2	Able to solve practice problems related to the range of final exam for the first semester.
		16th	Return of final exam answers for the first semester	
2nd Semester	3rd Quarter	1st	Outline of cutting	Able to explain about principles of cutting, classification of cutting methods, and cutting tools.
		2nd	Lathe	Able to explain about types and names of parts of tools, types and structures of lathes.
		3rd	Drill press	Able to explain about types and names of parts of drills, types and structures of drill presses.
		4th	Milling machine	Able to explain about types and names of parts of milling cutters, types and structures of milling machines.
		5th	Cutting mechanism and chip morphology	Able to explain about mechanism of cutting and shape of chips.
		6th	Cutting mechanism and chip morphology	Able to explain about mechanism of cutting and shape of chips.
		7th	Exercise 3	Able to solve practice problems related to the range of midterm exam for the second semester.
		8th	Second semester midterm exam	
	4th Quarter	9th	Cutting tools and cutting conditions	Able to explain about conditions and types of cutting tool materials.
		10th	Cutting tools and cutting conditions	Able to explain about tool damage, tool life, and cutting fluids.
		11th	Outline of grinding	Able to explain about outline of grinding.
		12th	Grindstone composition (three elements and five factors)	Able to explain about three elements and five factors of grinding wheel.
		13th	Various grinding processes	Able to explain about relationship between work materials, grinding conditions, and various grinding states.
		14th	Special grinding	Able to explain about types and applications of special grinding processes.
		15th	Exercise 4	Able to solve practice problems related to the range of final exam for the second semester.
		16th	Return of final exam answers for the second semester	

Evaluation Method and Weight (%)

	Midterm/Final exam	Quiz	Portfolio	Presentation/Attitude	Other	Total
Subtotal	70	0	30	0	0	100
Basic Proficiency	30	0	10	0	0	40
Specialized Proficiency	40	0	20	0	0	60
Cross Area Proficiency	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Mechanical Materials 1

Course Information

Course Code	1212F01	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	School Credit: 2
Department	Course of Mechanical Engineering	Student Grade	2nd
Term	Year-round	Classes per Week	前期:2 後期:2
Textbook and/or Teaching Materials	「zairyogaku・kikaikeikyokashoshirizu6」, CORONA PUBLISHING/ 「karazukai・tetsutohaganegawakaruhon」		
Instructor	Nishimoto Koji		

Course Objectives

1. Able to explain the properties required of mechanical materials and to explain the properties and applications of various mechanical materials.
2. Able to understand the meaning of various mechanical properties and explain the principles and testing methods of various testing methods.
3. Able to explain the crystal structures of metals and alloys.
4. Able to explain how plastic deformation occurs and to explain work hardening and recrystallization.
5. Able to explain the change of state and solidification process of metals and alloys.
6. Able to explain how to read an alloy phase diagram.

Rubric

	Ideal Level	Standard Level	Minimum Level
Achievement 1	Able to explain the relationship between various processing methods for metallic materials, non-metallic materials, composite materials, and functional materials.	Able to explain the types of metallic materials, non-metallic materials, composite materials, and functional materials and examples of their application to practical structural components.	Able to explain the properties required of mechanical materials and to explain the properties and applications of various mechanical materials.
Achievement 2	Able to understand the significance of various material tests and explain strength, hardness, brittleness and fatigue.	Able to understand various material testing methods and various mechanical properties, and be able to explain strength.	Able to understand the meaning of various mechanical properties and explain the principles and testing methods of various test methods.
Achievement 3	Able to understand the planes and orientations of crystals and express them in terms of Miller indices.	Able to explain the crystal structure and unit cell of metals.	Able to explain the crystal structures of metals and alloys
Achievement 4	Able to explain how the deformation and strength of a material is related to its internal structure.	Able to explain how the deformation and strength of a material is related .	Able to explain how plastic deformation occurs and describe work hardening and recrystallization.
Achievement 5	Able to draw the all proportional solid solution type equilibrium state diagram from the thermal analysis curve.	Able to explain thermal analysis curves.	Able to explain state changes and solidification processes of metals and alloys.
Achievement 6	Able to calculate the weight percentage of each phase in the equilibrium state diagram of a simple alloy.	Able to explain the constituent phases at any point in the equilibrium state diagram of a simple alloy.	Able to explain how to read an alloy phase diagram.

Assigned Department Objectives

学習・教育到達度目標 D-1

Teaching Method

Outline	First, the necessity of studying mechanical materials will be explained by learning about the properties required of mechanical materials and the types and applications of various types of mechanical materials. Next, through learning the significance of material testing, the meaning of studying mechanical materials will be explained in relation to the surrounding subjects. In addition, the crystal structure of metals, which are typical mechanical materials, will be explained in order to understand the strength of materials, and the expression of alloys using equilibrium state diagrams will be explained as a preliminary step to learning heat treatment. The course develops the habit of continuous learning of engineering techniques and knowledge of materials science throughout the year.
Style	【60 hours of class time】
Notice	First of all, you should know exactly what the terminology of mechanical materials is. If you keep this review in mind, mechanical materials will become a study to understand, not a study to memorize, and you will become interested in materials and find it an interesting subject. Textbooks will be used continuously for the two years of the course. Although you will not have many opportunities to use the textbook directly in class, you are encouraged to make use of it when preparing reports and doing other research.

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	Classification of machine materials	Able to explain the properties required for mechanical materials.
		2nd	Classification of machine materials	Able to explain the classification of metals, polymeric materials and ceramics.
		3rd	Classification of machine materials	Able to explain the classification of metals, polymeric materials and ceramics.

		4th	Material testing (tensile testing)	Able to understand tensile test methods and explain stress-strain diagrams.
		5th	Material testing (tensile testing)	Able to understand tensile test methods and explain stress-strain diagrams.
		6th	Material testing (hardness Testing)	Able to hardness and principles of hardness testing.
		7th	Material testing (Impact Testing)	Able to understand the meaning of brittleness and toughness and be able to explain impact testing methods.
		8th	Midterm exam	
	2nd Quarter	9th	Material testing (Fatigue and creep testing)	Able to understand the meaning of fatigue and be able to explain fatigue testing methods and S-N curves. Able to explain the relationship between mechanical properties and temperature and creep phenomena.
		10th	Formability Tests, non-destructive testing, Structure observation, composition analysis	Able to explain the formability Tests, non-destructive testing, Structure observation, composition analysis.
		11th	Formability Tests, non-destructive testing, Structure observation, composition analysis	Able to explain the formability Tests, non-destructive testing, Structure observation, composition analysis.
		12th	Fundamentals of Crystal Structure	Able to explain the crystal structure of metal crystals.
		13th	Fundamentals of Crystal Structure	Able to explain the crystal structure of metal crystals.
		14th	Fundamentals of Crystal Structure	Able to explain the orientation of crystal orientation.
		15th	Fundamentals of Crystal Structure	Able to explain the orientation of crystal orientation.
		16th	Final exam	
2nd Semester	3rd Quarter	1st	Solid solutions and intermetallic compounds	Able to explain the solid solutions and intermetallic compounds.
		2nd	Solid solutions and intermetallic compounds	Able to explain the solid solutions and intermetallic compounds.
		3rd	Defects in Metallic Crystals	Able to explain defects in metallic crystals.
		4th	Slip in Metallic Crystals	Able to explain the slip of metallic crystals.
		5th	Recovery and Recrystallization	Able to explain about the recovery and recrystallization.
		6th	Material deformation and strength	Able to explain strengthening methods for metals and other materials.
		7th	Material deformation and strength	Able to explain strengthening methods for metals and other materials.
		8th	Midterm exam	
	4th Quarter	9th	Melting and Solidification of Metals	Able to explain melting and solidification of metals.
		10th	Thermal analysis curve	Able to explain thermal analysis curves.
		11th	Solid solution phase diagram	Able to explain the equilibrium constitutive phases in arbitrary states.
		12th	Eutectic and eutectoid phase diagrams	Able to calculate the weight percentage of each phase.
		13th	Peritectic and peritectoid phase diagrams	Able to explain standard microstructure of steel
		14th	Fe-C equilibrium phase diagram	Able to explain how to read an equilibrium state diagram of steel.
		15th	Fe-C equilibrium phase diagram	Able to calculate the weight percentage of each phase.
		16th	Final exam	

Evaluation Method and Weight (%)

	midterm/final exam	quiz	portfolio	presentation/attitude	Other	Total
Subtotal	80	0	20	0	0	100
Basic Proficiency	0	0	0	0	0	0
Specialized Proficiency	80	0	20	0	0	100
Cross Area Proficiency	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Experiments in Mechanical Engineering 1

Course Information

Course Code	1212T02	Course Category	Specialized / Compulsory
Class Format	実験･実習	Credits	School Credit: 4
Department	Course of Mechanical Engineering	Student Grade	2nd
Term	Year-round	Classes per Week	前期:4 後期:4
Textbook and/or Teaching Materials	Materials will be distributed as needed.		
Instructor	Nishimoto Koji,Itami Shin		

Course Objectives

1. Able to understand the basic operation of lathes, milling machines, and grinders, and be able to perform operations using these machines.
2. Able to understand the basic methods of arc welding and perform operations using these tools.
3. Able to understand the basic usage of hand tools, etc., and be able to fabricate simple machine parts using these tools.
4. Able to understand the basic use of a robot arm and be able to pick and place using a suction cup.

Rubric

	Ideal Level	Standard Level	Minimum Level
Achievement 1	Able to understand the basic operations and principles of lathes, milling machines, and grinders, and be able to machine them into desired shapes.	Able to understand the basic operation of lathes, milling machines, and grinders, and be able to perform machining using these machines.	Able to understand the basic operation of lathes, milling machines, and grinders, and the machining processes using these machines.
Achievement 2	Able to understand the basic methods and principles of arc welding and be able to perform butt welding.	Able to understand basic arc welding methods and be able to perform work using these methods.	Able to understand the basic methods of arc welding and the operations using these methods.
Achievement 3	Able to understand the basic use and principles of hand tools and other tools, and be able to perform finishing operations to desired shapes.	Able to understand the basic use of hand tools, etc., and be able to perform fabrication of simple machine parts using these tools.	Able to understand the basic use of hand tools, etc.
Achievement 4	Able to understand the basic use of a robotic arm and be able to perform pick and place, including control structures.	Able to understand the basic use of a robotic arm and be able to perform pick and place using a suction cup.	Able to understand the basic use of robotic arms.

Assigned Department Objectives

学習・教育到達度目標 D-2

Teaching Method

Outline	Students acquire skills and knowledge in the operation of lathes, milling machines, and grinders, which are general-purpose machine tools used to produce various machine parts, as well as basic skills and knowledge in welding and manual finishing operations through practical training. In mechatronics, students develop skills and knowledge of robot arm control. In addition, students will develop the ability to accurately communicate information related to practical training and their own results by preparing and submitting a report after the completion of practical training. The two goals of the course are to acquire the mental attitude toward work (safety first) and report writing skills, as well as to understand the correct use of various measuring instruments and to be able to perform basic measurements.
Style	For practical training, one class will be divided into groups. Turning, milling/grinding, manual finishing, and welding will be conducted in the school's experimental training factory. Robot arm training will be conducted in the drafting room. 【120 hours of class time】
Notice	During practical training, be sure to wear work clothes and pay sufficient attention to safety. Students are expected to study the textbooks on Manufacturing Process in advance, and try to understand and master the skills in concrete terms through practical training. Students should not be satisfied with only the tasks given to them, but should also make efforts to cultivate an engineering sense in manufacturing by carefully observing the phenomena. The evaluation will be based on 70% of the products and reports in each store, and 30% of the normal points (attendance, attitude, dress, etc.). Absence without prior notice or justifiable reason and failure to submit reports will not be accepted.

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	Orientation	Able to explain attitude toward preparedness for work, safety first concept and report writing.
		2nd	Lathe processing	Able to understand basic lathe operations and be able to perform turning operations.
		3rd	Lathe processing	Able to understand basic lathe operations and be able to perform turning operations.
		4th	Lathe processing	Able to understand basic lathe operations and be able to perform turning operations.
		5th	Lathe processing	Able to understand basic lathe operations and be able to perform turning operations.

		6th	Lathe processing	Able to understand basic lathe operations and be able to perform turning operations.
		7th	Milling and grinding machine processing	Able to understand the basic operation of milling and grinding machines and be able to perform machining using these machines.
		8th	Milling and grinding machine processing	Able to understand the basic operation of milling and grinding machines and be able to perform machining using these machines.
	2nd Quarter	9th	Milling and grinding machine processing	Able to understand the basic operation of milling and grinding machines and be able to perform machining using these machines.
		10th	Milling and grinding machine processing	Able to understand the basic operation of milling and grinding machines and be able to perform machining using these machines.
		11th	Milling and grinding machine processing	Able to understand the basic operation of milling and grinding machines and be able to perform machining using these machines.
		12th	Hand finishing	Able to understand the basic use of hand tools, etc., and be able to fabricate simple machine parts.
		13th	Hand finishing	Able to understand the basic use of hand tools, etc., and be able to fabricate simple machine parts.
		14th	Hand finishing	Able to understand the basic use of hand tools, etc., and be able to fabricate simple machine parts.
		15th	Hand finishing	Able to understand the basic use of hand tools, etc., and be able to fabricate simple machine parts.
		16th	Hand finishing	Able to understand the basic use of hand tools, etc., and be able to fabricate simple machine parts.
2nd Semester	3rd Quarter	1st	Measurement practice	Able to understand the name and construction of each part of calipers and micrometers, how to read and use scales, and be able to measure.
		2nd	Report guidance	Able to understand and practice how to create reports.
		3rd	Report guidance	Able to understand and practice how to create reports.
		4th	Report guidance	Able to understand and practice how to create reports.
		5th	Report guidance	Able to understand and practice how to create reports.
		6th	Welding	Able to understand basic arc welding methods and be able to perform these tasks.
		7th	Welding	Able to understand basic arc welding methods and be able to perform these tasks.
		8th	Welding	Able to understand basic arc welding methods and be able to perform these tasks.
	4th Quarter	9th	Welding	Able to understand basic arc welding methods and be able to perform these tasks.
		10th	Welding	Able to understand basic arc welding methods and be able to perform these tasks.
		11th	Mechatronics	Able to understand the basic use of a robotic arm and be able to perform pick and place using a suction cup.
		12th	Mechatronics	Able to understand the basic use of a robotic arm and be able to perform pick and place using a suction cup.
		13th	Mechatronics	Able to understand the basic use of a robotic arm and be able to perform pick and place using a suction cup.
		14th	Mechatronics	Able to understand the basic use of a robotic arm and be able to perform pick and place using a suction cup.
		15th	Mechatronics	Able to understand the basic use of a robotic arm and be able to perform pick and place using a suction cup.
		16th		

Evaluation Method and Weight (%)

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

Anan College	Year	2024	Course Title	3D Computer Aided Design

Course Information

Course Code	1213101	Course Category	Specialized / Elective
Class Format	Seminar	Credits	School Credit: 1
Department	Course of Mechanical Engineering	Student Grade	3rd
Term	First Semester	Classes per Week	2
Textbook and/or Teaching Materials	Solidworks Self-study Book : Solidworks Workbook for CSWA (Certified SolidWorks Associatte)		
Instructor	Nakaoka Nobushi		

Course Objectives

1. Using SolidWorks, you can accurately create a solid model of a simple mechanical part from a drawing.
2. You can model and assemble simple-shaped parts and calculate the center of gravity, etc using mass property.
3. Two-dimensional drafting of assembly components and assemblies can be performed, and drawing instructions such as processing symbols and tolerances can be applied.

Rubric

	Ideal Level	Standard Level	Unacceptable Level
Achievement 1	You can model complex models on your own.	You can model simple machine parts.	You can model simple machine parts with individual instruction.
Achievement 2	Parts can be modeled and assembled to accurately evaluate length and center of gravity.	Existing parts can be modeled and assembled.	Can model and assemble parts with tutoring.
Achievement 3	2D drafting of assembly model parts drawings and assembly drawings can be performed, and you can add your own drawing instructions.	2D drafting of assembly model part drawings and assembly drawings can be performed.	Receive individual instruction and perform two-dimensional drafting of assembly model parts drawings and assembly drawings.

Assigned Department Objectives

学習・教育到達度目標 D-1

Teaching Method

Outline	Mechanical parts are three-dimensional shapes. Three-dimensional CAD, which is being introduced in many companies today, has the advantage that it is easier to embody the designer's thoughts into a concrete shape compared to conventional hand-drawn drafting and two-dimensional CAD. In addition, manufacturing using 3D CAD is the mainstream in automobile-related companies, and by learning 3D CAD technology, it is possible to improve the efficiency and sophistication of manufacturing. In this course, instructors who have used their experience in engine development at a company will teach the basics of modeling and assembly of three-dimensional parts, with the aim of passing the CSWA qualification exam (2 credits).
Style	Using teaching materials and online handouts, students will learn various techniques for modeling three-dimensional parts of interest, as well as develop into two-dimensional drawings and acquire the basics of assembly. If there is enough time in the lecture, we will also conduct stress and mechanism simulation practice. Acquire operation skills by making full use of textbooks and workbooks.[Class time 30 hours]
Notice	For self-study outside class hours, the second seminar room can be used during open hours. In addition, since it is possible to install SolidWorks on your own PC outside class hours, we would like you to use your own PC for self-study in addition to using it in the second seminar room. In addition, since it is possible to rent a PC in the machine course, please use this as well. In addition to intensive 3D CAD exercises during class, there are plenty of video explanations of how to operate on Youtube etc., so please make use of this as well.

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	Basic SolidWorks Modeling Exercise	Simple shapes can be modeled using draft and full round fillets.
		2nd	Basic SolidWorks Modeling Exercise	Simple shapes with thin plates and straight hole patterns can be modeled.
		3rd	Basic SolidWorks Modeling Exercise	Simple geometries (bearings) with circular patterns can be modeled, and additional geometries can be modeled using reference planes.
		4th	Advanced SolidWorks Modeling Exercise	Modeling of complex shapes corresponding to the CSWA qualification test can be performed.
		5th	Advanced SolidWorks Modeling Exercise	Modeling of complex shapes corresponding to the CSWA qualification test can be performed.
		6th	SolidWorks Modeling and Assembly Exercises	Examine modeling and assembly and specified dimensional and mass properties for CSWA qualifying exams.
		7th	SolidWorks Modeling and Assembly Exercises	Examine modeling and assembly and specified dimensional and mass properties for CSWA qualifying exams.
		8th	midterm exam	Modeling and Assembly Practical Exam using Solidworks
	2nd Quarter	9th	vise modeling exercises	A vise component consisting of four points is modeled.

		10th	Vise assembly exercise	Assembly of vise parts consisting of four points is performed.
		11th	2D drawing of vise components	Two-dimensional drawing of the fixed table (instruction of processing symbols, dimensions, tolerances, etc.)
		12th	2D drawing of vise components	2D drawings of moving blocks (instruction of processing symbols, dimensions, tolerances, etc.)
		13th	2D drawing of vise components	2D drawings of feed screws (instruction of processing symbols, dimensions, tolerances, etc.)
		14th	2D drawing of vise components	Two-dimensional drawings of nuts (instruction of processing symbols, dimensions, tolerances, etc.)
		15th	2D drawing of vise assembly	Creation of 2D assembly drawing (parts list creation)
		16th	Final exam answer return	Practical exam commentary on part modeling and assembly and drawing

Evaluation Method and Weight (%)

	Examination	Presentation	Mutual Evaluations between students	Behavior	Portfolio	Other	Total
Subtotal	50	0	0	0	50	0	100
Basic Proficiency	25	0	0	0	25	0	50
Specialized Proficiency	25	0	0	0	25	0	50
Cross Area Proficiency	0	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Machine Design and Drawing 1

Course Information

Course Code	1213A01	Course Category	Specialized / Compulsory
Class Format	Seminar	Credits	School Credit: 2
Department	Course of Mechanical Engineering	Student Grade	3rd
Term	Year-round	Classes per Week	前期:2 後期:2
Textbook and/or Teaching Materials	Materials will be distributed as needed.		
Instructor	Yasuda Takeshi		

Course Objectives

1. Student be able to understand the structure and function of the machine element given as an assignment.
2. Student be able to perform function and strength calculations.
3. Student be able to create basic design drawings based on specific dimensions.
4. Student be able to create drawings based on design documents and basic plans.

Rubric

	Ideal Level	Standard Level	Minimum Level
Achievement 1	Student be able to understand by self the structure and function of mechanical elements given as assignments.	Student be able to understand with guidance the structure and function of machine elements given as assignments.	Student be able to understand with personal guidance the structure and function of machine elements given as assignments.
Achievement 2	Student be able to solve by self functional and strength design for a given design origin.	Student be able to solve with guidance functional and strength design for a given design origin.	Student be able to solve with personal guidance functional and strength design for a given design origin.
Achievement 3	Student be able to draft plan drawing by self due to contents of the design document.	Student be able to draft plan drawing with guidance due to contents of the design document.	Student be able to draft plan drawing with personal guidance due to contents of the design

Assigned Department Objectives

学習・教育到達度目標 D-1

Teaching Method

Outline	In machine design, knowledge and skills related to mechanical engineering including strength of materials, machine dynamics, and mechanism are required. In this course, students will learn about design and drafting techniques through lectures and exercises, with V-belt wheels and sliding bearings, and other mechanical elements that make up machines.
Style	Each student will be given different design conditions according to their attendance number. After learning the outline of each mechanical element through lectures, the student will start design work. The design results will be checked as necessary and feedback will be provided. After the design is drawn, a plan will be made on graph paper, and then a CAD plan will be drawn. The drawings will be submitted as PDF files. [60 hours of class time]
Notice	This course is deeply related to design of machine elements. Students are required to bring a calculator, report paper, drafting tools, and A4 grid paper when preparing their design documents. If you miss a class, do not understand the content of the class, or are behind in the progress of your assignments, you should make up for the delay by coming to the next class to ask questions. "Portfolio" of the evaluation weight includes evaluation of notes, design documents, plans, and CAD drawings. Reference: JIS Handbook Machine Elements (Japanese Standards Association)

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	Overview of V-belt conduction equipment	Student be able to understand the structure and function of V-belt conduction.
		2nd	Design of V-belt conduction equipment, pulley diameter	Student be able to design using given specifications.
		3rd	Design of V-belt conduction equipment, pulley diameter	Student be able to design using given specifications.
		4th	Design of V-belt conduction equipment, belt length	Student be able to design using given specifications.
		5th	Design of V-belt conduction equipment, belt velocity	Student be able to design using given specifications.
		6th	Design of V-belt conduction equipment, transfer power	Student be able to design using given specifications.
		7th	Design of V-belt conduction equipment, shaft diameter	Student be able to design using given specifications.
		8th	Design of V-belt conduction equipment, key	Student be able to design using given specifications.
	2nd Quarter	9th	Draft plan drawing of V-belt parts	Student be able to draw draft plan based on the design.
		10th	Draft plan drawing of V-belt parts	Student be able to draw draft plan based on the design.

		11th	Drawing of V-belt parts diagrams using CAD	Student be able to draw parts diagrams using CAD based on the draft plan.
		12th	Drawing of V-belt parts diagrams using CAD	Student be able to draw parts diagrams using CAD based on the draft plan.
		13th	Drawing of V-belt parts diagrams using CAD	Student be able to draw parts diagrams using CAD based on the draft plan.
		14th	Drawing of V-belt parts diagrams using CAD	Student be able to draw parts diagrams using CAD based on the draft plan.
		15th	Quiz of V-belt conduction equipment design	
		16th		
2nd Semester	3rd Quarter	1st	Overview of sliding bearing	Student be able to understand the structure and function of sliding bearing.
		2nd	Design of sliding bearing, bearing metal	Student be able to design using given specifications.
		3rd	Design of sliding bearing, bearing cup	Student be able to design using given specifications.
		4th	Design of sliding bearing, bearing cup	Student be able to design using given specifications.
		5th	Design of sliding bearing, bolt	Student be able to design using given specifications.
		6th	Design of sliding bearing, bolt	Student be able to design using given specifications.
		7th	Design of sliding bearing, bearing base	Student be able to design using given specifications.
		8th	Design of sliding bearing, bearing base	Student be able to design using given specifications.
	4th Quarter	9th	Draft plan drawing of sliding bearing	Student be able to draw draft plan based on the design.
		10th	Draft plan drawing of sliding bearing	Student be able to draw draft plan based on the design.
		11th	Drawing of sliding bearing parts diagrams using CAD	Student be able to draw parts diagrams using CAD based on the draft plan.
		12th	Drawing of sliding bearing parts diagrams using CAD	Student be able to draw parts diagrams using CAD based on the draft plan.
		13th	Drawing of sliding bearing assemble diagrams using CAD	Student be able to draw assemble diagrams using CAD.
		14th	Drawing of sliding bearing assemble diagrams using CAD	Student be able to draw assemble diagrams using CAD.
		15th	Quiz of sliding bearing design	
		16th		

Evaluation Method and Weight (%)

	Midterm/Final exam	Quiz	Portfolio	Presentation/Attitude	Other	Total
Subtotal	0	20	80	0	0	100
Basic Proficiency	0	0	40	0	0	40
Specialized Proficiency	0	20	40	0	0	60
Cross Area Proficiency	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Mathmatics for Mechanical Engineering

Course Information

Course Code	1213A02	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	School Credit: 1
Department	Course of Mechanical Engineering	Student Grade	3rd
Term	Second Semester	Classes per Week	後期:2
Textbook and/or Teaching Materials	わかりやすい応用数学（コロナ社）, Primary大学ノートよくわかる基礎数学（実教出版）/理工系の数学入門シリーズ（岩波書店）		
Instructor	Kawabata Nariyuki,Matsuura Fuminori,Okumoto Yoshihiro,Okita Yuji		

Course Objectives

1.機械工学の学習に必要なベクトル解析と行列の計算手法を理解し、簡単な問題を解くことができる。
2.機械工学の学習に必要な複素解析の計算手法を理解し、簡単な問題を解くことができる。
3.機械工学の学習に必要なラプラス変換、積分および微分方程式の計算手法を理解し、簡単な問題を解くことができる。
4.機械工学の学習に必要なフーリエ解析、微分法および極限の計算手法を理解し、簡単な問題を解くことができる。

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(可)
評価項目1	ベクトル解析と行列の計算手法を十分に理解し、機械工学への応用を想定した問題を解くことができる。	ベクトル解析と行列の計算手法を理解し、標準的な問題を解くことができる。	ベクトル解析と行列の計算手法を理解し、例題レベルの問題を解くことができる。
評価項目2	複素解析の計算手法を十分に理解し、機械工学への応用を想定した問題を解くことができる。	複素解析の計算手法を理解し、標準的な問題を解くことができる。	複素解析の計算手法を理解し、例題レベルの問題を解くことができる。
評価項目3	ラプラス変換、積分および微分方程式の計算手法を十分に理解し、機械工学への応用を想定した問題を解くことができる。	ラプラス変換、積分および微分方程式の計算手法を理解し、標準的な問題を解くことができる。	ラプラス変換、積分および微分方程式の計算手法を理解し、例題レベルの問題を解くことができる。
評価項目4	フーリエ解析、微分法および極限の計算手法を十分に理解し、機械工学への応用を想定した問題を解くことができる。	フーリエ解析、微分法および極限の計算手法を理解し、標準的な問題を解くことができる。	フーリエ解析、微分法および極限の計算手法を理解し、例題レベルの問題を解くことができる。

Assigned Department Objectives

学習・教育到達度目標 B-2

Teaching Method

Outline	本科目は3年後期以降に学習する専門科目の基礎となる数学的手法について、基礎的な内容を学ぶ科目である。 各項目には少々高度な内容も含まれるが、専門科目の理解を助けるものとなることから十分な理解が求められる。
Style	基礎事項の説明を踏まえた十分な演習によって授業を進める。 主体的な演習問題への取り組みによって理解が進むことを理解し、繰り返し演習問題に取り組むことが求められる。 演習中心の授業であり、学生同士の教えあいによる理解促進を期待する。 なお、単元終了ごとに小テストを実施する。小テストの点数は評価に含まれる。 【授業時間30時間】
Notice	3年前期までの数学科目の十分な理解が必要である。不安のあるものは夏季休業中などによく復習しておくこと。 また、3年後期の数学科目の内容よりも高度な内容を学習する項目も含まれることから、演習を通して不明な点は早めに質問して解決すること。

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	ベクトル解析と行列（１） 基礎事項の復習と演習	基礎的な数学的知識を理解し、例題に適用することができる。
		2nd	ベクトル解析と行列（２） 例題と解説、演習問題	標準的な数学的知識を理解し，演習問題を解くことができる。
		3rd	ベクトル解析と行列（３） 小テスト	標準的な問題を解くことができる。
		4th	複素解析（１） 基礎事項の復習と演習	基礎的な数学的知識を理解し、例題に適用することができる。
		5th	複素解析（２） 例題と解説、演習問題	標準的な数学的知識を理解し，演習問題を解くことができる。
		6th	複素解析（３） 小テスト	標準的な問題を解くことができる。
		7th	ベクトル解析と行列、複素解析に関する応用演習	若干高度な数学的知識を習得し、機械工学への応用を想定した問題を解くことができる。
		8th	中間試験	
	4th Quarter	9th	ラプラス変換、積分、微分方程式（１） 基礎事項の復習と演習	積分の応用と簡単な微分方程式の問題を解くことができる. ラプラス変換に関する基礎的な知識を理解し、例題に適用することができる。
		10th	ラプラス変換、積分、微分方程式（２） 例題と解説、演習問題	積分の応用と標準的な微分方程式の問題を解くことができる。 逆ラプラス変換とラプラス変換の応用に関する知識を理解し、例題に適用することができる。

		11th	ラプラス変換、積分、微分方程式（３） 小テスト	ラプラス変換、積分、微分方程式に関する演習問題を解くことができる。
		12th	フーリエ解析、微分法、極限（１） 基礎事項の復習と演習	基礎的な関数のフーリエ級数を求めることができる。 フーリエ解析に関する基礎的な数学的知識を理解し、例題に適用することができる。
		13th	フーリエ解析、微分法、極限（２） 例題と解説、演習問題	フーリエ級数を工学的な問題に応用することができる。 微分法と極限に関する数学的知識を理解し，説明することができる。
		14th	フーリエ解析、微分法、極限（３） 小テスト	フーリエ解析、微分法、極限に関する演習問題を解くことができる。
		15th	ラプラス変換、フーリエ解析に関する応用演習	若干高度な数学的知識を習得し、機械工学への応用を想定した問題を解くことができる。
		16th	試験返却	

Evaluation Method and Weight (%)

	中間・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	60	40	0	0	0	100
基礎的能力	20	30	0	0	0	50
専門的能力	40	10	0	0	0	50
分野横断的能力	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Design of Machine Elements

Course Information

Course Code	1213B01	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	School Credit: 1
Department	Course of Mechanical Engineering	Student Grade	3rd
Term	Second Semester	Classes per Week	後期:2
Textbook and/or Teaching Materials	機械要素設計(日本理工出版会)/機械要素設計(実教出版)		
Instructor	Okumoto Yoshihiro		

Course Objectives

1．動力と回転速度から回転軸の伝達トルクを計算できる。また、軸の曲げ応力、ねじり応力が計算できる。
2．ねじに加わるトルクとねじサイズから、ねじの軸力が計算できる。
3．軸受の寿命計算ができる。
4．コイルばねの諸元を求める設計計算ができる。

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(可)
到達目標1	必要動力から軸に加わるトルクを計算し、ねじり応力を計算できる。また、曲げ応力を計算できる。	動力と回転速度から回転軸の伝達トルクを計算できる。また、軸の曲げ応力、ねじり応力が計算できる。	例題と同様の状況下において、動力と回転速度から回転軸の伝達トルクを計算できる。また、軸の曲げ応力、ねじり応力が計算できる。
到達目標2	ねじの軸力を得るための必要トルクの計算とねじに作用する引張応力を計算できる。	ねじに加わるトルクとねじサイズから、ねじの軸力が計算できる。	例題と同様の状況下において、ねじに加わるトルクとねじサイズから、ねじの軸力が計算できる。
到達目標3	基本動定格荷重、必要軸受寿命と適用軸径から軸受の選定ができる。	ラジアル荷重とアキシャル荷重が同時に作用する軸受の寿命計算ができる。	ラジアル荷重が作用する軸受の寿命計算ができる。
到達目標4	ばねの諸元計算に有効なグラフを活用して、ばねの諸元を効率的に計算することができる。	コイルばねの基本的な設計ができる。	例題と同様の状況下において、コイルばねの設計ができる。

Assigned Department Objectives

学習・教育到達度目標 D-1

Teaching Method

Outline	機械製品を構成するためには、設計者が設計する部品に加え、軸、ねじ、歯車、ばねなど多種多様な機械要素の利用が必要不可欠である。したがって、機械要素なくして機械製品の設計、製作、組立は実施できない。
Style	本講義では機械要素の利用を考えた設計を行う上で基礎となる軸、ねじ、軸受け、ばねおよび管に作用する力と応力の計算や、軸受寿命の計算を学ぶ。そして、各種機械要素の設計計算を適切に行うことができる能力を備えることを目的とする。授業で 【授業時間30時間】
Notice	各回、機械要素に対しての講義を終えた時点で、設計計算演習を実施する。日頃からしっかり予習、復習をすること。

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	動力とトルク、トルク計算	動力とトルクの関係が説明でき、動力と回転数とトルクの関係式を用いて必要な数値が計算できる。
		2nd	曲げを受ける軸	曲げ応力と断面係数、モーメントの関係が説明できる。 曲げ応力が計算できる。
		3rd	ねじりを受ける軸	ねじり応力と極断面係数、トルクの関係が説明できる。 ねじりを受ける軸の直径を設計できる。
		4th	曲げとねじりを同時に受ける軸	相当ねじりモーメントと相当曲げモーメントの関係を説明でき、曲げとねじりが同時に作用する軸の設計ができる。
		5th	軸の剛性	ねじり角度と軸長さ、直径、トルクの関係を説明できる。 ねじり応力とねじり角度の計算ができる。
		6th	ねじの軸力	ねじの種類と特徴を説明できる。 ねじに加わるトルクと軸力から必要なねじを設計できる。
		7th	ねじにかかる力	せん断力のかかるねじの設計ができる。 軸力の作用するねじの長さを設計できる。 リード角と締付けトルクの関係を説明でき、必要な締付けトルクを計算できる。
		8th	中間試験	
	4th Quarter	9th	転がり軸受け１	軸受けの種類と特徴を説明できる。 軸受けの呼び番号の意味を説明できる。 転がり軸受けの寿命を計算できる。
		10th	転がり軸受け２	ラジアル荷重とアキシャル荷重が同時に作用する軸受けの寿命を計算できる。

		11th	ばね要素１	ばねの種類と特徴を説明できる。 コイルばねの応力と寸法諸量の関係を説明でき、諸元を計算できる。
		12th	ばね要素２	重ね板ばねの設計ができる。
		13th	ばね要素３	トーションバーの設計ができる。
		14th	管・バルブ・シール	配管の種類と特徴を説明できる。 使用圧力から配管の設計ができる。
		15th	総合演習	これまでに修得した要素設計法を用いて、様々な機械要素を組み合わせた設計ができる。
		16th	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	70	20	0	0	10	100
基礎的能力	0	0	0	0	0	0
専門的能力	70	20	0	0	10	100
分野横断的能力	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Mechanism

Course Information

Course Code	1213B03	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	School Credit: 1
Department	Course of Mechanical Engineering	Student Grade	3rd
Term	First Semester	Classes per Week	前期:2
Textbook and/or Teaching Materials	Kikougaku (Science) / Kikougaku (OHM)		
Instructor	Kawabata Nariyuki		

Course Objectives

1. Able to calculate the degrees of freedom, instantaneous center, and velocity of a mechanism.
2. To understand the function of friction transmission and to be able to calculate the speed ratio of a friction wheel. Also, as an application, be able to explain the mechanism of a continuously variable transmission.
3. Able to explain types of gears, names of each part, tooth profile curves, how to express tooth size, and to be able to calculate sliding ratio and meshing ratio.
4. Able to calculate the speed transmission ratio of a gear train and also be able to explain about plofile shifted gear.
5. Able to know the types of cam and linkage devices and analyze their motions.

Rubric

	Ideal Level	Standard Level	Minimum Level
Achievement 1	Able to calculate velocity by appropriate use of degrees of freedom and instantaneous center, and by drawing methods appropriate to the task.	Able to find the degrees of freedom and instantaneous center and explain their meaning. Also, be able to calculate velocities according to the solution of the example.	Able to find the degrees of freedom and draw to find the instantaneous center.
Achievement 2	Able to calculate the speed ratio of a friction wheel and correctly explain the mechanism and features of various friction transmission devices, citing their advantages and disadvantages.	Able to calculate the speed ratio of a friction wheel and explain the names and characteristics of various friction transmission devices.	Able to explain name and the basic features of various friction transmission devices.
Achievement 3	Able to explain the principle of gears and the physical meaning of sliding ratio and contact ratio, and to be able to calculate each value.	Able to explain terms related to gears and calculate sliding ratio and contact ratio.	Explain terms related to gears.
Achievement 4	A gear train with a speed transmission ratio that meets the design requirements can be designed, taking even feasibility into consideration.	The speed transmission ratio of the gear train can be calculated and the gear train can be designed to meet the design requirements.	Able to calculate the speed transfer ratio of the gear train.
Achievement 5	Understand the principles of cam and linkage devices and be able to design mechanisms that meet design requirements.	Understand the principles of cam devices and linkage devices, and be able to analyze the motion of existing mechanisms.	Able to explain the names and features of cam and linkage devices.

Assigned Department Objectives

学習・教育到達度目標 D-1

Teaching Method

Outline	The goal of this course is to understand the "tricks" to easily elucidate the mechanisms of machine structures, to be able to elucidate the movements of various machines, and to be able to design the desired structures easily. The contents of this course are also used in the design of machine elements, so students are expected to make efforts to understand the basics through their own study.
Style	The course will focus on theoretical explanations and exercises through lectures, but will also include group work exercises to give participants an opportunity to understand their roles when working as a team. Students are encouraged to move and learn on their own. [30 hours of class time]
Notice	It is easy to learn if you have a good understanding of mechanical motion, which is covered in Mechanical Design and Drafting. Students are expected to bring their own drawing tools such as rulers and compasses, as there will be a lot of drawing during the lecture. The portfolio evaluation will include the evaluation of [Report Assignment] and [Online Review Test].

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	Velocity and instantaneous center and how to calculate the velocity in the mechanism I	Able to explain the definitions of machine, mechanism and element.
		2nd	Velocity and instantaneous center and how to calculate the velocity in the mechanism II	Able to calculate the degree of freedom of the mechanism.
		3rd	Velocity and instantaneous center and how to calculate the velocity in the mechanism III	Able to find the instantaneous center and instantaneous center trajectory of the mechanism.

		4th	Velocity and instantaneous center and how to calculate the velocity in the mechanism IV	Able to calculate the velocity of the mechanism using by the instantaneous center.
		5th	Friction Transmission devices I	Able to calculate the rotation speed of the friction wheel based on the rotation ratio.
		6th	Friction Transmission devices II	Understand various mechanisms using friction and be able to explain how each works.
		7th	Friction Transmission devices III	Able to explain the mechanism of a continuously variable transmission.
		8th	Midterm examination	
	2nd Quarter	9th	Gear Tooth Profile and Gears I	Able to explain the characteristics of various types of gears and calculate the speed transfer ratio of a gear train.
		10th	Gear Tooth Profile and Gears II	Understand the theory of involute gears and be able to calculate tooth thickness.
		11th	Gear Tooth Profile and Gears III	Able to explain and calculate sliding ratio and contact ratio. Able to explain the profile shifted gear.
		12th	Cum I	Able to explain the characteristics of various cam devices.
		13th	Cum II	Understand cam diagrams and basic design of plate cams.
		14th	Linkage I	Understand the principle of a 4-node linkage mechanism and be able to calculate the rotational conditions.
		15th	Linkage 2	Able to explain the mechanism and features of slider crank mechanism and linear motion mechanism.
		16th	Final examination	

Evaluation Method and Weight (%)

	midterm / final exam	quiz	portfolio	presentation / attitude	other	Total
Subtotal	60	0	40	0	0	100
Basic Proficiency	10	0	0	0	0	10
Specialized Proficiency	50	0	40	0	0	90
Cross Area Proficiency	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Strength of Materials 1

Course Information

Course Code	1213C03	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	School Credit: 2
Department	Course of Mechanical Engineering	Student Grade	3rd
Term	Year-round	Classes per Week	前期:2 後期:2
Textbook and/or Teaching Materials	PEL 材料力学（実教出版）		
Instructor	Okumoto Yoshihiro		

Course Objectives

1. 応力とひずみを理解し、応力ーひずみ線図を説明できる。
2. 引張・圧縮負荷を受けた部材の応力とひずみを計算できる。
3. 各種の荷重が作用するはりのせん断力図と曲げモーメントを作成できる。
4. 曲げモーメントによって生じる曲げ応力およびその分布を計算できる。

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（可）
1. 応力とひずみを理解し、応力ーひずみ線図を説明できる。	種々の金属材料の応力ひずみ関係から材料の機械的特性を評価できる。	応力とひずみを理解し応力－ひずみ線図を説明できる。	応力、ひずみを説明できる。
2. 引張・圧縮負荷を受けた部材の応力とひずみを計算できる。	断面形状が一様でない部材の応力、ひずみ、伸びを計算できる。	引張り圧縮を受けた部材の応力、ひずみ、伸びを計算できる。	引張応力や垂直ひずみを計算できる。
3. 各種の荷重が作用するはりのせん断力図と曲げモーメントを作成できる。	集中荷重と分布荷重同時等、複雑な荷重を受けるはりのせん断力図と曲げモーメント図を作成できる。	集中荷重、分布荷重を受ける基本的なはりのせん断力図と曲げモーメント図を作成できる。	単純荷重を受けるはりのせん断力図と曲げモーメントを作成できる。
4. 曲げモーメントによって生じる曲げ応力およびその分布を計算できる。	非対称なはり断面の図心と断面二次モーメントを求め、曲げ応力を計算できる。	対称な形状の断面の二次モーメントを求め、曲げ応力を計算できる。	矩形断面や円形断面のはりの曲げ応力を計算できる。

Assigned Department Objectives

学習・教育到達度目標 B-3 学習・教育到達度目標 D-1

Teaching Method

Outline	機械・構造物に外荷重が作用する場合、それらの部材又は全体が荷重に耐え得るか否かは、部材に生ずる力(応力)や変形(ひずみ)で決まる。本教科では応力とひずみの概念を理解し、荷重とこれらの関係を解析する手法並びに解析結果を機械設計に作用する考え方を身につけることを目標とする。この科目は企業で火力発電用ボイラの設計基準の研究を担当していた教員が，その経験を活かし、応力・ひずみ計算の手法等について講義形式で授業を行うものである。
Style	前期中間，前期期末，後期中間，後期期末の各定期試験の間に小テストを実施する。【授業時間62時間】
Notice	講義内容を理解し、機械設計に応用できるようになるには、正しく解析できる「技術」を習得する必要があり、宿題等を通じて、講義後の自主的演習を欠かさず実施してほしい。尚、大きな数値と小さな数値の混在する計算及び単位の換算など間違えないことも大切である。総合評価に関する後期の割合を前期の２倍とする.

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	材料力学の概要および到達目標説明	力学の中での材料力学の位置づけが説明できる。
		2nd	力と応力	荷重の種類およびにる材料変形を説明でき。
		3rd	引張り圧縮とせん断	引張り応力とせん断応力を計算できる。
		4th	引張りひずみとせん断ひずみ	引張りひずみとせん断ひずみを計算できる。
		5th	小テスト	
		6th	応力ひずみ線図	応力ひずみ線図を説明できる。
		7th	許容応力と安全率	許容応力と安全率を説明できる。
		8th	中間テスト	
	2nd Quarter	9th	自重による引張り応力	自重による引張り応力の計算ができる。
		10th	断面積が一様でない部材の応力，伸びの計算	テーパー棒に引張り荷重が作用した場合の伸び計算
		11th	断面積が一様でない部材の応力，伸びの計算	テーパー棒に引張り荷重が作用した場合の伸び計算
		12th	小テスト	
		13th	不静定問題の説明，熱応力の計算	静定問題と不静定問題の違いを説明できる。熱応力の計算ができる
		14th	組み合わせ棒の計算	組み合わせ棒の応力計算ができる
		15th	組み合わせ棒の計算	組み合わせ棒の伸び計算ができる。
		16th	期末試験	
2nd Semester	3rd Quarter	1st	はりの種類。せん断力と曲げモーメントの符号	はりの支持及び荷重の種類を説明できる。せん断力と曲げモーメントの符号を説明できる。
		2nd	両端支持はりに集中荷重が作用する場合のせん断力図と曲げモーメント図	両端支持はりに集中荷重が作用する場合のせん断力図と曲げモーメント図を描くことができる。
		3rd	片持はりに集中荷重及び分布荷重が作用する場合のせん断力図と曲げモーメント図	片持はりに集中荷重及び分布荷重が作用する場合のせん断力図と曲げモーメント図を描くことができる。

		4th	両端支持はりに分布荷重が作用する場合のせん断力図と曲げモーメント図	両端支持はりに分布荷重が作用する場合のせん断力図と曲げモーメント図を描くことができる。
		5th	小テスト	
		6th	片持はりに集中荷重と分布荷重が同時に作用する場合	片持はりに集中荷重と分布荷重が同時に作用する場合のせん断力図と曲げモーメント図を描くことができる。
		7th	両端支持はりに集中荷重と分布荷重が同時に作用する場合	両端支持はりに集中荷重と分布荷重が同時に作用する場合のせん断力図と曲げモーメント図を描くことができる。
		8th	中間試験	
	4th Quarter	9th	曲げモーメントと曲げ応力の関係	曲げモーメントと曲げ応力の関係を説明できる。
		10th	図心の求め方	図心を計算できる。
		11th	断面二次モーメントの求め方。	断面二次モーメントを計算できる。
		12th	断面二次モーメントの加法定理と平行軸の定理	加法定理と平行軸の定理を使って断面二次モーメントを計算できる。
		13th	小テスト	
		14th	はりに作用する曲げ応力の計算	はりに作用する曲げ応力の計算ができる。
		15th	平等強さのはり	平等強さのはりを説明できる。
		16th	期末試験	

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	70	20	0	0	10	100
基礎的能力	0	0	0	0	0	0
専門的能力	70	20	0	0	10	100
分野横断的能力	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Fundamentals of Machinery Dynamics 1

Course Information

Course Code	1213C04	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	School Credit: 1
Department	Course of Mechanical Engineering	Student Grade	3rd
Term	First Semester	Classes per Week	前期:2
Textbook and/or Teaching Materials	工業力学（森北出版）/工業力学（コロナ社）		
Instructor	Kawabata Nariyuki		

Course Objectives

1．合力・分力、および力や偶力のモーメント求め、一点に作用するもしくは異なる点に作用する力のつり合い条件を計算できる。
2．物体の重心位置を求め、物体の安定性を判別することができる。
3．等速・等加速度運動をはじめとする直線運動や平面運動を理解し、物体の運動を解析できる。
4．運動の法則を理解し、各法則を考慮して物体の運動を解析できる。
5．回転運動に関して理解し、円運動や向心力・遠心力、コリオリの力について解析できる。

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(可)
到達目標1	複数の、或いは複雑な物体から成る力学系について、正しく力の図示ができ、つり合い条件を計算できる。	単一もしくは少数の物体から成る力学系に対し生じている力を図示し、つり合い条件を計算できる。	作用する力が図示された単純な力学系に対して、つり合い条件を計算できる。
到達目標2	複雑な平面・立体形状の物体の重心を求め、安定性を判別することができる。	簡単な平面・立体形状の物体の重心を求め、安定性を判別することができる。	簡単な平面形状の重心を求め、安定性を判別することができる。
到達目標3	複雑な平面運動を適切な手順を考慮しながら運動の解析ができる。	比較的単純な平面運動を示された手順によって解析ができる。	簡単な直線運動、平面運動を公式を利用しながら運動の解析ができる。
到達目標4	様々な条件下での物体の運動を、適切な手順を考慮しながら解析ができる。	比較的単純な運動状態にある力学系に対し、力学法則を適用して物体の運動を解析できる。	適用する力学法則が明示された状況下で、単純な運動をしている力学系の運動を解析できる。
到達目標5	様々な条件下での物体の回転運動を、適切な手順を考慮しながら解析ができる。	比較的単純な回転運動系に対し、示された手順によって解析ができる。	適用する力学法則が明示された状況下で、単純な回転運動をしている力学系の運動を解析できる。

Assigned Department Objectives

学習・教育到達度目標 B-3 学習・教育到達度目標 D-1

Teaching Method

Outline	工学の基礎の一つである力学は機械工学科引き続き学ぶ多くの応用力学への入門としての重要な基礎科目であるので、十分な理解が求められる。本講義では静力学と動力学における機械系の基礎的事項を理解し、工業的応用の初等的解法を修得する。また、継続して応用力学の知識を学習する習慣を身に付けることを目的とする。
Style	毎週の学習内容について基礎事項の説明と例題を示したのち、演習問題を解く形式で進める。できるだけ多くの演習問題を供し、解説を実施するがすべての問題に授業時間内に取り組むことは困難であるから、授業前後での自主的な学習が望まれる。【授業時間30時間】
Notice	３年生までの数学、および物理で学んだ内容を前提として活用するので、これらの内容をしっかり復習しておくこと。また、授業各回の課題の実施を含む自学自習が不可欠である。基本の概念はすでに修得しているものが大半であるが、実践的な工学問題への適用方法は多様であり、各自で繰り返し練習し、習熟することが肝要である。そのために演習問題等をできるだけ自力で多く解くことを求める。 ポートフォリオ評価には【課題レポート】【復習オンラインテスト】が含まれる。

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	静力学の基礎	力をベクトルで表現し、合力・分力・モーメントを求めることができる。
		2nd	力	着力点の異なる力の合成ができる。
		3rd	力のつりあい	1点にはたらく力のつりあいを理解し、接触点や支点にはたらく力を求めることができる。
		4th	トラス	着力点の異なる力のつりあいを理解し、トラス構造に作用する力を求めることができる。
		5th	重心Ⅰ 平面図形の重心	簡単な形状の物体の重心を求めることができる。
		6th	重心Ⅱ 立体の重心、すわり	複雑な形状の物体の重心を求めることができ、安定性を判別することができる。
		7th	点の運動Ⅰ 速度・加速度	速度・加速度を理解し、ベクトルで表現することができる。
		8th	中間試験	
	2nd Quarter	9th	点の運動Ⅱ 直線運動	等速度運動・等加速度運動をする質点の運動を解析できる。 加速度が一定でない運動をする質点の運動を解析できる。
		10th	点の運動Ⅲ 平面運動	放物運動の解析ができる。

		11th	点の運動Ⅳ 相対運動	相対速度を理解し、相対運動を解析できる。
		12th	運動と力Ⅰ 運動の法則	作用・反作用の法則を理解し、運動方程式を用いた運動解析ができる。
		13th	運動と力Ⅱ 慣性力	慣性の法則を理解し、運動方程式を用いた運動解析ができる。 ダランベールの法則を理解し、運動の解析に適用できる。
		14th	回転運動Ⅰ 円運動	回転運動に関する法則を理解し、基本的な円運動を解析できる。
		15th	回転運動Ⅱ 向心力・遠心力	向心力・遠心力を求めることができる。 コリオリの力を理解し、やや複雑な回転運動の解析に適用できる。
		16th	試験返却	

Evaluation Method and Weight (%)

	中間・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	60	0	40	0	0	100
基礎的能力	10	0	0	0	0	10
専門的能力	50	0	40	0	0	90
分野横断的能力	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Fundamentals of Machinery Dynamics 2

Course Information

Course Code	1213C05	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	School Credit: 1
Department	Course of Mechanical Engineering	Student Grade	3rd
Term	Second Semester	Classes per Week	後期:2
Textbook and/or Teaching Materials	工業力学（森北出版）/工業力学（コロナ社）		
Instructor	Kawabata Nariyuki		

Course Objectives

1．剛体の慣性モーメントを求め、回転運動を運動方程式で表し、剛体の運動を解析できる。
2．運動量と衝突現象を理解し、運動量保存則を利用して向心衝突、斜め衝突、偏心衝突の運動を解析できる。
3．仕事とエネルギー保存則の意味を理解し、動力および位置・運動エネルギーを計算できる。
4．すべり摩擦、ころがり摩擦を理解し、各種機構の摩擦を考慮した運動を解析できる。
5．滑車やてこ、斜面を用いる機構の運動を解析し、機械の効率を計算できる。

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(可)
到達目標1	複雑な形状の物体の慣性モーメントを求めることができ、複雑な機構の運動を解析できる。	標準的な形状の物体の慣性モーメントを求めることができ、各種機構の運動解析に適用できる。	単純な形状の物体の慣性モーメントを求めることができる。
到達目標2	運動量と衝突現象の原理を理解し、偏心衝突を含む複雑な衝突運動を正しく解析できる。	運動量と衝突現象を理解し、標準的な２物体程度の向心・斜め衝突運動を解析できる。	運動量と衝突現象を理解し、基本的な２物体の向心衝突運動を解析できる。
到達目標3	複雑な力学系に対して正しいエネルギー保存則を適用し運動を解析できるとともに動力計算ができる。	力学的エネルギー保存則を適用して単純な運動の解析ができるとともに動力計算ができる。	状態が明らかな力学系に関する力学的エネルギーを計算できる。
到達目標4	摩擦と仕事・エネルギーへの理解を関連付け、摩擦を含む複雑な運動を正しく解析できる。	摩擦を考慮した運動の解析ができる。	すべり摩擦、ころがり摩擦を正しく求めることができる。
到達目標5	複数の運動状態が複合している力学系に対し、正しい力学法則を適用して物体の運動を解析できる。	比較的単純な運動状態にある力学系に対し、力学法則を適用して物体の運動を解析できる。	適用する力学法則が明示された状況下で、単純な運動をしている力学系の運動を解析できる。

Assigned Department Objectives

学習・教育到達度目標 B-3 学習・教育到達度目標 D-1

Teaching Method

Outline	工学の基礎の一つである力学は機械工学科引き続き学ぶ多くの応用力学への入門としての重要な基礎科目であるので、十分な理解が求められる。本講義では静力学と動力学における機械系の基礎的事項を理解し、工業的応用の初等的解法を修得する。また、継続して応用力学の知識を学習する習慣を身に付けることを目的とする。
Style	毎週の学習内容について基礎事項の説明と例題を示したのち、演習問題を解く形式で進める。できるだけ多くの演習問題を供し、解説を実施するがすべての問題に授業時間内に取り組むことは困難であるから、授業前後での自主的な学習が望まれる。【授業時間30時間】
Notice	３年生までの数学、および物理で学んだ内容を前提として活用するので、これらの内容をしっかり復習しておくこと。また、授業各回の課題の実施を含む自学自習が不可欠である。基本の概念はすでに修得しているものが大半であるが、実践的な工学問題への適用方法は多様であり、各自で繰り返し練習し、習熟することが肝要である。そのために演習問題等をできるだけ自力で多く解くことを求める。 ポートフォリオ評価には【課題レポート】【復習オンラインテスト】が含まれる。

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	剛体の運動Ⅰ 慣性モーメント	剛体の慣性モーメントを求めることができる。
		2nd	剛体の運動Ⅱ 剛体の平面運動	回転の運動方程式を理解し、剛体の平面運動を解析できる。
		3rd	剛体の運動Ⅲ 回転体のつり合い	回転体のつり合い問題を解くことができる。
		4th	運動量と力積	運動量と力積の関係を理解し、 運動量保存則と角運動量保存則を適用して運動を解析できる。
		5th	衝突Ⅰ 向心衝突	向心衝突現象を理解し、解析できる。
		6th	衝突Ⅱ 斜め衝突	斜め衝突現象を理解し、解析できる。
		7th	衝突Ⅲ 偏心衝突	偏心衝突現象を理解し、解析できる。
		8th	中間試験	
	4th Quarter	9th	仕事と動力Ⅰ 並進運動	ばねや重力による仕事を理解し、解析できる。
		10th	仕事と動力Ⅱ 回転運動、動力	回転の仕事を理解し、解析できる。 仕事と動力の関係を理解し、機械に必要な動力を求めることができる。

		11th	エネルギーⅠ 力学的エネルギー	力学的エネルギーを理解し、運動エネルギー、位置エネルギー、回転体の持つエネルギーを解析できる。
		12th	エネルギーⅡ 力学的エネルギー保存則	力学的エネルギー保存則を理解し、解析できる。 衝突等によるエネルギーの損失を解析できる。
		13th	摩擦Ⅰ すべり摩擦ところがり摩擦	すべり摩擦ところがり摩擦について理解し、解析できる。
		14th	摩擦Ⅱ ベルトの摩擦、ブレーキ、軸受の摩擦	各種機構の摩擦について理解し、解析できる。
		15th	各種機械の解析 てこ、滑車・輪軸、くさび・ねじ	様々な機械要素の運動について理解し、解析できる。 また、各種機械の効率を求めることができる。
		16th	試験返却	

Evaluation Method and Weight (%)

	中間・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	60	0	40	0	0	100
基礎的能力	10	0	0	0	0	10
専門的能力	50	0	40	0	0	90
分野横断的能力	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Manufacturing Process 2

Course Information

Course Code	1213E01	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	School Credit: 1
Department	Course of Mechanical Engineering	Student Grade	3rd
Term	Second Semester	Classes per Week	後期:2
Textbook and/or Teaching Materials	kikai-kousaku-hou (Corona)		
Instructor	Yasuda Takeshi		

Course Objectives

1. Student to be able to explain the different types of plastic forming methods, and to be able to explain how various plastic formed products are manufactured.
2. Student to be able to explain forging and its characteristics.
3. Student to be able to explain press working and its characteristics.
4. Student to be able to explain rolling, extrusion, drawing, etc. and their characteristics

Rubric

	Ideal Level	Standard Level	Minimum Level
Achievement 1	Student to be able to understand the material properties that enable plastic forming and be able to explain basic plastic forming methods that utilize these properties.	Student to be able to understand and explain plastic forming and its types.	Student understands about plastic forming.
Achievement 2	Student to be able to explain the relationship between the forging process and its dies, processing temperatures, and material properties.	Student to be able to understand and explain the forging process and its characteristics.	Student understands about forging.
Achievement 3	Student to be able to explain the relationship between press work, its dies, machining processes, and material properties.	Student to be able to understand and explain press work and its features.	Student understands about press work.
Achievement 4	Student to be able to understand and explain processing methods such as rolling, extrusion, drawing, etc. and their characteristics.	Student to be able to understand processing methods such as rolling, extrusion, drawing, etc. and their characteristics.	Student understands about rolling, extrusion, drawing, etc.

Assigned Department Objectives

学習・教育到達度目標 D-1

Teaching Method

Outline	Processing methods for metal materials are classified into melting, removal, and plastic forming. In the 3rd grade, students learn about plastic working, which is said to be the most efficient of these processing methods. Plastic working is a processing method to form a desired shape by utilizing the plasticity of materials. In this lecture, students will acquire basic knowledge of various processing methods such as forming of plates, forging, rolling, extruding, and drawing of materials.
Style	Classes will be conducted in a lecture style. [30 hours of class time]
Notice	The content of this course is closely related to the content of the 2nd and 3rd grade courses on mechanical materials and the 5th grade course on technology of plasticity forming. Students are expected to deepen their understanding of the relationship with material properties, etc., while being aware of the types of processing methods used to manufacture the products around us.

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	Outline of Plastic Working	Student be able to explain what is plastic working.
		2nd	Forging Process	Student be able to explain familiar products made by the forging process, their outline and characteristics.
		3rd	Free forging and die forging	Student be able to explain the outline and characteristics of free forging and die forging.
		4th	Hot forging and cold forging	Student be able to explain the difference between hot forging and cold forging and the material properties.
		5th	Rolling Process	Student be able to explain familiar products made by the rolling process, their overview and characteristics.
		6th	Hot and cold Rolling	Student be able to explain the difference between hot rolling and cold rolling and material properties.
		7th	Types of rolling mills and forces acting during rolling	Student be able to explain the types and characteristics of various types of rolling mills and the forces that act on them during rolling.

		8th	Midterm examination	
	4th Quarter	9th	Plate forming	Student be able to explain the overview of plate forming and the different types of processing methods.
		10th	Shearing process	Student be able to explain the overview of shear processing and the relationship between clearances and cut surfaces.
		11th	Types and features of precision shear processing	Student be able to explain the various types and characteristics of precision shear processing.
		12th	Overview of bending process and various bending styles	Student be able to explain the overview of bending process and various bending styles
		13th	Spring back	Student be able to explain about the spring back
		14th	Drawing and overhanging	Student be able to explain the outline, characteristics, and differences between drawing and overhang processes.
		15th	Extrusion, drawing, etc.	Student be able to explain the outline and characteristics of rolling, extrusion, drawing, etc.
		16th	Final examination and exam. paper return	

Evaluation Method and Weight (%)

	Midterm/Final exam	Quiz	Portfolio	Presentation/Attitude	Other	Total
Subtotal	80	0	20	0	0	100
Basic Proficiency	10	0	0	0	0	10
Specialized Proficiency	50	0	20	0	0	70
Cross Area Proficiency	20	0	0	0	0	20

Anan College	Year	2024	Course Title	Mechanical Materials 2

Course Information

Course Code	1213F01	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	School Credit: 1
Department	Course of Mechanical Engineering	Student Grade	3rd
Term	Second Semester	Classes per Week	2
Textbook and/or Teaching Materials	「zairyogaku・kikaikeikyokashoshirizu6」, CORONA PUBLISHING/ 「karazukai・tetsutohaganegawakaruhon」		
Instructor	Nishimoto Koji		

Course Objectives

1. Abele to understand and explain heat treatment methods for metallic materials.
2. Abele to understand and explain the production methods of metals.

Rubric

	Ideal Level	Standard Level	Minimum Level
Achievement 1	Able to explain the purpose and operation of various heat treatment methods, and understand and explain their relationship to the microstructure of metals.	Able to explain the purpose and operation of various heat treatment methods and understand the relationship with metal microstructure.	Able to explain the purpose and operation of various heat treatment methods.
Achievement 2	Able to understand and explain the importance of raw materials, fuels and production facilities for steel production.	Able to understand the production of steel in terms of raw materials, fuels and production facilities.	Able to explain the manufacturing process of iron and steel.

Assigned Department Objectives

学習・教育到達度目標 D-1

Teaching Method

Outline	Utilizing the knowledge learned in 2nd year Mechanical Materials 1, especially equilibrium state diagrams, the heat treatment of steel will be explained. The latter half of the course is mainly aimed at training engineers to think from a broad perspective about the production methods used to produce steel materials.
Style	【30 hours of class time】
Notice	First of all, you should know exactly what the terminology of mechanical materials is. If you keep this review in mind, mechanical materials will become a study to understand, not a study to memorize, and you will become interested in materials and find it an interesting subject.

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	Various metal materials	Able to explain the names and characteristics of typical metal materials.
		2nd	Standard microstructures of steel	Able to explain the standard structure from the equilibrium diagram of steel.
		3rd	Outline of heat treatment	Able to explain the heat treatment of metal materials.
		4th	Cooling rate and transformation of steel	Able to explain the relationship between cooling curves and transformation temperatures for iron and steel.
		5th	C.C.T. curve	Able to explain the continuous cooling transformation curve (CCT curve).
		6th	Annealing	Able to explain the purpose and operation of annealing.
		7th	Normalizing	Able to explain the purpose and operation of normalizing.
		8th	Midterm exam	
	4th Quarter	9th	Quenching	Able to explain the purpose and operation of quenching.
		10th	Tempering	Able to explain the purpose and operation of tempering.
		11th	Transformation at constant temperature	Able to explain the isothermal transformation treatment and TTT curve.
		12th	Surface hardening treatment	Able to explain the various surface hardening treatments.
		13th	Heat treatment of non-ferrous materials	Able to explain the aging treatment of aluminium.
		14th	Steelmaking plant	Able to explain the structure of a steelworks and the layout of equipment.
		15th	Steelmaking plant	Able to explain the mechanisms and functions of blast furnaces, converters, and continuous casting equipment.
		16th	Final exam	

Evaluation Method and Weight (%)						
	midterm/final exam	quiz	portfolio	presentation/attitude	Other	Total
Subtotal	80	0	20	0	0	100
Basic Proficiency	0	0	0	0	0	0
Specialized Proficiency	80	0	20	0	0	100
Cross Area Proficiency	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Computer Programming Exercises

Course Information

Course Code	1213G02	Course Category	Specialized / Compulsory
Class Format		Credits	School Credit: 2
Department	Course of Mechanical Engineering	Student Grade	3rd
Term	Year-round	Classes per Week	前期:2 後期:2
Textbook and/or Teaching Materials	Ichiban yasashii Python nyuumon kyoshitsu (Sotec)		
Instructor	Matsuura Fuminori		

Course Objectives

V-A-7 Mechanical Engineering::Information Processing
[a] Operation
a1) Students understand how to execute a code and can run it.

[b] Constants and Variables
b1) Students can explain what are Constants and Variables.
b2) Students can explain what are Integers, Floating Points and Character types.

[c] Operators
c1) Students can understand and implement what are the Operators and their priorities.
c2) Students can implement using arithmetic and compare operators.

[d] I/O
d1) Students can implement a software using I/O.

[e] Control
e1) Students can implement a software including a conditional branch.
e2) Students can implement a software including a loop.

[f] Arrays
f1) Students can implement a software using one-dimensional array.

Rubric

	Ideal Level	Standard Level	Minimum Level
Achievement 1	More than or equal to 80 % in achievement on [a], [b], [c] and [d]	More than or equal to 65 % and less than 80 % in achievement on [a], [b], [c] and [d]	More than or equal to 60 % and less than 65 % in achievement on [a], [b], [c] and [d]
Achievement 2	More than 80 % in achievement on [e] and [f]	More than or equal to 65 % and less than 80 % in achievement on [e] and [f]	More than or equal to 60 % and less than 65 % in achievement on [e] and [f]

Assigned Department Objectives

学習・教育到達度目標 B-4 学習・教育到達度目標 D-1

Teaching Method

Outline	Learn the syntax of the programming language Python, which is suitable for scientific and technological calculations, and hone the skills to create basic programs.
Style	Sixty hours of lecture
Notice	The "Learning Objectives" in the following "Course Plan" are listed only by items to avoid complicated descriptions. The actual learning objective is "to be able to explain or implement the content written in the respective section."

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 a program?	Lesson1-1 A collection of instructions. Lesson1-2 How do you create a program? Lesson1-3 What do you need to create a program? Lesson1-4 What should you study?
		2nd	Let's begin Python	Lesson2-1 Using Python Lesson2-2 Installing Python Lesson2-3 Let's execute some simple commands Lesson2-4 Playing with interactive mode
		3rd	Rule for programing in Python	Lesson3-1 Let's compile instructions into a single file Lesson3-2 Let's line up many instructions Lesson3-3 How to open a saved file Lesson3-4 Let's display some text Lesson3-5 Let's concatenate strings
		4th	Rule for programing in Python	Lesson3-6 Rules for properly displaying Japanese characters Lesson3-7 Let's display a long string Lesson3-8 The roles of spaces, indentation, and line breaks Lesson3-9 How to write comments to supplement your program

		5th	Fundamental functions of a program	Lesson4-1 The six major elements that make up a program Lesson4-2 Let's try using variables
		6th	Fundamental functions of a program	Lesson4-3 Let's try executing repetitively 1: for loop
		7th	Fundamental functions of a program	Lesson4-4 Let's try executing repetitively 2: while loop
		8th	Midterm exam	
	2nd Quarter	9th	Fundamental functions of a program	Lesson4-5 Conditional branching: if statement
		10th	Fundamental functions of a program	Prime number operations
		11th	Fundamental functions of a program	Prime number operations
		12th	Fundamental functions of a program	Prime number operations
		13th	Fundamental functions of a program	Lesson4-6 Using functions Lesson4-7 Extending functionality with modules
		14th	Fundamental functions of a program	Collatz conjecture
		15th	Fundamental functions of a program	Collatz conjecture
		16th	Final exam	
2nd Semester	3rd Quarter	1st	Data Structures and Algorithms	List structure
		2nd	Data Structures and Algorithms	Other data structures
		3rd	Data Structures and Algorithms	Examples using data structures
		4th	GUI	Displaying a window with Tkinter
		5th	GUI	Simple calculator
		6th	GUI	Calculator with state transitions
		7th	GUI	Calculator with state transitions
		8th	Midterm exam	
	4th Quarter	9th	Numerical calculation and graphing	Fitting using the least squares method
		10th	Numerical calculation and graphing	Creating graphs with Matplotlib
		11th	Numerical calculation and graphing	Application examples to experimental data
		12th	Challenge image recognition	Lesson8-1 Challenging AI Lesson8-2 Modules that add functionality to Python
		13th	Challenge image recognition	Lesson8-3 Let's try using the object detection library "YOLOv8" Lesson8-4 Let's display an image in a window
		14th	Challenge image recognition	Lesson8-5 Let's detect objects with Python
		15th	Challenge image recognition	Lesson8-6 Let's train images
		16th	Final exam	

Evaluation Method and Weight (%)

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

Anan College	Year	2024	Course Title	Experiments in Mechanical Engineering 2

Course Information

Course Code	1213T02	Course Category	Specialized / Compulsory
Class Format	Experiment / Practical training	Credits	School Credit: 4
Department	Course of Mechanical Engineering	Student Grade	3rd
Term	Year-round	Classes per Week	前期:4 後期:4
Textbook and/or Teaching Materials	Materials will be distributed as needed.		
Instructor	Yasuda Takeshi,Itami Shin,Okita Yuji		

Course Objectives

1. Student be able to demonstrate skill in more advanced lathe operations and sheet metal work with awareness of the accuracy, function, and cost of works.
2. Student be able to perform welding operations considering the function of welded parts and efficient work, and understand the characteristics of welding.
3. Student be able to understand the mechanism of internal combustion engines and the role of each mechanical element from disassembly and assembly work, and be able to handle tools appropriately.
4. Student be able to assemble and check the operation of a line-trace robot, and learn the basic knowledge of mechatronics technology necessary for mechanical engineers.
5. Student be able to conduct major experiments related to plastic forming and understand the characteristics of plastic forming.

Rubric

	Ideal Level	Standard Level	Minimum Level
Achievement 1	Student be able to demonstrate skill in more advanced lathe operations and sheet metal works with awareness of the accuracy, function, and cost of works.	Student be able to demonstrate skill in more advanced lathe operations and sheet metal works.	Student works in more advanced lathe operations and sheet metal works.
Achievement 2	Student be able to perform welding operations considering the function of welded parts and efficient work, and understand the characteristics of welding.	Student be able to perform welding operations considering the function of welded parts and efficient work.	Student works welding operations considering the requirement.
Achievement 3	Student be able to understand the mechanism of internal combustion engines and the role of each mechanical element from disassembly and assembly work, and be able to handle tools appropriately.	Student be able to work for engine disassembly and assembly, and be able to handle tools appropriately.	Student works for engine disassembly and assembly with handle tools appropriately.
Achievement 4	Student be able to assemble and check the operation of a line-trace robot, and learn the basic knowledge of mechatronics technology necessary for mechanical engineers.	Student be able to a line-trace robot work, and learn the basic knowledge of mechatronics technology.	Student works with a line-trace robot, and know about it.
Achievement 5	Student be able to conduct major experiments related to plastic forming and understand the characteristics of plastic forming.	Student be able to conduct major experiments related to plastic forming.	Student works about major experiments related to plastic forming.

Assigned Department Objectives

学習・教育到達度目標 D-2

Teaching Method

Outline	Students will understand the importance of technology for machining machine parts with higher precision using machine tools such as lathes and laser cutter, bender, as well as the characteristics of welding and plastic working, by working on each of the practical tasks. In engine disassembly and mechatronics, students learn the roles of machines and machine elements, their operations, and automatic control techniques.
Style	Students will be divided into 5 or 6 groups. [120 hours of class time]
Notice	The other goals are to learn how to prepare for work (safety first) and how to write a report. During the practical training, students must always wear work clothes and pay sufficient attention to safety. Be sure to understand and master specific techniques through practical training. Students should not only be satisfied with the tasks given to them, but also make efforts to cultivate an engineering sense in manufacturing by carefully observing the phenomena.

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	Sheet metal works	Through the production by operating a laser cutter and bender, student be able to manufacture with an awareness of the accuracy, function, and beautiful finish of parts.

		2nd	Sheet metal works	Through the production by operating a laser cutter and bender, student be able to manufacture with an awareness of the accuracy, function, and beautiful finish of parts.
		3rd	Sheet metal works	Through the production by operating a laser cutter and bender, student be able to manufacture with an awareness of the accuracy, function, and beautiful finish of parts.
		4th	Sheet metal works	Through the production by operating a laser cutter and bender, student be able to manufacture with an awareness of the accuracy, function, and beautiful finish of parts.
		5th	Sheet metal works	Through the production by operating a laser cutter and bender, student be able to manufacture with an awareness of the accuracy, function, and beautiful finish of parts.
		6th	Engine disassembly and reassembly	Through disassembly and assembly of a gasoline engine, students will learn the mechanism of the internal combustion engine and the role of each mechanical element. Students will also learn how to handle parts and tools.
		7th	Engine disassembly and reassembly	Through disassembly and assembly of a gasoline engine, students will learn the mechanism of the internal combustion engine and the role of each mechanical element. Students will also learn how to handle parts and tools.
		8th	Engine disassembly and reassembly	Through disassembly and assembly of a gasoline engine, students will learn the mechanism of the internal combustion engine and the role of each mechanical element. Students will also learn how to handle parts and tools.
	2nd Quarter	9th	Engine disassembly and reassembly	Through disassembly and assembly of a gasoline engine, students will learn the mechanism of the internal combustion engine and the role of each mechanical element. Students will also learn how to handle parts and tools.
		10th	Engine disassembly and reassembly	Through disassembly and assembly of a gasoline engine, students will learn the mechanism of the internal combustion engine and the role of each mechanical element. Students will also learn how to handle parts and tools.
		11th	Lathe	Through detailed planning of work processes and the manufacture of machine parts by lathe operation based on these plans, students acquire skills to be aware of the accuracy, function, and cost of parts.
		12th	Lathe	Through detailed planning of work processes and the manufacture of machine parts by lathe operation based on these plans, students acquire skills to be aware of the accuracy, function, and cost of parts.
		13th	Lathe	Through detailed planning of work processes and the manufacture of machine parts by lathe operation based on these plans, students acquire skills to be aware of the accuracy, function, and cost of parts.
		14th	Lathe	Through detailed planning of work processes and the manufacture of machine parts by lathe operation based on these plans, students acquire skills to be aware of the accuracy, function, and cost of parts.
		15th	Lathe	Through detailed planning of work processes and the manufacture of machine parts by lathe operation based on these plans, students acquire skills to be aware of the accuracy, function, and cost of parts.
		16th		
2nd Semester	3rd Quarter	1st	Welding	Through the fabrication of pressure vessels by welding, students will acquire more advanced skills in consideration of efficient work. In addition, students will learn the function of welded products and the effects of defects.
		2nd	Welding	Through the fabrication of pressure vessels by welding, students will acquire more advanced skills in consideration of efficient work. In addition, students will learn the function of welded products and the effects of defects.
		3rd	Welding	Through the fabrication of pressure vessels by welding, students will acquire more advanced skills in consideration of efficient work. In addition, students will learn the function of welded products and the effects of defects.

		4th	Welding	Through the fabrication of pressure vessels by welding, students will acquire more advanced skills in consideration of efficient work. In addition, students will learn the function of welded products and the effects of defects.
		5th	Welding	Through the fabrication of pressure vessels by welding, students will acquire more advanced skills in consideration of efficient work. In addition, students will learn the function of welded products and the effects of defects.
		6th	Mechatronics	Student be able to understand basic knowledge of mechatronics technology (electrical and electronic circuits, control programming) that necessary for mechanical engineers through the assembly and operation check of a line-trace robot.
		7th	Mechatronics	Student be able to understand basic knowledge of mechatronics technology (electrical and electronic circuits, control programming) that necessary for mechanical engineers through the assembly and operation check of a line-trace robot.
		8th	Mechatronics	Student be able to understand basic knowledge of mechatronics technology (electrical and electronic circuits, control programming) that necessary for mechanical engineers through the assembly and operation check of a line-trace robot.
	4th Quarter	9th	Mechatronics	Student be able to understand basic knowledge of mechatronics technology (electrical and electronic circuits, control programming) that necessary for mechanical engineers through the assembly and operation check of a line-trace robot.
		10th	Mechatronics	Student be able to understand basic knowledge of mechatronics technology (electrical and electronic circuits, control programming) that necessary for mechanical engineers through the assembly and operation check of a line-trace robot.
		11th	Experiment of plastic forming	Students be able to understand major plastic forming tests such as deep drawing test, cornical cup test, shearing observation, etc., and acquire the characteristics of plastic forming.
		12th	Experiment of plastic forming	Students be able to understand major plastic forming tests such as deep drawing test, cornical cup test, shearing observation, etc., and acquire the characteristics of plastic forming.
		13th	Experiment of plastic forming	Students be able to understand major plastic forming tests such as deep drawing test, cornical cup test, shearing observation, etc., and acquire the characteristics of plastic forming.
		14th	Experiment of plastic forming	Students be able to understand major plastic forming tests such as deep drawing test, cornical cup test, shearing observation, etc., and acquire the characteristics of plastic forming.
		15th	Experiment of plastic forming	Students be able to understand major plastic forming tests such as deep drawing test, cornical cup test, shearing observation, etc., and acquire the characteristics of plastic forming.
		16th		

Evaluation Method and Weight (%)

	Midterm/Final exam	Quiz	Portfolio	Presentation/Attitude	Other	Total
Subtotal	0	0	30	70	0	100
Basic Proficiency	0	0	0	70	0	70
Specialized Proficiency	0	0	30	0	0	30
Cross Area Proficiency	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Machine Design and Drawing 2

Course Information

Course Code	1214A01	Course Category	Specialized / Compulsory
Class Format	Seminar	Credits	Academic Credit: 2
Department	Course of Mechanical Engineering	Student Grade	4th
Term	First Semester	Classes per Week	前期:4
Textbook and/or Teaching Materials	Textbook of Mechanical design drafting Manual Winch（CORONA PUBLISHING CO., LTD.）		
Instructor	Itami Shin		

Course Objectives

1. Able to understand specific structure of manual winch.
2. Able to design manual winch that satisfies given specifications (maximum hoisting load, lifting height, type).
3. Able to draw scheme drawing of manual winch by handwriting.

Rubric

	Ideal Level	Standard Level	Minimum Level
Achievement 1	Able to deeply understand of specific structure and role of hand-wound winches.	Able to understand specific structure of manual winch.	Able to understand specific structure of manual winch with one-on-one coaching.
Achievement 2	Able to design manual winch that satisfies given specifications (maximum hoisting load, lifting height, type) with your own power.	Able to design manual winch that satisfies given specifications (maximum hoisting load, lifting height, type) with coaching.	Able to design manual winch that satisfies given specifications (maximum hoisting load, lifting height, type) with one-on-one coaching.
Achievement 3	Able to draw scheme drawing of manual winch by handwriting with your own power.	Able to draw scheme drawing of manual winch by handwriting with coaching.	Able to draw scheme drawing of manual winch by handwriting with one-on-one coaching.

Assigned Department Objectives

学習・教育到達度目標 D-1 学習・教育到達度目標 E-2

Teaching Method

Outline	In order to obtain strength and durability that satisfy the design specifications, it is essential to master the selection of materials, dynamic calculations, and design methods for various mechanical elements. In mechanical design drawing, it is required to have a complex understanding of these. Therefore, using manual winch as a theme, the participants will learn mechanical design and drafting techniques centered on strength calculations. Manual winch is a machine that hoists heavy objects by manual force, and is used in all industrial fields, including the civil engineering and construction fields.
Style	Perform design calculations and drawing plans based on the design specifications given individually. It is important to design and draft while always imagining the shape of the product in your head. As this course is academic credit course, you are required to submit design calculation sheets and scheme drawings periodically as pre- and post-learning. 【60 class hours + 30 self-study hours】
Notice	Be sure to bring your textbook, design notebook, and graph paper with you every time. Since design calculations are performed using spreadsheet software, it is desirable for those who have a laptop computer to bring it with them. Reference book: Mechanical design calculations solved with Excel (Ohmsha)

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	Presentation of design specifications Design calculation 1	Able to understand and explain principles and design specifications of manual winch.
		2nd	Scheme drawing 1	Able to perform design calculations for wire ropes and winding drum.
		3rd	Design calculation 2 and layout drawing 1	Able to perform design calculations for reduction gear ratio and gear specifications, and layout drawings for gears and winding drums can be drawn.
		4th	Design calculation 3 and layout drawing 2	Able to perform design calculations for brake equipment and draw layout drawing of brake drums.
		5th	Design calculation 4	Able to perform deign calculations of rachet wheel and pawl.
		6th	Scheme drawing 2	Able to draw scheme drawing of claw shaft and collar.
		7th	Layout drawing 3	Able to draw layout drawings in axial direction.
		8th	Design calculation 5	Able to perform design calculations for handle shaft and intermediate shaft (during brake operation).
	2nd Quarter	9th	Design calculation 6	Able to perform design calculations for intermediate shaft (winding) and winding drum shaft.
		10th	Design calculation 7	Able to perform design calculations for handle shaft and parts around handle shaft.

		11th	Layout drawing 4 and Scheme drawing 3	Able to draw layout drawings and scheme drawings of handle shaft and peripheral parts of handle shaft.
		12th	Design calculation 8	Able to perform design calculations for intermediate shaft and parts around intermediate shaft.
		13th	Layout drawing 5 and Scheme drawing 4	Able to draw layout drawings and scheme drawings of intermediate shaft and peripheral parts of intermediate shaft.
		14th	Design calculation 9	Able to perform design calculations for intermediate shaft and parts around winding drum shaft.
		15th	Layout drawing 6 and Scheme drawing 5	Able to draw layout drawings and scheme drawings of winding drum shaft and peripheral parts of winding drum shaft.
		16th		

Evaluation Method and Weight (%)

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

Anan College	Year	2024	Course Title	Machine Dynamics 2

Course Information

Course Code	1214C01	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Mechanical Engineering	Student Grade	4th
Term	Second Semester	Classes per Week	後期:2
Textbook and/or Teaching Materials	Kikai Rikigaku (CORONA)		
Instructor	Kawabata Nariyuki		

Course Objectives

1. Understand and derive equations of motion for masses and rigid bodies.
2. Able to explain the types of vibration and to analyze the free motion of mass, spring, and dashpot systems by expressing them in terms of equations of motion.
3. Able to express and analyze the forced vibration of a damped system subjected to harmonic external force and harmonic displacement by equations of motion.
4. Understand resonance phenomena and explain how to prevent vibration.

Rubric

	Ideal Level	Standard Level	Minimum Level
Achievement 1	Able to analyze the motion of complex-shaped objects, including rigid bodies, and dynamical systems composed of many objects.	Able to derive the equations of motion for simple dynamical systems at the exercise level and analyze the motion of the system.	Able to derive the equations of motion for simple dynamical systems at the example level and analyze the motion of the system.
Achievement 2	Able to derive and analyze the equations of motion for free vibration and identify the parameters of the system from experimental results.	Able to derive the equations of motion for free vibration systems and explain analytical results.	Able to derive the equations of motion for free vibration systems.
Achievement 3	Able to derive the equations of motion for forced vibration systems and correctly explain the relationship between analytical results and resonance phenomena.	Able to derive the equations of motion for forced vibration systems and analyze the motion of the system.	Able to derive the equations of motion for forced vibration systems.
Achievement 4	Able to explain the phenomenon of resonance and suggest methods of vibration prevention that are appropriate to the situation.	Understand resonance phenomena and explain various vibration prevention methods.	Able to explain the basic application of various vibration prevention methods.

Assigned Department Objectives

学習・教育到達度目標 B-3 学習・教育到達度目標 D-1

Teaching Method

Outline	Machine dynamics is one of the essential fields for designing machines, which includes a wide range of fields related to machines such as statics, dynamics, kinematics, vibration, and control. The objective of this course is to master the fundamentals of kinematics to vibration science while using the knowledge acquired in industrial mechanics.
Style	At the end of each class, exercises will be provided as self-study assignments. Each student is required to solve the exercises and submit them as a review. Online assignments via manaba will be provided in advance of the class. Each student is required to check the contents of the next lesson in advance and answer the exercises. [30 hours of class time + 60 hours of self-study]
Notice	This course is based on and further developed from the physics and industrial mechanics courses. Students are expected to review the fundamentals of mechanics thoroughly before the beginning of the course. There are plenty of exercises other than the assignments, and students are expected to master the methods of vibration analysis through independent study. The portfolio evaluation will include the evaluation of [assignment reports (self-study assignments)] and [online review tests].

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	Fundamentals of Dynamics I and Fundamentals of Mathematics for Machine Dynamics	Understand Newton's laws of motion and be able to model systems. Able to calculate ordinary differential equations and matrices.
		2nd	Fundamentals of Dynamics II and Dynamics of Rigid Body I	Able to derive equations of motion for modeled systems and analyze simple systems. Able to calculate the moment of inertia of rigid bodies with relatively complex geometry.
		3rd	Dynamics of Rigid Body II	Able to analyze the plane motion of a rigid body considering its moment of inertia.

		4th	Vibration of single-degree-of-freedom system I	Able to analyze Maxwell's model and Voigt's model. Understand the function of springs and analyze the vibration of undamped single-degree-of-freedom systems.
		5th	Vibration of single-degree-of-freedom system II	Able to analyze the motion of a physical pendulum. Understand the phenomenon of damped vibration and classify it by damping ratio.
		6th	Vibration of single-degree-of-freedom system III	Understand the function of a dashpot and be able to analyze the vibration of a damped single-degree-of-freedom system. Understand logarithmic damping rate and be able to calculate the damping rate from damping waveforms.
		7th	Vibration of single-degree-of-freedom system IV and Forced Vibration I	Able to analyze the vibration of single-degree-of-freedom system subjected to impact force. Analyze forced vibration due to harmonic external force and explain the resonance phenomenon.
		8th	Midterm examination	
	4th Quarter	9th	Forced Vibration II	Able to analyze by the half power method. Able to analyze forced vibration due to displacement input.
		10th	Vibration of two-degree-of-freedom systems	Able to analyze free and forced vibration analysis of two-degree-of-freedom systems.
		11th	Vibration of continuous systems	Understand modeling by partial differential equations for strings and be able to analyze the vibration of a continuum.
		12th	Vibration of Rotating Body I	Understand rotational motion and be able to analyze vibrations due to critical velocity and disproportionality.
		13th	Vibration of Rotating Body II	Understand the disproportionate amount of disproportion and be able to design the balancing design of rotating parts.
		14th	Prevention of Vibration I	Able to explain the types and characteristics of vibration prevention methods.
		15th	Prevention of Vibration II	Understand vibration insulation and be able to design dynamic absorbers.
		16th	Reflection of final examination	

Evaluation Method and Weight (%)

	midterm / final exam	quiz	portfolio	presentation / attitude	other	Total
Subtotal	70	0	30	0	0	100
Basic Proficiency	10	0	0	0	0	10
Specialized Proficiency	60	0	30	0	0	90
Cross Area Proficiency	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Strength of Materials 2

Course Information

Course Code	1214C03	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Mechanical Engineering	Student Grade	4th
Term	First Semester	Classes per Week	前期:2
Textbook and/or Teaching Materials	PEL 材料力学（実教出版）/参考書は図書館にたくさんあります。自分に合ったものを探してください。		
Instructor	Okumoto Yoshihiro		

Course Objectives

1．各種はりについて、たわみ角とたわみを計算できる。
2．長柱などの柱部材の軸方向の座屈応力を計算できる。
3．簡単な骨組み構造の各部材の軸力を計算できる。

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(可)
到達目標1	複雑な荷重を受けるはりのたわみ角とたわみを計算できる。	集中荷重または分布荷重のみを受けるけるはりのたわみ角とたわみを計算できる。	はりのたわみの基礎方程式を用いることではりのたわみ角とたわみが求められることを説明できる。
到達目標2	長柱以外の柱についても実験式等を用いて幅広く座屈荷重の評価ができる。	オイラーの式をもちいて、長柱の座屈応力を計算できる。	柱の座屈現象を理解し、説明できる
到達目標3	構造物をマトリックスで分割し、各要素の負担する荷重や変形を求める方法を理解できる。	複雑なトラスの各部材に発生する軸力を計算できる。	簡単なトラスの各部材に発生する軸力を計算できる。

Assigned Department Objectives

学習・教育到達度目標 B-3 学習・教育到達度目標 D-1

Teaching Method

Outline	機械・構造物に外荷重が作用する場合、それらの部材又は全体が荷重に耐え得るか否かは、部材に生ずる力(応力)や変形(ひずみ)で決まる。本教科では応力とひずみの概念を理解し、荷重とこれらの関係を解析する手法並びに解析結果を機械設計に作用する考え方を身につけることを目標とする。
Style	講義の時間を使って、材料力学の問題の解析方法を伝授する。適宜指定する演習問題を解くことにより、学習の理解を深めてほしい。補講において実施される小テストと中間試験（リスク分散のため複数開催）に向けての準備を怠らないように励むこと。 ※この科目は学修単位科目のため、事後学習として毎講義4時間ごとの演習課題を課します。【授業時間31時間＋自学自習時間60時間】
Notice	講義内容を理解し、機械設計に応用できるようになるには、正しく解析できる「技術」を習得する必要があり、講義後の自主的演習を欠かさず実施してほしい。尚、大きな数値と小さな数値の混在する計算および単位の換算など間違えないことも大切である。就職・進学に関しての重要な受験科目であるので、本番で高得点を取得できるよう頑張ってほしい。

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	はりの曲げモーメント	はりの曲げモーメント線図を作成できる。
		2nd	はりの曲げ応力	はりの曲げ応力の最大値と応力分布についての計算ができる
		3rd	はりのたわみ　たわみの基礎式　片持ちはりのたわみ	集中荷重や分布荷重が作用する片持はりのたわみたわみ角を計算できる。
		4th	はりのたわみ　片持ちはりと単純支持はりのたわみ	集中荷重や分布荷重が作用する片持はりのたわみたわみ角を計算できる。
		5th	はりのたわみ　単純支持はりのたわみ	集中荷重や分布荷重が作用する両端支持はりのたわみたわみ角を計算できる。
		6th	はりのたわみ　少し複雑なはりのたわみ	複数の集中荷重や特殊な分布荷重が作用するはりのたわみたわみ角を計算できる。
		7th	はりのたわみ　はりの重ねあわせと組み合わせ	はりのたわみとたわみ角の重ね合わせと組み合わせをつかって、複雑なはりのたわみたわみ角を計算できる。
		8th	中間試験	
	2nd Quarter	9th	不定静はりの問題	集中荷重や分布荷重が作用する不静定はりのたわみたわみ角を計算できる。
		10th	不定静はりの問題	集中荷重や分布荷重が作用する不静定はりのたわみたわみ角を計算できる。
		11th	柱の座屈	オイラーの式を用いて長柱の座屈荷重が計算できる。
		12th	柱の座屈	ランキンの式等を用いて柱の座屈荷重が計算できる。
		13th	簡単な骨組み構造	接点法を用いて、簡単なトラスの各部材の軸力を計算できる。
		14th	簡単な骨組み構造	接点法を用いて、簡単なトラスの各部材の軸力を計算できる。
		15th	期末試験前のまとめ	
		16th	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	70	20	0	0	10	100
基礎的能力	0	0	0	0	0	0
専門的能力	70	20	0	0	10	100
分野横断的能力	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Strength of Materials 3

Course Information

Course Code	1214C13	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Mechanical Engineering	Student Grade	4th
Term	Second Semester	Classes per Week	後期:2
Textbook and/or Teaching Materials	PEL 材料力学（実教出版）		
Instructor	Okumoto Yoshihiro		

Course Objectives

1. 多軸応力の意味を説明でき、二軸応力について任意の斜面に作用する主応力と最大せん断応力を計算できる。
2. 部材が引張や圧縮、ねじりを受ける場合のひずみエネルギを計算できる。
3. カスチリアノの定理を理解し、不静定はりの問題などに応用できる。

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(可)
到達目標1	種々の金属材料の応力ひずみ関係から材料の機械適特性を評価できる。	モールの応力円を描き主応力、最大せん断応力を計算できる。	多軸応力の意味を説明できる。
到達目標2	引張圧縮とねじりが同時に作用する部材のひずみエネルギを計算できる。	引張圧縮やねじりのいずれかを受けた部材のひずみエネルギを計算できる。	引張負荷を受けた部材のひずみエネルギを計算できる。
到達目標3	カスチリアノの定理を使って不静定はりの反力を求めることができる。	カスチリアノの定理を使って衝撃応力やはりのたわみを計算できる。	カスチリアノの定理を説明できる。

Assigned Department Objectives

学習・教育到達度目標 B-3 学習・教育到達度目標 D-1

Teaching Method

Outline	機械・構造物に外荷重が作用する場合，それらの部材又は全体が荷重に耐え得るか否かは，部材に生ずる力（応力）や変形（ひずみ）で決まる．本教科では，はり，軸及び柱を主対象に，応力と変形の算出法を理解し，機械設計に応用する知識・能力を身につけることを目標とする。この科目は企業で火力発電用ボイラの設計基準の研究を担当していた教員が，その経験を活かし、応力・ひずみ計算の手法等について講義形式で授業を行うものである。
Style	講義と演習問題で理解を深める。定期試験と小テストの結果で評価する。また，この科目は学修単位科目のため、事前・事後学習として演習課題の解答提出を課します。 【授業時間31時間＋自学自習時間60時間】
Notice	講義内容を理解し、機械設計に応用できるようになるには、正しく解析できる「技術」を習得する必要があり、宿題等を通じて、講義後の自主的演習を欠かさず実施して欲しい。尚、大きな数値と小さな数値の混在する計算及び単位の換算など間違えない事も大切である。

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	到達目標，評価方法等の説明。組み合わせ応力について。	多軸応力の意味を説明できる。
		2nd	組み合わせ応力について。	二軸応力状態での主応力と最大せん断応力を求めモールの応力円を描くことができる。
		3rd	組み合わせ応力について。	二軸応力状態で任意の斜面に作用する垂直応力とせん断応力を計算できる。
		4th	小テスト	
		5th	組み合わせ応力について。	二軸応力状態でのモールのひずみ円を説明できる。
		6th	組み合わせ応力について。	多軸応力条件下でのミーゼスの相当応力を計算できる。
		7th	組み合わせ応力について。	最大主応力説、最大せん断応力説、せん断ひずみエネルギ説を説明できる。
		8th	中間試験	
	4th Quarter	9th	ひずみエネルギを用いた解法	部材が引張・圧縮負荷を受けた場合のひずみエネルギを計算できる。
		10th	ひずみエネルギを用いた解法	部材がねじり負荷を受けた場合のひずみエネルギを計算できる。
		11th	ひずみエネルギを用いた解法	ひずみエネルギを用いて、部材に衝撃荷重が作用した場合に生じる応力を計算できる。
		12th	小テスト	
		13th	ひずみエネルギを用いた解法	カスチリアノの定理を用いてはりのたわみを計算できる。
		14th	ひずみエネルギを用いた解法	カスチリアノの定理を用いて不静定はりの反力を計算できる。
		15th	ひずみエネルギを用いた解法	カスチリアノの定理を用いてトラスと曲がりはりの変位を計算できる。
		16th	期末試験	

Evaluation Method and Weight (%)

	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	70	20	0	0	10	100
基礎的能力	0	0	0	0	0	0
専門的能力	70	20	0	0	10	100
分野横断的能力	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Hydrodynamics 1

Course Information

Course Code	1214D01	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Mechanical Engineering	Student Grade	4th
Term	First Semester	Classes per Week	前期:2
Textbook and/or Teaching Materials	水力学基礎と演習（パワー社）/例題と演習・水力学（パワー社）		
Instructor	Okita Yuji		

Course Objectives

1．流体の性質について説明でき、粘性法則を用いた計算ができる。
2．圧力の概念を理解し、マノマータを使った圧力測定の計算ができる。
3．平面板に作用する力や浮力など、流体の静力学に関する計算ができる。
4．ベルヌーイの定理を理解し、それを流れに適用した問題を解くことができる。
5．運動量の法則を理解し、流体が物体に及ぼす力を計算できる。

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
到達目標1	ニュートンの粘性法則を用いた計算、および圧力、浮力に関する複合的な問題を解くことができる。	ニュートンの粘性法則を用いた計算、および圧力、浮力大きさを計算で求めることができる。	ニュートンの粘性法則、および圧力、浮力について基礎的な問題を解くことができる。
到達目標2	圧力の概念を説明でき、マノマータを使った圧力測定の応用問題を解くことができる。	圧力の概念を説明でき、マノマータを使った圧力測定の基礎問題を解くことができる。	マノマータを使った圧力測定の基礎問題を解くことができる。
到達目標3	平面板に作用する力や浮力について説明でき、流体の静力学の応用問題を解くことができる。	平面板に作用する力や浮力について説明でき、流体の静力学の基礎問題を解くことができる。	流体の静力学の基礎問題を解くことができる。
到達目標4	ベルヌーイの定理を説明でき、設計等に応用させた複合的な問題を解くことができる。	ベルヌーイの定理を説明でき、流れの速度や圧力を計算で求めることができる。	ベルヌーイの法則を使って流れの速度や圧力を計算で求めることができる。
到達目標5	運動量定理について説明でき、設計等で必要となる力の大きさを計算で求めることができる。	運動量定理について説明でき、流れによって作られる力を求めることができる。	運動量定理を使って流れによって作られる力を求めることができる。

Assigned Department Objectives

学習・教育到達度目標 B-3 学習・教育到達度目標 D-1

Teaching Method

Outline	気体と液体を総称して流体という。水力学は流体の流れの基礎的な部分を取り扱った学問で、流体が静止した場合及び運動した場合の両方についての力学を対象としている。工学において流体が関係している分野は多く、我々の身近に存在する流れだけでなく、幅広い機械製品に流体の流れは関与している。本講義では流体の流れの基礎知識を身に付け、設計等に寄与する計算能力を習得し、問題を解くことができる能力を修得することを目標とする。
Style	講義が中心であるが、適宜演習問題を解いて実力を養う。各自、関数電卓を持参してください。 【授業時間31時間＋自学自習時間60時間】
Notice	本講義を受講するにあたって重要な基礎知識は、ニュートンの運動法則、質量保存則、エネルギー保存則などである。効率の良い流体機械や流体機器を設計するには、流れの性質をよく知ること、自然現象から学ぶという姿勢が大切である。毎回の授業で自学自習レポート（予習および復習）の提出が必要です。予習および復習（演習問題）を行うことで、理解を深め、様々な流体工学の問題を解く能力を養ってください。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：流体力学　シンプルにすれば「流れ」がわかる（実教出版）　平惣書店

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	流体の性質	流体の性質および単位についてを理解し、説明できる。
		2nd	流体の性質	ニュートンの粘性法則を理解し、計算問題を解くことができる。
		3rd	流体静力学	圧力について理解し、パスカルの原理について説明できる。
		4th	流体静力学	絶対圧力とゲージ圧について理解し、マノメータの原理とそれに基づく
		5th	流体静力学	平面板に作用する力について、計算問題を解くことができる。
		6th	流体静力学	浮力について理解し、計算で浮力の大きさを求めることができる。
		7th	流体静力学	相対的静止の状態にある液体について、計算問題を解くことができる。
		8th	中間試験	
	2nd Quarter	9th	連続の式	質量保存の法則と連続の式について理解し、計算問題を解くことができる。
		10th	ベルヌーイの定理	オイラーの運動方程式からベルヌーイの定理を誘導できる。

		11th	ベルヌーイの定理	ベルヌーイの定理を理解し、その基礎問題を解くことができる。
		12th	ベルヌーイの定理	ベルヌーイの定理を適用し、応用問題を解くことができる。
		13th	運動量の法則	運動量の法則について理解し、一方向に作用する力を計算できる。
		14th	運動量の法則	運動量の法則を用いて、二方向に作用する力を求めることができる。
		15th	運動量の法則	ベルヌーイの定理と運動量の法則を用いた複合的な問題を解くことができる。
		16th	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	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	Thermodynamics 1

Course Information

Course Code	1214D03	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Mechanical Engineering	Student Grade	4th
Term	First Semester	Classes per Week	前期:2
Textbook and/or Teaching Materials	例題でわかる工業熱力学(森北出版)		
Instructor	Matsuura Fuminori		

Course Objectives

V-A-4 Mechanical System::Heat-Fluid
a. Fundamentals of Thermodynamics
a1. Can explain the definitions and units of various physical quantities used in thermodynamics.
a2. Can explain the meaning of closed and open systems, system equilibrium, and state properties.

b. First Law of Thermodynamics
b1. Can explain the first law of thermodynamics.
b2. For closed and open systems, can calculate heat, work, internal energy, and enthalpy using the energy equation.
b3. Can explain the work done by closed and open systems on the surroundings using a p-V diagram.

c. Properties and State Changes of Ideal Gases
c1. Can explain the relationship between the pressure, volume, and temperature of an ideal gas using the state equation.
c2. Can explain the interrelationships between specific heats at constant volume and pressure, the heat capacity ratio, and the gas constant.
c3. Can explain the relationship between changes in internal energy or enthalpy and temperature.
c4. Understands the meaning of isobaric changes, isochoric changes, isothermal changes, reversible adiabatic changes, polytropic changes, and throttling changes, and can calculate state properties, heat, and work.
c5. Can calculate the gas constant, specific heat, internal energy, and enthalpy of a mixture of gases.
c6. For moist air, can calculate absolute humidity, relative humidity, specific volume, and enthalpy, both from calculations and using the psychrometric chart.

Rubric

	Ideal Level	Standard Level	Unacceptable Level
Achievement 1	In the exam questions and report assignments related to learning objective [a], the achievement rate is above 80%	In the exam questions and report assignments related to learning objective [a], the achievement rate is above 65%	In the exam questions and report assignments related to learning objective [a], the achievement rate does not fall below 60%
Achievement 2	In the exam questions and report assignments related to learning objective [b], the achievement rate is above 80%	In the exam questions and report assignments related to learning objective [b], the achievement rate is above 65%	In the exam questions and report assignments related to learning objective [b], the achievement rate does not fall below 60%
Achievement 3	In the exam questions and report assignments related to learning objective [c], the achievement rate is above 80%	In the exam questions and report assignments related to learning objective [c], the achievement rate is above 65%	In the exam questions and report assignments related to learning objective [c], the achievement rate does not fall below 60%

Assigned Department Objectives

学習・教育到達度目標 B-3 学習・教育到達度目標 D-1

Teaching Method

Outline	Enable to explain the basic matters, the first law of thermodynamics, and about ideal gases in thermodynamics. Explanations will be based on the textbook, and problem exercises will be conducted.
Style	Lecture hours: 30 hours + Self-study hours: 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	Fundamentals of Thermodynamics	Can explain the meaning of closed and open systems, heat, and thermal equilibrium
		2nd	Fundamentals of Thermodynamics	Can explain the definitions and units of physical quantities used in thermodynamics, as well as the meaning of state properties
		3rd	The First Law of Thermodynamics	Can explain the first law of thermodynamics
		4th	The First Law of Thermodynamics	Can explain the relationship between heat, work, and change in internal energy for absolute work (work done by closed systems)
		5th	The First Law of Thermodynamics	Can calculate heat, work, internal energy, and enthalpy for industrial work (work done by open systems)
		6th	Problem Exercises	Can answer problems related to the fundamentals of thermodynamics and the first law of thermodynamics
		7th	Midterm Exam	

		8th	Properties and State Changes of an Ideal Gas	Can explain the state equation of an ideal gas
	2nd Quarter	9th	Properties and State Changes of an Ideal Gas	Can explain specific heat, internal energy, and enthalpy
		10th	Properties and State Changes of an Ideal Gas	Can explain the state changes of an ideal gas
		11th	Properties and State Changes of an Ideal Gas	Can explain the isothermal and isobaric reversible changes of an ideal gas
		12th	Properties and State Changes of an Ideal Gas	Can explain the isochoric and adiabatic reversible changes of an ideal gas
		13th	Properties and State Changes of an Ideal Gas	Can explain the polytropic reversible changes of an ideal gas
		14th	Properties and State Changes of an Ideal Gas	Can explain the handling of mixed gases and determine the absolute and relative humidity of moist air from the psychrometric chart
		15th	Final Exam	
		16th		

Evaluation Method and Weight (%)

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

Anan College	Year	2024	Course Title	Hydrodynamics 2

Course Information

Course Code	1214D11	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Mechanical Engineering	Student Grade	4th
Term	Second Semester	Classes per Week	後期:2
Textbook and/or Teaching Materials	水力学基礎と演習（パワー社）/例題と演習・水力学（パワー社）		
Instructor	Okita Yuji		

Course Objectives

1．層流と乱流について説明でき、管摩擦力係数から管路内の圧力損失の計算ができる。
2．管路内の種々の損失について説明でき、総損失の値を求めることができる。
3．抗力と揚力の計算ができる。
4．次元解析として、バッキンガムのn定理を用いて式を求めることができる。
5．レイノルズおよびフルードの相似則を用いた計算ができる。

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
到達目標1	層流と乱流について説明でき、管摩擦力係数から管路内の圧力損失の値を求め設計計算に応用できる。	層流と乱流について説明でき、管摩擦力係数から管路内の圧力損失の計算ができる。	管摩擦力係数から管路内の圧力損失の計算ができる。
到達目標2	管路の種々の損失について説明でき、複雑な配管系での総損失の値を求めることができる。	管路の種々の損失について説明でき、基礎的な配管系での総損失の値を求めることができる。	管路の種々の損失について基礎的な配管系での総損失の値を求めることができる。
到達目標3	抗力および揚力の値を求め、抗力および揚力の計算ができるとともに、設計計算に応用できる。	抗力および揚力の値を求め、抗力および揚力の計算ができる。	抗力および揚力の基礎的な計算ができる。
到達目標4	バッキンガムのn定理について説明でき、流体工学に関する応用的な式を算出することができる。	バッキンガムのn定理について説明でき、流体工学に関する基礎的な式を算出することができる。	バッキンガムのn定理について基礎的な問題を解くことができる。
到達目標5	レイノルズおよびフルードの相似則を用いて応用的な問題を解くことができる。	レイノルズおよびフルードの相似則を用いて基礎的な問題を解くことができる。	レイノルズの相似則を用いて基礎的な問題を解くことができる。

Assigned Department Objectives

学習・教育到達度目標 A-3 学習・教育到達度目標 B-3 学習・教育到達度目標 D-1

Teaching Method

Outline	本講義は、前期で開講される「水力学」を継続させたものである。前期で学んだ流体静力学やベルヌーイの問題を基礎として、本講義では「管路内の流れ」、「抗力と揚力」、「次元解析と相似則」などの演習問題を解くことにより、「水力学」の理解をより確かなものにする。
Style	本講義は、より実用面が強い内容であるため、多くの演習を授業中や授業外で解くことで設計等に役立つ能力を養うことを目的とする。各自、関数電卓を持参してください。また，企業訪問による学外授業を実施し、授業で学んだ理解を深めるため簡易風洞を用いた実験観察を行う。 【授業時間31時間＋自学自習時間60時間】
Notice	水力学に関する問題解決能力を養うためには、演習問題をできるだけ多く自力で解くことが求められます。各種の定理、法則を活用して、設計等の問題に応用できる能力を修得することが大切です。毎回の授業で自学自習レポート（予習および復習）の提出が必要です。予習および復習（演習問題）を行うことで、理解を深め、様々な流体工学に関する問題を解く能力を養ってください。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：流体力学　シンプルにすれば「流れ」がわかる（実教出版）　平惣書店

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	管路内の流れ	層流と乱流について説明でき、円管内層流の速度分布を求めることができる。
		2nd	管路内の流れ	管摩擦係数について理解し、圧力損失を求めることができる。
		3rd	管路内の流れ	円管内乱流の速度分布について理解し、円管以外の断面をもつ管路の摩擦係数を求めることができる。
		4th	管路内の流れ	管路における入口損失、断面積が変化した場合、曲がり管、弁・コック、分岐・合流管による損失について説明できる。
		5th	管路内の流れ	水力こう配線と総損失について説明できる。
		6th	管路内の流れ	企業等における学外授業から実際の現場でどのような水力学の知識が応用されているかを理解し、その内容について説明できる。
		7th	中間試験	
		8th	抗力と揚力	抗力について理解し、抗力の値を計算で求めることができる。
	4th Quarter	9th	抗力と揚力	境界層の概念を理解し、平板の摩擦抗力を求めることができる。
		10th	抗力と揚力	球のまわりの流れについて説明することができる。

		11th	抗力と揚力	揚力について理解し、揚力の値を計算で求めることができる。
		12th	抗力と揚力	簡易風洞および揚力天秤を用いた実験により揚力を理解し、翼まわりの流れの可視化から翼の剥離や翼端渦を説明できる。
		13th	次元解析	バッキンガムのn定理を用いて各種の流体工学に関する式を算出できる。
		14th	相似則	相似の条件とレイノルズの相似則について説明できる。
		15th	相似則	フルードの相似則について説明でき、相似則に関する問題を解くことができる。
		16th	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	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	Thermodynamics 2

Course Information

Course Code	1214D13	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Mechanical Engineering	Student Grade	4th
Term	Second Semester	Classes per Week	後期:4
Textbook and/or Teaching Materials	Industrial Thermodynamics with Examples Problem (2nd Edition), Tetsuo Hirata,et. al. ,Morikita Publishing Co., Ltd.		
Instructor	Kusano Koji,Nishimoto Koji		

Course Objectives

1. Explain the first and second laws of thermodynamics.
2. Obtain the thermal efficiency of various heat engines and the Carnot cycle, and explain the changes in entropy in reversible and irreversible changes.
3. Draw P-V diagrams of Otto cycle and Diesel cycle, and explain the difference between the two cycles from the thermal efficiency that affects the compression ratio and cut-off ratio.

Rubric

	Ideal Level	Standard Level	Unacceptable Level
Achievement 1	Can explain the 1st and 2nd laws of thermodynamics in his/her own words and obtain each state quantity.	Can explain the first and second laws of thermodynamics in one's own words.	Can explain the 1st and 2nd laws of thermodynamics while looking at textbooks.
Achievement 2	Obtain the thermal efficiency of the Carnot cycle and various cycles, and explain the change in entropy in reversible and irreversible changes.	The thermal efficiency of the Carnot cycle and various cycles can be determined.	Explain the formulas and concepts for calculating the thermal efficiency of the Carnot cycle.
Achievement 3	You can explain the difference between the Otto cycle and diesel cycle PV diagrams, and how to improve their efficiency and performance.	The Otto cycle and the Diesel cycle are explained, and thermal efficiency and physical quantities in each state can be calculated.	You can explain the Otto cycle and diesel cycle while looking at textbooks and calculate the thermal efficiency.

Assigned Department Objectives

学習・教育到達度目標 B-3 学習・教育到達度目標 D-1

Teaching Method

Outline	In this course, the instructor who was in charge of designing the engine of a snowmobile uses his experience to apply the basics taught in "Thermodynamics", the first law of thermodynamics, and the equation of state of an ideal gas to study pressure and volume. ・Understanding and understanding of thermodynamics through the calculation of temperature, heat quantity, and work, the thermal efficiency of heat engines and the Carnot cycle, and the processes and P-V diagrams of specific heat engines such as the Otto cycle and diesel cycle. The class consists of lectures and exercises for the purpose of acquiring practical skills.
Style	Students will review and calculate the contents of thermodynamics they learned in the first semester, and will learn the second law of thermodynamics, the Carnot cycle, entropy, and the Otto cycle (gasoline engine) and diesel cycle, which are used as means of transportation on a daily basis as practical applications. learn. Deepen your understanding while answering the exercises. [30 hours of class time + 60 hours of self-study time] This course is a learning credit course, so reports and online tests will be conducted as pre- and post-learning.
Notice	Try to solve as many specific problems as possible to deepen your knowledge of thermodynamics. After teaching the basics, the lecture takes an active-learning format, in which students work in teams to present the results of their discussions and calculations on exercises created by the instructor.

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	1. Basic review of thermodynamics	(1) To be able to explain the unit system of thermodynamics and to calculate temperature and specific heat.
		2nd		(2) Explain and calculate the relationship between work, internal energy and enthalpy, and the first law of thermodynamics.
		3rd		(3) Understand and calculate the ideal gas law.
		4th		(4) Explain and calculate the definition of the general gas constant.
		5th		(5) To understand the state change of an ideal gas, and to be able to calculate work, heat, etc.
		6th	2. Second Law of Thermodynamics	(1) Explain the second law of thermodynamics.
		7th		(2) Understand the meaning of the cycle and calculate the thermal efficiency of the heat engine.
		8th	[Mid-term exam]	
	4th Quarter	9th		(3) Understand the state change of the Carnot cycle and calculate the thermal efficiency.

		10th		(4) Understand the definition of entropy and explain entropy changes in reversible and irreversible changes.
		11th		(5) A cycle can be represented by a T-S diagram.
		12th	3. Otto cycle and diesel cycle (practical engine)	(1) Explain the Otto cycle.
		13th		(2) explain the diesel cycle;
		14th		(3) The thermal efficiency of the Otto cycle and Diesel cycle and physical quantities at each state point can be calculated.
		15th	【routine exam】	
		16th	[Returning answers]	

Evaluation Method and Weight (%)

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

Anan College	Year	2024	Course Title	Instrumentaion Engineering

Course Information

Course Code	1214H01	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Mechanical Engineering	Student Grade	4th
Term	Second Semester	Classes per Week	後期:2
Textbook and/or Teaching Materials	Schematic Well Understood Mechanical Measurement （KYORITSU SHUPPAN CO., LTD.）		
Instructor	Itami Shin		

Course Objectives

1. Able to understand and explain basic knowledge of measurement (International System of Units, measurement terminology, etc.).
2. Able to understand and explain laws and phenomena related to measurement principles.
3. Able to understand and explain the structure, measurement principle, and measurement method of typical mechanical measuring instruments.

Rubric

	Ideal Level	Standard Level	Minimum Level
Achievement 1	Able to deeply understand and explain basic knowledge of measurement (International System of Units, measurement terminology, etc.).	Able to understand and explain basic knowledge of measurement (International System of Units, measurement terminology, etc.).	Able to explain basic knowledge of measurement (International System of Units, measurement terminology, etc.) while referring to related materials.
Achievement 2	Able to deeply understand and explain laws and phenomena related to measurement principles.	Able to understand and explain laws and phenomena related to measurement principles.	Able to explain laws and phenomena related to measurement principles while referring at related materials.
Achievement 3	Able to deeply understand and explain the structure, measurement principles, and measurement methods of typical mechanical measuring instruments.	Able to understand and explain the structure, measurement principles, and measurement methods of typical mechanical measuring instruments.	Able to explain the structure, measurement principles, and measurement methods of typical mechanical measuring instruments while referring to related materials.

Assigned Department Objectives

学習・教育到達度目標 D-1

Teaching Method

Outline	In this lecture, you will learn basic knowledge about measurement (International System of Units, measurement error, uncertainty, definitions and types of measurement, etc.), structures and principles of various mechanical measuring instruments, measurement methods and characteristics.
Style	Classes are conducted in a classroom style centered on textbooks. Have them look at actual measuring equipment (various sensors, block gauges, radiation thermometers, metal wire resistance thermometers, etc.) as necessary. As this course is academic credit course, you are required to submit report summarizing what prepared and reviewed as pre- and post-learning. 【31 class hours + 60 self-study hours】
Notice	About two reports are planned, but be sure to write in your own words. It is not acceptable to easily copy or reproduce information on the Internet or other people's reports. Reference book: INTRODUCTION MEASUREMENT ENGINEERING 3rd Edition/Revised Edition (Morikita Publishing Co., Ltd.)

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	Basic overview of measurements	Able to understand and explain the definition of measurement and measurement engineering.
		2nd	Basic overview of measurements	Able to understand and explain sensors and measurement methods in measurement engineering.
		3rd	Basic overview of measurements	Able to understand and explain measurement methods and measurement terms in measurement engineering.
		4th	Basic overview of measurements	Able to understand and explain the International System of Units and measurement errors.
		5th	Handling of measurement data	Able to understand and explain significant figures and statistical processing of measured data.
		6th	Length measurement	Able to understand and explain the structure, principles, measurement methods and characteristics of various measuring instruments related to length measurement.
		7th	Length measurement	Able to understand and explain the structure, principles, measurement methods and characteristics of various measuring instruments related to length measurement.
		8th	Second semester midterm exam	

	4th Quarter	9th	Angle measurement	Able to understand and explain the structure, principle, measurement method and characteristics of various measuring instruments related to angle measurement.
		10th	Surface measurement	Able to understand and explain the structure, principle, measurement method and characteristics of various measuring instruments related to surface measurement.
		11th	Measurement by coordinates	Able to understand and explain the structure, principles, measurement methods and characteristics of 2D and 3D measuring machines.
		12th	Mass and force measurements	Able to understand and explain the structure, principles, measurement methods and characteristics of various measuring instruments related to mass and force.
		13th	Force and pressure measurements	Able to understand and explain the structure, principle, measurement method and characteristics of various measuring instruments related to force and pressure.
		14th	Density and temperature measurement	Able to understand and explain the structure, principle, measurement method and characteristics of various measuring instruments related to density and temperature.
		15th	Measurement of temperature, humidity, heat, time and vibration	Able to understand and explain the structure, principles, measurement methods and characteristics of various measuring instruments for measuring temperature, humidity, heat, time, and vibration.
		16th	Return of final exam answers for the second semester	

Evaluation Method and Weight (%)

	Midterm/Final exam	Quiz	Portfolio	Presentation/Attitude	Other	Total
Subtotal	65	0	20	15	0	100
Basic Proficiency	25	0	5	0	0	30
Specialized Proficiency	40	0	10	15	0	65
Cross Area Proficiency	0	0	5	0	0	5

Anan College	Year	2024	Course Title	Experiments in Mechanical Engineering 3

Course Information

Course Code	1214T02	Course Category	Specialized / Compulsory
Class Format	Experiment / Practical training	Credits	Academic Credit: 4
Department	Course of Mechanical Engineering	Student Grade	4th
Term	Year-round	Classes per Week	前期:4 後期:4
Textbook and/or Teaching Materials	Distribute materials as required for each experimental theme.		
Instructor	Nakaoka Nobushi,Okumoto Yoshihiro,Okita Yuji,Matsuura Fuminori,Kawabata Nariyuki,Itami Shin		

Course Objectives

1. Understand the purpose and principles of the experiment and be able to carry out the experiment based on the guided experimental method.
2. Understand the principles of the experimental apparatus and be able to handle it correctly and make appropriate measurements.
3. Be able to organise and analyse the results of experiments and summarise them in a report using a PC.
4. Have an autonomous robotic car assembled and driven using mechatronic technology, and summarise the results in a report using a PC.

Rubric

	Ideal Level	Standard Level	Unacceptable Level
Achievement 1	Understand the purpose and principles of the experiment and be able to carry out the experiment based on the guided experimental method, considering the implications of the procedure.	Understand the purpose and principles of the experiment and be able to carry out the experiment based on the guided experimental method.	Understand the purpose and principles of the experiment through one-to-one guidance and be able to carry out the experiment based on the guided experimental method.
Achievement 2	Understand the principles of the experimental apparatus and be able to make the correct handling and appropriate measurements while summarising the results.	Understand the principles of the experimental apparatus and be able to handle it correctly and make appropriate measurements.	Understand the principles of laboratory equipment and be able to handle it correctly and make appropriate measurements through one-to-one instruction.
Achievement 3	Be able to organise and analyse the results of experiments and compile them into a well-designed report using a PC.	Be able to organise and analyse the results of experiments and summarise them in a report using a PC.	Be able to organise and analyse the results of experiments and summarise them in a report using a PC, with one-to-one guidance.
Achievement 4	Have an autonomous robotic car assembled and driven, which can be summarised in a report by the individual.	Have the team assemble and drive an autonomous robotic car and summarise it as a team in a report.	To have an autonomous robot car assembled and driven, which can be summarised in a report with one-to-one guidance.

Assigned Department Objectives

学習・教育到達度目標 D-2 学習・教育到達度目標 D-3 学習・教育到達度目標 D-4 学習・教育到達度目標 E-1 学習・教育到達度目標 E-2

Teaching Method

Outline	The students confirm the theory of each field of mechanical engineering through experiments, understand the necessity of the theory and learn the measurement principles for obtaining experimental values (physical quantity to be measured). They also acquire general technical writing skills. Using mechatronics technology, have each group assemble and drive an autonomous robot car and write a report on it. In the power transmission experiment, teachers who were in charge of snowmobile engine design use their experience to teach the power transmission performance evaluation method of gears and belt drives and the transmission characteristics of gears and belt drives through experiments.
Style	A proficiency test will be given at the end of the previous semester, so students should familiarise themselves with the content of each experimental topic. As this is a credit course, students are required to submit reports as pre- and post-learning. In addition, an assignment for CAD/CAM is due each week. 【121 class hours + 60 self-study hours】
Notice	Failure to submit an experimental report will be treated as an absence, and even one absence from each experimental topic will, in principle, be treated as a failing grade. If you are going to be absent for special or unavoidable reasons, you must inform us in advance. In the event of an unauthorised absence, strict instructions will be given. Please note that the attire and preparations are different for each theme.

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	Mechatronics 1 & 2	The characteristics of the photosensor can be measured and the measurement results can be summarised.
		2nd	Mechatronics 1 & 2	Measure the characteristics of ultrasonic sensors and summarise the measurement results.
		3rd	Mechatronics 1 & 2	Programmes can be written that use motor drivers to control the motors and to move forward and rotate the autonomous robotic car.

		4th	Fluid engineering	Experiments measuring the flow coefficient of a 60° triangular scepter can explain how flow is measured by the scepter.
		5th	Fluid engineering	From experiments measuring the coefficient of friction of circular tubes, learn about the pressure drop in circular tubes and explain the differences in the coefficients of friction.
		6th	Fluid engineering	Conduct flow measurement experiments with pipelines having an aperture mechanism and explain the relationship between the structure of the aperture mechanism and the flow coefficient. Based on the results of flow measurement experiments with aperture mechanisms, be able to explain the flow behaviour of various aperture mechanisms and predict the results.
		7th	Power transmission (gear)	The effect of speed and torque on transmission efficiency is investigated by spur gear testing using the step-load method.
		8th	Power transmission (gear)	From the results of the spur gear test, the transmission efficiency due to speed and torque is discussed in terms of P-V value and film pressure ratio.
	2nd Quarter	9th	Power transmission (magnetic gear)	The mechanism of magnetic gears that can transmit power without contact compared to conventional gears is explained, the effects of rotation speed and torque on transmission efficiency are investigated, and the advantages of magnetic gears compared to conventional gears are understood.
		10th	Material strength (tensile test)	Perform tensile tests on steel materials and explain yield stress, tensile strength, elongation, drawing and stress-strain relationships.
		11th	Material strength (impact test)	Perform impact tests and explain impact values, surface failure rates and transition temperatures.
		12th	Material strength (hardness and fatigue tests)	Perform Vickers, Rockwell and Shore hardness tests and evaluate the hardness of steel materials. Perform cyclic bending tests on metallic materials and explain fatigue strength.
		13th	CAD/CAM	Be able to explain the features and types of NC machine tools, principles of control, NC methods and programme flow. Be able to learn the basic operation of 2DCAM and create machining processes.
		14th	CAD/CAM	Acquire basic 3DCAM operations and be able to create machining processes. Acquire basic NC machining set-up and be able to perform NC machining.
		15th	CAD/CAM	Acquire basic 3DCAM operations and be able to create machining processes. Acquire basic NC machining set-up and be able to perform NC machining.
		16th	Return of final exam answers for the second semester	
2nd Semester	3rd Quarter	1st	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		2nd	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		3rd	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		4th	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		5th	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		6th	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		7th	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		8th	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
	4th Quarter	9th	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		10th	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.

		11th	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		12th	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		13th	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		14th	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		15th	Group work on mechatronics technology	The autonomous robot car can be assembled and the circuits and programmes to make it run can be set up.
		16th		

Evaluation Method and Weight (%)

	Midterm/Final exam	Quiz	Portfolio	Presentation/Attitude	Other	Total
Subtotal	10	0	90	0	0	100
Basic Proficiency	0	0	0	0	0	0
Specialized Proficiency	10	0	90	0	0	100
Cross Area Proficiency	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Seminar of Mechanical Engineering

Course Information

Course Code	1294201	Course Category	Specialized / Elective
Class Format	Lecture	Credits	School Credit: 1
Department	Course of Mechanical Engineering	Student Grade	4th
Term	Year-round	Classes per Week	前期:2 後期:2
Textbook and/or Teaching Materials	各研究室別に選定/各研究室別に選定		
Instructor	Okumoto Yoshihiro,Okita Yuji,Kawabata Nariyuki,Nishimoto Koji,Matsuura Fuminori,Yasuda Takeshi,Itami Shin		

Course Objectives

1．英文の学術文献または教科書を読み、翻訳することができる。
2．英文の学術文献の内容を発表し伝えることができる。

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(可)
評価項目1	英文の学術文献または教科書を読みその周辺の内容でまとめることができる。	英文の学術文献または教科書を読み内容を和訳できるだけでなく，内容を理解できる。	英文の学術文献または教科書を読み内容を和訳できる。
評価項目2	英文の学術文献または教科書を和訳しその周辺の内容を発表して伝えることができる。	英文の学術文献または教科書を和訳した内容をわかりやすく発表できる。	英文の学術文献または教科書を和訳した内容を発表できる。

Assigned Department Objectives

学習・教育到達度目標 D-2

Teaching Method

Outline	英文の学術文献または教科書を講読し、内容を把握し専門知識の獲得ができる力を養う。また、文献等から得た内容を発表で他人に伝える能力を修得する。
Style	各担当教員の指導の下，与えられた英語文献あるいは英語教科書を訳して，内容を理解し，理解した内容をわかりやすく伝える。【授業時間31時間】
Notice	英文文献や教科書の読み方を学ぶ。各自が積極的に取り組むことを心がけてもらいたい。工業英検の受験にも挑戦してほしい。

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	文献講読 次の各研究室で文献購読を行う。 熱力学、機械システム、材料強度学、応用物理、設計工学、材料科学、流体工学、知能機械、加工工学、計測工学、加工・材料評価	卒業研究で実施する研究課題の概要を理解し説明できる。
		2nd	文献講読	英文の学術文献または教科書を読み内容を説明できる。
		3rd	文献講読	英文の学術文献または教科書を読み内容を説明できる。
		4th	文献講読	英文の学術文献または教科書を読み内容を説明できる。
		5th	文献講読	英文の学術文献または教科書を読み内容を説明できる。
		6th	文献講読	英文の学術文献または教科書を読み内容を説明できる。
		7th	文献講読	英文の学術文献または教科書を読み内容を説明できる。

		8th	文献講読	英文の学術文献または教科書を読み内容を説明できる。
	4th Quarter	9th	文献講読	英文の学術文献または教科書を読み内容を説明できる。
		10th	文献講読	英文の学術文献または教科書を読み内容を説明できる。
		11th	文献講読	英文の学術文献または教科書を読み内容を説明できる。
		12th	文献講読	英文の学術文献または教科書を読み内容を説明できる。
		13th	文献講読	英文の学術文献または教科書を読み内容を説明できる。
		14th	文献講読	英文の学術文献または教科書を読み内容を説明できる。
		15th	文献講読発表	講読した英文の学術文献または教科書の内容を発表できる。
		16th		

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	0	0	30	30	40	100
基礎的能力	0	0	10	10	0	20
専門的能力	0	0	10	10	40	60
分野横断的能力	0	0	10	10	0	20

Anan College	Year	2024	Course Title	Mechatronics

Course Information

Course Code	1294301	Course Category	Specialized / Elective
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Mechanical Engineering	Student Grade	4th
Term	First Semester	Classes per Week	前期:2
Textbook and/or Teaching Materials	メカトロニクスの基礎 (森北出版)		
Instructor	Matsuura Fuminori		

Course Objectives

a. Mechanics
a1. Can explain electric, hydraulic, and pneumatic actuators.
a2. Can explain mechanical transmission mechanisms such as gears, belt-pulley mechanisms, and ball screw mechanisms.
b. Electronics
b1. Can explain position, acceleration, gyro, and force sensors.
b2. Can explain signal amplification and operation, A/D & D/A conversion, and frequency analysis.
b3. Can explain electronic circuit components, the role of transistor circuits, digital circuits, and power supplies.
c. System Control
c1. Can explain controllers and their peripheral equipment.
c2. Can explain feedback control.

Rubric

	Ideal Level	Standard Level	Unacceptable Level
Achievement 1	The achievement rate for objective (a) is above 80%.	The achievement rate for objective (a) is above 65%.	The achievement rate for objective (a) does not fall below 60%.
Achievement 2	The achievement rate for objective (b) is above 80%.	The achievement rate for objective (b) is above 65%.	The achievement rate for objective (b) does not fall below 60%.
Achievement 3	The achievement rate for objective (c) is above 80%.	The achievement rate for objective (c) is above 65%.	The achievement rate for objective (c) does not fall below 60%.

Assigned Department Objectives

学習・教育到達度目標 D-1

Teaching Method

Outline	Learn about a wide range of topics necessary for constructing mechatronics equipment represented by robots, including the principles and characteristics of servo system equipment, connection methods, and data processing techniques.
Style	Lecture hours: 30 hours + Self-study hours: 60 hours
Notice	The "Learning Objectives" listed in the following "Course Plan" are enumerated only by items to avoid complex descriptions. The actual learning objective is "to be able to explain the content written in the respective section."

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 Mechatronics	Overview of mechatronics systems
		2nd	Actuator [a]	DC motor, AC motor, Stepping motor
		3rd	Actuator [a]	Other electric, hydraulic, pneumatic actuators
		4th	Mechanical transmission mechanism [a]	Reduction gear mechanism, theory of gears, gear reduction mechanism
		5th	Mechanical transmission mechanism [a]	Belt-pulley mechanism, ball screw mechanism
		6th	Sensor [a]	Characteristics of sensors, position sensors
		7th	Sensor [a]	Acceleration sensors, gyro sensors, force sensors
		8th	Midterm exam	Mastery of the content up to week 1–7
	2nd Quarter	9th	Analog sensor information processing [b]	Signal amplification and operation, A/D conversion and sampling theorem
		10th	Analog sensor information processing [b]	D/A conversion, frequency analysis
		11th	Electronic circuit components and their applications [b]	Electronic circuit components, transistor circuits
		12th	Electronic circuit components and their applications [b]	Digital circuits, stabilized power supply
		13th	Controller, Introduction to control engineering [c]	Computers, cables and terminal blocks, types of control, overview of classical control theory
		14th	Introduction to control engineering [c]	System response, stability determination, feedback control systems
		15th	Final exam	Mastery of the learning objectives of this lecture
		16th		

Evaluation Method and Weight (%)

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

Anan College	Year	2024	Course Title	Internship

Course Information

Course Code	1294R11	Course Category	Specialized / Elective
Class Format	Lecture	Credits	School Credit: 1
Department	Course of Mechanical Engineering	Student Grade	4th
Term	Year-round	Classes per Week	前期:2 後期:2
Textbook and/or Teaching Materials	/１３歳のハローワーク（幻冬舎）		
Instructor	Kawabata Nariyuki		

Course Objectives

１．社会人として身に付けるべきマナーを説明できる。
２．インターンシップ先の業務内容について説明できる。
３．インターンシップ先での実習成果報告書を作成できる。
４．インターンシップ先での実習成果を発表できる。

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(可)
到達目標1	社会人として身に付けるべきマナーを説明でき、自ら自発的に学ぶことができる。	社会人として身に付けるべきマナーを理解し、説明できる。	社会人として身に付けるべきマナーを説明できる。
到達目標2	実習先の業務内容および社会責任（ＣＳＲ、ＳＲ）について説明できる。	実習先の業務内容について理解し、説明できる。	実習先の業務内容について説明できる。
到達目標3	実習先での実習成果の報告書について、目的等の項目が分かりやすく、理路整然に作成することができる。	実習先での実習成果を理解し、報告書を作成できる。	実習先での実習成果報告書を作成できる。
到達目標4	実習先での実習成果について、適切にスライドを使用しながらわかりやすく時間内に発表できる。	実習先での実習成果を理解し、発表できる。	実習先での実習成果を発表できる。

Assigned Department Objectives

学習・教育到達度目標 A-1 学習・教育到達度目標 A-2 学習・教育到達度目標 A-3 学習・教育到達度目標 B-1 学習・教育到達度目標 D-4

Teaching Method

Outline	企業・大学等（以下受入機関）において実習、研修を受けることにより、受入機関で求められる知識や能力を学び、自己理解を行うことを目的とする。また受入機関の業務内容等の理解から職業理解を深めるとともに、勤労観を培うことも目的である。実習体験から、技術者になるための心構えや自覚を積極的に修得するとともに、社会経験を通して、視野の拡大と人間的成長を図ることを目標とする。
Style	インターンシップの準備・外部機関での研修・校外実習報告書の作成を全て実施し、これらに要した時間が合計で30時間を超えること。
Notice	実習を完了することとレポート提出と報告会での発表は必須である。また期間中途での欠勤は履修放棄となり科目の修得条件を満たすことができないので注意すること。また往復の交通と期間中の通勤計画作成する必要がある。実習期間中は健康に留意し、遅刻や欠勤等に十分注意を払い、毎日の勤務に励むことが大事である。なお、インターネット等を利用して情報をとりいれるための準備をしておくこと。

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	ガイダンス	校外実習の意義および内容、実施の流れについて説明できる。
		2nd	実習先の決定	校外実習受け入れ先を決定し、実習先に提出する履歴書やエントリーシートを書くことができる。
		3rd	実習先の決定	校外実習受け入れ先を決定し、実習先に提出する履歴書やエントリーシートを書くことができる。
		4th	実習先の決定	校外実習受け入れ先を決定し、実習先に提出する履歴書やエントリーシートを書くことができる。
		5th	実習先の決定	校外実習受け入れ先を決定し、実習先に提出する履歴書やエントリーシートを書くことができる。
		6th	実習前説明会	校外実習における全般的な注意事項について理解し、説明できる。
		7th	実習の実施および内容の記録	夏季休暇中に５日間程度の期間で実習先の指導の下に実習および研修を実施することができる。 日々の実習項目を振り返り、実習内容を実習報告書（従事日誌）としてまとめることができる。
		8th	実習の実施および内容の記録	夏季休暇中に５日間程度の期間で実習先の指導の下に実習および研修を実施することができる。 日々の実習項目を振り返り、実習内容を実習報告書（従事日誌）としてまとめることができる。
	2nd Quarter	9th	実習の実施および内容の記録	夏季休暇中に５日間程度の期間で実習先の指導の下に実習および研修を実施することができる。 日々の実習項目を振り返り、実習内容を実習報告書（従事日誌）としてまとめることができる。

		10th	実習の実施および内容の記録	夏季休暇中に５日間程度の期間で実習先の指導の下に実習および研修を実施することができる。 日々の実習項目を振り返り、実習内容を実習報告書（従事日誌）としてまとめることができる。
		11th	実習の実施および内容の記録	夏季休暇中に５日間程度の期間で実習先の指導の下に実習および研修を実施することができる。 日々の実習項目を振り返り、実習内容を実習報告書（従事日誌）としてまとめることができる。
		12th	実習の実施および内容の記録	夏季休暇中に５日間程度の期間で実習先の指導の下に実習および研修を実施することができる。 日々の実習項目を振り返り、実習内容を実習報告書（従事日誌）としてまとめることができる。
		13th	実習の実施および内容の記録	夏季休暇中に５日間程度の期間で実習先の指導の下に実習および研修を実施することができる。 日々の実習項目を振り返り、実習内容を実習報告書（従事日誌）としてまとめることができる。
		14th	実習の実施および内容の記録	夏季休暇中に５日間程度の期間で実習先の指導の下に実習および研修を実施することができる。 日々の実習項目を振り返り、実習内容を実習報告書（従事日誌）としてまとめることができる。
		15th	実習の実施および内容の記録	夏季休暇中に５日間程度の期間で実習先の指導の下に実習および研修を実施することができる。 日々の実習項目を振り返り、実習内容を実習報告書（従事日誌）としてまとめることができる。
		16th		
2nd Semester	3rd Quarter	1st	実習の実施および内容の記録	夏季休暇中に５日間程度の期間で実習先の指導の下に実習および研修を実施することができる。 日々の実習項目を振り返り、実習内容を実習報告書（従事日誌）としてまとめることができる。
		2nd	実習の実施および内容の記録	夏季休暇中に５日間程度の期間で実習先の指導の下に実習および研修を実施することができる。 日々の実習項目を振り返り、実習内容を実習報告書（従事日誌）としてまとめることができる。
		3rd	実習の実施および内容の記録	夏季休暇中に５日間程度の期間で実習先の指導の下に実習および研修を実施することができる。 日々の実習項目を振り返り、実習内容を実習報告書（従事日誌）としてまとめることができる。
		4th	実習の実施および内容の記録	夏季休暇中に５日間程度の期間で実習先の指導の下に実習および研修を実施することができる。 日々の実習項目を振り返り、実習内容を実習報告書（従事日誌）としてまとめることができる。
		5th	実習の実施および内容の記録	夏季休暇中に５日間程度の期間で実習先の指導の下に実習および研修を実施することができる。 日々の実習項目を振り返り、実習内容を実習報告書（従事日誌）としてまとめることができる。
		6th	実習の実施および内容の記録	夏季休暇中に５日間程度の期間で実習先の指導の下に実習および研修を実施することができる。 日々の実習項目を振り返り、実習内容を実習報告書（従事日誌）としてまとめることができる。
		7th	実習の実施および内容の記録	夏季休暇中に５日間程度の期間で実習先の指導の下に実習および研修を実施することができる。 日々の実習項目を振り返り、実習内容を実習報告書（従事日誌）としてまとめることができる。
		8th	実習の実施および内容の記録	夏季休暇中に５日間程度の期間で実習先の指導の下に実習および研修を実施することができる。 日々の実習項目を振り返り、実習内容を実習報告書（従事日誌）としてまとめることができる。
	4th Quarter	9th	実習の実施および内容の記録	夏季休暇中に５日間程度の期間で実習先の指導の下に実習および研修を実施することができる。 日々の実習項目を振り返り、実習内容を実習報告書（従事日誌）としてまとめることができる。
		10th	実習の実施および内容の記録	夏季休暇中に５日間程度の期間で実習先の指導の下に実習および研修を実施することができる。 日々の実習項目を振り返り、実習内容を実習報告書（従事日誌）としてまとめることができる。
		11th	実習の実施および内容の記録	夏季休暇中に５日間程度の期間で実習先の指導の下に実習および研修を実施することができる。 日々の実習項目を振り返り、実習内容を実習報告書（従事日誌）としてまとめることができる。
		12th	実習報告書の作成	実習先の概要、実習内容、実習によって得られたことなどを成果報告書としてまとめることができる。
		13th	実習報告書の作成	実習先の概要、実習内容、実習によって得られたことなどを成果報告書としてまとめることができる。
		14th	実習成果報告会	実習成果報告会において、実習先の概要、実習内容、実習によって得られたことなどを発表することができる。
		15th	実習成果報告会	実習成果報告会において、実習先の概要、実習内容、実習によって得られたことなどを発表することができる。
		16th		

Evaluation Method and Weight (%)

	中間・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	0	0	20	40	40	100
基礎的能力	0	0	10	10	10	30
専門的能力	0	0	5	30	10	45
分野横断的能力	0	0	5	0	20	25

Anan College	Year	2024	Course Title	Probability and Statistics

Course Information

Course Code	1514A01	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Mechanical Engineering	Student Grade	4th
Term	Second Semester	Classes per Week	後期:2
Textbook and/or Teaching Materials	Shin Kakuritsu-tokei Kaiteiban, Dainihon Tosho		
Instructor	Sakaguchi Hideo,Sugino Ryuzaburo		

Course Objectives

1. We can compute the basic computation of the fundamentals of statistic processes.
2. We can understand basic properties and get the conditional probability and Bay's estimation.
3. We can make a solution of mean value, variance and standard deviation of basic probability distributions.

Rubric

	Ideal Level	Standard Level	Unacceptable Level
Achievement 1	We can compute the basic computation of the fundamentals of statistic processes and apply these for the various problems.	We can compute the basic computation of the fundamentals of statistic processes.	We can compute the basic computation of the elementary statistic processes.
Achievement 2	We can understand basic properties and get the conditional probability and Bay's estimation and apply these for the various problems.	We can understand basic properties and get the conditional probability and Bay's estimation.	We can understand basic properties and get the elementaries of conditional probability and Bay's estimation.
Achievement 3	We can make a solution of mean value, variance and standard deviation of basic probability distributions and apply these for the various problems.	We can make a solution of mean value, variance and standard deviation of basic probability distributions.	We can make a solution of mean value, variance and standard deviation of elementary probability distributions.

Assigned Department Objectives

学習・教育到達度目標 B-2

Teaching Method

Outline	We are to make a concentration for our class and use the knowledges and techniques about undergraduate mathematics to construction of understanding of the probability and statistics.
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. *Mastery of this course is required to complete the Mathematical and Data Science and AI Education Program(Literacy)

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	Analyzing the data of one-dimensional variable	We can understand and explain of frequency distribution and its measures of center.
		2nd	Analyzing the data of one-dimensional variable	We can understand and explain of its distribution bias and the dispersion.
		3rd	Analyzing the data of one-dimensional variable	We can understand and explain of its distribution bias and the dispersion.
		4th	Analyzing the data of two-dimensional variables	We can understand and explain of its distribution scatter plot bias and the regression line.
		5th	Analyzing the data of two-dimensional variables	We can understand and explain of its distribution co-variance and the correlation coefficient.
		6th	Analyzing the data of two-dimensional variables	We can understand and explain of its distribution co-variance and the correlation coefficient.
		7th	The properties of probability	We can understand and explain of the definition of probability and the number of cases.
		8th	The properties of probability	We can understand and explain of its probability theorems of the addition and multiplication .
	4th Quarter	9th	The properties of probability	We can understand and explain of its probability theorems of the addition and multiplication .
		10th	Mid-term examination	
		11th	The probability variables and its probability distributions	We can understand and explain of the discrete variables and binomial distribution.
		12th	The probability variables and its probability distributions	We can understand and explain of the continuous variables and normal distribution.

		13th	The probability variables and its probability distributions	We can understand and explain of the continuous variables and normal distribution.
		14th	The fundamentals of statistic	We can understand and explain of the statistics and sampling distribution.
		15th	Final examination	
		16th		

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	15	0	35
Cross Area Proficiency	10	0	0	0	5	0	15

Anan College	Year	2024	Course Title	Engineering Mechanics

Course Information

Course Code	1514B01	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Mechanical Engineering	Student Grade	4th
Term	First Semester	Classes per Week	2
Textbook and/or Teaching Materials	Kikai Rikigaku no Kiso (SuuriKougaku)		
Instructor	Kawabata Nariyuki		

Course Objectives

1. Able to describe position, velocity, and acceleration using algebraic and analytical methods, and to calculate their mutual transformations
2. Able to formulate problems related to particle using algebraic and analytical methods, to derive analytical and numerical solutions, and to examine the physical meaning of the results.
3. Able to formulate problems related to systems of particles using algebraic and analytical methods, derive analytical and numerical solutions, and physically examine the meaning of the results.
4. Able to formulate problems related to rigid bodies using algebraic and analytical methods, derive analytical and numerical solutions, and physically examine the meaning of the results.

Rubric

	Ideal Level	Standard Level	Unacceptable Level
Achievement 1	Able to describe position, velocity, and acceleration using algebraic and analytical methods. Able to also calculate mutual transformations in a polar coordinate system.	Able to describe position, velocity, and acceleration using algebraic and analytical methods. Able to also calculate mutual transformations.	Able to calculate position, velocity, acceleration, and their interconversions using algebraic and analytical methods with example-based solutions.
Achievement 2	Formulate particle problems using algebraic and analytical methods, derive analytical and numerical solutions, and physically discuss the results.	Formulate particle problems using algebraic and analytical methods and derive analytical and numerical solutions.	Formulate problems related to particle using algebraic and analytical methods with example-based solutions.
Achievement 3	Formulate system of particles problems using algebraic and analytical methods, derive analytical and numerical solutions, and physically discuss the results.	Formulate system of particles problems using algebraic and analytical methods and derive analytical and numerical solutions.	Formulate problems related to system of particles using algebraic and analytical methods with example-based solutions.
Achievement 4	Formulate rigid body problems using algebraic and analytical methods, derive analytical and numerical solutions, and physically discuss the results.	Formulate rigid body problems using algebraic and analytical methods and derive analytical and numerical solutions.	Formulate problems related to rigid body using algebraic and analytical methods with example-based solutions.

Assigned Department Objectives

学習・教育到達度目標 B-3 学習・教育到達度目標 D-1

Teaching Method

Outline	This course focuses on mechanics, one of the earliest established branches of classical physics, which is the basis of natural science, covering masses, systems of masses, and rigid bodies, and reinforces mathematical means to grasp it as a coherent logical system. By incorporating many exercises, students will develop problem-solving skills and acquire the ability to apply them to engineering fields.
Style	Classes will be developed with a focus on exercises based on the premise of preparatory study. Group work will be introduced in the exercises, and students will be encouraged to teach each other in order to promote their own understanding. Since most of the content is already known, it is necessary to review the textbook and previous class notes and understand the basic formulas in advance. The materials presented in class and answers to assignments will be distributed on the LMS, so students are encouraged to refer to them as necessary. At the end of each class, exercises will be provided for self-study. Each student is required to solve the exercises and submit them as a review. In addition, online assignments via manaba will be provided as knowledge confirmation questions and preliminary assignments. The students are expected to review or check the contents of the next session in advance and answer the questions. [30 hours of class time + 60 hours of self-study]
Notice	The content of mathematics up to the third grade and physics learned up to "Physics" and "Machine dynamics 1" will be used as prerequisites, so students should review these contents thoroughly. In addition, self-study is essential, including the completion of the assignments given in each class session. It is not possible to give sufficient explanations of the self-study assignments during class time, so if you have any questions, please come to the class to ask questions. When asking questions, please do your own research and think about it first, and clarify what you did not understand before coming to ask questions. The portfolio evaluation includes the evaluation of [reports (self-study assignments)] and [online assignments].

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	Fundamentals of Dynamics I	Able to calculations based on the basic laws concerning vectors.

		2nd	Fundamentals of Dynamics II	Able to describe position, velocity, and acceleration analytically.
		3rd	Particle Dynamics I	Able to analyze forces numerically.
		4th	Particle Dynamics II	Understand the laws of motion and solve equations of motion algebraically or analytically.
		5th	Particle Dynamics III	Uniformly accelerated motion: analytically solve for motion in a uniform gravitational field.
		6th	Particle Dynamics IV	Varying acceleration motion: analytically solve for simple harmonic motion and simple pendulum.
		7th	Particle Dynamics V	Able to derive the relationship between work, kinetic energy, potential energy and force.
		8th	Midterm examination	Understand the law of conservation of mechanical energy and apply it to problem solving.
	2nd Quarter	9th	Particle Dynamics VI	
		10th	Dynamics of Mass System I	Able to calculate the relationship between the momentum and impulse of a particle.
		11th	Dynamics of Mass System II	Understand the equations of motion and conservation of momentum of a mass system, and be able to perform analytical calculations.
		12th	Dynamics of Mass System III	Understand the angular momentum of a mass and the torque equation, and be able to perform analytical calculations.
		13th	Dynamics of Mass System IV	Understand and analytically calculate angular momentum of a mass system and rigid body. Able to solve the torque equation and angular momentum conservation laws for mass systems and rigid bodies, and perform analytical calculations.
		14th	Dynamics of Rigid Body I	Able to solve problems of equilibrium and motion of rigid bodies. Understand the motion of rigid bodies with fixed axes and perform analytical calculations.
		15th	Dynamics of Rigid Body II	Able to calculate moments of inertia in figures of good symmetry.
		16th	Reflection of Final examination	Able to formulate equations of motion for plane motion of rigid bodies and solve them analytically.

Evaluation Method and Weight (%)

	midterm / final exam	quiz	portfolio	presentation / attitude	other	Total
Subtotal	70	0	30	0	0	100
Basic Proficiency	10	0	0	0	0	10
Specialized Proficiency	60	0	30	0	0	90
Cross Area Proficiency	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Research for Graduation Thesis

Course Information

Course Code	1215000	Course Category	Specialized / Compulsory
Class Format	Seminar	Credits	School Credit: 10
Department	Course of Mechanical Engineering	Student Grade	5th
Term	Year-round	Classes per Week	10
Textbook and/or Teaching Materials	At the direction of the faculty advisor/at the direction of the faculty advisor		
Instructor	Okumoto Yoshihiro,Nishimoto Koji,Okita Yuji,Kawabata Nariyuki,Matsuura Fuminori,Itami Shin,Yasuda Takeshi		

Course Objectives

1. Able to explain the background of the research theme and its significance in engineering and society.
2. Able to independently conduct research under the guidance of a faculty member in charge in order to plan and examine experiments and analysis methods to promote the research theme.
3. Able to summarize and present the results of experiments and analyses conducted in the research in a scientific and technical paper with an English summary.

Rubric

	Ideal Level	Standard Level	Minimum Level
Achievement 1	Able to independently summarize and explain the background, peripheral knowledge, and engineering significance of the topic.	Able to under the guidance of the faculty member in charge, understand and explain the background of the research theme and its engineering and social significance.	Able to under the guidance of the faculty member in charge, be able to explain the background of the research topic and its engineering and social significance.
Achievement 2	Able to independently examine plans, experimental and analytical methods, etc. to promote research themes.	Able to understand and be able to implement plans, experiments, and analysis methods to promote research themes under the supervision of the faculty member in charge.	Able to independently conduct research under the guidance of a faculty member in charge of the project to plan, conduct experiments, and analyze methods to promote the research theme.
Achievement 3	Able to independently compile and present research results in a scientific technical paper with an English summary.	Able to under the guidance of the instructor, comprehend the results of the research, compile them into a scientific and technical paper with an English summary, and present the paper.	Able to under the guidance of the instructor in charge, be able to summarize and present the results of experiments and analyses conducted in the research in a scientific and technical paper with an English summary.

Assigned Department Objectives

学習・教育到達度目標 B-1 学習・教育到達度目標 C-1 学習・教育到達度目標 D-2 学習・教育到達度目標 E-3

Teaching Method

Outline	In the process of promoting their research themes, students will acquire the practical skills to solve given problems and issues by applying and utilizing the specialized knowledge they have acquired up to the fourth grade, with the goal of enhancing their cultivation as engineers who can contribute to society.
Style	1. the student is the main actor in the graduation research. Students should take the initiative in working on their research projects. 2. When conducting research, students must enter the results of the day's research in the research logbook. 3. Even if the research hours (including contact hours) exceed the minimum hours required for JABEE accreditation, the research must be conducted during the graduation research hours specified for class time. 4. failure to submit a preliminary draft or graduation thesis, or failure to make a presentation, will result in failure of the graduation research. 【300 class hours】
Notice	We expect students to plan their own research projects, work independently and continuously, and carry out their research.

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	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		2nd	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		3rd	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.

		4th	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		5th	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		6th	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		7th	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		8th	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
	2nd Quarter	9th	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		10th	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		11th	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		12th	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		13th	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		14th	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		15th	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		16th	Graduation research interim presentation	Able to outline the results of the research at the time of the interim presentation and the issues involved in carrying out the research, and to explain them through a presentation.
2nd Semester	3rd Quarter	1st	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		2nd	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		3rd	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		4th	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.

		5th	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		6th	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		7th	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		8th	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
	4th Quarter	9th	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		10th	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		11th	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		12th	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		13th	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		14th	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		15th	Conduct of Research	Able to under the guidance of the faculty member in charge, independently conduct research background investigation, experiments, and analysis, and examine and discuss the results of the analysis.
		16th	Graduation research presentation	Able to summarize research results in a graduation thesis and outline, and to explain the results in a presentation.

Evaluation Method and Weight (%)

	midterm/final exam	quiz	portfolio	presentation/attitude	Other	Total
Subtotal	0	0	0	60	40	100
Basic Proficiency	0	0	0	0	0	0
Specialized Proficiency	0	0	0	50	30	80
Cross Area Proficiency	0	0	0	10	10	20

Anan College	Year	2024	Course Title	Technology Mechanics

Course Information

Course Code	1215501	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Mechanical Engineering	Student Grade	5th
Term	First Semester	Classes per Week	前期:2
Textbook and/or Teaching Materials	Reidai-de-manabu hajimete-no-soseirikigaku (Morikita)		
Instructor	Yasuda Takeshi		

Course Objectives

1. Student be able to explain plasticity of materials, true stress, true strain, constant volume law, etc.
2. Student be able to explain various types of approximated stress-strain curves.
3. Student be able to explain plane stress state, plane strain state, yield condition, etc. that necessary for analysis of plasticity.
4. Student be able to analyze major plastic forming processes by solution method.

Rubric

	Ideal Level	Standard Level	Minimum Level
Achievement 1	Student be able to understand and explain in detail the plasticity of materials, true stress, true strain, constant volume law, etc.	Student be able to explain outline the plasticity of materials, true stress, true strain, constant volume law, etc.	Student recognizes plasticity of materials, true stress, true strain, constant volume law, etc.
Achievement 2	Student be able to understand and explain in detail the various types of approximated stress-strain curves.	Student be able to explain outline various types of approximated stress-strain curves.	Student recognizes various types of approximated stress-strain curves.
Achievement 3	Student be able to understand and explain in detail plane stress state, plane strain state, yield conditions, etc.	Student be able to explain outline of plane stress states, plane strain states, yield conditions, etc.	Student recognizes plane stress conditions, plane strain conditions, yield conditions, etc.
Achievement 4	Student be able to understand and explain in detail the solution methods of major plastic forming processes.	Student be able to explain outline of the solution methods of major plastic forming processes.	Student recognizes the solution methods of major plastic forming processes.

Assigned Department Objectives

学習・教育到達度目標 D-1

Teaching Method

Outline	The property of a material that does not return to its original shape after a force is applied to it and then removed is called "plasticity". Plastic forming, which uses the plasticity of a material to form a predetermined shape, is an efficient method in terms of material utilization and processing time. In order to become an engineer who can analyze and judge the appropriateness of various types of plastic forming, it is first necessary to learn the concept of "plasticity" and to have the ability to apply it. In this lecture, students will first learn the basics of plasticity, and then understand the deformation in various plastic forming processes through analysis using elementary solution methods.
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	Manufacturing Process 2 and Strength of Materials will be the basis of this course. In addition, knowledge acquired in Mechanical Materials will be used. Differential equations will be applied to the solutions. Students are advised to review the above before taking 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	Plasticity, true stress, true strain, constant volume rule, etc.	Student be able to explain plasticity, true stress, true strain, constant volume law, etc.
		2nd	Plasticity, true stress, true strain, constant volume rule, etc.	Student be able to explain plasticity, true stress, true strain, constant volume law, etc.
		3rd	Approximated stress-strain curve	Student be able to explain approximated stress-strain curve.
		4th	Plane stress state and plane strain state	Student be able to explain plane stress state and plane strain state.
		5th	Yield condition	Student be able to explain yield condition.
		6th	Solution of bending	Student be able to explain solution of bending process.
		7th	Solution of bending	Student be able to explain solution of bending process.
		8th	Solution of bending	Student be able to explain solution of bending process.
	2nd Quarter	9th	Midterm examination	
		10th	Solution of compression process	Student be able to explain solution of compression process.
		11th	Solution of compression process	Student be able to explain solution of compression process.

		12th	Solution of compression process	Student be able to explain solution of compression process.
		13th	Solution of compression process	Student be able to explain solution of compression process.
		14th	Solution of compression process	Student be able to explain solution of compression process.
		15th	Solution of compression process	Student be able to explain solution of compression process.
		16th	Final examination and return exam. paper	

Evaluation Method and Weight (%)

	Midterm/Final exam	Quiz	Portfolio	Presentation/Attitude	Other	Total
Subtotal	80	0	20	0	0	100
Basic Proficiency	10	0	0	0	0	10
Specialized Proficiency	50	0	20	0	0	70
Cross Area Proficiency	20	0	0	0	0	20

Anan College	Year	2024	Course Title	Automatic Control 1

Course Information

Course Code	1215H02	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Mechanical Engineering	Student Grade	5th
Term	First Semester	Classes per Week	前期:2
Textbook and/or Teaching Materials	Jidou seigyo (CORONA)		
Instructor	Kawabata Nariyuki		

Course Objectives

1. Understand the definitions and concepts of automatic control and feedback control, and explain their components.
2.Able to calculate Laplace and inverse Laplace transforms of basic functions and apply them to the solution of differential equations.
3. Able to construct model a mechanical system using a block diagram and obtain the transfer function of the system.
4. Able to calculate transient characteristics, steady-state characteristics, and frequency characteristics of a control system and explain their meanings.
5. Understand stability criterion equations and be able to discriminate between stable and unstable control systems, and explain compensator design guidelines.

Rubric

	Ideal Level	Standard Level	Minimum Level
Achievement 1	Understand and explain the concepts and definitions of automatic control and feedback control.	Able to explain the types of automatic control and the components of feedback control.	Able to explain the definition of feedback control.
Achievement 2	Able to calculate Laplace and inverse Laplace transforms of complicated functions and apply them to the solution of differential equations.	Able to calculate Laplace and inverse Laplace transforms of basic functions at the example level and apply them to the solution of differential equations.	Able to calculate Laplace and inverse Laplace transforms of basic functions at the example level.
Achievement 3	Able to model general dynamical systems using block diagrams and obtain transfer functions.	Able to obtain the transfer function by simplifying the system given the block diagram.	Able to obtain the transfer function of the simple block diagram.
Achievement 4	Able to describe the characteristics of a control system by selecting the appropriate value for the task from transient, steady-state, and frequency characteristics.	Understand and explain transient, steady-state, and frequency characteristics of control systems.	The transient, steady-state, and frequency characteristics of the control system can be obtained with the characteristics to be obtained clear.
Achievement 5	Correctly use the stability criterion method to determine the stability of the control system and design compensators for unstable systems.	Understand multiple stability criterion methods and be able to discriminate between stable and unstable control systems, and explain the role of compensators.	The stability of the control system can be determined in situations where the stability criterion method to be used is indicated.

Assigned Department Objectives

学習・教育到達度目標 D-1

Teaching Method

Outline	Feedback control is not only the basis of classical control theory, but also an essential foundation for mastering modern control theory. In this lecture, students learn the fundamentals of feedback control from analysis in the frequency domain, acquire design methods to realize the concept of automatic control systems, and acquire the habit of continuously learning knowledge for control.
Style	At the end of each class, exercises will be provided as self-study assignments. Each student is required to solve the exercises and submit them as a review. Online assignments via manaba will be provided in advance of the class. Each student is required to check the contents of the next lesson in advance and answer the exercises. [30 hours of class time + 60 hours of self-study]
Notice	In the analysis of control systems, it is assumed that the response of the model under consideration is known in the time domain. A thorough review of the fundamentals of the various dynamics is required. The portfolio evaluation will include [report assignment (self-study task)] and [online review test].

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	Configuration of Feedback System	Understand what automatic control is and be able to explain the components of a feedback system.
		2nd	Laplace Transform	Able to calculate Laplace transforms of various functions.
		3rd	Inverse Laplace Transform	Able to calculate inverse Laplace transforms of various functions.
		4th	Application for Laplace Transform	Able to apply Laplace transforms to the solution of differential equations.

		5th	Dynamic System and Transfer Function	The system can be modeled, the transfer function can be obtained, and it can be represented on a block diagram. The transfer function can also be obtained from a simplification of the block diagram.
		6th	Transient Characteristics	Understand system transient response and be able to determine impulse response and step response.
		7th	Frequency Characteristics I	Understand frequency response functions and be able to obtain vector trajectories as a method of system analysis.
		8th	Midterm examination	
	2nd Quarter	9th	Frequency Characteristics II	Able to create Bode diagrams as a system analysis method.
		10th	Stability I	Understand the stability conditions of a system and be able to determine whether a system is stable or unstable using the Routh-Hurwitz stability criterion method.
		11th	Stability II	The stability discrimination method using vector trajectories can be used to discriminate between stable and unstable systems and to determine the degree of stability.
		12th	Response Characteristics and Specifications I	Able to calculate the steady-state deviation and analyze the response characteristics of the system.
		13th	Response Characteristics and Specifications II	Able to calculate various parameters representing frequency response control specifications.
		14th	Compensator and PID Control I	Able to explain design guidelines for control system design using compensators.
		15th	Compensator and PID Control II	Understand PID control and be able to design simple parameters.
		16th	Reflection of Final examination	

Evaluation Method and Weight (%)

	midterm / final exam	quiz	portfolio	presentation / attitude	other	Total
Subtotal	70	0	30	0	0	100
Basic Proficiency	10	0	0	0	0	10
Specialized Proficiency	60	0	30	0	0	90
Cross Area Proficiency	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Automatic Control 2

Course Information

Course Code	1215H03	Course Category	Specialized / Elective
Class Format	Lecture	Credits	School Credit: 1
Department	Course of Mechanical Engineering	Student Grade	5th
Term	Second Semester	Classes per Week	後期:2
Textbook and/or Teaching Materials	わかりやすい現代制御理論（森北出版）		
Instructor	Kawabata Nariyuki		

Course Objectives

1．システムのモデル化について理解し、状態空間表現を用いてシステムの数式モデルを構築できる。
2．状態遷移行列の性質を理解し、システム行列の固有値による安定性判別ができる。
3．システムの可制御性と可観測性を判定できる。
4．極配置法，最適レギュレータ，折り返し法について理解し、サーボ系を含めたフィードバック制御系を設計できる。
5．オブザーバを理解し、総合的なシステムの設計ができる。

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(可)
到達目標1	比較的複雑なシステムについて状態空間表現を用いて数式モデルを構築できる。	基本的なシステムについて状態空間表現を用いて数式モデルを構築できる。	状態空間表現について理解し、例題に沿った数式モデルの構築ができる。
到達目標2	状態遷移行列を理解し、自ら構築したモデルの安定性をシステム行列の固有値を用いて判定できる。	システム行列の固有値とシステムの安定性の関係を理解し、与えられたモデルの安定性を判別できる。	システム行列の固有値が与えられたときに、システムの安定性を判別できる。
到達目標3	可制御性と可観測性について理解し、様々な手法によって可制御性と可観測性を解析できる。	システムの数式モデルに基づき、可制御性と可観測性について解析できる。	行列のランクと可制御性・可観測性との関係を理解し、解析できる。
到達目標4	各システムに適切な設計手法を用いてフィードバック制御系を設計できる。	指定された設計手法を用いてフィードバック制御系を設計できる。	各種設計手法を用いたフィードバック制御系の設計を例題に沿って行うことができる。
到達目標5	オブザーバを理解し、自ら設計手順を立て、倒立振子を対象とした総合的なシステム設計ができる。	オブザーバを理解し、定められた手順に従って、倒立振子を対象としたシステム設計ができる。	オブザーバを理解し、個々の段階の例題に沿って倒立振子を対象としたシステム設計ができる。

Assigned Department Objectives

学習・教育到達度目標 D-1

Teaching Method

Outline	すでに学んだ古典制御理論は周波数領域でシステムを表現するものであったが、原則として1入力1出力系に適用されるものであり、多入力多出力の複雑なシステムに適用することは困難であった。本講義を通して複雑なシステムへの適用が可能な現代制御理論の基礎を学び、最先端の制御理論を継続的に学んでいくための素養を修得する。
Style	授業各回終了時、演習問題を自学自習課題として供する。各自復習として課題を解き、提出すること。 また、事前課題としてmanabaを通じたオンライン課題を供する。各自あらかじめ次回の内容を確認して解答すること。 授業では各自が調査した内容を報告し、相互に理解を深める方法で進める。担当部分の十分な予習が求められる。 【授業時間30時間】
Notice	ポートフォリオ評価には【レポート課題】【オンライン課題】の評価が含まれる。 各自の担当部分に関する口頭報告に対して【発表・取り組み姿勢】の評価を行う。

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	古典制御理論と現代制御理論 状態空間表現	古典制御理論と現代制御理論の違いについて理解し、説明できる。 状態空間表現について理解し、簡単なシステムの表現ができる。
		2nd	状態遷移行列と安定性判別 1	システムの状態遷移行列を求め、システムの時間応答を求めることができる。
		3rd	状態遷移行列と安定性判別 2	状態遷移行列のモード展開について理解し、固有値からシステムの安定性を判別できる。
		4th	座標変換	線形システムの座標変換と正準形について理解し、行列の対角化ができる。
		5th	可制御性	可制御性行列を導くことができ、可制御であるための条件との関係を説明できる。
		6th	可観測性	可観測性行列を導くことができ、可観測であるための条件との関係を説明できる。
		7th	行列のランク，双対性	行列のランクを求めることができる。 双対性について理解し、説明できる。
		8th	中間試験	
	4th Quarter	9th	極配置法	極配置法を用いてフィードバック制御系を設計できる。
		10th	最適レギュレータ	最適制御について理解し、安定性の判別ができる。
		11th	折り返し法	折り返し法について理解し、制御系の設計ができる。
		12th	サーボ系	サーボ系について理解し、設計条件を説明できる。

		13th	オブザーバ	オブザーバについて理解し、簡単なシステムのオブザーバを設計できる。
		14th	システム設計演習１	倒立振子を対象としたシステム設計ができる。 システムを数式モデルに表し、各種特性を知ることができる。
		15th	システム設計演習２	倒立振子を対象としたシステム設計ができる。 最適レギュレータを用いたフィードバック系の設計ができる。
		16th	答案返却	

Evaluation Method and Weight (%)

	中間・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	70	0	20	10	0	100
基礎的能力	10	0	0	0	0	10
専門的能力	60	0	20	10	0	90
分野横断的能力	0	0	0	0	0	0

Anan College	Year	2024	Course Title	Experiments in Mechanixal Engineering 4

Course Information

Course Code	1215T02	Course Category	Specialized / Compulsory
Class Format	Experiment / Practical training	Credits	Academic Credit: 2
Department	Course of Mechanical Engineering	Student Grade	5th
Term	First Semester	Classes per Week	前期:4
Textbook and/or Teaching Materials	機械工学実験法（日刊工業新聞社）		
Instructor	Nishino Seiichi,Nishimoto Koji,Kawabata Nariyuki,Matsuura Fuminori,Nakaoka Nobushi		

Course Objectives

VI-A Mechanical Engineering Field (Experimental and Learning Abilities)
1. Understand the objectives and the right mindset for experiments, and can conduct experiments based on the instructed experimental methods.
2. Understand the principles of the experimental equipment, and can prepare for the experiments, handle the equipment correctly, and perform appropriate operations.
3. Can organize, analyze, and consider the experimental results, and can compile a report.

Rubric

	Ideal Level	Standard Level	Unacceptable Level
Achievement 1	Can understand the purpose and principles of the experiment through pre-study and carry out the instructed experimental methods.	Can understand the purpose and principles of the experiment during the experiment and carry out the instructed experimental methods.	May require assistance, but can understand the purpose and principles of the experiment during the experiment and carry out the instructed experimental methods.
Achievement 2	Can understand the operating principles of the experimental equipment through pre-study and use it correctly.	Can understand the operating principles of the experimental equipment during the experiment and use it correctly.	May require assistance, but can understand the operating principles of the experimental equipment during the experiment and use it correctly.
Achievement 3	Can organize and analyze experimental results and add one's own reflections to the report.	Can organize and analyze experimental results and create a report.	May require assistance, but can organize and analyze experimental results and create a report.

Assigned Department Objectives

学習・教育到達度目標 D-2 学習・教育到達度目標 E-2

Teaching Method

Outline	Mechanical engineering experiments are practical demonstrations of concepts learned in the classroom. This lecture aims to understand the mechanisms behind mechanical phenomena related to mechanical engineering and the performance testing of machinery through manufacturing, thereby acquiring experimental techniques. During the experiments in weeks 4 to 6, a faculty member who was responsible for the research of design standards for boilers used in power generation at a company will utilize their experience to teach stress and strain measurement and analysis methods in an experimental format.
Style	Experiments will be conducted in five fields related to mechanical engineering, followed by report writing. As this course is a credit-bearing subject, report submission is required as pre- and post-study activities. 【Lecture hours: 30 hours + Self-study hours: 60 hours】
Notice	Interest begins to emerge as one understands the content of the experiment themes. Therefore, it is advisable to research the related fields in advance before the experiment and understand the content. While carrying out the experiment and organizing the data is important, pre-experimental contemplation is particularly crucial. In addition to literature research, students are encouraged to use their creativity in writing the report. Completing the report within the deadline is also one of the tasks. Details of the schedule and course registration method will be distributed in a separate document, so please check it carefully.

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	Stirling Engine Experiment (Understanding and Preparation)	
		2nd	Stirling Engine Experiment (Experiment and Comparison)	
		3rd	Stirling Engine Experiment (Consideration & Summary)	
		4th	Strain Measurement Experiment on a Simply Supported Beam	
		5th	Strain Measurement Experiment on a Cantilever Beam	
		6th	Strain Distribution Measurement Experiment on a Plate with a Notch	
		7th	Metal Material Experiment: Heat Treatment of Steel	
		8th	Metal Material Experiment: Heat Treatment of Steel	
	2nd Quarter	9th	Metal Material Experiment: Heat Treatment of Steel	

		10th	Mechanical Dynamics Experiment: Basics of Vibration Measurement, Measuring Natural Vibration Modes	
		11th	Mechanical Dynamics Experiment: Basics of Vibration Measurement, Measuring Natural Vibration Modes	
		12th	Mechanical Dynamics Experiment: Basics of Vibration Measurement, Measuring Natural Vibration Modes	
		13th	Systems Engineering Experiment: Overview of Sequence Control	
		14th	Systems Engineering Experiment: Basic Ladder Diagrams	
		15th	Systems Engineering Experiment: Ladder Diagram for Product Sorting	
		16th		

Evaluation Method and Weight (%)

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

Anan College	Year	2024	Course Title	Fluid Dynamics

Course Information

Course Code	1295401	Course Category	Specialized / Elective
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Mechanical Engineering	Student Grade	5th
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．連続の式について説明でき、連続の条件が成り立つための計算をすることができる。
2．渦なしの条件について説明でき、流れ場の渦度を求めることができる。
3．完全流体に関する運動方程式について説明できる。
4．速度ポテンシャル、流れ関数を使って基礎的な流れを表すことができる。
5．複素ポテンシャルによる問題解法ができる。

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
到達目標1	連続の式について説明でき、連続の条件が成り立つための応用問題を解くことができる。	連続の式について説明でき、連続の条件が成り立つための基礎的計算をすることができる。	連続の条件が成り立つための基礎的計算をすることができる。
到達目標2	渦なしの条件について説明でき、複雑な流れ場の渦度を求めることができる。	渦なしの条件について説明でき、基本的な流れ場の渦度を求めることができる。	渦なしの条件について基本的な流れ場の渦度を求めることができる。
到達目標3	完全流体に関する運動方程式について説明でき、式を導出することができる。	完全流体に関する運動方程式について説明できる。	完全流体に関する運動方程式について基礎的な問題を解くことができる。
到達目標4	速度ポテンシャル、流れ関数を使って基礎的な流れを表し、複合的な流れに適用できる。	速度ポテンシャル、流れ関数を使って基礎的な流れを表し、基礎的な問題を解くことがきる。	速度ポテンシャル、流れ関数を使って基礎的な問題を解くことができる。
到達目標5	複素ポテンシャルによる問題解法ができ、円柱等に作用する抗力、揚力を求めることができる。	複素ポテンシャルによる問題解法ができ，円柱等に作用する力、力について説明できる。	複素ポテンシャルによる基礎的な問題解法ができる。

Assigned Department Objectives

学習・教育到達度目標 B-3 学習・教育到達度目標 D-1

Teaching Method

Outline	本講義は、流体の運動を理論的に取り扱う部分を主な内容とする。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。流体の運動を詳細に取り扱う場合は、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。また、完全流体を用いることで流れを単純化し、理論的表記をしやすくなり流れの本質を表現することができる。本講義では、「流体運動の基礎方程式」、「二次元ポテンシャル流れ」の基礎を理解することを目標とする。
Style	適宜、簡単な演習を行いながら授業を行う。 【授業時間31時間＋自学自習時間60時間】
Notice	本講義を受講するに必要な基礎知識は、「水力学1」ならびに「水力学2」で学習した内容と、数学の知識（偏微分方程式など）である。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：高校数学でわかる流体力学（講談社）　平惣書店

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	１．流体力学の基礎方程式	流体運動を表す物理量について説明できる。
		2nd	１．流体力学の基礎方程式	流線の方程式を説明できる。
		3rd	１．流体力学の基礎方程式	検査体積の概念と連続の式について説明できる。
		4th	１．流体力学の基礎方程式	渦無し条件を理解し、説明できる。
		5th	２．二次元ポテンシャル流れ	速度ポテンシャルについて説明できる。
		6th	２．二次元ポテンシャル流れ	流れ関数と流量の関係について説明できる。
		7th	２．二次元ポテンシャル流れ	循環と渦度について説明できる。
		8th	中間試験	
	2nd Quarter	9th	２．二次元ポテンシャル流れ	一様流れなどについて速度ポテンシャル、流れ関数を求めることができる。
		10th	２．二次元ポテンシャル流れ	２重吹出し、円柱まわりの流れの速度ポテンシャル、流れ関数を求めることができる。
		11th	３．複素ポテンシャルによる解法	複素数と複素関数について理解し、説明できる。
		12th	３．複素ポテンシャルによる解法	正則関数について説明できる。
		13th	３．複素ポテンシャルによる解法	複素ポテンシャルについて説明できる。
		14th	３．複素ポテンシャルによる解法	一様流れなどについて、複素ポテンシャルをを用いた解法ができる。
		15th	３．複素ポテンシャルによる解法	２重吹出し、円柱まわりの流れについて、複素ポテンシャルを用いた解法ができる。
		16th	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	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	Information Processing 2

Course Information

Course Code	1295801	Course Category	Specialized / Elective
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Mechanical Engineering	Student Grade	5th
Term	First Semester	Classes per Week	前期:2
Textbook and/or Teaching Materials	ニューラルネットワーク自作入門 (マイナビ)		
Instructor	Matsuura Fuminori		

Course Objectives

1. Can explain the training of prediction machines and classifiers as well as backpropagation of errors.
2. Can implement a neural network with input, hidden, and output layers, capable of identifying handwritten digits.

Rubric

	Ideal Level	Standard Level	Unacceptable Level
Principle	Can derive the matrix form for output layer computation and weight updates using the backpropagation method.	Understands and can explain the matrix form for output layer computation and weight updates using the backpropagation method.	Can provide a general explanation of the method for updating weights using the output layer computation method and the backpropagation method.
Implementation in Python	Can identify one's own handwritten digits.	Can identify handwritten digits using the MNIST dataset.	Can implement a simple neural network.

Assigned Department Objectives

学習・教育到達度目標 B-4 学習・教育到達度目標 D-1

Teaching Method

Outline	Can explain classifiers and their learning methods based on neural networks, which are fundamental to deep learning (deep neural networks), and can implement them in Python.
Style	Students are assumed to have already acquired knowledge of matrix inner products and basics of Python (functions, matrix operations using Numpy) through other classes or self-study. 【Lecture hours: 30 hours + Self-study hours: 60 hours】
Notice	This course is designed for individuals who have acquired linear algebra and programming skills, aiming to learn the principles used in machine learning (artificial intelligence). There is a significant portion where matrix operations are carried out by hand, demanding not only proficiency in matrix operations but also "grit."

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	Simple Prediction Machine	Can explain methods for learning predictive machines.
		2nd	Learning a Simple Classifier	Can explain how to use classifiers to categorize data.
		3rd	Neuron	Can describe the structure of a neuron and networks formed by neurons.
		4th	Learning Weights from Two or More Nodes	Can explain how to adjust the internal parameters of a neuron.
		5th	Backpropagation from Many Nodes	Can explain how to adjust the internal parameters of a neural network with many nodes.
		6th	Backpropagation to Many Layers	Can explain how to propagate errors from the output layer to the hidden layers.
		7th	Midterm Exam	
		8th	Weight Update	Can explain the equations used for updating the weights of an entire neural network.
	2nd Quarter	9th	Introduction to Python	Can create Python programs using classes, among other things, to implement neural networks.
		10th	Definition of Neural Network Class 1	Can implement the structure of a neural network.
		11th	Definition of Neural Network Class 2	Can implement a neural network that is capable of backpropagation.
		12th	Learning the Network	Can train a neural network and visualize the process.
		13th	Handwritten Digit Dataset 1	Can explain what the MNIST dataset of handwritten digits is.
		14th	Handwritten Digit Dataset 2	Can implement a neural network that recognizes handwritten digits.
		15th		
		16th		

Evaluation Method and Weight (%)

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

Anan College	Year	2024	Course Title	Heat Transfer Engineering

Course Information

Course Code	1295D03	Course Category	Specialized / Elective
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Mechanical Engineering	Student Grade	5th
Term	Second Semester	Classes per Week	後期:4
Textbook and/or Teaching Materials	Heat Transfer Engineering ; Second Edition, Hidenori Tasaka, Morikita Publishing.		
Instructor	Kusano Koji,Nishimoto Koji		

Course Objectives

1. Understand and estimate the basics of heat conduction, heat convection, and heat radiation.
2. Design the heat transfer device.
3. Multidimensional approach to energy use.

Rubric

	Ideal Level	Standard Level	Minimum Level
Achievement 1	Understand the principles of the three basic forms of heat transfer: heat conduction, heat transfer, and heat radiation, and calculate the amount of heat transferred.	Understand and classify the principles of the three basic forms of heat transfer: heat conduction, heat transfer, and heat radiation.	Can classify the three basic forms of heat transfer. Heat conduction, heat transfer, and heat radiation.
Achievement 2	Understand and implement thermal design and numerical simulation methods for heat transfer device.	Understand and explain thermal design of heat transfer device and numerical simulation methods.	Understand the thermal design of heat transfer device and numerical simulation methods.
Achievement 3	Consider multiple aspects of how to effectively use thermal energy.	Understand the effective use of thermal energy and explain its characteristics.	Understand how to use thermal energy effectively.

Assigned Department Objectives

学習・教育到達度目標 D-1

Teaching Method

Outline	Heat transfer phenomena can be seen from thermal phenomena in nature to heat transfer equipment for domestic and industrial use. This course focuses on various forms of heat transfer phenomena and the problems of heat transfer quantities that occur in such phenomena, and provides knowledge on the thermal design of heat transfer devices and effective methods of heat energy utilization required in the future society, such as the use of renewable heat energy and energy conservation.
Style	Heat transfer engineering is related to thermodynamics and fluid mechanics, as well as other engineering subjects, so students will develop the ability to solve applied problems of heat transfer calculation and thermal design, while learning the outline of related subjects and the principles of various heat transfer forms. In addition, students will learn how to use renewable energy sources, which is necessary for building a sustainable society in the future.[Course hours] : 30H, [self-learning] (preparation, review, report, etc.) : 60H (Two hours preparation and review are necessary to understand the lecture and earn the credit.)
Notice	Heat transfer is caused by physical phenomena. Since these physical phenomena are often expressed mathematically, it is important to understand and take notes during the lecture as much as possible. Please use the notes to review and deepen your understanding of heat transfer engineering.

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	Heat transfer phenomena around us and the three basic forms of heat transfer	Explain the three basic forms of heat transfer phenomena and their principles.
		2nd	Steady-state heat conduction 1	Calculate the basic equation of heat conduction, heat flow velocity and heat transfer rate.
		3rd	Steady-state heat conduction 2 and Unsteady heat conduction 1	Understand the difference between steady-state and unsteady heat conduction and calculate heat transfer quantities.
		4th	Unsteady heat conduction 2	Calculate temperatures and heat transfer quantities for unsteady heat conduction in two dimensions and complex geometries.
		5th	Overall heat transfer	Understand overall heat transfer and calculate thermal resistance.
		6th	Forced convective heat transfer	Understand the phenomenon of convective heat transfer by forced convection as seen in heat transfer devices and calculate heat transfer rates.
		7th	Natural convective heat transfer	Understand the heat transfer phenomena caused by natural convection, which is often found in natural, and calculate the amount of heat transfer.
		8th	Midterm examination	
	4th Quarter	9th	Radiative heat transfer	Explain the heat transfer phenomena by radiation.

		10th	Heat transfer with phase change and combustion and reaction phenomena	Calculate the heat transfer rate for heat transfer phenomena involving boiling and condensation, as well as combustion and chemical reactions.
		11th	Thermal design and numerical analysis	Design and numerical analysis the simple heat transfer device.
		12th	Thermal energy and resources	Understand the issues surrounding energy and explain the renewable energy.
		13th	Conventional thermal energy systems	Explain conventional thermal energy circulation and energy devices.
		14th	Future thermal energy systems	Understand the effective use of thermal energy and energy conservation in the future, consider how to deal with the situation.
		15th	Final examination	
		16th	Return of examination 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