Tsuyama College	Year	2020	Course Title	Robot Programming

Course Information

Course Code	0128	Course Category	Specialized / Elective
Class Format	Lecture	Credits	Academic Credit: 2
Department	Department of Integrated Science and Technology Advanced Science Program	Student Grade	5th
Term	First Semester	Classes per Week	2
Textbook and/or Teaching Materials	Textbook: Introduction to Numerical Calculation Method by C (Morikita Publishing		
Instructor	HOSOTANI Kazunori		

Course Objectives

Purpose of learning: Computer programming is required to implement various functions in robots. In this lecture, you will first learn the basics of programming, then learn numerical calculation methods for interpolation, numerical integration, simultaneous equations, and differential equations, and develop the programming skills necessary to solve simple engineering problems.

Achievement goals*
1. To understand the concept of variables and data types.
2. To understand the concepts of assignments and operators.
3. To able to use a computer to solve problems related to numerical calculations.

Rubric

	Ideal Level	Standard Level	Acceptable Level	Unacceptable Level
Achievement 1	Understand the concepts of variables and data types and use them to solve problems.	Understand the concepts of variables and data types, and find ways to solve problems.	Understand the concept of variables and data types.	Has not reached the level described in the columns on the left.
Achievement 2	Understand and master the concepts of assignments and operators.	Understand the concepts of assignments and operators, and find ways to solve problems.	Understand the concepts of assignments and operators.	Has not reached the level described in the columns on the left.
Achievement 3	Problems related to numerical calculations can be solved and applied using a computer.	Can use a computer to solve problems related to numerical calculations.	Understand the basics of solving problems related to numerical calculations using a computer.	Has not reached the level described in the columns on the left.

Assigned Department Objectives

Teaching Method

Outline	General or Specialized : Specialized Field of learning : Energy / Measurement and Control Required, Elective, etc. : Elective must complete subjects Foundational academic disciplines : Engineering / Mechanical Engineering Relationship with Educational Objectives :This class is equivalent to "(2) Acquire basic science and technical knowledge and (3) Acquire deep foundation knowledge of the major subject area". Relationship with JABEE programs : The main goal of learning / education in this class are "(A) , also "(C), (D)" are involved. Class outline: Computer programming is indispensable for learning robot technology. In the first half of this lecture, you will learn the numerical calculation method required for robot programming using a dynamics simulator. In the middle stage, we will explain the basic grammar using an interpreted language with simple examples. Acquire basic knowledge for use as a tool for experimental data processing, control, and numerical analysis. In the second half, you will learn the numerical calculation methods of the items (nonlinear equations, interpolation, numerical integration, simultaneous equations, differential equations) that are the basis of engineering calculations.
Style	Class method: Present each calculation algorithm as an example and let them understand by solving the applied problem by improving the program. The programming language uses a MATLAB compatible interpreter language. Grade evaluation method: Evaluation is performed by regular examination (60%) and exercises (40%). Retests will be conducted as necessary.
Notice	Precautions on the enrollment : Robotics program applicants are required to take courses (absence hours are less than one-third of the prescribed class hours). This subject is a "subject that requires study outside of class hours". Classes are offered for 15 credit hours per credit, but 30 credit hours are required in addition to this. Follow the instructions of your instructor for these studies. Foundational subjects: Comprehensive science and engineering basics (1st year), Information literacy (1st), Computational science (3rd), Mechatronics I (3rd), Mechatronics II (4th), Robot control (4th), sensor engineering (4th), robot creative exercises (4th), robotics Introduction (4th), etc. Related subjects: specialized subjects in general (3rd) Attendance advice : The programming language is far much less than the language people use and is easy to remember in a short time. In order to use this word properly, it is necessary to learn programming style, so it is a quick way to improve by making many programs by yourself. Regarding lateness, if it is within 25 minutes of the start of class will be considered to be late, and 3 times late will be considered as 1 absence.

Course Plan

			Theme	Goals
1st Semester	1st Quarter	1st	Guidance of this subject, learning content, guidance on methods, explanation of using the practice room	
		2nd	Exercise by dynamic simulation: Understanding the concept of robot simulation	Perform simulations using a physics engine to understand the importance of numerical calculations used in statics and kinetic calculations.
		3rd	Exercise by dynamic simulation: Understanding the concept of robot simulation	Solve problems related to mechanics using a physics engine and find solutions.

		4th	Basic operation and basic knowledge of programs using an interpreted language [basic data type]	Understand the basics of programming with MATLAB-compatible applications [basic data types].
		5th	Basic knowledge of programs using interpreted languages [input / output]	Understand the basics [input / output] of programming using MATLAB compatible applications.
		6th	Data and operators [Types of operators] [Handling of operators]	Understand data and operators [types of operators] [handling of operators].
		7th	Programming that applies operators	Programing by applying operators
		8th	Mid-term exam (evaluate by report without conducting)	
	2nd Quarter	9th	Return the answer to the mid-term test and explain, exercise: Review of computer exercises	Understand the contents of the first half exam
		10th	Bifurcation and repetition [if statement]	Understand bifurcation and repetition [if statements]
		11th	Simultaneous linear equations [LU decomposition (1)], Exercise: Creating and executing a program for the LU decomposition method	Understand the principle of the LU decomposition method and its characteristics, and be able to create and execute the desired program.
		12th	Numerical interpolation method [Spline interpolation, curve fitting, FFT]	Create and execute programs for numerical interpolation methods [spline interpolation, curve fitting, FFT]
		13th	Numerical interpolation method [Spline interpolation, curve fitting, FFT]	Create and execute programs for numerical interpolation methods [spline interpolation, curve fitting, FFT]
		14th	Solving nonlinear equations [fixed point method, dichotomy, Newton's method]	Create and execute programs for solving nonlinear equations [fixed point method, dichotomy, Newton's method]
		15th	Exam	
		16th	Return of the exam and explanation of answers	

Evaluation Method and Weight (%)

	Examination	Presentation	Mutual Evaluations between students	Behavior	Report	Other	Total
Subtotal	60	0	0	0	40	0	100
Basic Proficiency	0	0	0	0	0	0	0
Specialized Proficiency	60	0	0	0	40	0	100
Cross Area Proficiency	0	0	0	0	0	0	0