Akashi College	Year	2021		Course Title	Science I

Course Information

Course Code	0005		Course Category	General / Compulsory
Class Format	Lecture		Credits	School Credit: 2
Department	Mechanical Engineering		Student Grade	1st
Term	Year-round		Classes per Week	2
Textbook and/or Teaching Materials	國友正和ほか著 総合物理 1 -力と運動・熱- (数研出版)数研出版編集部編 リードα 物理基礎・物理 (数研出版)			
Instructor	TAKEUCHI Masahiro			

Course Objectives

1. Understand the concept of significant figures and units, and handle them appropriately.
2. Understand the concept of vector and component, and use them properly.
3. Understand the concept of the dynamics of the physical quantity, and be able to explain those concepts and perform basic calculations.

Rubric

	Excellent	Good	Insufficient
Achievement 1	Understand the concept of significant figures and units, and handle them appropriately.	Can handle significant figures and units appropriately.	Doesn't understand the concept of significant figures and units, and can't handle them appropriately.
Achievement 2	Understand the concept of vector and component, and use them properly.	Can use vector and component properly.	Doesn't understand and can't use vector and component.
Achievement 3	Understand the concept of the dynamics of the physical quantity, and be able to explain those concepts and perform basic calculations.	Understand the concept of the dynamics of the physical quantity.	Doesn't understand the concept of the dynamics of the physical quantity.

Assigned Department Objectives

学習・教育到達度目標 (D) 学習・教育到達度目標 (F) 学習・教育到達度目標 (G)

Teaching Method

Outline	Learn physics dynamics which is the basis of engineering. The study of dynamics is divided into four topics. In the first year, the students will learn until constant velocity circular motion (middle of dynamics topic 4). The students are required to acquire a tremendous amount of knowledge out a difficult topic, to be perseverant and don't give up. Dynamics 1: To understand the vector concept. The contents used here are speed and acceleration, topics learned at junior high school. To explain the components of a vector is necessary to understand the trigonometric functions. Also, will be guided to handle significant figures and units. The students will learn how to study by themselves through daily tasks, such as self-learning, doing assignments (task preparation research notes), etc. Dynamics 2: to understand the relation between cause and consequence in physical phenomena. For example, acceleration (learned in dynamics 1) is the result, caused by the exercise of a force and influenced by mass. The students will learn more about movements equations in dynamics 4. Dynamics 3: to understand torque which is a quantitative concept of lever principle. Next, the students will study energy conservation law and momentum conservation law. Here, by conducting a total review of physical quantities learned so far, the students will be prepared to comprehend dynamics 4. The students must pay attention to the differences in power and energy, that are easily confused. Dynamics 4: To understand constant velocity circular motion through the study of two-dimensional. As an application, the students will use simple vibration as an instrument to learn about sound and light waves. Furthermore, through the study of the law of universal gravitational attraction by Newton, the students will become aware of all the dynamic phenomena, represented by the equation of motion. To make the students perceive that if they can write the equations, they can solve it.
Style	During each lesson (90 minutes) in the first half the teacher will explain the contents from in the textbook, and in the second half the students will participate in group-specific activities and solve problems together from the textbook. The students are required to read the textbooks in advance, to make team activities smooth and meaningful. Also, to acquire problem-solving and presentation style, we recommend the use of the support web page and videos. In the future, physical reversal classes will be abolished, so the students should focus on preparation for the classes from the beginning. Assignment: The students have to make and submit their "problem research note." The note contains explanations of the background and essence of each problem and not be used as a tool to show how much the student had studied. It also should include long-term vacations periods of study time. Test: The test problems are from high school physics book (the style of the problem is preserved, numbers and way of solving are changed), to avoid difference of interpretation between students and teacher, original questions elaborated by the teacher are not used. In resume, this course is centered on the problems from the textbook, in addition to other learning materials as the videos and the web page task, etc. The students should understand the textbook from corner to corner, as a third-party external evaluation system. In addition to the teachers' commentary, extra handouts may be distributed as a reference. I can solve Ichi's problems! This fact and feeling will give confidence to the students in other activities inside and outside the campus.
Notice	Evaluation points: For specific calculation methods: https://sites.google.com/s.akashi.ac.jp/physics/ Re-examination: No retesting 10 absences will be excused. In junior high school, students think about something from zero. Learners who do not stand on the shoulder of the giants, are not only inefficient but also blaspheme. In the learning of physics, images from comics and animation may lead to erroneous concepts (simple concept) and sometimes interfere with correct understanding of physical phenomena. By acquiring the "style" of thinking developed by predecessor physics, you will become a sophisticated technician who is not misled by misconceptions and pseudoscience!

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	Calculate sum difference of vector components (p6 - p13)	Can explain textbook's problems 2,3,4.
		2nd	Vector subtraction and relative velocity (p14 - p18)	Can explain textbook's problems 5,7,8.
		3rd	3 equations of equal acceleration linear motion and it's exercises (p19 - p25)	Can explain textbook's problems 11,12,13.
		4th	Gravity acceleration measurement experiment (experiment hand out)	Execute the experiment safely and submit the assignment in time.
		5th	Powers and significant figures (p241-p244)	Can explain textbook's problems 21,22, 23
		6th	Falling body motion and horizontal projection (p31-p36)	Can explain textbook's problems 27, 28, 29
		7th	Oblique projection (p37-p41)	Can explain textbook's problems 30, 31, 32
		8th	Mid term exams	Correctly answer more than 80 % of the test.
	2nd Quarter	9th	How to calculate the force and force vector(p44-p49)	Can explain textbook's problems 40, 41, 44, 45
		10th	Force balance and Force action / reaction (p50-p55)	Can explain textbook's problems 40,41, 46, 47,49
		11th	Equation of motion (p61-p70)	Can explain textbook's problems 56,58,59,60
		12th	Friction force (p71-p74)	Can explain textbook's problems 64,65,66
		13th	Atmospheric pressure and water pressure (p75-p77)	Can explain textbook's problems 68, 69
		14th	Buoyancy and air resistance (p78-p80)	Can explain textbook's problems 70,71
		15th	Exercises	Can explain textbook's problems 67,61,62
		16th	End term exams	Correctly answer more than 80 % of the test.
2nd Semester	3rd Quarter	1st	Assignment test and force moment (p81-p85)	Can explain textbook's problems 80,81,82
		2nd	Combined force and center of gravity acting on a rigid body (p86-p89)	Can explain textbook's problems 83,84,85, 86
		3rd	Rigid body tilt and fall (p90-p93)	Can explain textbook's problems 87,88,89
		4th	Work and power (p94-p99)	Can explain textbook's problems 94, 95, 96, 97
		5th	Kinetic energy and potential (p100-p106)	Can explain textbook's problems 100, 101, 102, 103
		6th	Preservation of mechanical energy (p107-p112)	Can explain textbook's problems 104,105
		7th	Exercises	Can explain textbook's problems 106,107
		8th	Mid term exams	Correctly answer more than 80 % of the test.
	4th Quarter	9th	Momentum conservation law (p118-p123)	Can explain textbook's problems 114,116,117
		10th	Collision on the plane and coefficient of restitution (p124-p132)	Can explain textbook's problems 120, 121, 122
		11th	Collision energy (p133-p134)	Can explain textbook's problems 123,124, 125
		12th	Constant velocity circular motion (p136-p141)	To explain in order the six formulas and the textbook's problems 131, 132, 133, 134
		13th	Inertial force (p142-p145)	Can explain textbook's problems 139, 137, 138
		14th	Centrifugal force (p146-p150)	Can explain textbook's problems 139, 140, 141
		15th	Exercises	Can explain textbook's problems 142, 143, 135
		16th	End term exams	Correctly answer more than 80 % of the test.

Evaluation Method and Weight (%)

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