Tsuyama College	Year	2021	Course Title	High Voltage Engineering

Course Information

Course Code	0078	Course Category	Specialized / Elective
Class Format	Lecture	Credits	Academic Credit: 2
Department	Department of Integrated Science and Technology Electrical and Electronic Systems Program	Student Grade	4th
Term	First Semester	Classes per Week	2
Textbook and/or Teaching Materials	Textbooks : Tadao Uetsuki et al, "High Voltage Engineering", CORONA PUBLISHING CO., LTD.		
Instructor	UETSUKI Tadao		

Course Objectives

Learning purposes :
Acquire the ability and knowledge to deal with basic electrical problem by understanding the high voltage phenomena. At the same time, acquire the knowledge to evaluate the high voltage measuring system by understanding the mechanism of measuring system and high voltage generation devices.

Course Objectives :
1. To understand the fundamental process of the high voltage phenomena.
2. To understand the breakdown mechanism of the gas, the liquid, and the solid.
3. To understand the kinds and characteristics of high voltage generation devices.
4. To understand the kinds and characteristics of the measurement systems of high voltage and huge current.

Rubric

	Excellent	Good	Acceptable	Not acceptable
Achievement 1	The student can describe the characteristics and kinds of breakdown mechanism of gas, liquid and solid. At the same time, the student can describe the problems to be noted.	The student can describe the characteristics and kinds of the breakdown mechanism of the gas, the liquid and the solid.	The student can describe the characteristics of the basic breakdown mechanism of the gas, the liquid and the solid.	The student cannot describe the characteristics of the breakdown mechanism of the gas, the liquid and the solid at all.
Achievement 2	The student can describe the characteristics and kinds of the generators as to DC, AC and HF and also describe conditions for their use.	The student can describe the characteristics and kinds of the generators as to DC, AC and HF.	The student can describe the fundamental characteristics and kinds of the generators as to DC, AC and HF.	The student cannot describe the characteristics and kinds of generators as to DC, AC and HF at all.
Achievement 3	The student can describe the kinds, characteristics and the conditions of use for the measuring systems of high voltage.	The student can describe the kinds and the characteristics of the measuring systems for the high voltage.	The student can describe the kinds and the fundamental characteristics of measuring systems for high voltage.	The student cannot describe the kinds and the characteristics of measuring systems for the high voltage at all.
Achievement 4	The student can describe the kinds, characteristics and the using conditions of use for the noncontact current measuring system.	The student can describe the kinds and the characteristics of noncontact current measuring system.	The student can describe the kinds and the fundamental characteristics of the noncontact current measuring system.	The student cannot describe the kinds and the characteristics of noncontact current measuring system at all.

Assigned Department Objectives

Teaching Method

Outline	General or Specialized : Specialized Field of learning : Electrical and Electronic Required, Elective, etc. : Elective Must complete subjects Foundational academic disciplines : Engineering / Electric and electronic Relationship with Educational Objectives : This class is equivalent to "(3) Acquire deep foundation knowledge of the major subject area". Relationship with JABEE programs : The main goals of learning / education in this class are "(A),(A-2)". Course outline : High Voltage Engineering is the study to understand "the phenomena of the breakdown mechanism under the high electric field condition" , "the devices used to generate high voltage" and "the devices used to measure high voltage". To achieve this purpose, prior specialized knowledge is required. In this lecture, the relationship between the study of High Voltage Engineering and the students' prior specialized knowledge will be integrated.
Style	Course method : This course is held in the second semester (16 weeks), and each lecture is 90 minutes in a week. The class is advanced by the lecture in line with the text book. Grade evaluation method : There are assignments that must be submitted. Exams (70%)+ Portfolio (30%). Examinations will be conducted a total of 2 times, and the evaluation ratios will be the same. The textbook can be used in the examination, but the detail condition about it is instructed every time. Re-examination may be possible but will depend on the situation of the student.

Notice	Precautions on the enrollment : This is a "class that requires study outside of class hours". Classes are offered for 15 hours per credit, but 30 credit hours are required in addition to this. Follow the instructions of your instructor for these studies. Course advice : Read the textbooks and read aloud before class to see if there are any parts you do not understand. Foundational subjects : Electrical and Electronic Circuits (2nd year), Basic Electric (2nd), Electrical and Electronic Measurements Ⅰ, Ⅱ(2nd, 3rd), Electric Circuit Ⅰ, Ⅱ(3rd, 4th), Electromagnetism Ⅰ, Ⅱ(3rd, 4th) Related subjects : Electrical Application and Environment (4th year), Electrical and Electronic Materials (5th), Graduation Thesis(5th) Attendance advice : Take notes during the lecture to aid your understanding. Prior knowledge should be considered and engaged while attending this course. If you are late, you will be treated as absent after 20 minutes.

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	Guidance, Introduction to the high voltage engineering, the kinetic theory of gas	Understand the outline of the breakdown, the temperature andthe pressure.
		2nd	The kinetic theory of gas	Understand the technical term for the kinetic theory, for example, cross section, ionization, rcombination, and so on.
		3rd	The electron emission from the solid to space.	Understand the kinds of the electron emission from the solid to the space.
		4th	The breskdown of gas Ⅰ	Understand the meaning of the corona discharge, the spark dischrge, the Townsend theory and the stremer theory.
		5th	The breskdown of gas Ⅱ	Understand the meaning of the discharge time lag, the polar effect, the Paschen's law.
		6th	The breskdown of gas Ⅲ	Understand the meaning of the Penning effect, the Mater effect and the vacuum dischrge.
		7th	The characteristics of plasma	Understand the meaning of the Deby length, the plasma frequency, the cutoff frequency.
		8th	1st semester mid-term exam	
	2nd Quarter	9th	Return and commentary of exam answers, and the breakdown of the liquid.	Understand how the breakdown of the liquid happens.
		10th	The breakdown of the solid.	Understand how the breakdown of the solid happens.
		11th	The brekdown of the composite dielectrics	Understand how the breakdown of the composite dielectrics happens.
		12th	The insulation coordination and the devices for the insulation	Understand the technics to avoid the breakdown as to the high voltage devices and apparatus.
		13th	The generation of the high voltage	Understand how the high voltage generates.
		14th	The measurement of the high voltage	Understand how the high voltage measures.
		15th	(1st semester final exam)	
		16th	Return and commentary of exam answers	

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