Republic of the Philippines
SULTAN KUDARAT STATE UNIVERSITY
ACCESS, EJC Montilla, 9800 City of Tacurong
Province of Sultan Kudarat

ET 212 – ELECTRICAL MACHINES

UNIVERSITY VISION

A leading University in advancing scholarly innovation, multi-cultural convergence, and responsive public service in a borderless Region.

UNIVERSITY MISSION

The University shall primarily provide advanced instruction and professional training in science and technology, agriculture, fisheries, education and other related fields of study. It shall also undertake research and extension services, and provide progressive leadership in its areas of specialization.

UNIVERSITY STRATEGIC GOALS

a. Deliver quality service to stakeholders to address current and future needs in instruction, research, extension, and production
b. Observe strict implementation of the laws as well as the policies and regulations of the University
c. Acquire with urgency state-of-the-art resources for its service areas
d. Bolster the relationship of the University with its local and international customers and partners
e. Leverage the qualifications and competences in personnel action and staffing
f. Evaluate the efficiency and responsiveness of the University systems and processes

INSTITUTIONAL OUTCOMES (IO)

a. Enhance competency development, commitment, professionalism, unity and true spirit of service for public accountability, transparency and delivery of quality services
b. Provide relevant programs and professional trainings that will respond to the development needs of the region
c. Strengthen local and international collaborations and partnerships for borderless programs
d. Develop a research culture among faculty and students
e. Develop and promote environmentally-sound and market-driven knowledge and technologies at par with international standards
f. Promote research-based information and technologies for sustainable development
g. Enhance resource generation and mobilization to sustain financial viability of the university

PROGRAM OUTCOMES (PO) COMMON TO ALL PROGRAMS AND ITS RELATIONSHIPS TO INSTITUTIONAL OUTCOMES

	INSTITUTIONAL OUTCOMES (IO)						
A graduate of Sultan Kudarat State University can:	a	b	c	d	e	f	g
a. Analyze broadly defined industrial technology processes by using analytical tools that enhance creativity, innovativeness, and intellectual curiosity to improve methods, processes, and systems that meet the industry standards;	✓	✓				✓	
b. Design and implement broadly defined industrial systems, components, products, or processes to meet specific industry needs with proficiency and flexibility in the area of specialization in accordance with global standards;	✓	✓		✓		✓	
c. Apply appropriate techniques, resources, and state-of-the-art industrial technology tools to meet current industry needs and use these modern tools and processes to improve and increase entrepreneurial activities upholding the safety and health standards of business and industry;	✓		✓	✓	✓		

d. Communicate with diverse groups of clienteles the appropriate cultural language with clarity and persuasion, in both oral and written forms, including understanding and giving of clear instructions, high comprehension level, effectiveness in delivering presentations and writing documents, and articulating technological innovation outputs;	✓	✓	✓	✓	✓		
e. Develop leadership and management skills in a team-based environment by making informed decisions, keeping the team motivated, acting and delegating responsibility, and inspiring positive changes in the organization by exercising responsibility with integrity and accountability in the practice of one's profession;	✓	✓	✓	✓	✓		
f. Practice the moral responsibilities of an industrial technologist to manage and balance wider public interest and uphold the norms and safety standards of the industrial technology profession;				✓	✓	✓	✓
g. Demonstrate enthusiasm and passion for continuous personal and professional development in broadly defined industrial technology and effecting positive changes in the entrepreneurial and industrial endeavor; and	✓	✓	✓	✓	✓	✓	✓
h. Recognize the need for, and an ability to engage in lifelong learning.	✓	✓	✓	✓	✓	✓	✓

1 **COURSE CODE** ET 212A
2 **COURSE TITLE** ELECTRICAL MACHINES
3 **PREREQUISITE** ET 121/ET 122/ET 123
4 **CREDITS** 3 units

5 **COURSE DESCRIPTION**

This course deals on two categories of electrical machines commonly used in industry. The DC machines cover the principles, construction, characteristics, repairs and maintenance of the different types of DC motors and generators. For AC machines covers the principles of operation, construction, characteristics, repair and maintenance of single phase and poly-phase motors and alternators. This includes the study of power transformer.

6 **COURSE LEARNING OUTCOMES (CLO) AND ITS RELATIONSHIPS TO PROGRAM OUTCOMES**

Course Learning Outcomes (CLO)	Program Outcomes						
	a	b	c	d	e	f	g
At the end of the course, a student can:							
a. Understand SKSU-VGMO, Classroom Policies, Course Overview, Course Requirements and Grading System;	✓	✓				✓	✓
b. Explain the principles of DC generator construction, operation, and characteristics, and apply this knowledge to real-world applications.	✓			✓		✓	✓
c. Analyze the construction, operation, and characteristics of DC motors, and apply this understanding to solve practical problems.	✓	✓	✓			✓	
d. Demonstrate comprehension of AC motor construction, operation, characteristics, and applications through problem-solving and design exercises.		✓		✓	✓	✓	
e. Describe the construction, operation, characteristics, and applications of alternators.					✓		✓
f. Install and connect transformers correctly, following safety regulations and best practices. They will also be able to troubleshoot common issues.	✓				✓		
g. Compare and contrast the operational principles and applications of DC and AC motors and generators.	✓	✓			✓		✓
h. Demonstrate knowledge of the relevant safety precautions and regulations when working with generators, motors, and transformers.	✓	✓		✓	✓	✓	✓

7 **COURSE CONTENTS**

WEEK	CONTENT	INTENDED LEARNING OUTCOMES((ILOs)	TEACHING AND LEARNING ACTIVITIES (TLA)	OUTCOMES-BASED ASSESSMENT (OBA)	COURSE LEARNING OUTCOMES (CLOs)

1	**Course Orientation** *SKSU VMGO, Classroom Policies, Course Overview, Course Requirements, Grading System*	At the end of the week, the student can: a. Discuss the University's VMGO, classroom policies, course overview, requirements and grading system	Discuss the VMGO of the University, the classroom policies, scope of the course, course requirements and grading system		
2-3	**Transformer – Single Phase**	At the end of the week, the students can: a. Demonstrate the operation of the transformer b. Identify the parts of transformers c. Classify the operation of transformer step-up, step-down, and isolation transformer.	a. Professional lectures on electromagnetic circuits and transformers b. Lab works on electromagnetic circuits and single-phase transformers	a. Teachers made test b. Quiz c. Written output of student activity d. Assembled step-down transformer.	a, b, c, e, f
4	**Autotransformer & Current Transformer**	At the end of the week, the students can: a. Discuss the operation of autotransformer b. Compute value of voltage, currents, turns ration for autotransformer c. Discuss the operation of a current transformer d. Describe how current transformer differs from voltage transformer e. Connect a current transformer in a circuits	a. Lectures on autotransformers and current transformers b. Lab works on connection of autotransformers and current transformers	a. Teachers made test b. Quiz c. Written output of student activity d. Assemble an autotransformer e. Lab works on connecting current transformer	b, c, d, e, f
5	**Three Phase Circuits & Transformer**	At the end of the week, the students can: a. Demonstrate the single-phase circuits and three phase circuits b. Identify the three phase Wye and Delta connection c. Explain the parts of three phase transformers d. Demonstrate the operation of three phase transformers	a. Lectures on single-phase circuits and three phase circuits b. Lab works on single-phase transformers and three phase transformer connections.	a. Teachers made test b. Quiz c. Written output of student activity	a, b, d, e, f
6	**Transformer Installation, Cooling, and Maintenance**	At the end of the week, the students can: a. Determine the correct conductor size for transformer installation in accordance to the PEC b. Determine the proper branch circuit protective device of the transformer of different rating c. Identify the source of heat in a transformer d. Determine different methods of transformer cooling e. List safety procedure when maintaining transformer	a. Lectures on proper calculation of conductor sizing and protection of transformers b. Designing calculation on conductor and fuse/circuit breaker sizing.	a. Teachers made test b. Quiz c. Written output of student activity	b, c, d, e

		f. Discuss the necessity of regular preventive maintenance			
8-9	**DC Motors & Generators**	At the end of the week, the students can: a. Demonstrate the different parts and operation of DC motors. b. Identify the classifications of DC motors c. Discuss the operation of DC Generators d. Identify the parts of DC Generators and the its function e. Demonstrate the different types of DC Generator	a. Lectures on DC Motors and Generator b. Lab works on DC Motors	a. Teachers made test b. Quiz c. Written output of student activity	a, b, d, e, f
10	**MIDTERM EXAM**				
11	**AC Generators**	At the end of the week, the students can: a. Discuss the operation of three phase generators b. Explain the effect of rotation on frequency c. Explain the effect of field excitation on output voltage	a. Lectures on operation of three phase generators b. Video presentation on generators	a. Teachers made test b. Quiz c. Written output of student activity	a, b, c, d
12-13	**Three Phase Motors**	At the end of the week, the students can: a. Discuss the basic operating principles of three phase motors b. List different types of three phase motors c. Discuss the operating principle of squirrel cage induction motor d. Discuss the operation of wound rotor motor e. Discuss the operation of synchronous motor	a. Lectures on three phase motors b. Video presentation on three phase motors	a. Teachers made test b. Quiz c. Written output of student activity	b, c, d, f
14-15	**Single Phase Motor**	At the end of the week, the students can: a. List the different types of split-phase motors b. Discuss the operation of split-phase motors c. Reverse the direction of rotation of a split-phase motors d. Discuss the operation of multi-speed split-phase motors e. Discuss the operation of shaded pole motors f. Discuss the operation of universal motors	a. Lectures on Single-Phase motors b. Video presentation on Single-phase motors	a. Teachers made test b. Quiz c. Written Output of Student Activity	a, b, d, e, f

16	**Motor Maintenance and Troubleshooting**	At the end of the week, the students can: a. Describe the maintenance procedure for motors b. Discuss the necessity of keeping accurate maintenance records c. Test motor windings to determine if they are open of grounded d. Discuss the differences in the maintenance required for DC machines as compared with AC machines	a. Lectures on motor maintenance and troubleshooting b. Simulation on motor maintenance	a. Teachers made test b. Quiz c. Written Output of Student Activity	a, b, c, d, f
17	**Motor installation**	At the end of the week, the students can: a. Determine motor current using Philippine Electrical Code Table b. Determine the proper conductor size for connecting a motor c. Select proper overload size for a motor d. Select the proper fuse/circuit breaker size for a motor e. Determine proper conductor size for a multimotor installation f. Select proper fuse/circuit breaker for a multimotor installation.	a. Professional lectures b. Calculation on proper sizing of conductor for motor branch circuits c. Calculation on proper sizing of fuse/circuit breaker as an overcurrent protective device	a. Long examination b. Quiz c. Written output of student activity	a, c, d, e, f
18	**FINAL EXAM**				

Total No. of Hours : 54

8 COURSE REQUIREMENTS AND COURSE POLICIES

COURSE REQUIREMENTS

Each student is required to:

1. Submit accomplished laboratory activity;
2. Prepare a comprehensive lecture notebook;
3. Make a PowerPoint presentation, and a written summary of the assigned report;
4. Discuss an assigned topic to report and participate in class discussions; and
5. Pass the major exams (midterm and final)

COURSE POLICIES

Attendance: A student will be marked late if he/she enters the class 5 minutes after start of class period. Any student who comes to class 15 minutes after the scheduled time or always late for three consecutive meetings shall be marked absent.

Missed work or exam: Any student who missed to submit a work assignment or to take a test should consult the concerned instructor for immediate compliance

Cheating and Plagiarism: Any student who committed any form of academic dishonesty (e.g., copy-paste plagiarism) shall be given disciplinary action provided in the SKSU Student's Handbook

Use of Technology: Cell phones should be turned off while the session is in progress. Using laptops, notebook PCs, smart phones, and tablets shall be allowed only when needed. A scientific calculator (e.g. Casio fx-991ES) shall be utilized in solving.

9 GRADING SYSTEM AND RUBRICS FOR GRADING

GRADING SYSTEM

Midterm Grade	
Midterm Examination	50%
Attendance/ Class Participation	10%
Quizzes	15%
Laboratory Activity	15%
Assignment/Problem Sets	10%
TOTAL	100%

Final Term Grade	
Final Term Examination	50%
Attendance/Class Participation	10%
Quizzes	15%
Laboratory Activity	15%
Assignment/Problem Sets	10%
TOTAL	100%

FINAL GRADE	
Midterm Grade	50%
Final Term Grade	50%
TOTAL	**100%**

10 REFERENCES

Textbooks
Electrical Transformers and Rotating Machines by Stephen L. Herman
Electricity AC/DC Motors, Controls, and Maintenance by: JEFF KELJIK
Electric Motor Repair Second Edition by Robert Rosenberg

Online References
https://www.monolithicpower.com/en/learning/mpscholar/electric-motors/dc-motors/fundamentals?srsltid=AfmBOoodP5sqOSQjO1UYJEclQg0uTTJ7hOwN301PQRJC-nj9osRRzhN1
https://byjus.com/physics/dc-motor/
https://www.magneticinnovations.com/faq/dc-motor-how-it-works/

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