Republic of the Philippines
SULTAN KUDARAT STATE UNIVERSITY
Isulan Campus, Isulan Sultan Kudarat
College of Industrial Technology

ELX 221– SENSOR TECHNOLOGY

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

A graduate of the BIndTech program can:	INSTITUTIONAL OUTCOMES (IO)						
	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** ELX 221
2 **COURSE TITLE** Sensor Technology
3 **PREREQUISITE** ELX 212
4 **CREDITS** 3 units

5 **COURSE DESCRIPTION**
This course provides knowledge and understanding of sensors field usage and their role in control systems, divided into two parts. The first part deals with discrete and solid state devices where analog and digital signals are used for control applications, and the second part focuses on practical implementation using programmable logic controllers and computers.

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

Course Learning Outcomes (CLO)	Program Outcomes						
At the end of the course, a student can:	a	b	c	d	e	f	g
a. Understand SKSU-VGMO, Classroom Policies, Course Overview, Course Requirements and Grading System;	✓	✓	✓	✓	✓	✓	✓
b. Understand the concept of sensors and their characteristics.;	✓	✓	✓	✓	✓	✓	✓
c. Identify different types of sensors and their applications in various fields.	✓	✓	✓	✓	✓	✓	✓
d. Analyze sensor characteristics and operational principles;	✓	✓	✓	✓	✓	✓	✓
e. Compare and contrast the advantages and disadvantages of various sensor technologies.	✓	✓	✓	✓	✓	✓	✓
f. Learn various sensor materials and technologies used in designing sensors.	✓	✓	✓	✓	✓	✓	✓
g. Understand the practical approach in designing technology based on different sensors.	✓	✓	✓	✓	✓	✓	✓

h. Troubleshoot and optimize sensor systems for accuracy and reliability and evaluate the performance of sensors in practical applications.	✓	✓	✓	✓	✓	✓	✓	

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	a. Participation in discussions	abcdefg
2	**Sensors Fundamentals and Characteristics** a. Sensors, Signals and Systems; Sensor Classification; Units of Measurements: Sensor Characteristics	At the end of the week, the students can: a. Explain the fundamental principles of how sensors operate, including types of sensors and their applications. b. Identify and describe key characteristics of sensors, including sensitivity, accuracy, precision, and response time. c. Explain how sensors are integrated into larger systems, including the role of signal conditioning and data acquisition. d. Apply their knowledge of sensors to solve practical problems in various applications, such as automation, robotics, or environmental monitoring.	a. Video/PowerPoint presentation b. Interactive Lecture on Sensor Basics c. Group Activity on Sensor Characteristics d. Activity 1.2 Hands-On Sensor Project	a. Sensor Principles Quiz b. participation c. Activity outputs d. Project Presentation and Report	abcdefg
3	**Physical Principles of Sensing** a. Electric Charges, Fields, and Potentials; Capacitance; Magnetism; Induction; Resistance; Piezoelectric Effect; Hall Effect;	At the end of the week, the students can: a. Explain the fundamental physical principles underlying sensing technologies, such as electrical, mechanical, and optical principles. b. Identify and categorize different types of sensors based on the physical principles they utilize, such as resistive,	a. Interactive Lecture on Physical Principles b. Video/PowerPoint presentation c. Hands-On Demonstration d. Activity 3.1 Sensor Design Project	a. Quiz b. participation c. Activity outputs d. Operation Analysis Report	abcdefg

	Temperature and Thermal Properties of Material; Heat Transfer; Light: Dynamic Models of Sensor Elements	capacitive, and inductive sensors. c. Apply physical principles to design a basic sensor system for a specific application, considering factors such as sensitivity and calibration.			
4	**Sensors in Different Application Areas** a. Occupancy and Motion Detectors; Position, Displacement, and Level, Velocity and Acceleration, Force, Strain, and Tactile Sensors: Pressure Sensors, Temperature Sensors	At the end of the week, the students can: a. Identify and explain the various application areas of sensors, including industrial, automotive, medical, and environmental sectors. b. Analyze the role and impact of sensors in industrial automation processes, including manufacturing and robotics. c. Evaluate various medical sensor technologies and their applications in healthcare diagnostics and monitoring. d. Explore and discuss the types of sensors used in environmental monitoring and their significance in sustainability efforts.	a. Students' participation in discussions. b. PowerPoint and video presentation. c. Capstone Project d. Activity 4.1 — Group Research Project	a. Quiz b. participation c. Activity outputs d. Research Presentation e. Environmental Sensor Reflection	abcdefg
5	**STRAIN, FORCE, TORQUE, AND PRESSURE SENSORS** a. Strain gauges, strain gauge beam force sensor, piezoelectric force sensor, load cell, torque sensor, Piezoresistive and capacitive pressure sensor, Manometer, vacuum sensors, Pirani gauge.	At the end of the week, the students can: a. Explain the fundamental principles of operation for strain, force, torque, and pressure sensors. b. Identify and describe various applications of strain, force, torque, and pressure sensors in different industries. c. Analyze key performance characteristics of strain, force, torque, and pressure sensors, including sensitivity, accuracy, and response time. d. Design a basic measurement system utilizing strain, force, torque, or pressure sensors to solve a practical problem.	a. Students' participation in discussions. b. PowerPoint and video presentation. c. Interactive Lecture on Sensor Principles d. Hands-On Lab Experiment e. Activity 5.1 Sensor Design Project	a. Principles Quiz b. participation c. Activity outputs d. Project Presentation and Report e. hands-on output	abcdefg

6	**MIDTERM EXAM**				
7	**DISPLACEMENT, LEVEL, AND FLOW SENSORS** **a.** Displacement Sensors: LVDT, RVDT, eddy current, transverse inductive, Hall Effect, magneto resistive, magnetostrictive sensors. b. Liquid level sensor: Fabry Perot sensor, ultrasonic sensor, capacitive liquid level sensor. c. Flow sensors: pressure gradient technique, ultrasonic, electromagnetic sensors, and Hot wire anemometer. Micro flow sensor, Coriolis mass flow and drag flow sensor..	At the end of the week, the students can: a. Explain the fundamental principles of operation for displacement, level, and flow sensors. b. Identify and describe various applications of displacement, level, and flow sensors in different industries. c. Understand the importance of calibration and the techniques used to calibrate displacement, level, and flow sensors. d. Design a basic measurement system utilizing displacement, level, or flow sensors to solve a practical problem.	a. Interactive Lecture on Sensor Principles b. Students' participation in discussions. c. PowerPoint and video presentation. d. Calibration Workshop e. Activity 7.1 Sensor Design Project	a. Quiz b. participation c. activity outputs d. Project Presentation and Report	abcdefg
8	**Temperature Sensors** a. Various temperature sensors and their characteristics.	At the end of the week, the students can: a. Explain the fundamental principles of temperature measurement and the working mechanisms of different types of temperature sensors. b. Identify and describe various applications of temperature sensors across different industries, such as healthcare, automotive, and food processing. c. Analyze key performance characteristics of temperature sensors, including accuracy, range, response time, and sensitivity.	a. Students' participation in discussions. b. PowerPoint and video presentation. c. Group Research Project d. Hands-On Lab Experiment f. Activity 8.1 — Sensor Design Project	a. Quiz b. participation c. Activity outputs d. Project Presentation and Report e. laboratory output	abcdefg

		d. Design a basic temperature measurement system utilizing appropriate temperature sensors for a specific application.			
9	**Proximity Sensors** a. The operation of proximity sensors in automation.	At the end of the week, the students can: a. Understand the fundamental principles of operation for various types of proximity sensors, including inductive, capacitive, and ultrasonic sensors. b. Identify and describe various applications of proximity sensors in industries such as manufacturing, automotive, and consumer electronics. c. Design a basic system that utilizes proximity sensors to solve a specific problem or improve a process.	a. Students' participation in discussions. b. PowerPoint and video presentation. c. Group Research Project d. Hands-On Lab Experiment	a. Quiz b. participation c. Activity outputs d. Project Presentation and Report e. laboratory output	abcdefg
10	**Integration with PLCs** a. Integrate sensors with programmable logic controllers.	At the end of the week, the students can: a. Write basic ladder logic programs to integrate various sensors with PLCs. b. Design a PLC-based control system that incorporates multiple sensors and actuators. c. Troubleshoot and debug PLC programs and sensor integrations effectively.	a. Students' participation in discussions. b. PowerPoint and video presentation. c. Group Research Project d. Hands-On Lab Experiment e. Troubleshooting Lab	a. Quiz b. participation c. Activity outputs d. Project Presentation and Report e. laboratory output	abcdefg
11	**FINAL EXAMINATION**				

Total No. of Hours : 54

8 COURSE REQUIREMENTS AND COURSE POLICIES

COURSE REQUIREMENTS

Each student is required to:

1. submit accomplished assignments, and activities;
2. make a PowerPoint presentation, and a written summary of the assigned report;
3. participate actively in all discussion;
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	5%
Quizzes	5%
Recitation	5%
Activity	20%
Report	15%
TOTAL	100%

Final Term Grade

GRADE

Final Term Examination	50%
Attendance/Class Participation	5%
Quizzes	5%
Recitation	5%
Activity	20%
Report	15%
TOTAL	100%

FINAL

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

Materials used: Laptop, Powerpoint presentations and video clips
Books, Magazines, Online slides, Teacher-made slides

References:

Neuman, R. (2014). *Sensors and Transducers.*

Doebelin, E. O. (2011). *Measurement Systems: Application and Design.*

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