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

# IPC 001– INSTRUMENTATION AND PROCESS CONTROL

## 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;* | ✓ | ✓ | | ✓ | | ✓ | |

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|---|---|---|---|---|---|---|---|
| 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** IPC 001
2 **COURSE TITLE** Instrumentation and Process Control
3 **PREREQUISITE** ELX 212
4 **CREDITS** 3 units

5 **COURSE DESCRIPTION**
This course covers the principles of energy conversion and the system by which these physical quantities a measured. The topics include sensors and transducers, signal conditioning circuits, control applications, hardwa installation, and performance of process measurement instrumentation and control valves.

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. Explain the fundamentals of instrumentation and process control systems as used in the industry. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| c. Identify various sensors and transducers used in measurement.; | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| d. Analyze and design signal conditioning circuits; | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| e. Compare and contrast different types of measurement devices and their applications.; | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| f. Evaluate the performance of measurement and control systems. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| g. Design and install practical instrumentation systems to get accurate feedback from production processes. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| h. Troubleshoot and optimize instrumentation systems. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

## 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 | **Introduction to Process Control** **a.** Basic Concepts of Process Control. | At the end of the week, the students can: a. Define and understand the key concepts in process control, including process variables, control loops, and feedback mechanisms. b. Analyze the components of a control system, including sensors, controllers, and actuators, and explain their roles in maintaining process stability.; c. Analyze and troubleshoot common process control issues. | a. Interactive Lecture b. Video/PowerPoint presentation c. Individual participation in discussions d. Activity 2.1 Case studies of real-world process control failures and their causes | a. Quiz b. participation c. activity outputs d. Set up a lab | abcdefg |
| 3 | **Elements of Process Control** a. Key elements of a process control system | At the end of the week, the students can: a.Identify and describe the key elements of a process control system, including sensors, controllers, and actuators. b. Analyze the role of feedback in maintaining process stability and performance. | a. Interactive Lecture b. Video/PowerPoint presentation c. Individual participation in discussions d. Activity 3.1: Design a basic process control system | a. Quiz b. participation c. activity outputs d. Laboratory activity e. Report detailing their design process | abcdefg |
| 4 | **Control Loop Operations** | At the end of the week, the students can: a. Explain the fundamental concepts of control loop operations. b. Troubleshoot and improve the performance of existing control loops. | a. Interactive Lecture b. Video/PowerPoint presentation c. Individual participation in discussions d. Activity 4.1: Case studies of real-world control loop failures and their causes. | a. Quiz b. participation c. activity outputs d. Simulation-based troubleshooting e. Laboratory report documenting the experimental setup | abcdefg |

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| 5 | **Standard Symbols and Diagrams**<br>a. Common standard symbols from relevant standards. | At the end of the week, the students can:<br>a. Identify and correctly interpret standard symbols used in technical drawings and diagrams.<br>b. Create accurate and unambiguous technical drawings and diagrams using standard symbols.<br>c. Analyze and interpret complex technical drawings and diagrams to understand system functionality. | a. Interactive Lecture<br>b. Video/PowerPoint presentation<br>c. Group discussions<br>d. Demonstrations and tutorials<br>e. Activity 5.1: Case studies of complex technical drawings | a. Quiz<br>b. participation<br>c. activity outputs<br>d. practical assignment<br>e. problem-solving assignment<br>f. Actual lab | abcdefg |
| 6 | **MIDTERM EXAM** | | | | |
| 7 | **Industrial Measurements**<br>a. Sensors and Transducers<br>b. General Principles & Measurement Practices<br>c. Industrial Pressure Measurement<br>d. Industrial Flow Measurement<br>e. Industrial Level Measurement<br>f. Industrial Temperature Measurement | At the end of the week, the students can:<br>a. Understand the principles and limitations of various industrial measurement techniques.<br>b. Select and apply appropriate measurement instruments and techniques for specific industrial applications.<br>c. Analyze and interpret measurement data to identify trends, anomalies, and potential process improvements. | a. Interactive Lecture<br>b. Video/PowerPoint presentation<br>c. Group discussions<br>d. Demonstrations and tutorials<br>e. Activity 7.1: Design project report | a. Quiz<br>b. participation<br>c. activity outputs<br>d. practical assignment<br>e. problem-solving assignment<br>f. Actual lab | abcdefg |

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| 8 | **Receiving Elements**<br>a. Pneumatic Controllers<br>b. Electronic Controllers<br>c. Typical Functions & Troubleshooting<br>d. Microprocessor-Based Process Controllers | At the end of the week, the students can:<br>a. Identify and classify different types of receiving elements based on their function and characteristics.<br>b. Analyze the performance of receiving elements considering factors such as sensitivity, accuracy, and noise. | a. Interactive Lecture<br>b. Video/PowerPoint presentation<br>c. Group discussions<br>d. Demonstrations and tutorials<br>e. Activity 8.1: Laboratory experiments<br>f. Workshops and tutorials | a. Quiz<br>b. participation<br>c. activity outputs<br>d. practical assignment<br>e. problem-solving assignment<br>f. Actual lab | abcdefg |
| 9 | **Final Control Elements**<br>a. Selection of Control Valves and Other Final Control Devices<br>b. Operation, Maintenance & Repair of Control Valves | At the end of the week, the students can:<br>a. Identify and classify different types of final control elements based on their operating principles and applications.<br>b. Analyze the performance characteristics of final control elements and their impact on overall system performance<br>c. Select and size appropriate final control elements for specific process applications. | a. Interactive Lecture<br>b. Video/PowerPoint presentation<br>c. Group discussions<br>d. Demonstrations and tutorials<br>e. Activity 9.1: Presentations and peer reviews<br>f. Workshops and tutorials | a. Quiz<br>b. participation<br>c. activity outputs<br>d. practical assignment<br>e. problem-solving assignment<br>f. Actual lab | abcdefg |
| 10 | **Calibration & Testing**<br>a. Repair and Calibration Techniques<br>b. Calibration of Gauges, Transmitters, Transducers,<br>c. Valve Positioners, Controllers, etc | At the end of the week, the students can:<br>a. Understand the principles and importance of calibration and testing in ensuring measurement accuracy and system reliability.<br>b. Perform calibration and testing procedures on various measurement instruments and systems using appropriate techniques and equipment. | a. Interactive Lecture<br>b. Video/PowerPoint presentation<br>c. Group discussions<br>d. Demonstrations and tutorials<br>e. Activity 10.1: Laboratory experiments and Troubleshooting<br>f. Workshops and tutorials | a. Quiz<br>b. participation<br>c. Activity outputs<br>d. practical assignment<br>e. problem-solving assignment<br>f. Actual lab | 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 | 40% |
| Attendance/ Class Participation | 5% |
| Quizzes | 5% |
| Recitation | 5% |
| Lab Activity | 30% |
| Report | 15% |
| TOTAL | 100% |

| **Final Term Grade** | |
|---|---|
| **GRADE** | |
| Final Term Examination | 40% |
| Attendance/Class Participation | 5% |
| Quizzes | 5% |
| Recitation | 5% |
| Lab Activity | 30% |
| 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:

Textbooks:
Doebelin, E. O., & Manik, D. (2011). Measurement Systems: Application and Design.
Johnson, C. D. (2006). Process Control Instrumentation Technology.

Prepared:

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