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

ELX 212 – DIGITAL ELECTRONICS

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;	✓	✓		✓		✓	

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 212
2 **COURSE TITLE** Digital Electronics
3 **PREREQUISITE** ELX 121
4 **CREDITS** 3 units

5 **COURSE DESCRIPTION**
This course covers the principles and applications of TTL and CMOS electronic logic devices, their use in combinational and sequential logic circuits, the interface between digital and analog circuits, and the analysis of Boolean algebra, numbers, and circuits used in semiconductor switching.

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. Describe the basic components and functions of digital electronic circuits.	✓	✓	✓	✓	✓	✓	✓	✓
c. Analyze and design combinational logic circuits using various logic gates, implement sequential logic circuits, and understand their timing diagrams.;	✓	✓	✓	✓	✓	✓	✓	✓
d. Apply Boolean algebra to simplify digital circuits.	✓	✓	✓	✓	✓	✓	✓	✓
e. Utilize number systems and codes in digital electronics.	✓	✓	✓	✓	✓	✓	✓	✓
f. Design and troubleshoot digital circuits using simulation software.	✓	✓	✓	✓	✓	✓	✓	✓
g. Demonstrate the functionality of basic digital devices, including multiplexers and flip-flops.	✓	✓	✓	✓	✓	✓	✓	✓
h. Construct and analyze 7-segment display systems.	✓	✓	✓	✓	✓	✓	✓	✓

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	**Basic Switching Devices** a. Fundamentals of switching devices.	At the end of the week, the students can: a. Define basic switching devices and explain their operational principles. b. Identify different types of switching devices and their specific applications in electronic circuits. c. Analyze basic circuits that include switching devices, focusing on their role in controlling current flow.; d. Design simple switching circuits using various switching devices for specific applications.	a. Video/PowerPoint presentation b. Interactive Lecture on Switching Devices c. Device Identification Workshop d. Circuit Analysis Exercise e. Activity 2.1 Circuit Design Project	a. Fundamentals Quiz b. participation c. Component Identification Quiz d. Device Identification Report e. Design Submission and Presentation f. Troubleshooting Report	abcdefg
3	**Logic Gates** a. Basic logic circuits	At the end of the week, the students can: a. Define logic gates and explain their basic functions and symbols. b. Create and analyze truth tables for various logic gate combinations. c. Design simple logic circuits using multiple logic gates to achieve a desired output. d. Implement and simulate logic circuits using appropriate software tools.	a. Video/PowerPoint presentation b. Interactive Lecture on Logic Gates c. Group Discussion d. Hands-on Lab e. Activity 3.1 Truth Table Workshop	a. Conceptual Quiz b. participation c. activity outputs d. Lab Report on Logic Gate Applications	abcdefg

	Applications of Logic Gates a. Practicalal Applications of Logic Gates. b. Combinational Logic Circuits	At the end of the week, the students can: a. Explain various practical applications of logic gates in digital circuits. b. Design combinational logic circuits for specific applications using logic gates. c. Implement basic sequential logic circuits, such as flip-flops and counters, using logic gates. d. Explore and present advanced applications of logic gates in modern technology, such as in microcontrollers and digital signal processing.	a. Video/PowerPoint presentation b. Interactive Lecture on Applications c. Sequential Circuit Implementation Lab d. Combinational Circuit Design Project e. Performance Analysis Workshop f. Activity 4.1 Research Presentation on Advanced Applications	a. Conceptual Quiz b. participation c. Activity outputs d. Analysis Assignment e. Performance Analysis Report f. Research Presentation	abcdefg
5	**Pulse Waveforms and Codes** a. Pulse waveforms and their significance in digital circuits.	At the end of the week, the students can: a. Understand the pulse waveforms and describe their characteristics, including amplitude, frequency, and duty cycle. b. Analyze and calculate the key parameters of pulse waveforms, such as period, frequency, and duty cycle. c. Explain the concept of Pulse Code Modulation (PCM) and its applications in digital communication.	a. Video/PowerPoint presentation b. Interactive Lecture on Pulse Waveforms c. Maintenance Procedure Demonstration c. Hands-on Lab and Demonstration d. Activity 5.1 Parameter Calculation Workshop	a. Pulse Waveform Quiz b. participation c. activity outputs d. Lab Report on Industrial Control Devices	abcdefg
6	**MIDTERM EXAM**				
7	**Boolean Algebra** a. Boolean algebra to simplify digital circuits.	At the end of the week, the students can: a. Define Boolean algebra and explain its basic concepts, including variables, operations, and truth values. b. Apply Boolean operations to simplify logical expressions. c. Construct truth tables for various Boolean expressions and analyze their outputs.	a. Video/PowerPoint presentation b. Interactive Lecture on Boolean Algebra Basics c. Logic Circuit Design Project d. Activity 7.1 Truth Table Construction Exercise	a. Basic Concepts Quiz b. participation c. Troubleshooting Report d. Truth Table Assignment	abcdefg

	Number Systems and Codes a. Utilize different number systems and codes in digital applications.	At the end of the week, the students can: a. Define and explain various number systems, including binary, decimal, octal, and hexadecimal. b. Convert numbers between different bases (e.g., binary to decimal and vice versa). c. Describe various binary codes, such as ASCII, BCD, and Gray code, and their applications.	a. Video/PowerPoint presentation b. Interactive Lecture on Number Systems c. Group Lecture and Discussion on Binary Codes d. Activity 7.1 Conversion Workshop	a. Number Systems Quiz b. participation c. activity outputs d. Binary Code Report	abcdefg
9	**Multiplexers and Flip-Flops** a. Multiplexers and their function in digital circuits.	At the end of the week, the students can: a. Define multiplexers and explain their function in digital circuits. b. Design and implement a multiplexer circuit for a given application. c. Understand flip-flops and describe their types, functions, and applications in digital systems. d. Implement flip-flop circuits and analyze their behavior in sequential logic applications.	a. Video/power point presentation b. Interactive Lecture on Multiplexers c. Lecture and Discussion on Flip-Flops c. Circuit Design Project d. Activity 9.1 Lab Session on Flip-Flop Implementation	a. Multiplexer Quiz b. participation c. activity outputs d. Troubleshooting Report e. Lab Report	abcdefg
10	**7-Segment Display Systems** a. Construct and analyze 7-segment display systems.	At the end of the week, the students can: a. Define 7-segment displays and explain their structure, operation, and common applications. b. Analyze the control logic required to drive a 7-segment display to represent numerical values. c. Implement their designed circuits for 7-segment displays and test their functionality. d. Design a circuit that drives a 7-segment display using combinational logic.	a. Video/PowerPoint presentation b. Interactive Lecture on 7-Segment Displays c. Control Logic Analysis Workshop c. System Design Project d. Activity 10.1 Circuit Design Project	a. 7-Segment Display Quiz b. participation c. activity outputs d. Analysis Assignment e. Design Submission and Presentation	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

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

FINAL GRADE

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:

M. Morris Mano, "Digital Design," 5th Edition, Pearson, 2013.
John F. Wakerly, "Digital Design: Principles and Practices," 4th Edition, Prentice Hall, 2017.
R. P. Jain, "Modern Digital Electronics," 4th Edition, Tata McGraw-Hill, 2010.
S.

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