Republic of the Philippines
SULTAN KUDARAT STATE UNIVERSITY
Province of Sultan Kudarat
S.Y. 2022-2023

AT316
DIGITAL DESIGN
Syllabus

1st Semester
A.Y 2024 – 2025

Republic of the Philippines
SULTAN KUDARAT STATE UNIVERSITY
College of Computer Studies
Isulan Campus, Isulan, Sultan Kudarat

1st Semester S.Y. 2024 – 2025

UNIVERSITY VISION

A trailblazer in arts, science and technology in the region

UNIVERSITY MISSION

The University shall primarily provide advanced instruction and professional training in science and technology, agriculture, fisheries, education and other relevant fields of study.

It shall also undertake research and extension services, and provide progressive leadership in its areas of specification.

UNIVERSITY GOAL

To produce graduates with excellence and dignity in arts, science and technology.

UNIVERSITY OBJECTIVES

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 (CMO 87 s. 2017)

By the time of graduation, the student of the program shall have the:

a) Ability to apply knowledge of mathematics and science to solve complex engineering problems;
b) Ability to design and conduct experiments, as well as to analyze and to interpret data;
c) Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability, in accordance to standards;
d) Ability to function on multidisciplinary teams;
e) Ability to identify, formulate, and solve complex engineering problems;
f) Understanding of professional and ethical responsibility;
g) Ability to communicate effectively;
h) Broad education necessary to understand the impact of engineering solutions in global, economic, environmental, and societal context;
i) Recognition of the need for, and an ability to engage in life-long learning;
j) Knowledge of contemporary issues;
k) Ability to use techniques, skills, and modern engineering tools necessary for engineering practice; and
l) Knowledge and understanding of engineering and management principles as a member and leader in a team, to manage projects and in multidisciplinary environments.

Program Objectives and its relationship to University Objectives

PROGRAM OBJECTIVES (PO)	**OBJECTIVES**						
A graduate of BS in Computer Science can:	a	B	c	d	e	f	G
a. Design and implement effectively the innovative computing researches.	/	/			/		/
b. Apply proficiently the algorithmic theories and related computational system in conducting researches.	/	/	/	/	/	/	/
c. Address societal problems through producing sustainable research outputs	/	/	/	/	/	/	/
d. Demonstrate the codes of conduct as well as the social and legal aspects of computer science	/	/	/	/	/	/	/

Course Code : AT 316
Course Title : Digital Design
Prerequisite : NC 225
Credits : 3 Units with Laboratory

Course Description:

This course deals with the fundamental principles of Digital Design. It covers the review of the basic concepts in Electricity and Electronics which is the foundation of students in moving on with the other parts of the digital design. The course include the introduction of the Number Systems and Boolean Algebra. It proceeds with the bottom up study of the basic unit of a computer and the basic building blocks of digital electronics, the Logic Gates. It covers also the simplification of Boolean Function, Combinational Logic and Sequential Circuits.

6. Course Learning Outcomes and Relationships to Program Objectives

Course Learning Outcomes	Program Objectives						
At the end of Semester the students can:	a	b	c	d	e	f	g
1. Define the terms related to Logic Circuit and Switching Theory;	✓	✓	✓				
2. Recall the basic principles of electricity and electronics as among the foundations of digital design ;	✓	✓	✓	✓			
3. Utilize the theory of binary numbers in implementing logical circuits;	✓	✓	✓	✓			
4. Learn the principles of Boolean Algebra and how it is used in Logic Gates;	✓	✓	✓		✓		
5. Simplify Boolean functions using the Karnaugh Map;	✓	✓	✓		✓		
6. Describe the different combinational logic circuits and its application to digital systems;	✓	✓	✓		✓		
7. Discuss the importance of sequential circuits as comprised of combinational circuit with memory element; and	✓	✓	✓		✓		
8. Appreciate the usefulness of the knowledge and skills in Digital Design as applied in his/her professional development.	✓	✓	✓	✓			

7. Course Content

Course Objectives, Topics, Time Allotment	Desired Student Learning Outcomes	Outcomes-Based Assessment (OBA) Activities	Evidence of Outcomes	Course Objectives	Program Outcomes	Values Integration
Topic: SKSU VMGO, Classroom Policies, Course Overview, Course Requirements, Grading System (2 hours)						
1.1 Discuss the VMGO of the university, classroom policies, scope of the course, course requirements and grading system	Students can be aware and appreciate the university's VMGO, classroom policies, course overview, requirements and grading system.	Individual participation in class discussion and group presentation	Group and individual discussions			Respect Obedience Patriotism
Topic: Introduction to Digital Design (1 hour)						
2.1 Discuss the overview of the digital systems 2.2 Discuss the difference of analog and digital systems	The students can describe the concept of the digital system as a building block of computer systems 2.2 The students can Describe the difference of analog and digital system and appreciate the importance of digital systems in our daily life	Students participation in question and answer activity facilitated by teacher	Student and class participation accomplished by professor.	a, b, e	a, b, c, d	Gratefulness Appreciation
Topic: Binary Systems (3 hours)						
5.1 Discuss the fundamentals of Number Systems and be able to convert numbers in different bases. 5.2 Discuss the	5.1 The student can describe the concept of Number Systems and be able to convert numbers in different bases 5.2 The students can	Pair work / diagramming Group dynamics	Presentation of outputs Rubrics score card of class participation			Value of participation and teamwork Value of cooperation

fundamentals of Complements of the numbers 5.3 Discuss concept of Signed Binary Numbers 5.4 Discuss the principles of Binary Codes	Can determine the complements of the numbers 5.3 The students can explain the concept of Signed Binary Numbers 5.4 The students can describe the principles of Binary Codes	Students participation in question and answer activity facilitated by professor	accomplished by the professor. Group and individual discussions			Value of participation and self-reliance
Topic: Boolean Algebra and Logic Gates (3 hours)						
6.1 Discuss the Basic Theorems and properties of Boolean Algebra 6.2 Discuss how to simplify Boolean Equations in to the least number of variables. 6.3 Discuss the principles of the Boolean Functions, Canonical and Standard Forms 6.4 Discuss the principles of Digital Logic Gates and its operations	6.1 The student can describe the Basic Theorems and properties of Boolean Algebra 6.2 The students can simplify Boolean Equations in to the least number of variables 6.3 The students can discuss the principles of the Boolean Functions, Canonical and Standard Forms 6.4 The students can learn the principles of Digital Logic Gates and its Operations	Pair work / diagramming Group dynamics Students participation in question and answer activity facilitated by professor	Presentation of outputs Rubrics score card of class participation accomplished by the professor. Group and individual discussions			Value of participation and teamwork Value of cooperation Value of participation and self-reliance

6.5 Explain the principles and characteristics of Integrated Circuits (IC) containing Logic Gate circuits	6.5 The students can describe the characteristics of Integrated Circuits (IC) containing Logic Gate circuits					
Topic: Simplification of Boolean Functions (9 hours)						
7.1 Discuss the simplification of Boolean Functions using the Map Method 7.2 Discuss the principles of Product of Sums (POS) Simplification 7.3 Discuss the concept of NAND and NOR Implementation 7.4 Discuss the principles of other two-level implementation 7.5 Discuss the concept of Don't care condition	7.1 The students can Simplify Boolean Functions using the Karnaugh Map (K-Map) Method 7.2 The students can used the product of sums in simplifying Boolean Functions 7.3 The students can appreciate the concept of NAND and NOR Implementation 7.4 The students can discuss the principles of other two-level Implementation 7.5 The students can describe the function of the Don't care condition	Students participation in question and answer activity facilitated by teacher Pair work / diagramming Group dynamics	Presentation of outputs Rubrics score card of class participation accomplished by the professor. Group and individual discussions			Value of participation and teamwork Value of cooperation Value of participation and self-reliance
Topic: Combinational Logic (9 hours)						
8.1 Present the Design Procedure in working with Combinational Logic	8.1 The student can describe the design procedure in working	Students participation in question and answer	Presentation of outputs			Value of participation and teamwork

	with Combinational Logic	activity facilitated by teacher	Rubrics score card of class participation accomplished by the professor.			Value of cooperation
8.2 Discuss the concept of Adders and Subtractors	8.2 The students can appreciate the	Pair work / diagramming				
8.3 Discuss the principles of Code Conversion	8.3 The students can learn the principles of Code Conversion	Group dynamics	Group and individual discussions			Value of participation and self-reliance
8.4 Discuss the Analysis Procedure in designing combinational logic circuits	8.4 The students learn the analysis procedure in designing combinational logic					
8.5 Discuss the concept of the Multi-level NAND Circuits and Multi-level NOR Circuits	8.5 The students can describe the concept of the Multi-level NAND Circuits and Multi-level NOR Circuits					
Topic: MSI and PLD Components (3 hours)						
9.1 Discuss the concept of Binary Adder and Subtractor	9.1 The student can describe the concept of Binary Adder and Subtractor	Students participation in question and answer activity facilitated by teacher	Presentation of outputs			Value of participation and teamwork
9.2 Discuss the concept of Decimal Adder	9.2 The students can appreciate the theory and the use of Decimal Adder	Pair work / diagramming	Rubrics score card of class participation accomplished by the professor.			Value of cooperation
9.3 Discuss the function of the Magnitude Comparator	9.3 The students can describe the function of the Magnitude Comparator	Group dynamics	Group and individual discussions			Value of participation and self-reliance

9.4 Discuss the principles of Decoders and Encoders 9.5 Discuss the characteristics of Multiplexers	9.4 The students can discuss the principles of Decoders and Encoders 9.5 The students can describe the characteristics of Multiplexers					
Topic: Synchronous Sequential Logic (3 hours)						
10.1 Present the concept of Flip-flops: JK Flip-flops, RS Flip-flops, D Flip-flops, and T Flip-flops and their characteristics. 10.2 Discuss the concept in the triggering of Flip-flops	10.1 The student can describe the concepts of the different Flip-flops and their characteristics. 10.2 The students can Explain the principles in triggering of Flip-flops	Pair work / diagramming Group dynamics Students participation in question and answer activity facilitated by teacher	Rubrics score card of class participation accomplished by the professor. Group and individual discussions			Value of participation and teamwork Value of participation and self-reliance
Lecture – 36 hours Laboratory - 54 hours Examination - 4 hours **Total - 94 hours**						

8. Course Evaluation

Course Requirements:

Grading System

MIDTERM		**FINAL TERM**	
Exam	50%	Exam	50%
Course Requirement	30%	Course Requirements	30%

Attendance/ Participation	10%	Attendance/ Participation	10%
Quizzes/Assignment	10%	Quizzes/Assignment	10%
Total	**100%**	**Total**	**100%**

(Midterm Grade + Final Term Grade) / 2 = Final Grade

9. References

Textbooks:

1. Digital Design by Morris Mano
2. Digital Electronics by Tokheim
3. Digital Design by Malvino
4. Fundamentals of Digital Electronics by Benjo Tirol
5. Laboratory Manual in Digital Electronics by Gil Bosita
6. Learning Digital Electronics thru Experiments by Benjo Tirol

Supplemental:

1. Grob Electronics by Grob
2. Fundamentals of Electricity by Elpidio J. Cardenas
3. Practical Electronics by Pagarigan & Bandi

Prepared:

ZIUS D. APRESTO, MIT
Faculty

Reviewed:

CYRUS B. RAEL MIT
Program Head, BSIT

Recommending Approval:

ELBREN O. ANTONIO, DIT
Dean, College of Computer Studies