No	Course Information (2019-2020)	
1	Unit name	Digital Electronics
2	Code:	EcE-21021
3	Classification:	Engineering subject
4	Credit value:	2.5
5	Semester/ Year Offered:	1/2 **(2-0-1)**
6	Pre-requisite	Basic Electronics
7	Mode of delivery	Lecture, Practical, Tutorial
8	Assessment system and breakdown of marks:	Lab report, Tutorial, Exam
	Tutorial, Practical	30%
	Mid-term/Final Examination	70%
9	Academic staff teaching unit	
10	Course outcome of unit: In this course, students will be able 1. to covert the analog signal to digital and several types of logic operation. 2. to explain about digital number systems , logic gate ,the basic laws , rules of Boolean expression, the functions of various digital integrated circuits and the basic concepts of a digital signal processor (DSP). 3. to apply a combinational logic circuit for a given Boolean output expression and adder, decoders, encoders, multiplexers, de-multiplexers , flip-flops, counters, registers . 4. To demonstrate the knowledge gained in the digital integrated circuits through practical experiment.	
11	Synopsis of unit: This course covers the fundamental of digital, their related devices and applications. Digital technology pervades almost everything in our daily lives. This course aims to provide students with all information about digital signals and systems, pulse waveforms, logic technologies and families, digital integrated circuits technology, tri-state, ECL family, MOS technology, operation and types, MOS inverter, NMOS, PMOS, CMOS, dynamic MOS, CMOS transmission circuits. Interfacing, TTL driving CMOS, flip-flop, multivibraters, monostables, astables, Schmitt trigger, bistables, 555 IC timer, memory elements and types, programmable	

	logic devices, analog to digital converter and digital to analog converter. This course is designed to teach the students the fundamentals of digital systems. Both combinational and sequential circuit analysis and design are covered. Several logic gates and memory circuits are introduced. Troubleshooting procedures and problem solving are covered. Hands-on equipment and practical application design are emphasized. Projects on how to design combinational and sequential applications are assigned.
12	Topic **1 Introductory Concept** 1.1 Digital and Analogue Quantities 1.2 Binary Digits, Logic Levels, and Digital Waveforms 1.3 Basic Logic Operations 1.4 Introduction to the System Concept 1.5 Fixed- Function Integrated Circuits 1.6 Test and Measurement Instrunments 1.7 Introduction to Programmable Logic **2 Number System, Operations, and Codes** 2.1 Decimal Numbers 2.2 Binary Numbers 2.3 Decimal- to Binary Conversion 2.4 Binary Arithmetic 2.5 1's and 2's Complements of Binary Numbers 2.6 Signed Numbers 2.7 Arithmetic Operations with Signed Numbers 2.8 Hexadecimal Numbers 2.9 Octal Numbers 2.10 Binary Coded Decimal 2.11 Digital Codes 2.12 Error Detection Codes **3 Logic Gates** 3.1 The Inverter

		3.2 The AND Gate 3.3 The OR Gate 3.4 The NAND Gate 3.5 The NOR Gate 3.6 The Exclusive- OR and Exclusive-NOR Gates 3.7 Fixed-Function Logic 3.8 Troubleshooting 3.9 Programmable Logic
	4	**Boolean Algebra and Logic Simplification** 4.1 Boolean Operations and Expression 4.2 Laws and Rules of Boolean Algebra 4.3 DeMorgan's Theorems 4.4 Boolean Analysis of Logic Circuits 4.5 Simplification Using Boolean Algebra 4.6 Standard Forms of Boolean Expressions 4.7 Boolean Expressions and Truth Tables 4.8 The Karnaugh Map 4.9 Karnaugh Map SOP Minimization 4.10 Five-Variable Karnaugh Map 4.11 Describing Logic with an HDL (System Application Activity)
	5	**Combinational Logic Analysis** 5.1 Basic Combinational Logic Circuits 5.2 Implementing Combinational Logic 5.3 The Universal Property of NAND and NOR Gates 5.4 Combinational Logic Using NAND and NOR Gates 5.5 Logic Circuit Operation with Pulse Waveform Inputs 5.6 Troubleshooting 5.7 Combinational Logic with VHDL(System Application Activity)

	6	**Functions of Combinational Logic** 6.1 Basic Adders 6.2 Parallel Binary Adders 6.3 Ripple Carry versus Look – Ahead Carry Adders 6.4 Comparators 6.5 Decoders 6.6 Encoders 6.7 Code Converters 6.8 Multiplexers 6.9 Demultiplexers 6.10 Parity Generators/Checkers 6.11 Troubleshooting (System Application Activity)
13	Main references: 1. EcE-21021 &22021 Digital Electronics	
14	Additional references: • www.faadooengineers.com (Digital electronics ebook pdf free download) • https://www.scribd.com • www.mavenscientists.com	

Information on Lab Practical (Digital Electronics)

Lab	Activity

1	**Experiment 1: Basic logic gates circuit test experiment.** **Objectives:** • Familiar with gate circuit logic function **Required equipments:** 1. Experiment Accessories： XK-DEB1 TRAINING BOX Multimeter some jumper wires； 2. Experiment Content： Finish logic function test of AND gate OR gate NOT gate NAND gate and NOR gate and XOR gate;
2	**Experiment 2: Logic Expressions for an 3 input AND gate** **Objectives:** • Familiar with gate circuit logic function **Required equipments:** 1. Experiment Accessories： • XK-DEB1 TRAINING BOX Multimeter some jumper wires； 2. Experiment Content： Finish logic function test of AND gate
3	**Experiment 3: Logic Function and parameter test of TTL Integration Logic Gate** **Objectives:** • To know the basic concept of digital electronic. • To design and verify the truth table for TTL Integration Logic. **Required Equipments:** 1. Experiment Accessories： XK-DEB1 TRAINING BOX Multimeter Oscilloscope chip 74LS00 1pcs、some jumper wires； 2. Experiment Content： Logic function test of TTL NAND gate 74LS00 Parameter test of TTL

	NAND gate 74LS00
4	**Experiment 4 : Combinational Logic Circuit Analysis and Design** **Objectives:** • To know the basic concept of digital electronic. • To design and verify the truth table for half adder & full adder. 1. Experiment Accessories： XK-DEB1 TRAINING BOX Multimeter； Chip 74LS00 3pcs, 74LS86, 74LS10 1pce for each type some jumper wires； 2. Experiment Content： Verify logic function of half adder Using "NAND" gate to design one three-person vote circuit.
5	**Experiment 5: Decoder and its Application** **Objectives:** • To know the basic concept of digital electronic. • To design and verify the truth table for decoder. **Required Equipments:** 1. Experiment Accessories： XK-DEB1 TRAINING BOX、Multimeter、74LS138: 1pce、some jumper wires； 2. Experiment Content： Verify 74LS138 logic function Using 74LS138 to do data distributor Learning nixie tube display decoder

Program Educational Objectives (PEO)

1. Produce engineer who can apply the engineering knowledge and skills, complex problem solving skills and critical thinking in electronic engineering practices.
2. Nurture engineer who can apply effective communication, management, teamwork and leadership skills in electronic engineering and multidisciplinary environment.
3. Foster development of an engineer who adopts ethical and moral behavior considering safety, environment and sustainable development for professional careers in electronic engineering, and is committed to professional excellence through life-long learning.

Program Outcomes (PO)

Upon completion of the program, students will have:

1. an ability to apply the knowledge of mathematics, sciences, and fundamentals of electronic engineering to the solution of complex engineering problems;
2. an ability to identify, formulate and solve complex electronic engineering problems;
3. an ability to design solutions for complex electronic engineering problems and design systems, components or processes to meet desired needs within realistic constraints such as environmental, societal and safety consideration;
4. an ability to conduct investigation into complex electronic engineering problems using research-based knowledge and research methods including design of experiments, analysis, interpretation and synthesis of data to give proper conclusions;
5. an ability to employ necessary techniques, hardware and software tools for electronic engineering applications;
6. an ability to apply the contextual knowledge to assess societal, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice;
7. an ability to understand the significance of sustainable development and impact of professional engineering solutions in societal and environmental contents;
8. an ability to apply the professional and ethical responsibility;
9. an ability to communicate effectively in both oral and written form on complex engineering activities with the engineering community and with society at large;
10. an ability to function effectively as an individual and as a multidisciplinary team;
11. an ability to recognize the needs for and to engage in life-long learning;
12. an ability to demonstrate and apply electronic engineering and management principles in multidisciplinary environment.

No:	**Course Outcomes**	**Indicators**
1	1. to covert the analog signal to digital and several types of logic operation.	
2	1. to explain about digital number systems , logic gate ,the basic laws , rules of Boolean expression, the functions of various digital integrated circuits and the basic concepts of a digital signal processor (DSP).	
3	1. to apply a combinational logic circuit for a given Boolean output expression and adder, decoders, encoders, multiplexers, de-multiplexers , flip-flops, counters, registers .	
4	1. To demonstrate the knowledge gained in the digital integrated circuits through practical experiment.	

Matrix of CO and PO

CO	**Program Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	*											
2	*											
3	*	*										
4	*	*			*							