Course Syllabus
Gyanmanjari Institute of Technology
Semester-2

Subject: Digital Electronics-BETEE10302

Type of course: Minor

Prerequisite: Basic Understanding of Electronics

Rationale:

This course has been designed to impart in-depth knowledge of digital electronics. The students learn basic concepts of digital circuits and systems and apply the principles of digital electronics when required to develop complex circuits. The students need to learn combinational and sequential circuits using digital logic fundamentals along with the Memories Fundamental.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				Theory Marks		Practical Marks		CA	
CI	T	P	C	ESE	MSE	V	P	ALA	
3	0	2	4	60	30	10	20	30	150

Legends: CI-Classroom Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Course Content:

Unit No.	Course content	Hrs	% Weightage
1	**Basics of Digital Electronics and Number system.** • Fundamentals of Digital Systems, Advantages and Disadvantages of Digital over Analog • Number systems-Decimal, Binary, octal hexadecimal number systems, • Binary arithmetic operations • 1s,2s,7s,9s (R,(R-1s))compliments • Binary Codes -Weighted Codes , Non weighted codes , Gray Code, BCD Code, Excess-3 Code. • Numerical practice.	12	25%
2	**Logic Gates, Boolean Algebra& Logic Families** • Logic Gates: AND, OR, NOT, NAND, NOR, Exclusive OR Operation, Exclusive NOR Operation • NAND & NOR as universal gate • Boolean algebra, Laws, Properties of Boolean algebra • De-Morgan's Theorems • Boolean functions • Error detecting and correcting codes • Characteristics of digital ICs • Introduction to Digital logic families, Characteristics of Digital logic families • TTL and CMOS logic.	12	25%
3.	**Introduction and Design of Combinational Logic circuit** • Combinational Digital Circuits • Sum of products (SOP) & Product of Sum(POS), • Implementation of SOP and POS equation using universal gate. • K-map(2,3 and 4 variable), Don't care-conditions • Tabulation method(Quine mccluskey method) • Design of Multiplexer and Demultiplexer • Decoders-Encoder • Adder-Subtractor • Digital comparator, parity checker and generator, code converters, priority encoders • 4 bit Binary Adder, Carry look ahead adder. • Implementation of Logic Function using Mux and Decoder.	12	25%

4.	**Sequential circuit(Flip Flop, Registers and Counter)** • Sequential circuits and systems • Latch • The clocked SR flip flop, JK, T and D types flip flops, • Applications of flip flops • Shift Registers - Bi- directional, Universal Shift Register • Design of counters • Modulo-n, Synchronous Counter: Ring counter, Johnson counter. • Asynchronous Counter: Ripple UP counter, Ripple DOWN counter, Applications of Counters.	12	25%

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**Code Generator** Students will be assigned numbers and required to generate numbers in different codes and upload in GMIU Web portal	10
2	**Micro Project** Students will design and prepare a micro project. Video clip of working should be upload.(No. of Students per group-3)	10
3	**Solve & Simulate** A puzzle (Problem) will be assigned by faculty, students need to solve and simulate on any application and upload the file.	10
Total		30

Suggested Specification table with Marks (Theory):60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weight age	30%	40%	20%	10%	0	0

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course the students should be able to:	
CO1	Solve the given problem using fundamentals of Number systems
CO2	Analyze working of logic families and logic gates and design the simple circuits using various gates for a given problem
CO3	Interpret the working of combinational circuits and design the simple circuits using various gates for a given problem
CO4	Design of sequential circuits and it's working

List of Practicals

Sr. No	Descriptions	Unit No	Hrs
1.	To perform basic logic gates & Verification of truth table	1	2
2.	To solve various conversion of number systems.	2	2
3.	To perform Universal Building Block Implementation of various Logic gates using only NAND gates & verification of truth Table.	2	2
4.	To perform Universal Building Block Implementation of various Logic gates using only NOR gate & verification of truth table	2	2
5.	To study and verify DE - Morgan's Theorem.	2	2
6.	To design & Implement Half Adder & Full Adder circuits.	2	2
7.	To design & Implement Half - Subtractor & Full- Subtractor circuits.	2	2
8.	To study Encoder & Decoder Combinational Circuits.	3	2
9.	Implement Multiplexer & Demultiplexer Combinational Circuit.	3	2
10.	To solve and simulate Boolean Expression using K-MAP	3	2
11.	To study & verify the function of SR Flip Flops & D Flip Flop	4	2
12.	To study & verify the function of JK Flip Flops. & T Flip Flops.	4	2
13.	To validate the truth table of Ring & Johnson Counter	4	2
14.	Study of different Type of shift registers	4	2
15.	Design Flip Flop using combinational logic circuit.	4	2
	TOTAL		30

Instructional Method:

The course delivery method will depend upon the requirement of content and the needs of students. The teacher, in addition to conventional teaching methods by black board, may also use any tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in the laboratory.

Reference Books:

[1] "Digital logic and Computer design", M. M. Mano, Pearson Education India, 2016.
[2] "Fundamentals of Digital Circuits", A. Kumar, Prentice Hall India, 2016.
[3] "Digital Principles and Applications" Malvino& Leach, McGraw-Hill Education
[4] "Modern Digital Electronics", R. P. Jain, McGraw Hill Education, 2009.