FORM - 2

BETHLAHEM INSTITUTE OF ENGINEERING

Karungal, Kanyakumari Dist. – 629 157

Approved by AICTE / Affiliated to Anna University

BIoE/ECE/CP/2020-21/REV 0

Name of the Staff : **A.ALWIN RAJA SINGH**

Program : **B.E**

Course Code &Title : **CS8351 & DIGITAL PRINCIPLES AND SYSTEM DESIGN**

Year / Semester : **II / III**

COURSE PLAN

1. Vision& Mission of the Program

VISION:-

To become a centre of excellence in Computer Science and Engineering with quality learning and in embracing future technologies with ethical values.

MISSION:-

- To impart quality education to computer science students irrespective of the socio-economical discriminations and enlighten their minds to achieve academic excellence.
- Adopt innovative strategies and add-on courses in Computer Science and Engineering in order to meet the national and global changes through student centric learning approach.
- To nurture the excellent and efficient staff and student community along with technical manpower.
- Establish the state-of-the-art computing system for effective teaching-learning process.
- Arrange the platform to share the views of the stakeholders to improve the overall personality development of the students.
- Motivate the social responsibilities of computer science engineers.

2.Program Educational Objective(PEOs)

PEO 1:To enhance the analysing, designing and competing knowledge of the graduates of our program by applying the basic engineering knowledge.

PEO 2: The graduates of our program will have sound capabilities to posses and access innovative skills to adapt the rapid change in technologies.

PEO 3: Our graduates are trained to be a leader to engage in socio economic development of the society with ethical and legal values and captivate in life long learning

3.Program outcomes(POs)

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2.Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

4.Program Specific Outcomes(PSOs):

- **PSO 1**: Apply standard software engineering practices and strategies in real time software project development using open source programming environment or commercial environment to deliver quality product for the organization success.
- **PSO 2**:Design and develop computer programs/computer based systems in the areas related to algorithms ,Networking,web design,multimedia,artificial intelligence,IOT and data analytics of varying complexity.
- **PSO 3:**Acquaint with the contemporary trends in industrial/research settings and thereby innovate novel solutions to existing problems

5. Course Outcomes(Cos)

Students able to

CO1: Simplify Boolean functions using KMap
CO2: Design and Analyze Combinational Circuits
CO3: Design and Analyze Sequential Circuits
CO4: Implement designs using Programmable Logic Devices
CO5: Write HDL code for combinational and Sequential Circuits

6. Mapping of PO's & CO's

Course Outcomes	Program Outcomes (POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PO 2
CO 1	3	1	-	-		-	-	-	1	-	-	1	-	2
CO 2	3	2	3	-		-	-	-	1	-	-	3	-	-
CO 3	3	2	3	-		-	-	-	1	-	-	3	2	-
CO 4	3	3	3	-		-	-	-	1	-	-	3	-	-
CO 5	3	1	-	-	2	-	1	1	1	-	-	1	-	2

* 3 - High 2 – Medium 1 – Low

JUSTIFICATION FOR CORELATION

Sl.No	Related POs	Justification
CO1	PO1 PO2 PO9	1. Apply the basic mathematical knowledge to solve problems involving number systems, Boolean algebra and logical operations

	PO12	2. Identify and solve problems of number system and Boolean algebra 9. Work effectively as an individual and as a team to implement logic gates 12 Develop the knowledge of number system which will be used in real life
CO2	PO1 PO2 PO3 PO9	1. Apply the basic mathematical knowledge in the design of combinational circuits 2. Analyze and solve problems related with combinational circuits using the principles of mathematics 3. Design combinational circuits with reduced gates which reduce the electronic waste considering environmental considerations 9. Work effectively as an individual and as a team to implement combinational circuits
CO3	PO1 PO2 PO3 PO9	1.Apply the basic mathematical knowledge in the design of synchronous sequential circuits 2. Analyze and solve problems related with synchronous sequential circuits using the principles of mathematics 3. Design synchronous sequential circuits with reduced gates which reduce the electronic waste considering environmental considerations 9. Work effectively as an individual and as a team to implement synchronous sequential circuits
CO4	PO1 PO2 PO3 PO9	1. Apply the basic mathematical knowledge in the design of asynchronous sequential circuits 2. Analyze and solve problems related with asynchronous sequential circuits using the principles of mathematics 3. Design asynchronous sequential circuits with reduced gates which reduce the electronic waste considering environmental considerations 9. Work effectively as an individual and as a team to implement asynchronous sequential circuits
CO5	PO1 PO2 PO12	1. Apply the basic knowledge of science to understand semiconductor memories 2. Solve problem related to programmable logic devices 12. Able to engage in the the life-long learning of digital integrated circuits

JUSTIFICATION FOR CORELATION

Sl.No	Related PSOs	Justification
CO1	PSO1	1.Able to solve problems involving number systems, Boolean algebra and logical operations by applying basic mathematics

CO2	PSO1	1.Design combinational circuits using the principles of mathematics
CO3	PSO1	1. Analyze and design synchronous sequential circuits using the principles of mathematics
CO4	PSO1	1.Analyze and design asynchronous sequential circuits using the principles of mathematics
CO5	PSO1	1.Able to implement programmable logic devices with the aid of mathematical knowledge

7. Pre-requisite

To have a knowledge about basics of electronics.

Mathematics

Electronic Devices

8.Course Description

This course describes the digital fundamentals, design of various digital circuits such as combinational and sequential, types of semiconductor memories and digital integrated circuits

9. Course Objectives

On completion of this course the student will understand

- To design digital circuits using simplified Boolean functions
- To analyze and design combinational circuits
- To analyze and design synchronous and asynchronous sequential circuits
- To understand Programmable Logic Devices
- To write HDL code for combinational and sequential circuits

10. Curriculum gaps-To meet Industry/Professional requirements:

Sl.No	**Description**	**Proposed Actions**
1	To understand the implementation of logic gates using Modern Tool	Hands on training for implementation of logic gates using VHDL
2	To discuss the pros and cons of Digital Technology	Group Discussion

11. Lesson plan

Lecture No.	Topic(s) to be covered	Text / Ref. Book	Page No	Teaching Mode	No. of Hours	Cumulative Hours
Unit – 1 BOOLEAN ALGEBRA AND LOGIC GATES						
1	Number Systems	T1	1-9	ICT	1	1
2	Arithmetic Operations	T1	10-14	CTL	1	2
3	Binary Codes	T1	18-24	CTL	2	4
4	Boolean Algebra and Logic Gates	T1	43-46, 60-65	CTL	1	5
5	Theorems and Properties of Boolean Algebra	T1	43-46	CTL	1	6
6	Boolean Functions	T1	43-46	CTL	1	7
7	Canonical and Standard Forms	T1	86-93	CTL	1	8
8	Simplification of Boolean Functions using Karnaugh Map -	T1	73-111	CTL	2	10
9	Logic Gates – NAND and NOR Implementations.	T1	73-111	CTL	2	12
Unit – II COMBINATIONAL LOGIC						
10	Combinational Circuits	T1	153-156	CTL	1	13
11	Analysis and Design Procedures	T1	156	CTL	1	14
12	Binary Adder	T1	157	CTL	1	15
13	Subtractor	T1	158	CTL	1	16

14	Decimal Adder	T1	178	CTL	1	17
15	Binary Multiplier	T1	181	CTL	1	18
16	Magnitude Comparator	T1	170-171	CTL	1	19
17	Decoders	T1	171-176	CTL	1	20
18	Encoders	T1	171-176	CTL	1	21
19	Multiplexers	T1	179-185	CTL	1	22
20	Introduction to HDL	T1	185	CTL	1	23
21	HDL Models of Combinational circuits	T1	190	CTL	1	24
Unit – III SYNCHRONOUS SEQUENTIAL LOGIC						
22	Sequential Circuits	T1	217-218	CTL	1	25
23	Storage Elements: Latches, Flip-Flops	T1	218-220	ICT	2	27
24	Analysis of Clocked Sequential Circuits	T1	225-294	ICT	2	29
25	State Reduction and Assignment	T1	225-238	ICT	2	31
26	Design Procedure	T1	225--238	ICT	2	33
27	Registers and Counters	T1	279-284	ICT	2	35
28	HDL Models of Sequential Circuits	T1	290-295	ICT	1	36
Unit – IV ASYNCHRONOUS SEQUENTIAL LOGIC						
29	Analysis and Design of Asynchronous Sequential Circuits	R4	629-645	CTL	5	41
30	Reduction of State and Flow Tables	R4	592-603	CTL	4	45
31	Race-free State Assignment	R4	629-645	CTL	2	47
32	Hazards	R4	667-672	ICT	1	48
Unit – V MEMORY AND PROGRAMMABLE LOGIC						
34	RAM	T1	335-338	ICT	1	49

35	Memory Decoding	T1	335	ICT	2	51
36	Error Detection and Correction	T1	330	ICT	2	53
37	ROM	T1	350	ICT	1	54
38	Programmable Logic Array	T1	357-360	ICT	2	56
39	Programmable Array Logic	T1	367-370	ICT	2	58
40	Sequential Programmable Devices	T1	357-360	ICT	2	60

12.List of Text Books by AU:

1. M. Morris R. Mano, Michael D. Ciletti, ―Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog‖, 6th Edition, Pearson Education, 2017.

13.Reference Books by AU:

R1. G. K. Kharate, Digital Electronics, Oxford University Press, 2010
R2. John F. Wakerly, Digital Design Principles and Practices, Fifth Edition, Pearson Education, 2017.
R3. Charles H. Roth Jr, Larry L. Kinney, Fundamentals of Logic Design, Sixth Edition, CENGAGE Learning, 2013
R4. Donald D. Givone, Digital Principles and Design‖, Tata Mc Graw Hill, 2003.

14. Other Related books Available in our library:

O1. L.Gopinath , Digital Principles and System Design, Suchitra Publications.

O2. A.P.Godse, Dr.D.A.Godse, Digital Principles and System Design, Technical Publications

15. Web Resources

Unit	Topic	Web Link
I	Simplification of Boolean Functions using Karnaugh Map	https://www.javatpoint.com/simplification-of-boolean-expressions-using-karnaugh-map
II	Binary Adder-Subtractor	https://www.electronicshub.org/binary-adder-and-subtractor/
III	Storage Elements: Latches , Flip-Flops	https://upscfever.com/upsc-fever/en/gatecse/en-gatecse-chp25.html

IV	Hazards	https://www.electrically4u.com/hazards-in-digital-circuits/
V	Error Detection and Correction	https://www.electronicshub.org/error-correction-and-detection-codes/

16.Video Resources

S.No	Video Link
V1	**https://www.youtube.com/watch?v=EENG94k6Zno**
V2	https://www.youtube.com/watch?v=FKvnmxte98A

17. Other Related activities

.No	Name of the activity	No. of activities planned	Details
1.	**Assignment**	5	1)BooleanTheorems and Properties of Boolean Algebra 2) Magnitude Comparator 3)Master Slave JK Flipflop 4)Real time examples of digital systems using asynchronous sequential circuits 5)Identification and description of memories used in any real time digital system
2.	**Seminar**	2	1) Reduction of State and Flow Tables 2) Sequential Programmable Devices
3.	**Guest Lectures**	-	**-**
4.	**Industrial Visit**	-	**-**

18. Content Beyond syllabus

Sl. No	Gap Identified	Contents/Activity to bridge the gap	Method of Implementation (Seminar /	No. of Period	POs Mapping

			Guest Lecture/ IV / Workshop etc.)		
1	Modern Tool Usage	Implementation of logic gates using VHDL	Hands on Training	2	PO5
2	Communication	Pros and Cons of Digital Technology	Group Discussion	2	PO10

Proof has to be retained for verification

19.Journals Link

Sl.No	Journal Name	Publisher	Link
1	International Journal of Analog and Digital Electronics	Springer	**https://www.springer.com/journal/10470**
2	International Journal of Digital Electronics	Journals Pub	**http://journalspub.com/JournalsDetails.aspx?jid=25**
3	IEEE Transactions on Circuits and Systems	IEEE Explore	**https://ieeexplore.ieee.orgxpl/RecentIssue.jsp?punumber=8919**

20.Assessment Methodology

Assessment	**Topic**	**CO**	**Weightage**
IAT 1	1.5UNITS	**CO1** **CO2**	**66%** **34%**
IAT2	1.5UNITS	**CO2** **CO3**	**42%** **58%**
MODEL TEST	5 UNITS	**CO1**	**16.66%**

		CO2 **CO3** **CO4** **CO5**	**16.66%** **16.66%** **25%** **25%**

CourseIn-charge	**Verified by** (ACADAMIC RESOURCE CELL MEMBER)	**HoD**	**Principal**