University of Kerala

Discipline	**PHYSICS**				
Course Code	**UK4DSEPHY201**				
Course Title	**BASIC DIGITAL PRINCIPLES AND APPLICATIONS**				
Type of Course	**DSE**				
Semester	**IV**				
Academic Level	**200 - 299**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 Hrs	-	2 Hrs	5 Hrs
Pre-requisites					
Course Summary	To equip the students with the concepts of Boolean algebra, digital logic gates, combinational and sequential digital circuits				

BOOKS FOR STUDY:

1. Digital Principles and Applications: Malvino and Leach, Tata McGraw Hill Education Private Limited
2. Basic Electronics Solid State: B. L. Theraja, S Chand& Company LTD
3. Basic Electronics: Devices, circuits and IT fundamentals: Santiram Kal, PHI, 2010

BOOKS FOR REFERENCE:

1. Digital Fundamentals: Thomas L Floyd, 11th Edition by Pearson Education
2. Fundamentals of Digital Circuits – Anand Kumar – PHI
3. Digital Electronics Principles and Integrated circuits – Maini – Wiley India.

DETAILED SYLLABUS: THEORY

Module	Unit	Content	Hrs	CO No
I		**Number Systems, Boolean Algebra (Book 2, Chapter 32 & 34 Book 1 Chapter 3)**	**9**	
	1	Review of number system, binary, octal, hexa-decimal	2	1
	2	Binary addition and subtraction (1's and 2's complement methods)	2	1
	3	Boolean algebra- Laws and identities, De-Morgan's Theorems	2	1,6
	4	Simplification of Boolean expressions using Boolean identities	1	6
	5	Reduction of Boolean expressions using Karnaugh Maps - Sum of Products (SOP) representation (up to four variables)	2	6,
II		**Logic Families (Book 2, Chapter 35)**	**9**	
	6	Saturated and Non-Saturated Logic Circuits - Characteristics of Logic Families	2	2
	7	RTL Circuit - DTL Circuit - TTL Circuit	3	3
	8	ECL Circuit - I^2L Circuit	2	3
	9	MOS Family - PMOS, NMOS and CMOS Circuits.	2	3,5
III		**Adders, Subtractors and Flip Flops (Book 2 Chapter 33 & Book 1 Chapter 8)**	**9**	
	10	Half and Full adder	2	5,
	11	Half and Full Subtractors	2	5,
	12	Flip flops –SR flip flop, JK flip flop, JK Master slave Flip flop	3	4,5
	13	D flip flop, T flip flop	2	4,5
IV		**Counters (Book 1, Chapter 10)**	**9**	
	14	Asynchronous Counter, Synchronous Counter (timing diagram)	3	2
	15	Ring Counter, Ripple Counters	3	5

	16	Mod 10,16, n Counter- popular IC versions (7490A)	3	5
V*	**Registers (Book 1, Chapter 9)**		**9**	
	17	Shift registers Serial in – Serial out shift register	2	5
	18	Serial in – Parallel out shift register	2	5
	19	Parallel in – Serial out shift register	2	5
	20	Parallel in – Parallel out shift register	2	5
	21	Bidirectional Shift Register	1	

DETAILED SYLLABUS: PRACTICALS

Part A – At least 5 Experiments to be performed		**CO No**
Sl No	**Name of Experiment**	
1	Characteristics of PN junction diode.	4,5
2	Network theorems (Superposition, Thevenin's & Norton's theorems) - To verify the (i) Superposition, (ii) Thevenin's & (iii) Norton's theorems	4,5
3	Characteristics of LED	4,5
4	Familiarising and verifying different logic gates using 74XX series	4,5
5	Verification of truth tables of AND, OR, NOT Gates using IC 74XX series	4,5
6	Verification of truth tables of NAND, NOR, EXOR Gates using IC 74XX series	4,5
7	Construction of basic gates using NAND and NOR gates using IC.	4,5
8	Construct and verify a Half Adder using IC 74XX series.	4,5
9	Construct and verify a Full Adder using IC 74XX series.	4,5
10	Verification of truth tables of flip flops: RS, D, and JK using IC 74XX series.	4,5
Part B* – At least One Experiment to be performed		
11	To verify the Maximum Power Transfer Theorem	4,5
12	Characteristics of photo diode	4,5
13	Construction of binary counters using IC 74XX series	4,5

COURSE OUTCOMES

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Understand the basics of number systems	U	1
CO-2	Understand basics of Digital electronics	U	1
CO-3	Describe commonly used logic families	E	1
CO-4	Test commonly used IC chips	Ap, E	3
CO-5	Design logic circuits using ICs	Ap	5
CO-6	Solve digital equations using De-Morgans theorem	Ap	2

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: BASIC DIGITAL PRINCIPLES AND APPLICATIONS

Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO No.	CO	PO / PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO-1	Understand the basics of number systems	PO1/ PSO 1	U	C	L	-
CO-2	Understand basics of Digital electronics	PO1/ PSO 1	U	C	L	-
CO-3	Describe commonly used logic families	PO2,3 /PSO 1	E	C	L	-
CO-4	Test commonly used IC chips	PO 2,3/ PSO 3	An, E	P	L	P
CO-5	Design logic circuits using ICs	PO 2,3 /PSO 5	Ap	P	L	P
CO-6	Solve digital equations using De-Morgans theorem	PO 1/ PSO 2	Ap	C,P	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO-1	2	-	-	-	-	-	-	1	-	-	-	-	-	-	-
CO-2	2	-	-	-	-	-	-	1	-	-	-	-	-	-	-
CO-3	2	-	-	-	-	-	-	-	1	1	-	-	-	-	-
CO-4	-	-	2	-	-	-	-	-	1	1	-	-	-	-	-
CO-5	-	-	-	-	3	-	-	-	1	1	-	-	-	-	-
CO-6	-	3	-	-	-	-	-	1	-	-	-	-	-	-	-

Correlation Levels:

Level	-	1	2	3
Correlation	Nil	Slightly / Low	Moderate / Medium	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

CO No	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO-1	✓	✓	-	✓
CO-2	✓	✓	-	✓
CO-3	✓		-	✓
CO-4	✓	-	-	-
CO-5	✓	-	-	✓
CO-6	✓	-	-	✓