



University of Kerala

Discipline	PHYSICS				
Course Code	UK3DSCPHY201				
Course Title	DIGITAL ELECTRONICS AND DATASCIENCE				
Type of Course	DSC				
Semester	III				
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	<p>This course introduces the fundamental concepts of Digital and Computational Methods in Physics. The first module comprises of the introduction to various number systems and codes. The idea of digital logic gates are introduced in the second module. The third module incorporates Boolean Laws and Theorems along with the concept Karnaugh Maps. The basics of data science which includes the types, collection pre-processing etc are discussed in fourth module. Fifth module explains the various data analysis and analytic techniques</p>				

BOOKS FOR STUDY:

1. DIGITAL PRINCIPLES AND APPLICATION Albert Paul Malvino , Donald P Leach 7th Edition , Tata McGraw Hill Education Private limited
2. Digital Electronics_ Principles and Applications, Roger L. Tokheim, Patrick E. (2021, McGraw-Hill Education)
3. A Hands-On Introduction to Data Science- Chirag Shah - Cambridge University Press (2020)

BOOKS FOR REFERENCE:

1. Albert P. Malvino, Jerald A. Brown - Digital Computer Electronics (1993, McGraw-Hill)
2. Anil K. Maini - Digital Electronics. Principles, Devices and Applications [messy] (2007, Wiley)
3. Basics of Digital Electronics , Banani Ghosh, CRC Press, 2024
4. Electronics. Analog and Digital , Barun Raychaudhuri, Cambridge University Press, 2024
5. Ozdemir, Sinan - Principles of Data Science_ Learn the techniques and math you need to start making sense of your data (2016, Packt Publishing)
6. Sinan Ozdemir - Principles of Data Science_ A beginner's guide to essential math and coding skills for data fluency and machine learning-Packt Publishing Pvt Ltd (2024)

DETAILED SYLLABUS: THEORY

Module	Unit	Content	Hrs	CO No
I	Number Systems and Codes (Book 1: Chapter 5)		9	
	1	Binary Number System	1	1
	2	Binary-to-decimal Conversion, Decimal-to-binary Conversion, BCD	2	1
	3	Octal Numbers-Conversions , Hexadecimal Numbers-Conversions	3	1
	4	The ASCII Code, The Excess-3 Code, The Gray Code	1	1
	5	Error Detection and Correction	2	1
II	Digital Logic Gates (Book 2: Chapter 3)		9	
	6	The AND Gate, The OR Gate ,The Inverter and Buffer	2	2
	7	The NAND Gate, The NOR Gate,	2	2
	8	The Exclusive OR Gate, The Exclusive NOR Gate	2	2
	9	The NAND Gate as a Universal Gate ,The NOR Gate as a Universal Gate	2	2
	10	Gates with More Than Two Inputs	1	2
III	Combinational Logic Circuits (Book 1: Chapter 3)			
	11	Boolean Laws and Theorems	2	3

	12	Sum-of-Products Method	1	3
	13	Truth Table to Karnaugh Map, Karnaugh Simplifications	3	3
	14	Don't-care Conditions	1	3
	15	Product-of-sums Method, Product-of-sums Simplification	2	3
IV	Introduction to Data Science (Book 3: Chapter 1 & 2)		9	
	16	Introduction- Data Science, Relation to other fields	1	4
	17	Data Types	2	4
	18	Data Collections	3	4
	19	Data Pre-processing	3	4
V*	Data Analysis and Data Analytics (Book3: Chapter 3)		9	
	20	Descriptive Analysis- Variables, Frequency Distribution, Measures of Centrality, Dispersion of a Distribution	4	5
	21	Diagnostic Analytics- Correlations	3	5
	22	Predictive Analytics, Prescriptive Analytics	1	5
	23	Exploratory Analysis, Mechanistic Analysis	1	5

DETAILED SYLLABUS: PRACTICALS

Part A – At least 5 Experiments to be performed		CO No
SI No	Name of Experiment	
1	Familiarising different logic gates using 74XX series	6
2	Construction and Verification of the truth tables of AND gate using diodes	6
3	Construction and Verification of the truth tables of OR gate using diodes	6
4	Construction and Verification of the truth tables of NOT gates using transistors	6
5	Construction and Verification of the truth tables of AND gate using IC's	6

6	Construction and Verification of the truth tables of OR gate using IC's	6
7	Construction and Verification of the truth tables of NOT gate using IC's	6
8	Construction and Verification of the truth tables of NAND gate using IC's	6
9	Construction and Verification of the truth tables of NOR gate using IC's	6
10	Verification of Demorgan's theorem for 2 variables	6
Part B* – At least One Experiment to be performed		
11	Familiarising different logic gates using 74XX series	6
12	Construction and Verification of the truth tables of AND gate using diodes	6
13	Construction and Verification of the truth tables of OR gate using diodes	6

COURSE OUTCOMES

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Discuss the conversion of different types of number system and codes	U	PSO 1,3,6
CO-2	Realize the concepts of digital logic gates and its applications	U	PSO 1,3,6
CO-3	Use DeMorgan's theorems to create equivalent circuits and to simplify complex logic circuits using fundamental Boolean algebra laws, make Karnaugh maps and Entered variable maps and use them to simplify Boolean expressions.	U	PSO 1,3,6
CO-4	Distinguish different Data types, major data sources, and formats and to perform basic data cleaning and transformation	U, Ap	PSO 1,2
CO-5	Discuss Various forms of data analysis and analytics techniques.	U	PSO 1,2
CO-6	Construct and verify the working of various digital logic gates using diode/transistors and IC's	Ap, An	PSO 7

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

Name of the Course: DIGITAL ELECTRONICS AND DATASCIENCE

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

CO No.	CO	PO / PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO-1	Discuss the conversion of different types of number system and codes	PO 1/ PSO 1,3,6	U	F, C	L	-
CO-2	Realize the concepts of digital logic gates and its applications	PO 1/ PSO 1,3,6	U	C	L	-
CO-3	Use DeMorgan's theorems to create equivalent circuits and to simplify complex logic circuits using fundamental Boolean algebra laws, make Karnaugh maps and Entered variable maps and use them to simplify Boolean expressions.	PO 1/ PSO 1,3,6	U	C	L	-
CO-4	Distinguish different Data types, major data sources, and formats and to perform basic data cleaning and transformation	PO 1/ PSO 1,2	U, Ap	C	L	-
CO-5	Discuss Various forms of data analysis and analytics techniques.	PO 1/ PSO 1,2	U	C	L	-

CO-6	Construct and verify the working of various digital logic gates using diode/transistors and IC's	PO 6,7/ PSO 7	Ap, An	C,P	-	P
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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	1	-	1	-		1	-	1	-	-	-	-	-	-	-
CO-2	2	-	2	-		2	-	2	-	-	-	-	-	-	-
CO-3	2	-	1	-		1	-	2	-	-	-	-	-	-	-
CO-4	2	1	-	-	-	-	-	2	-	-	-	-	-	-	-
CO-5	2	2	-	-	-	-	-	2	-	-	-	-	-	-	-
CO-6	-	-	-	-	-	-	2	-	-	-	-	-	2	2	-

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	✓	-	-	-