FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART-A: INTRODUCTION

Program : Bachelor in Science *(Honors/Honors with Research)*	Semester - VII	Session: 2024-2025

1	Course Code	PHSE- 07 T	
2	Course Title	DIGITAL ELECTRONICS	
3	Course Type	Discipline Specific Elective	
4	Pre-requisite (if, any)	*As per Program*	
5	Course Learning. Outcomes (CLO)	➢ *Understand basics of logic gates, Boolean algebra, and simplifying complex Boolean functions.* ➢ *Learn about combinational circuits, logic families, and digital ICs.* ➢ *Understand the working of flip-flops and thus memory* ➢ *Capable to know the various sequential circuits an Ads & DAs*	
6	Credit Value	3 Credits	*Credit = 15 Hours - learning & Observation*
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40

PART -B: CONTENT OF THE COURSE

Total No. of Teaching–learning Periods (01 Hr. per period) - 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Period
I	**Number system:** Decimal, Binary, Octal and Hexadecimal Number System with mutual conversion, Mathematics of number systems (addition, subtraction, multiplication and division), 1's and 2's compliments, addition and subtraction using 1's and 2's compliments. **Binary Codes:** Binary Coded Decimal (BCD), its addition and subtraction, Excess –3 code, its addition and subtraction, Gray code, binary to gray code and gray code to binary code conversion. **Logic gates:** Positive and negative logic, Basic gates, Universal building block. Basic laws of Boolean Algebra, De-Morgan's Theorem	12
II	**Simplification of Boolean Functions:** Simplification of Boolean functions through Boolean laws, Realization through logic gates, Minterms and Maxterms, Two, Three and Four variable Karnough Map (K-Map), and minimization of SOP and POS expressions. **Combinational Logic Circuits:** Half-adder, Full-adder, Binary serial and parallel adders, Half Subtractor, Full Subtractor. Multiplexers (2:1, 4:1 and 16:1), Demultiplexer (1:2, 1:4 and 1:16), Encoders (Octal to Binary encoder, Decimal to BCD), Binary decoders BCD to Decimal, BCD to Seven Segment)	11
III	**Digital logic Families:** Introduction, Basic concepts of RTL, DTL, TTL, ECL and CMOS logic families and their characteristics (Fan-in, Fan-out, Supply voltage range, Power dissipation, Input/ Output logic levels, Noise margin, Speed of operation) **Flip-flop and timing diagram:** RS flip-flop, R-S flip-flop using NOR gate, RS flip-flop using NAND gate, Clocked RS flip-flop, D- latch flip-flop, Flip-flop with Preset and Clearinputs, JK flip-flop, Positive and negative edge triggered flop-flops., JK Master Slave flip-flop	11
IV	**Sequential Circuits: Counters:** Synchronous and Asynchronous counters: Binary ripple counter, up counter, down counter, up-down counter and ring counter with their time diagrams. **Registers:** Shift Register, PIPO, SIPO, PISO, SISO and Bi-directional shift Register, Application of shift register (Serial Adder, Sequence generator) **Digital to analog converter and Analog to Digital converters:** D/A converters using binary weighted resistor network and R-2R ladder Network; Counter type A/D converter, applications of DACs and ADCs	11

Keywords	Number System, Logic gates, Codes, Digital Logic Families, Flip flops, Registers, counters

Signature of Convener & Members (CBoS) :

PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended–

1. Digital Design by M. Morris Mano and Michael D. Ciletti
2. Modern Digital Electronics by R.P. Jain
3. Digital Electronics: Principles, Devices and Applications by Anil K. Maini

Reference Books Recommended–

1. Digital and Analogue Technique- Navneet Gokhale and Kale, Kitab Mahal
2. Digital Electronics and Micro-Computers- R K Gaur, Dhanpat Rai Publications
3. Digital electronics- D K Kaushik, Dhanpat Rai Publication Company
4. Digital Electronics: Principles, Devices and Applications- A K Maini, John Wiley & Sons Ltd.
5. Digital Principles and applications – Malvino and Leach, Tata McGraw Hills, New Delhi
6. Hand Book of Electronics – Gupta and Kumar, Pragati Prakashan, Meerut
7. Digital integrated Electronics _ Taub and Schilling, McGraw International Edition
8. Fundamentals of Digital Circuits – A.Anand Kumar, Prentice Hall of India, New Delhi
9. Modern Digital Electronics- R P Jain, Tata McGraw Hill Publication, New Delhi

Online Resources–

e-Resources / e-books and e-learning portals

1. https://www.freebookcentre.net/Electronics/Digital-CircuitsBooks.html#google_vignette
2. https://www.researchgate.net/profile/Dk Kaushik/publication/264005171_Digital_Electronics/links/53fca84a0cf2364ccc04b6dd/Digital-Electronics.pdf
3. https://www.freebookcentre.net/electronics-ebooks-download/Digital-Electronics-Notes.html
4. https://www.academia.edu/40001993/Digital_Electronics
5. https://www.technicalbookspdf.com/electronic-engineering/digital-electronics/
6. https://www.tutorialspoint.com/digital_circuits/digital_circuits_multiplexers.htm
7. https://www.electronics-tutorials.ws/combination/comb_3.html
8. https://www.youtube.com/watch?v=Eb56gaw6JrQ
9. https://www.tutorialspoint.com/computer_logical_organization/digital_counters.htm
10. https://www.youtube.com/watch?v=bAQfPQqKCHs
11. https://www.youtube.com/watch?v=K2wPxfiggAU

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam(ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2):	**20 +20**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall b considered against **30** Marks
	Assignment / Seminar -	**10**	
	Total Marks -	**30**	
End Semester Exam (ESE):	**Two section – A & B**		
	Section A: **Q1**. Objective – **10 x1= 10** Mark; **Q2**. Short answer type- **5x4 =20Marks**		
	Section B: Descriptive answer type qts.,**1 out of 2** from each unit-**4x10=40 Marks**		

Name and Signature of Convener & Members of CBoS:

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Program : Bachelor in Science *(Honors/Honors with Research)*		**Semester - VII**		Session: 2024-2025
1	**Course Code**	**PHSE- 07 P**		
2	**Course Title**	**DIGITAL ELECTRONICS**		
3	**Course Type**	**Discipline Specific Elective**		
4	**Pre-requisite** (if,any)	**As per Program**		
5	**Course Learning. Outcomes(CLO)**	**After completion of this course a student will be able to-** ➢ Understand the working of logic gates and realization of Functions ➢ Clarify the concept of combinational logic circuits ➢ Understand the differences between MUX, DMUX, Encoder and Decoder and their uses ➢ Familiar with basic memory elements (Flip-flop) ➢ Understand the concept of counters and shift registers, Able to use D/A and A/D convertors.		
6	**Credit Value**	**1 Credits**	***Credit =30 Hours Laboratory or Field learning/Training***	
7	**Total Marks**	**Max. Marks: 50**		**Min Passing Marks:20**

PART -B: CONTENT OF THE COURSE		
Total No. of learning-Training/performance Periods:30 Periods (30 Hours)		
Module	**Topics (Course Contents)** **At least 10 of the following or related Experiments**	**No. of Period**
Lab./Field Training/ Experiment Contents of Course	1. To study and verify the truth-tables of various logic gates 2. To study the Binary to Gray and Gray to Binary conversion 3. To verify the Boolean Laws with the help of logic gates 4. To realize Half Adder and Full Adder 5. To realize Half and Full subtractor 6. To verify the working and truth table of a Multiplexer 7. To verify the working and truth table of a Demultiplexer 8. To study the Decimal to BCD Encoder 9. To study the BCD to Seven Segment Decoder 10. To verify the truth table of (i) R-S flip-flop, (ii) Data latch and (iii) Edg triggered flip-flop 11. To verify the truth table of (i) J-K flip-flop, (ii) J-K Master-Slave flip-flop an (iii) T flip-flop 12. To understand the working of Ripple counter and verify its truth table 13. To understand the working of Up-Down counter and verify its truth table 14. To understand the working of Left/Right Shift Register and verify its truth table 15. To understand the working of SIPO/ PIPO Shift Register and verify its trut table 16. To understand the working of Sequence generator 17. To study the R-2R ladder Digital to Analog convertor 18. To study Counter type Analog to Digital convertor	**30**
Keywords	***Logic gates, Boolean algebra, Adders, Multiplexer, Flip-flop, Counter, Shift register. Convertors.***	

Signature of Convener & Members (CBoS):

10/6/24

PART–C:LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended–

1. Digital Electronics: Theory and Practical- Virendra Kumar, New Age International Publications
2. Digital Electronics – A Comprehensive Lab Manual- Cherry Bhargava, B S Publication
3. Digital electronics experiment manual- Toger Tokheim, McGraw Hill
4. Handbook of Experiments in Electronics and Communication- B Sasikala & S P Rao, Vikas Publishing
5. Practical Digital Electronics Manual- Nigel P Cook, Prentice Hall

Reference Books Recommended–

1. Digital Design by M. Morris Mano and Michael D. Ciletti
2. Fundamentals of Digital Circuits by A. Anand Kumar
3. Digital Electronics: Principles and Integrated Circuits" by Anil K. Maini
4. Digital Fundamentals by Thomas L. Floyd
5. Modern Digital Electronics by R. P. Jain
6. Digital Logic Design by B. Somanathan Nair

Online Resources–

- **e-Resources / e-books and e-learning portals**

1. https://nationallibraryopac.nvli.in/cgi-bin/koha/opac-detail.pl?biblionumber=15445&query_desc=Provider%3ANew%20Age%20International%2
2. https://books.google.com/books/about/Digital_Electronics.html?id=b7WwzQEACAAJ
3. https://ssit.edu.in/dept/assignment/declabmanual.pdf

PART-D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks:	**50 Marks**
Continuous Internal Assessment (CIA):	**15 Marks**
End Semester Exam (ESE):	**35 Marks**

Continuous Internal Assessment (CIA): **(By Course Teacher)**	Internal Test / Quiz-(2):	**10 & 10**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **15** Marks
	Assignment/Seminar +Attendance-	**05**	
	Total Marks -	**15**	
End Semester Exam (ESE):	**Laboratory / Field Skill Performance: On spot Assessment** **A. Performed the Task based on lab. work - 20 Marks** **B. Spotting based on tools& technology (written) – 10 Marks** **C. Viva-voce (based on principle/technology) - 05 Marks**		**Managed by Course teacher as per lab. status**

Name and Signature of Convener & Members of CBoS:

10/6/24