	National Institute of Technology Meghalaya An Institute of National Importance	**CURRICULUM**

Programme	**Bachelor of Technology in Electronics and Communication Engineering**	Year of Regulation	**2018-19**
Department	**Electronics and Communication Engineering**	Semester	**VIII**

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
EC 416	**Digital Arithmetic Circuits**	**3**	**0**	**0**	**3**	**50**	**50**	**100**	**200**

Course Objectives		Course Outcomes		
	To study digital representation of Various number systems		CO1	Able to understand different representation of number systems
	To understand the redundant and residue number system and application		CO2	Able to apply the concept of redundant number and residue number system and implementation concept
	To introduce the concept of binary addition, multiplication and division circuits		CO3	Criticize the of different adder architectures
	To develop the concept of floating point arithmetic		CO4	Criticize the different architectures of multipliers and dividers
	To analyse the concept of floating point arithmetic circuits		CO5	Able to understand the floating point number representation in digital domain and architectures of floating point circuits
			CO6	

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	CO1	**2**	**-**	**-**	**1**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**3**
2	CO2	**-**	**-**	**-**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**
3	CO3	**-**	**-**	**3**	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**
4	CO4	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**-**	**-**	**2**	**3**	**2**
5	CO5	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**	**-**	**-**	**-**	**3**	**3**	**3**

SYLLABUS

No.	Content	Hours	COs
I	**Review of the Number Representation** Numbers and their encodings, Fixed-radix positional number systems, Number radix conversion, Classes of number representations, Signed-magnitude representation, Biased representations, Complement representations, Direct and indirect signed arithmetic.	**06**	**CO1**
II	**Redundant Number Systems** Coping with the carry problem, Redundancy in computer arithmetic, Digit sets and digit-set conversions, Generalized signed-digit numbers, Carry-free addition algorithms, Conversions and support functions. Introduction to Residue Number systems.	**04**	**CO2**
III	**Addition / Subtraction** Bit-serial and ripple-carry adders, Conditions and exceptions, Analysis of carry propagation, Carry completion detection, Manchester carry chains adders. Carry-look-ahead adder design, Ling adder and related designs, Carry determination as prefix computation, Alternative parallel prefix networks, VLSI implementation aspects , Modular two-operand adders	**06**	**CO3, CO4**
IV	**Multiplication** Shift/add multiplication algorithms, Programmed multiplication, Basic hardware multipliers, Multiplication of signed numbers, Multiplication by constants, and Preview of fast multipliers. Radix-4 multiplication, Modified Booth's recoding, Radix-8 and radix-16 multipliers, Multi-bit multipliers, VLSI complexity issues. Full-tree multipliers, Alternative reduction trees, Tree multipliers for signed numbers, Partial-tree and truncated multipliers, Array multipliers, Pipelined tree and array multipliers.	**08**	**CO4, CO5**
V	**Division** Shift/subtract division algorithms, Programmed division, Restoring hardware dividers, Nonrestoring and signed division, Division by constants, Radix-2 SRT division. Basics of high-radix division, Using carry-save adders, Radix-4 SRT division, General high-radix dividers, Quotientdigit selection, Using p-d plots in practice.	**08**	**CO3, CO4, CO5**
VI	**Floating Point Arithmetic** Floating-Point Representations, Floating-point numbers, The ANSI/IEEE floating-point standard, Basic floating-point algorithms, Conversions and exceptions, Rounding schemes, Logarithmic number systems. Floating-point adders/subtractors, Pre- and post-shifting, Rounding and exceptions, Floating-point multipliers and dividers, Fused-multiply-add units, Logarithmic arithmetic unit.	**08**	**CO4, CO5**
Total Hours		**40**	

Essential Readings

1. B. Parhami, “Computer Arithmetic: Algorithms and Hardware Designs”, Oxford University Press, 2nd Edition, 2010
2. I. Koren, Computer Arithmetic Algorithms, Prentice Hall Publications, 2nd Edition, 2003

Supplementary Readings

1. M. D. Ercegovac, Digital Arithmetic, The Morgan Kaufmann Series in Computer Architecture and Design. 1st Edition, 2003.
2. D. A. Patterson and J. L. Hennessy, Computer Organization and Design, Morgan Kaufmann Publishers Inc. San Francisco, 5 th Edition, 2014.