



National Institute of Technology Meghalaya
An Institute of National Importance

CURRICULUM

Programme	Master of Technology in VLSI and Embedded System	Year of Regulation	2018-2019
Department	Electronics and Communication Engineering	Semester	II

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total

EC 504	Digital Arithmetic Circuits	3	0	0	3	50	50	100	200	
Course Objectives	To study digital representation of Various number systems	Course Outcomes	CO1	Describe the different representation of number systems						
	To understand the redundant and residue number system and application		CO2	Concept of redundant number and residue number system and implementation concept						
	To understand the concept of binary addition, multiplication and division circuits		CO3	Familiarization of different adder architectures						
	To understand concept of floating point arithmetic		CO4	Familiarization of different architectures of multipliers and dividers						
	To understand the concept of floating point arithmetic circuits		CO5	Familiarization with 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	0	0	1	1	3	0	0	0	0	0	0	3	0	3
2	CO2	0	0	0	3	2	3	0	0	0	0	0	0	0	2	2
3	CO3	0	0	3	2	2	3	0	0	0	0	0	0	0	3	2
4	CO4	0	0	0	0	0	0	3	3	0	0	0	0	2	3	2
5	CO5	0	0	0	0	0	0	0	3	2	0	0	0	3	3	3
6	CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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
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
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	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

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

Supplementary Readings

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