Number Systems & Complements

The material covered in this class will be as follows:

- Binary arithmetic.

- Introduction to complements.

After finishing this class, you should be able to:

- Perform binary arithmetic operation and apply the rules to other number systems.

- Understand and be able to obtain the complements of numbers in any number system.

Binary Arithmetic:

The rules used in decimal arithmetic operations are applied in any other number system. (digit carry to the higher order position in addition and the digit borrow from higher order position in subtraction).
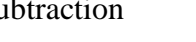
Examples:

Addition		Carry		
	1	1	0	1
+	1	0	1	0
1	0	1	1	1

Subtraction		Borrow		
	1	1	0	1
-	1	0	1	0
	0	0	1	1

multiplication

				1	1	0	1
x					1	0	1
				1	1	0	1
			0	0	0	0	
		1	1	0	1		
	1	0	0	0	0	0	1

Division

					1	1	0	1
1	0	1	1	0	0	0	0	0	1
				1	0	1		
			0	1	1	0		
			1	0	1			
		0	0	0	1	0	1	
				1	0	1		
			0	0	0			

Introduction to complements:

- Complements are used to simplify the subtraction operation and for logical manipulations.

- For each base (r), there are two complements:

- (r-1)'s complement, also called diminished radix complement

- r's complement, also called radix complement.

- (r-1)'s complement → For any integer number N in base r with number of digits equal n we define:

- (r-1)'s complement of N = $(r^n - 1) - N$.

- R's complement of N = $r^n - N$ = (r-1)'s complement + 1