Engin 103	Topics:
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1	0001
2	0010
3	0011
8	1000
15	1111
16	0001 0000
255	1111 1111

Analog to Digital conversion (A/D):

We want to write 2003 (an analog number) in digital (or binary) format:

 $127=1*10^2+2*10^1+7*10^0$ (using powers of 10; since we use decimal system)

127= 2^7 2^6 2^5 2^4 2^3 2^2 2^1 2^0 In binary system, numbers are just 0 or 1, starting from the left, let's insert either 1 or 0 in front of the powers of 2:

Now convert 2009 into digital format:

Digital to Analog conversion (D/A):

 $1001 = 1*2^3 + 0*2^2 + 0*2^1 + 1*2^0 = 9$ 1001 -> 9

Now convert 0101 1010 1101 0010 into analog format:

More on CW11:

2)

A/D conversion:

2^{15}	2^{14}	2^{13}	2^{12}	2 ¹¹	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}
327	163	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1
68	84														

What is the highest binary number using 8 bits of information? Answer: 255

27	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}
128	64	32	16	8	4	2	1

D/A conversion: 0101 1010 1101 0010 -> ?

3) Represent 0.5 in binary/digital:

a) First alternative:

Decimal system	Binary or Digital system
1	1111 1111 (255)
0.5	1000 0000 (128)

b) Second alternative: using a "binary dot"

 $2.5= 2 \times 10^{\circ} + 5 \times 10^{-1}$ (to the right of the dot: negative powers of 10)

We can use this in binary or digital format as well: to the right of the "binary dot" use negative powers of 2:

				2	•	5			
Decima	0*10 ³	0*10 ²	0*10 ¹	2*10 ⁰		5*10 ⁻¹	0*10 ⁻²	0*10 ⁻³	0*10-4
1									
Binary	0*2 ³	0*2 ²	1*2 ¹	0*2 ⁰		1*2 ⁻¹	0*2-2	0*2-3	0*2-4

2.5 -> 0010.1000

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LOGBOOK: example of a logbook page

-Use a quadrille notebook; number all pages; date all entries

-Write your notes for all activities, thoughts, problems and solutions, and learning conclusions related to Engin 103. You should write down progress, outcomes, and conclusions on projects and teamwork; conclusions from class work (including LabVIEW) and homework.

-In addition you should answer in the logbook all questions listed in these notes in blue, as shown below:

45) How many peaks do you see in the spectrum (as produced by the FFT.vi and Abs) for a signal that is composed of two sinusoids of different frequencies? What happens to the spectrum if you leave the frequency of sinusoid #1 fixed while increasing the frequency of sinusoid #2. What would you see in the spectrum of a signal that is composed of 5 sinusoids of different frequencies?

46) In our LabVIEW exercise we used a sinusoid of amplitude 128; then we added 127 to the Y series before converting it to a digital signal using U8 (To Unsigned Byte Integer). Is there any connection between 128; 127; and the 8 in "U8"? Explain. Fill out the table below

# binary digits	Largest decimal number
4	15
8	

	12	
	16	
	32	
	64	
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