

**Course Codes: ELEC 5705**

**Course Title: Fundamentals of Data Converters**

**Course Description:**

This course focuses on the conversion process and techniques between the analog and digital worlds. The course covers system-level concepts such as Signal-to-Noise Ratio (SNR), distortion, quantization noise, Effective Number of Bits (ENOB), and also circuit-level concepts such as sample and hold, comparator reference generation, etc.

**Pre-requisites or Co-requisite:**

Electronics I & II or equivalent

**Grading Scheme:**

<b>Item</b>	<b>Weight</b>
<b>Midterm (TBD)</b>	40%
<b>Project</b>	30%
<b>Class participation and assignments</b>	30%
<b>Total</b>	100%

Textbook:

**1. Principles of Data Conversion System Design by Behzad Razavi**

ISBN: 978-0-780-31093-3 December 1994

**2. Analog Integrated Circuit Design**

by Ken Martin and David Johns

Week-by-week Description:

Week	Topics / Assignments	Reading / Assignment
1	Fundamental concepts of ADCs and DACs: SNDR, SFDR, ENOB, Quantization noise etc.	
2	Nyquist rate data converters: <ul style="list-style-type: none"> <li>Flash ADC</li> <li>SAR ADC</li> </ul>	
3	Nyquist rate data converters (cont.): <ul style="list-style-type: none"> <li>Pipeline ADC</li> <li>Sub-ranging ADC</li> </ul>	
4	Oversampled data converters: <ul style="list-style-type: none"> <li>1<sup>st</sup> order delta sigma ADC</li> <li>Higher order delta sigma ADC</li> </ul>	
5	Design Example of ADCs: <ul style="list-style-type: none"> <li>High resolution low speed ADC</li> <li>High speed, moderate resolution ADC</li> </ul>	
6	Components of ADCs: Sample and hold, Comparator, reference generation and clock generation.	
7	Digital to Analog Converter (DAC): <ul style="list-style-type: none"> <li>Current mode DAC.</li> <li>Voltage mode DAC.</li> <li>Capacitive DAC.</li> </ul>	Mid term
8	Design study of 50+ GS/s 7-bit DACs	
9	Recent trends in data converters: time/phase domain data converter	

10	Characterization of ADCs and DACs	
11	Time interleaved ADCs	
12	Calibration of ADCs and DACs	
13		Project Presentation