# Shiv Nadar University

Department of Electrical Engineering-(SoE)

**EED305:** Digital Signal Processing **Lab-7** **Instructor:** Prof. Vijay Kumar Chakka

**Topics**: Time Varying Spectrum using Sliding DFT

**Lab Instructors: Prof.** Vijay Kumar Chakka & **Dr.** Ravi Kant Saini

## Time Varying Spectrum:

1. Generate the following chirp signal $x(n)$ for 10 sec duration, sweeping the frequency from $10Hz(f_0)$ to $200Hz(f_1)$, with a sampling frequency of $500Hz(f_s)$:

$$x(n) = Acos(k\frac{n^2}{2} + w_0 n + \phi)$$

Where $k = \frac{w_1 - w_0}{T}$ is rate of change in digital frequency, $w_0$ and $w_1$ are the digital frequencies (radians/sample) corresponds the sweeping frequencies $f_0$ and $f_1$ respectively.

   a. Plot the generated signal with time on x-axis and amplitude on y-axis
   b. Now divide the total signal into blocks, with a block duration of $0.1\ sec$ having an overlap of 98% (0.0980 sec) with previous block.
   c. Compute the DFT of each block (using your previous lab code), arrange them in a matrix form $'X(i,k)'$ where $i$ is the block index and $k$ is the DFT coefficient index.
   d. Plot a 2D graph of Time varying spectrum$'X'$. (Hint: Read MATLAB keyword: $imagesc()$)
   e. Plot the Time varying spectrum"$X$" in 3D. (Hint: Read MATLAB keyword: $mesh()$)

## Sliding DFT:

2. Consider the signal $x(n)$ generated in question 1, compute the $X(i,k)$ using sliding DFT method. Repeat (d) and (e) for the result.
3. Calculate the savings in number of multiplications by using this method