EE 21381 Advanced Power Systems and Protection Lab FIRST SEMESTER (E-IlI)

List of experiments for Advanced Power System protection – Modified 29/08/2018 Prof. Nand Kishor, EED

S. No.	Name of Experiment	Name of Student
Simulation Based (Signal Processing application to Power System Protection)		
1.	(a) For a given aperiodic pulse, use Matlab function *sinc* to obtain the Fourier Transform for frequency range [-5 5] in interval of 0.01. Also plot the amplitude and phase spectrum separately. Use function *abs* and *angle*. (b) For the above signal, perform the Fourier integral numerically. Find the complete transform over a range of frequencies [-5 5], using for loop and using function *trapz* (c) Study on Nyquist frequency criteria for a given sine wave.	Mr. Baru Chauhan
2.	Determine the approximate Fourier transform of an infinite duration signal, i.e. find the amplitude spectrum of two frequency signal. $x(t) = \cos(2\pi 100t) + \cos(2\pi 500t)$ a) Plot the signal. b) Obtain approximate Fourier transform integral for 0≤ f≤ 800 Hz. Use 'for' loop and function trapz. Plot amplitude spectrum. c) Change sampling interval by a factor of 10, i.e. 0.002 sec and decrease number of samples to 25. Repeat plot problem (ii). Discuss on approximation. d) Consider sampling interval of 0.0002 sec and increase number of samples to 500. Repeat problem (ii).	Mr. Dinesh Kr. Singh
3.	Obtain the FFT and power spectrum for the following signals: $x_1(t) = -10 + 10\cos(120\pi t + 1) + 5\cos(240\pi t + 2) + 2\cos(360\pi t + 3) + \cos(600\pi t + 5) + 10e^{-40t}$ $x_2(t) = 10\cos(120\pi t + 1) + 5\cos(360\pi t + 3) + 2\cos(600\pi t + 5) + \cos(840\pi t + 7) - 10e^{-40t}$ (i) Sampling frequency = 2880 Hz, Number of samples per half cycle = 48. (ii) Reduce sampling frequency to = 1440 Hz. Discuss on the plots.	Mr. Prashant Biswas
4.	Use Matlab functions *fft, ifft* and *fix* function in to remove noise from signals. Generate random noise using function "*randn*". The original signal is given as:	Mr. S. Gopi Chandra
5.	(a)Use Matlab functions *fft, ifft* and *fix* function in to remove noise from signals. Generate random noise using function "*randn*". The original signal is given as: $y(t) = 3\sin(8\pi t) + 5\sin(4\pi t)$ The signal is sampled during 4 sec at a sampling rate of 0.01. (b)Use *fft* and *ifft* function to determine the power spectrum and phase. Consider a current signal which does not have noise, but it has DC offset. The fault current on unloaded system is given as: $i(t) = 10sin(100\pi - 30^o) + 5e^{-10\pi t}$	Mr. Ankur Singh
6.	(a) Use function *fft* function on given time series signals (of different frequency) for power spectrum and phase. Sampling frequency is 1000 Hz and FFT length, N = 256. (b) Using above sampling frequency and FFT length, for the given time series signal (of different frequency), obtain the power spectrum and phase. Comment on results. (c) Repeat part (b) with reduced FFT length, N = 128. (d) Repeat part (b with reduced FFT length, N = 64.	Mr. Anurag Yadav
7.	Current transformer saturation detection and its effect on the performance of Distance Relay.	Mr. Omkar Yadav
Protection issues with Distributed Generation(simulation)		
8.	Study on design of Butterworth low pass filter using functions *butter, filter*. Consider 2nd order Butterworth low pass filter with cut off frequency of 300 Hz. Sampling frequency=4000 Hz. Use matlab function "butter" to obtain filter coefficients (numerator and denominator). Use function "filter" to get amplitude and phase plot. Apply the full cycle, half cycle DFT at output of low pass filter. The input signal has 3rd & 5th harmonic component.	Mr. Dinesh Kr. Singh

	$x_1(t) = 10\sin(2pi50t) + 0.1\sin(2pi150t) + 0.01\sin(2pi250t) + e^{-t2pi0.5}$ Sampling frequency = 1000 Hz, FFT length= 256.	
9.	Formulate a protection coordination problem in a standard benchmark distributed system	Mr Ashutosh Kumar Singh
10.	(a)Use function dft to compute spectrum with frequency resolution to be equal to or less than 8 Hz. (b)Use function dft and sero padding to compute the spectrum. The signal is given as: $x(n) = 2sin\left(2000\pi\frac{n}{8000}\right)$ Obtained by sampling the analog signal $x(t) = 2sin(2000\pi t)$ with a sampling rate of $f_s = 8000\ Hz$.	Ashutosh Kumar Singh/ Mr. Ankur Singh
Renewable Energy - Simulation based		
11.	Obtain the aerodynamic, Cp-$lambda$ of a three bladed wind turbine for given parameters.	
12.	To simulate a given PY Array and to plot the 1-Y characteristics using Matlab.	
13.	Simulate the dynamics of single area system (Load frequency control problem) as 3rd order system with given parameters.	Mr. Anurag Yadav
Protection -Experiment based		
14.	To study characteristics of over current relays; IDMT electromagnetic relay and microprocessor based relay.	Mr. Dinesh Kr. Singh
15.	Study the construction of the Thermal relay. ii Find operational characteristics of the relay. Determine time-current characteristics of given fuse.	Mr. Baru Chauhan
16.	Digital Over Current Relay Setting and Relay Coordination.	Mr. Prashant Biswas
17.	Simulation and Implementation of Voltage Source Inverter	Mr. Prashant Biswas
18.	Coordination of over-current and distance relays for radial line protection	Mr. S. Gopi Chandra
Renewable Energy - Experiment based		
19.	For the given design of PSS, obtain the root locus and frequency response and compare them with two different techniques.	Mr. Anurag Yadav
20.	Simulate (in Simulink) the PSS with excitation system for a change in step voltage (0.05 pu) and frequency deviation $0.05sin(2\pi0.5t)$.	Mr. S. Gopi Chandra