

PEI203: VIRTUAL INSTRUMENTATION AND APPLICATIONS

L	T	P	Cr
2	0	4	4.0

Course Objectives: To understand the concepts of Virtual Instrumentation, to enable design and programming of Virtual Instruments

Review: Graphical programming in data flow VIs and sub-VIs, loops and charts, Arrays, Clusters and graphs, Case and sequence structures, Formula nodes, Local and global variables, String and file I/O.

Elements of Data acquisition: ADC, DAC, DIO, Counters and timers, PC Hardware structure, Timing, Interrupts; DMA Software and hardware installation Current loop RS232C/ RS485, GPIB
Signal processing: Sampling Signals, Sampling Considerations, Need of Anti-aliasing Filters, The Discrete Fourier Transform (DFT) and the Fast Fourier Transform (FFT), The Power Spectrum, Auto-correlation, Cross-correlation, Convolution, Deconvolution, Characteristics of Different Types of Window Functions , Realization of IIR and FIR filters.

Interface buses: USB, PCMCIA, VXI, SCXI, PXI, etc., Networking basics for office and industrial applications, VISA and IVI, Motion Control.

Machine Vision: Digital images, definition, types, files, borders ad masks, Image display, Pallets, Region of Interest, Non-Destructive overlays, Convolution kernels, Spatial filters, Gray scale morphology, Thresholding, Particle measurement, Edge detection, Pattern matching.

Laboratory Work: Experiments around various elements of Labview like charts, Graphs, Loops, Arrays, Clusters etc., and data-acquisition and signal processing tools.

Minor Project :

1. Case studies of virtual instrumentation related to data acquisition, processing and control.
Application of virtual instrumentation to image processing, sound processing etc.
Applications of virtual instrumentation to process modeling.
Applications of virtual instrumentation to process control.

Course learning outcome (CLO): After the completion of the course the students will be able to

1. Use graphical programming
Identify elements of data acquisition for software and hardware installation
Use signal processing, sampling signals and filtering
Handle network interface layer protocol, system buses, interface buses.
Implement and design machine vision and motion control.

Recommended Books:

1. Johnson, G., *LabVIEW Graphical Programming*, McGraw Hill (2006) 4th ed.
2. Sokoloff, *Basic Concepts of LabVIEW 4*, Prentice Hall of India (1998).
3. Wells, L.K., and Travis, J., *LabVIEW for Everyone*, Prentice Hall Inc. (2001) 2nd ed.

Evaluation Scheme:

S.No	Evaluation Elements	Weightage (%)
1.	MST	25
	EST	45
	Sessionals (May include Assignments/ Projects/ Tutorials/ Quizes/ Lab Evaluations)	30