Course code	Course name	L-T-P-Credits	Year of Introduction
AE361	VIRTUAL INSTRUMENT DESIGN	3-0-0-3	2016

Prerequisite : Nil

Course objectives

- To review background information required for studying virtual instrumentation.
- To study the basic building blocks of virtual instrumentation.
- To study the various graphical programming environment in virtual instrumentation.
- To study few applications in virtual instrumentation.

Syllabus

Review of digital instrumentation - Fundamentals of virtual instrumentation - VI programming techniques - Data acquisition - VI Chassis requirements - Graphical programming environment - Analysis tools and simple applications

Expected outcome

- The students will gain knowledge in virtual instrumentation and some of its applications.

Text Books

1. Peter W. Gofton, 'Understanding Serial Communications', Sybex International.
2. Robert H. Bishop, 'Learning with Lab-view', Prentice Hall, 2003.
3. S. Gupta and J.P Gupta, 'PC Interfacing for Data Acquisition and Process Control', Instrument society of America, 1994.

Reference Books

1. Gary W. Johnson, Richard Jennings, 'Lab-view Graphical Programming', McGraw Hill Professional Publishing, 2006.
2. Kevin James, 'PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control', Newness, 2000.

WEB RESOURCES:

www.ni.com

Course Plan

Module	Contents	Hours	Semester Exam Marks
I	Review of digital instrumentation: - Representation of analog signals in the digital domain – Review of quantization in amplitude and time axes, sample and hold, sampling theorem, ADC and DAC.	6	15%
II	Virtual Instrumentation: Historical perspective - advantages - block diagram and architecture of a virtual instrument - Conventional Instruments versus Traditional Instruments - data-flow techniques, graphical programming in data flow, comparison with conventional programming.	7	15%
	FIRST INTERNAL EXAMINATION		
III	VI programming techniques: VIs and sub-VIs, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, State machine, string and file I/O, Instrument Drivers, Publishing measurement data in the web.	7	15%

IV	Data acquisition basics: Introduction to data acquisition on PC, Sampling fundamentals, Input/Output techniques and buses. ADC, DAC, Digital I/O, counters and timers, DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements. .	6	15%
SECOND INTERNAL EXAMINATION			
V	VI Chassis requirements. Common Instrument Interfaces: Current loop, RS 232C/ RS485, GPIB. Bus Interfaces: USB, PCMCIA, VXI, SCSI, PCI, PXI, Firewire. PXI system controllers, Ethernet control of PXI. Networking basics for office & Industrial applications, VISA and IVI.	8	20%
VI	VI toolsets, Distributed I/O modules. Application of Virtual Instrumentation: Instrument Control, Development of process database management system, Simulation of systems using VI, Development of Control system, Industrial Communication, Image acquisition and processing, Motion control.	8	20%
END SEMESTER EXAMINATION			

QUESTION PAPER PATTERN:

Maximum Marks:100 Exam Duration: 3 Hours

Part A

Answer any two out of three questions uniformly covering Modules 1 and 2 together. Each question carries 15 marks and may have not more than four sub divisions.

(15 x 2 = 30 marks)

Part B

Answer any two out of three questions uniformly covering Modules 3 and 4 together. Each question carries 15 marks and may have not more than four sub divisions.

(15 x 2 = 30 marks)

Part C

Answer any two out of three questions uniformly covering Modules 5 and 6 together. Each question carries 15 marks and may have not more than four sub divisions.

(20 x 2 = 40 marks)