

Course code	Course name	L-T-P-Credits	Year of Introduction
AE361	VIRTUAL INSTRUMENT DESIGN	3-0-0-3	2016
<b>Prerequisite : Nil</b>			
<b>Course objectives</b>			
<ul style="list-style-type: none"> <li>To review background information required for studying virtual instrumentation.</li> <li>To study the basic building blocks of virtual instrumentation.</li> <li>To study the various graphical programming environment in virtual instrumentation.</li> <li>To study few applications in virtual instrumentation.</li> </ul>			
<b>Syllabus</b>			
Review of digital instrumentation - Fundamentals of virtual instrumentation - VI programming techniques - Data acquisition - VI Chassis requirements - Graphical programming environment - Analysis tools and simple applications			
<b>Expected outcome</b>			
<ul style="list-style-type: none"> <li>The students will gain knowledge in virtual instrumentation and some of its applications.</li> </ul>			
<b>Text Books</b>			
<ol style="list-style-type: none"> <li>Peter W. Gofton, 'Understanding Serial Communications', Sybex International.</li> <li>Robert H. Bishop, 'Learning with Lab-view', Prentice Hall, 2003.</li> <li>S. Gupta and J.P Gupta, 'PC Interfacing for Data Acquisition and Process Control', Instrument society of America, 1994.</li> </ol>			
<b>Reference Books</b>			
<ol style="list-style-type: none"> <li>Gary W. Johnson, Richard Jennings, 'Lab-view Graphical Programming', McGraw Hill Professional Publishing, 2006.</li> <li>Kevin James, 'PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control', Newness, 2000.</li> </ol>			
<b>WEB RESOURCES:</b>			
www.ni.com			
<b>Course Plan</b>			
Module	Contents	Hours	Semester Exam Marks
<b>I</b>	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%
<b>II</b>	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%
<b>FIRST INTERNAL EXAMINATION</b>			
<b>III</b>	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%

<b>IV</b>	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%
<b>SECOND INTERNAL EXAMINATION</b>			
<b>V</b>	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%
<b>VI</b>	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%
<b>END SEMESTER EXAMINATION</b>			

### 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)