

GUJARAT TECHNOLOGICAL UNIVERSITY

INSTRUMENTATION AND CONTROL (APPLIED INSTRUMENTATION) (03)

VIRTUAL INSTRUMENTATION

SUBJECT CODE: 2730305

M.E. SEM-III

Type of course: Major Elective - IV

Prerequisite: Basic simulation tools, Programming skills, etc.

Rationale: This course provides an overview and fundamentals of virtual instrumentation design using Labview software.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	PA (V)		PA (I)			
ESE	OEP	PA			RP					
3	2 [#]	2	5	70	30	20	10	10	10	150

Content:

Sr. No	Topics	Teaching Hrs.	Module Weightage
1.	Introduction: Definition, comparison with hard wired instruments, VI architecture, block diagram representation, VI application softwares, salient features and application areas.	06	0-10%
2.	LabVIEW basics: Introduction, building front panel and block diagram, tools and palettes, creating subVI, Controlling program flow – Loops, structures, shift registers, local and global variables, data types- Numeric, digital, strings, arrays, clusters, waveform, data presentation elements, graphs and charts.	03	0-10%
3	LabVIEW advance: File input – output, timing and synchronization, mathematical analysis function. Data communication functions, programmatically controlling VIs	09	15-20%
4	Data acquisition basics: Classification of signals, analog I/O and digital I/O signal acquisition, study different types of data acquisition system (USB, PCI, RS-485 network based).	06	20-30%
5	LabVIEW data acquisition and instrument control: Study of various functions, Interfacing DAQ system with LabVIEW, Building VIs for analog I/O and digital I/O, study of VIs, control of instruments and DAQ system using serial, RS-485 and GPIB interface.	03	15-20%
6	Software signal processing and manipulation: Sampling theorem, anti-aliasing filters, time and frequency domain analysis, Windowing, signal generation, spectrum analysis, digital filtering.	08	15-25%
7	Case study: Development of VIs for specific application (simulation, real time), control engineering, DSP	10	20-30%

Reference Books :

1. Wells LK, "LabVIEW for everyone – Graphical Programming made even easier," Prentice Hall
2. Gupta S and Joseph J, "Virtual Instrumentation using LabVIEW," Tata McGraw Hill
3. Johnson GW, "LabVIEW graphical Programming- Practical application in instrumentation and Control," Tata McGraw-Hill
4. Ritter DJ, "LabVIEW GUI- Essential Techniques," Tata McGraw-Hill
5. National Instruments, "LabVIEW-User Manual," National Instruments Corporation

Course Outcome:

After learning the course the students should be able to

1. Understand the design of VI using Labview
2. Understand the Real time Data Acquisition using Labview
3. Understand the software signal Processing, control engineering using Labview

List of Experiments:

Student has to prepare VI ,Real time Data Acquisition and signal Processing with any computing tool like Labview.

Prepare research paper and submit report of various design of VI using Labviewcovered in this course .

Open Ended Problem: Solution of the open ended problem(s) in guidance of course instructor is mandatory.

Major Equipment:

Computer Laboratory

List of Open Source Software/learning website:

- Labview
- NPTEL

Review Presentation (RP): The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website.