GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor/Master of Engineering Syllabus

Subject Code : ME01067061

Subject Name : Simulation Software tools for Instrumentation

WEF Academic Year :	
Semester:	1
Category of the Course :	Program Elective II

Prerequisite:	Basic simulation tools, Programming etc.
Rationale:	This course provides an overview and fundamentals of virtual instrumentation design using LabVIEW, Scilab and MATLAB software.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Understand the design of VI using LabVIEW, Scilab and MATLAB software.	01
02	Understand the Real time Data Acquisition using LabVIEW, Scilab and MATLAB software.	02
03	Understand the software signal processing, control engineering using LabVIEW, Scilab and MATLAB software.	03
04	Design real time application using LabVIEW/MATLAB	
05		

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme			Total Credits	Assessment Pattern and Marks				Total Marks
				Theory		Practical		
L	T	PR	C	ESE (E)	PA(M)	ESE (V)	PA (I)	
3	0	2	5	70	30	30	20	150

Course Content:

Sr. No.	Course Content	No. of Hours	% of Weightage
1.	**Introduction to Virtual Instrumentation:** Historical perspective, Block diagram and Architecture of Virtual Instruments	**03**	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,	**03**	0-10%

	digital, strings, arrays, clusters, waveform, data presentation elements, graphs and charts.		
3	**LabVIEW advance:** File input – output, timing and synchronization, mathematical analysisfunction. Data communication functions, programmatically controlling VIs	**06**	15-20%
4	**LabVIEW data acquisition and instrument control:** Interfacing DAQ system with LabVIEW, Building VIs for analogI/O and digital I/O, study of VIs, control of instruments and DAQ system using serial, RS-485 and GPIB interface.	**03**	0-10%
5	**Scilab:** Vector operations and Matrix operations, Introduction to Xcos, different components for simulation. Xcos: Mathematical and logical examples.	**06**	15-20%
6	**MATLAB: Visualization and Programming** Functions, Flow Control, Line Plots, Image/Surface Plots, Efficient Codes, Debugging	**06**	15-20%
7	**MATLAB: Various functions and toolbox** Documentation, Miscellaneous Useful Functions, Graphical User Interfaces, Simulink, Symbolic Toolbox, Image Processing, Hardware Interface	**06**	15-20%
8	**Software signal processing and manipulation:** Sampling theorem, anti-aliasing filters, time and frequency domain analysis, Windowing, signal generation, spectrum analysis, digital filtering.	**06**	15-20%
9	**Case study:** Development of VIs / models for specific application (simulation, real time), control engineering, DSP	**03**	0-10%
	Total		**100**

Reference Book:

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
6. Marvin Marcus, Matrices and MATLAB: A Tutorial, Prentice Hall , 2010
7. Sandeep Nagar, Introduction to Scilab: For Engineers and Scientists. Apress publisher, New York,USA, 2017.
8. A.S.Nair, SCILAB (A free software to MATLAB), S. Chand Publishing, New Delhi, India, 2012
9. Holly Moore, *Salt Lake Community College*, Pearson Education Inc, 2022, ISBN: 9780137627981

Suggested Course Practical List:

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

Suggested Experiments

1. BASIC ARITHMETIC OPERATIONS
2. BOOLEAN OPERATIONS
3. SUM OF 'n' NUMBERS USING 'FOR' LOOP
4. FACTORIAL OF A GIVE NUMBER USING FOR LOOP
5. SUM OF 'n' NATURAL NUMBERS USING WHILE LOOP
6. FACTORIAL OF A GIVE NUMBER USING WHILE LOOP
7. SORTING EVEN NUMBERS USING WHILE LOOP IN AN ARRAY
8. ARRAY MAXIMUM AND MINIMUM
9. BUNDLE AND UNBUNDLE CLUSTER
10. FLAT AND STACKED SEQUENCE
11. APPLICATION USING FORMULA NODE
12. MEDIAN FILTER
13. DISCRETE COSINE TRANSFORM
14. CONVOLUTION OF TWO SIGNALS
15. Analog and Digital Signal Hardware Interfacing with LabVIEW

List of Laboratory/Learning Resources Required:

Computer Laboratory

List of Open Source Software/learning website:

- Labview
- MATLAB
- NPTEL
- Scilab

- **Suggested Activities for Students: Prepare research paper and submit report of various design of VI using LabVIEW, Scilab and MATLAB software covered in this course .**

CO- PO Mapping:

Semester ___	Course Name (Course Code:)											
	POs											
Course Outcomes												
CO1												
CO2												
CO3												
CO4												
CO5												

*Legend: '**3**' for high, '**2**' for medium, '**1**' for low and '**-**' for no correlation of each CO with PO.*

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