Course Code	Course Title	L	T	P	C
1152EC211	VIRTUAL INSTRUMENTATION	1	0	4	3

a) Course Category

Program Elective

b) Preamble

Virtual instrumentation provides the basics, programming techniques, data acquisition and interfacing techniques of Virtual Instrumentation (VI) and its applications.

c) Prerequisite

Nil

d) Related Courses

Nil

e) Course Outcome

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Skill Level (Based on Dave's Taxonomy)
CO1	Perform the basic VI programming.	S1
CO2	Implement the graphical programming using various functions available in VI.	S2
CO3	Demonstrate the real time data acquisition using DAQ device	S4

f) Correlation of Cos with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M	L	L	L	L	-	-	-	M	L	-	L	L	-
CO2	H	M	M	M	M	-	-	-	M	L	-	M	M	-
CO3	H	M	H	H	H	M	L	-	H	L	-	L	H	H

g)Examination Scheme for practical dominated course

Internal evaluation (40M)							**Semester end evaluation (60M)**			
Laboratory experiment (15M)				**Model laboratory test (25M)**			**Part-A (20M)**	**Part-B (40M)**		
Performance in conducting experiment (5)	Result and analysis (3)	Viva Voce (3)	Record (4)	Performance in conducting experiment (15)	Result and analysis (5)	Viva Voce (5)	Theory questions to evaluate the knowledge and understanding (20)	Performance in conducting experiment (25)	Result and analysis (10)	VivaVoce (5)

h) Course Content :

Theory **15 Hours**

Virtual Instrumentation and its evolution, advantages, block diagram and architecture of a virtual instrument .graphical programming, comparison with conventional programming, development of virtual instrument using GUI.

Programming techniques: creating and Saving VI, front panel controls and indicators, block diagram, Sub VI, Data types, Loops and charts, arrays and graphs, formula nodes, case and sequence structures.

Introduction to data acquisition on PC, software and hardware installation, configuring data acquisition hardware using the drives in application software, Interface standards and PC buses, use of DAQ library functions for different analog and digital input/output operations.

i) List of experiments

S. No	**CO Mapping**	**Practical Exercises (60 Hours)**
1.	CO1	Graphical programming introduction
2.	CO1	Develop a program on controls and indicators.

3.	CO1	Develop a program on arithmetic operations.
4.	CO2	Create a sub VI that performs a linear scaling Y=AX+B.
5.	CO2	Create a sub VI to convert given temperature value from degree Celsius to Fahrenheit.
6.	CO2	Create a VI displaying two signals on a graph and to run it.
7.	CO2	Build VI panels customizing a knob control and a wave form graph in Lab VIEW.
8.	CO2	Build a VI from a blank VI.
9.	CO2	Create a VI to find addition of first n natural numbers using for loop.
10.	CO2	Create a VI to find a factorial of a given number using while loop.
11.	CO2	Configure a VI to run continuously until the user stops it.
12.	CO2	Build a VI to implement an array functions.
13.	CO2	Develop a VI program using case structures.
14.	CO2	Develop a VI program to concatenate two strings.
15.	CO2	Create a VI to calculate BMI using cluster.
16.	CO2	Develop a VI program to bundle and unbundle a cluster
17.	CO2	Develop a VI program to perform an arithmetic functions using formula node.
18.	CO2	Develop a VI program to demonstrate Amplitude Modulation.
19.	CO2	Develop a VI program to demonstrate Frequency Modulation.
20.	CO2	Build a VI program to perform a Boolean operation.
21.	CO2	Develop a VI program to demonstrate Half adder and Half subtractor.
22.	CO2	Develop a VI program to demonstrate Full adder and Full subtractor.
23.	CO2	Build a VI to create 4:1 Multiplexer.
24.	CO2	Develop a VI program on analysing and saving a signal.
25.	CO2	Create a VI program on analysing a signal using filter.

26.	CO3	Develop a program on graphing data from DAQ device.
27.	CO3	Develop and run a program to measure temperature with a thermistor.
28.	CO3	Develop and run a program to measure temperature using thermocouple.
29.	CO3	Develop VI based instrumentation of an amplifier to acquire an ECG signal.
30.	CO3	Measure Current, Voltage, Capacitance, Resistance and Inductance using ELVIS.

Total 75 hrs

j)Learning Resources

Textbooks

1. S.Gupta and J.P Gupta, "PC interfacing for Data Acquisition and Process Control", Instrument society of America, 1994.
2. Peter W. Gofton "Understanding serial communications", Sybex International.
3. Robert H.Bishop, "Learning with Lab VIEW", Prentice Hall, 2003

List of Major Equipment/ Instrument/Software with Broad Specifications

1. DAQ cards
2. NI ELVIS
3. Temperature transducers
4. ECG Electrodes
5. Computers

List of Software/Learning Websites

1.https://www.ni.com/

Online resources

1. http://www.ni.com/training/online
2. http://www.labviewmakerhub.com/doku.php?id=learn:tutorials:labviewbasics.