**Suggestive readings**

1. Nakamura, S., Numerical Analysis and Graphic Visualization with MATLAB - Second Edition, Prentice Hall PTR, Upper Saddle River, New Jersey

**Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.**

## COMMON POOL OF GENERIC ELECTIVES (GE) COURSES OFFERED BY THE DEPARTMENTS

## GENERIC ELECTIVES (GE-3):

**Credit distribution, Eligibility and Pre-requisites of the Course**

| Course title & Code | Credits | Credit distribution of the course | | | Eligibility criteria | Pre-requisite of the course |
|---|---|---|---|---|---|---|
| | | Lecture | Tutorial | Practical/ Practice | | |
| Virtual Instrumentation (INGE3A) | 04 | 02 | 0 | 02 | Course admission eligibility | Basic knowledge Electronics |

**Learning Objectives**

The Learning Objectives of this course are as follows:

- To study the basic structure of virtual instrumentation
- To learn the basic programming concepts in LabVIEW
- To understand the basics of data acquisition for designing a Virtual Instrument

**Learning outcomes**

The Learning Outcomes of this course are as follows:

- Understand the importance and applications of Virtual Instrumentation
- Learn the basic programming concepts in LabVIEW
- Recognize the components of Virtual instrumentation and use them for PC Based measurement

**SYLLABUS OF GE-3**

**UNIT – I** **(8 hours)**

**Graphical System Design:** Graphical system design model, Design flow with GSD,

Virtual Instrumentation, Virtual instrument, and traditional instrument, Hardware and software in virtual instrumentation, Virtual instrumentation for Test, control & design, Graphical system design using LABVIEW, Graphical programming & textual programming.

**UNIT – II** **(7 hours)**

**LabVIEW Basics:** Introduction, advantages of LABVIEW software environment, palettes, front panel controls & indicators, Block diagram, Data flow program. Repetition and Loops: For loops, while loops, structure tunnels, terminals inside or outside loops, shift registers, feed-back nodes, control timing, case structure.

**UNIT – III** **(8 hours)**

**Arrays and Clusters:** Arrays, Introduction, arrays in LABVIEW, creating one – dimensional array controls, indicators, and constants, creating two-dimensional arrays, creating multidimensional arrays, initializing array, deleting, inserting, and replacing elements, rows, columns, and pages within arrays, arrays functions. Clusters: Cluster controls and indicator, order of cluster elements, Cluster operations.

**Plotting Data:** Types of waveforms, waveform graphs, waveform charts, XY graphs, Intensity graphs & charts, Digital waveform graphs, 3D graphs, customizing graphs & charts, configuring a graph or chart, Displaying special planners on the XY graph.

**UNIT – IV** **(7 hours)**

**File Input/ Output:** File formats, file write &read, generating filenames automatically, String handling,string functions, LABVIEW string formats, parsing of strings. Instrument Control: Introduction, GPIB communication, Hardware specification, software architecture, Instrument I/O assistant, VISA, Instrument drivers, serial port communications, using other interfaces.

**Practical component:** **(60 hours)**

1. Build a VI to compute the expressions Y = (A*B*C) + (D*E) and Y = mx + c.
2. Split an input string into two outputs with reference to a separating character. Find the length of the input string and reverse the string.
3. Build a VI to perform various Boolean Operations (AND, OR, NAND, NOR, XOR).
4. Write a program in LabVIEW to find whether the given number is odd or even.
5. Create a VI to find the sum of first n natural numbers using a While Loop with a feedback node.
6. Create a VI to compute full adder logic using half adder logic as subVI.
7. Write a program in LabVIEW to find the square of the numbers from 1 to 100 using (a) a For Loop and (b) a While Loop.
8. Create a VI to compare the element of two clusters if the value of the corresponding elements are the same switch on LED in the output cluster.
9. Create a VI to compare clusters and Switch ON an LED in the output cluster if the nth element of cluster 1 is greater than the nth element of cluster 2.
10. Create a 2D numeric array (5 x 5) containing random numbers and find its transpose.
11. Create a VI to read a two-dimensional array and find the sum of the elements

in the row-wise and column-wise separately and display the sums of the rows and columns.

12. Create a 1D array and find its reverse.
13. Build a VI to plot a circle in the XY graph using a For Loop.
14. Build a VI that generates a 1D array of random numbers and sort the ascending descending array and also find the max. and min. value array element.
15. Build a cluster control that consists of a seven-segment LED display, a switch, a string control, and numeric control. Split the cluster elements using the Unbundle function and alter the values of some of the cluster controls. Bundle them again and display in a cluster indicator.
16. Using For loop determine the number of odd numbers between a range of numbers entered by the user.
17. Build a VI to plot different colors in an intensity graph using an array.
18. Create a VI to check whether the cluster elements are in range or not. Specify the upper and lower limits. Display the coerced output and a cluster of LEDs to indicate whether a particular cluster element is in the range or not.
19. Write a program to solve x2+bx+c=0.
20. Build a VI to generate two waveforms of different amplitude and frequencies add the signal to find the resultant and plot it on a separate waveform graph.
21. Create a VI to read a two-dimensional array and find the sum of the elements in the row-wise and column-wise separately and display the sums of the rows and columns.

**Essential/recommended readings**


1. Jovitha Jerome,Virtual Instrumentation Using Labview,PHI Learning Pvt. Ltd. (2010)
2. John Essick, Hands-on Introduction to LabVIEW for Scientists and Engineers, 3rd Edition, 2015.
3. Gupta, Virtual Instrumentation Using Labview 2E, McGraw Hill. (2010)


**Suggestive readings**


1. Jeffrey Travis, LabVIEW for everyone, Prentice-Hall PTR,2007.


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## GENERIC ELECTIVES (GE-3): Industrial and environmental techniques (INGE3B)

**Credit distribution, Eligibility and Pre-requisites of the Course**

| Course title & Code | Credits | Credit distribution of the course | | | Eligibility criteria | Pre-requisite of the course |
|---|---|---|---|---|---|---|
| | | Lecture | Tutorial | Practical/ | | |