VI SEMESTER OPEN ELECTIVE (For other branch students)

UEI646N: VIRTUAL INSTRUMENTATION

Credits (3-0-0)

Course Objectives:

1. To impart the concepts of virtual instrumentation.
2. To apply concepts of LabVIEW in developing graphical programs.
3. To develop skills in data acquisition, instrumentation and control.

UNIT-I

Virtual instrumentation: Virtual instrument and traditional instrument, hardware and software in VI, VI for test, control and design, VI in engineering process, virtual instruments beyond personal computer, graphical system design using LabVIEW. **Introduction to LabVIEW:** Advantages, software environment, creating and saving VI, front panel and block diagram toll bar, palettes, controls and indicators, block diagram, data types, data flow program.

10Hrs.

UNIT-II

Modular programming: Build a VI front panel and block diagram, building a connector pane, displaying sub VIs and express VIs, creating sub VIs, **Repetition and loops:** For loops, while loops, structure tunnels, terminal inside or outside loops, shift registers, feedback nodes, control timing, communication among multiple loops, local and global variables.

10Hrs.

UNIT-III

Arrays: Creating one dimensional, two dimensional, multi-dimensional arrays, array initialization, deleting, inserting, replacing elements within an array, array function, auto indexing. **Structures:** Case, sequence, customizing, timed structures, formula nodes, event structures.

10Hrs.

UNIT-IV

Data acquisition: Signals, signal conditioning, DAQ hardware configuration, DAQ hardware, analog inputs, outputs, counters. **Motion control:** Components, software for configuration, prototyping and development, motion controller, move types, motor amplifiers and drives, feedback devices and motion I/O.

10Hrs.

Course Outcomes:

Students will be able to:

TOTAL: 40Hrs.

CO1: Describe various aspects of VI.
CO2: Comprehend the aspects of VI.
CO3: Apply the concepts of VI for the given logic.
CO4: Analyze the software and hardware components of VI.
CO5: Evaluate the given expression /problem using VI.
CO6: Develop LabVIEW program for a given application.

Text Books:

1. Jerome, Jovitha, "Virtual instrumentation using LabVIEW", PHI, 1st Edition, 2010 (Unit I, II, III).
2. Gary W. Johnson, Richard Jennings, "LabVIEW Graphical Programming", MGH, 4th Edition (Unit IV).

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	--	--	--	--	--	1	--	1	3	2
CO2	2	3	3	1	2	--	--	--	--	1	--	1	2	3
CO3	3	3	3	3	2	--	--	--	--	1	--	1	2	3
CO4	2	2	2	1	--	--	--	--	--	1	2	1	3	2

VII SEMESTER OPEN ELECTIVE (For other branch students)

UEI747N: INDUSTRIAL AUTOMATION
3 Credits (3-0-0)

Course Learning Objectives:

1. To convey the importance and benefits of industrial automation.
2. To develop PLC programming skills.
3. To discuss SCADA and DCS for process automation.

UNIT-I

Introduction: Expectations from automation, Basic functions, Historical development of control systems, Current trends in computer of process plants. **Introduction to Programmable Logic Controllers (PLC):** Introduction to PLC operation-The digital concept, Analog signals, The input status file, The output status file, Input and output status files, Sixteen point I/O modules, PLC memory, Input modules - Discrete type, Discrete AC and DC type. Output Modules - Discrete type, Solid-state type, Switching relay type.

10 Hrs.

UNIT-II

Introduction to Logic: The logic, Conventional ladder v/s LPLC ladder, Series and parallel function of OR, AND, NOT, XOR logic, Analysis of rung. **PLC Instructions:** The basic relay instructions normally open and normally closed instructions, Output latching instructions, Understanding relay instructions and the programmable controller input modules, Interfacing start stop pushbutton and motor to PLC, Developing ladder diagram with analytical problems.

10 Hrs.

UNIT-III

Timer and Counter Instructions: On delay and off delay and retentive timer instructions, PLC counter up and down instructions, Combining counters and timers, Developing ladder diagram with analytical problems. **Comparison and Data Handling Instructions:** Data handling instructions, Sequencer instructions - Programming sequence output instructions, Developing ladder diagram with analytical problems.

10 Hrs.

UNIT-IV

Supervisory Control And Data Acquisition (SCADA): Introduction. Channel scanning, Conversion to engineering units, Data processing, Distributed SCADA system. **Distributed Control System (DCS):** Introduction, Distributed Vs Centralized control, Advantages of Distributed Control System, Functional requirements of distributed control system, System architecture, Distributed Control Systems.

10 Hrs.

Total Hrs.: 40

Text Books:

1. Garry Dunning, "Introduction to Programmable Logic Controllers," 2nd Edition. Thomson Publishing, ISBN: 981-240-625-5.
2. Krishna Kant, "Computer based Industrial Control," 6th Edition, 2004, PHI, ISBN: 1-203-11237

Reference Books:

1. Curtis Johnson, "Process Control Instrumentation Technology", Prentice Hall of India.
2. Bela G. Liptak, "Instrumentation Engineers Hand Book – Process Control", Chilton Book Company, Pennsylvania.
3. W.Bolton, "Industrial Control and Instrumentation", Universities Press.

Course Outcomes (COs):

Students will:

CO1: a. Elucidate the role of automation in industry and comprehend the various controllers used in industries
b. Illustrate typical elements of PLC and its memory organization

CO2: a. Compare electrical relay logic and PLC ladder logic illustrate the working of PLC instructions
b. Develop program using basic PLC instructions

CO3: a. Illustrate the working of advanced PLC instructions
b. Develop program for PLC applications

CO4: a. Interpret the role of SCADA in process control
b. Analyze the role of Distributed Control System (DCS)

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	--	--	--	--	--	1	--	1	3	2
CO2	2	3	3	1	2	--	--	--	--	1	--	1	2	3
CO3	3	3	3	3	2	--	--	--	--	1	--	1	2	3
CO4	2	2	2	1	--	--	--	--	--	1	2	1	3	2