Devi Ahilya University, Indore, India **Institute of Engineering & Technology**				**IV Year B.E. (Electronics and Instrumentation Engg.)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
8EIRC5 **Intelligent Instrumentation System**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**1**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Course Objective:

The course is designed

1. To get Familiar with interfacing of computer System with the control theory making it an Automatic System and to learn the Lab View Programming and Virtual Instrumentation.
2. To illustrate Different types of Buses and its uses in industries.
3. To illustrate in details industrial Ethernet.
4. To understand operation, benefits, architecture classification and applications of SCADA system
5. To demonstrate distributed control system and different types of displays.
6. To elaborate PC Hardware, DMA, ISA, PCI, USB, PCMCIA buses, IEEE488.1 & IEEE488.2 serials, SCXI and PXI.

COURSE CONTENTS

Unit I

Introduction: Introduction to intelligent instrumentation, Historical perspectives, Current status, Software based instruments. Virtual Instrumentation: Introduction to graphical programming, data flow and graphical programming techniques.

Unit II

Instrumentation Standard Protocol: HART protocol, Field Bus H1, GPIB, CAN, Industrial Ethernet: introduction, frame structure, programming, implementation, benefits, advantages and limitation.

Unit III

Introduction To SCADA: SCADA system, evolution, objectives, benefits and function of SCADA system. SCADA function, SCADA hardware: RTU, Single board RTU, Basic Operation, Features of SCADA, SCADA software: ISO model, DNP3

protocol, IEC60870 protocol, MODBUS protocol. Power System Automation: benefits, architecture classification, implementation, SCADA applications.

Unit IV

Distributed Control System: Introduction and overview, history, system architecture, system element. Displays: Group display, Overview display, Detail display, Data Highways, Fieldbuses, Multiplexers and remote sensing terminal units, I/O hardware, Set-point stations

Unit V

PC Hardware review and Instrumentation buses: structure, timing, interrupts, DMA, operation systems, ISA, PCI, USB, PCMCIA buses. IEEE488.1 and IEEE488.2 serials, SCXI and PXI.

Course Outcome:

Students earned credits will develop ability to

CO No.	CO	PO
CO1	Understand the concept of Intelligent instrumentation	PO-1
CO2	Identify the optimized protocol selection according to the application area	PO-1, PO-2
CO3	Design complete automatic process control system	PO-1, PO-2, PO-4
CO4	Analyze the DCS systems In industry	PO-3
CO5	Analyze the SCADA systems In industry	PO-1, PO-2,PO-5, PO-9

CO-PO Relationship

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO1	2											
CO2	2	3										

CO3		2	3	4								
CO4			3	3								
CO5			2	4	5					6		

BOOKS RECOMMENDED:

[1] Liptak B.G, *Instrument Engineers Handbook*, Clinton Book Company, (1982)
[2] D.Patranabis, *Principles of Industrial Instrumentation*, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1999.
[3] SteveMackey, Edwin Wright, *Practical Industrial Data Network* I/e, Elsevier Publications, 2004
[4] David Bailey, Edwin Wright, *Practical SCADA for Industry*, I/e, Elsevier Publications, 2003
[5] Poppovik Bhatkar, *Distributed Computer Control for Industrial Automation*, Dekkar Publications.

List of Practical Assignments:

To perform the following operations using LabVIEW.

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. Windowing technique
16. Instrumentation of an amplifier to acquire an ECG signal
17. Acquire, analyse and present an eeg using virtual

Instrumentation