Academic Course Description

BHARATH UNIVERSITY
Faculty of Engineering and Technology
Department of Electrical and Electronics Engineering

BEI704 &Virtual Instrumentation
Eighth Semester, (even Semester)

Course (catalog) description

The purpose of this course is to develop a strong foundation in Instrumentation. This course introducesthe students to the graphical system design model and its different phases of functionality such as design, prototyping and deployment. This course explain about the basic concepts of graphical programming and high lights the features and Techniques used in Lab view to create virtual Instruments.

Compulsory/Elective course: Elective for EEE students

Credit & Contact hours : 3 and 45 hours

Course Coordinator : Mrs.K.VENKATESWARI

Instructors : Mrs.K.VENKATESWARI

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
Mrs.K.VENKATESWARI	final year EEE	KS 303	**04422290125**	kvenkateswari07@gmail.com	9.00-9.50 AM

Relationship to other courses:

Pre –Requisites **:**BEE603 Microprocessor and Microcontroller
Assumed Knowledge :BasicKnowledge in analog and Digital Electronics, Measurement and Instrumentation and computer.

Syllabus Contents

UNIT- I INTRODUCTION 9Hours

Virtual Instrumentation - Definition and Flexibility - Block diagram and Architecture for Virtual Instruments versus Traditional Instruments Instrumentation -VI Programming techniques - VI, sub VI, Loop and Charts, Arrays, Clusters and Graphs, Case and Sequence Structures, Formula nodes, String and File Input / Output

UNIT- II DATA ACQUISTITION IN VI 9 Hours

A/D and D/A converters, Plug-in Analog Input / Output cards – Digital Input and Output Cards, Organization of the DAQ VI system – Opto-isolation – Performing analog input and analog output – Scanning multiple analog channels – Issues involved in selection of Data acquisition cards – Data acquisition modules with serial communication – Design of digital voltmeter with transducer input –Timers and Counters.

UNIT –III COMMUNICATION NETWORKED MODULES 9 Hours

Introduction to PC Buses – Local busses:- ISA, PCI, RS232, RS422 and RS485 – Interface Buses:- USB, PCMCIA, VXI, SCXI and PXI –Instrumentation Buses :- Modbus and GPIB – Networked busses – ISO/OSI Reference model, Ethernet and TCP/ IP Protocols.

UNIT- IV REAL TIME CONTROL IN VI 9Hours

Designs using VI Software - ON/OFF controller – Proportional controller – Modeling and basic control of level and reactor processes – Case studies on development of HMI, SCADA in VI

UNIT- V OPERATING SYSTEM AND HARDWARE OVERVIEW 9Hours

PC architecture, current trends, operating system requirements, PC based instrumentation, analog and digital interfaces, PXI and SCXI main frame - modular instruments – Transducers – power, speed and timing considerations.

TEXT BOOKS: Total=45 Hours

T1.Lab VIEW Graphical Programming, Gary W. Johnson, Richard Jennings 3rd edition,McGraw-Hill Professional Publishing

T2.Lisa K Wells, Lab view for Everyone‖, Prentice Hall of India.

T3.Jovitha Jerome, Virtual Instrumentation using lab view, PHI learning pvt.ltd, 30Jan 2010.

T4.Sanjay Gupta /joseph john, Virtual Instrumentation using lab view, TataM.C.Graw-Hill education, 2010.

REFERENCES:

R1.Lab view based Advanced Instrumentation systems, P.Surekha, veilag Berlin Heidel berg, 2007.

R2.Lab view programming Data acquisition and analysis by Jeffrey y .Beyon, prentice hall, 30 Aug. 2000.

R3.Learning with Lab view by Robert h.Bish national Instruments, addisionWesley 1999.

Computer usage:

Professional component

General	-	0%
Basic Sciences	-	0%
Engineering sciences & Technical arts	-	0%
Professional subject	-	0%
Non major elective	-	100%

Broad area:Controller/ Logic Circuits/Instrumentation/Electrical and Electronics/**Computer**

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	August 1st week	Session 1 to 14	2 Periods
2	Cycle Test-2	September 2nd week	Session 15 to 28	2 Periods
3	Model Test	October 2nd week	Session 1 to 45	3 Hrs
4	University Examination	TBA	All sessions / Units	3 Hrs.

Mapping of Instructional Objectives with Program Outcome

This course is to develop a strong foundation in analysis and design of digital electronics. This course introduces combinational and sequential circuit design. It also discussed concepts of memory, programmable logic and digital integrated circuits.	Correlates to program outcome		
	H	**M**	**L**
1. Define virtual instrumentation concepts	a,e	f,j	
2. Describe acquisition methodologies	c	a,g	b,h
3. Compare traditional and virtual instrumentation	d,i,l	a	
4. Discuss operating systems required for virtual instrumentation		a,k	
5. Illustrate implementation methods for instrumentation			b
6. Familiarize the basics and interfacing of VI	f		

H: high correlation, M: medium correlation, L: low correlation

Draft Lecture Schedule

S.NO	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I			
1.	Virtual Instrumentation	NO	[T3] ,[T4] [R1] Chapter 1
2.	Definition and Flexibility	NO	
3.	Block diagram and Architecture for Virtual Instruments versus Traditional Instruments Instrumentation	NO	
4.	VI Programming techniques	NO	
5.	VI, sub VI, Loop and Charts	NO	
6.	Arrays, Clusters and Graphs	NO	
7.	Case and Sequence Structures	NO	
8.	Case and Sequence Structures	NO	
9.	Formula nodes, String and File Input / Output	YES	
UNIT II			
10.	A/D and D/A converters, Plug-in Analog Input / Output cards	YES	
11.	Digital Input and Output Cards, Organization of the DAQ VI system	NO	
12.	Opto-isolation		

13.	Performing analog input and analog output	YES	[T3] ,[T4] [R2]
14.	Scanning multiple analog channels	NO	
15.	Issues involved in selection of Data acquisition cards	NO	
16.	Data acquisition modules with serial communication	NO	
17.	Design of digital voltmeter with transducer input	NO	
18.	Timers and Counters	YES	
UNIT III			
19.	Introduction to PC Buses	NO	
20.	Local busses:- ISA, PCI, RS232, RS422 and RS485	NO	
21.	Interface Buses:- USB, PCMCIA, VXI, SCXI and PXI	NO	
22.	Instrumentation Buses :- Modbus and GPIB	NO	
23.	Instrumentation Buses :- Modbus and GPIB	NO	
24.	Networked busses	NO	
25.	Networked busses	NO	
26.	ISO/OSI Reference model, Ethernet and TCP/ IP Protocols.	NO	
27.	ISO/OSI Reference model, Ethernet and TCP/ IP Protocols.	NO	
UNIT IV			
28.	Designs using VI Software - ON/OFF controller	NO	
29.	Designs using VI Software - ON/OFF controller	NO	
30.	Designs using VI Software - ON/OFF controller	NO	
31.	Proportional controller	NO	
32.	Proportional controller	NO	
33.	Modeling and basic control of level and reactor processes	NO	
34.	Modeling and basic control of level and reactor processes	NO	
35.	Case studies on development of HMI, SCADA in VI	NO	
36.	Case studies on development of HMI, SCADA in VI	NO	
UNIT V			
37.	PC architecture, current trends	NO	[T3] ,[T4]
38.	operating system requirements	NO	
39.	PC based instrumentation, analog and digital	NO	

	interfaces		
40.	PXI and SCXI main frame	NO	
41.	PXI and SCXI main frame	NO	
42.	modular instruments	NO	
43.	modular instruments		
44.	Transducers, power, speed and timing considerations	NO	
45.	Transducers, power, speed and timing considerations	NO	

Teaching Strategies

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal face-to-face lectures
- Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material.
- Laboratory sessions, which support the formal lecture material and also provide the student with practical construction, measurement and debugging skills.
- Small periodic quizzes, to enable you to assess your understanding of the concepts.

Evaluation Strategies

Cycle Test – I	-	5%
Cycle Test – II	-	5%
Model Test	-	10%
Assignment	-	5%
Attendance	-	5%
Final exam	-	70%

Prepared by: Mrs.K.VENKATESWARI **Dated:**

Addendum

ABET Outcomes expected of graduates of B.Tech / EEE / program by the time that they graduate:

a) An ability to apply knowledge of mathematics, science, and engineering fundamentals.

b) An ability to identify, formulate, and solve engineering problems.

c) An ability to design a system, component, or process to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

d) An ability to design and conduct experiments, as well as to analyze and interpret data.

e) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

f) An ability to apply reasoning informed by the knowledge of contemporary issues.

g) An ability to broaden the education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

h) An ability to understand professional and ethical responsibility and apply them in engineering practices.

i) An ability to function on multidisciplinary teams.

j) An ability to communicate effectively with the engineering community and with society at large.

k) An ability in understanding of the engineering and management principles and apply them in project and finance management as a leader and a member in a team.

l) An ability to recognize the need for, and an ability to engage in life-long learning.

Program Educational Objectives

PEO1: PREPARATION
Electrical Engineering Graduates are in position with the knowledge of Basic Sciences in general and Electrical Engineering in particular so as to impart the necessary skill to analyze and synthesize electrical circuits, algorithms and complex apparatus.

PEO2: CORE COMPETENCE
Electrical Engineering Graduates have competence to provide technical knowledge, skill and also to identify, comprehend and solve problems in industry, research and academics related to power, information and electronics hardware.

PEO3: PROFESSIONALISM
Electrical Engineering Graduates are successfully work in various Industrial and Government organizations, both at the National and International level, with professional competence and ethical administrative acumen so as to be able to handle critical situations and meet deadlines.

PEO4: SKILL
Electrical Engineering Graduates have better opportunity to become a future researchers/ scientists with good communication skills so that they may be both good team-members and leaders with innovative ideas for a sustainable development.

PEO5: ETHICS
Electrical Engineering Graduates are framed to improve their technical and intellectual capabilities through life-long learning process with ethical feeling so as to become good teachers, either in a class or to juniors in industry.

Course Teacher	Signature
Mrs.K.VENKATESWARI	

Course Coordinator
(Mrs.K.VENKATESWARI)

HOD/EEE

( )