Academic Course Description

BHARATH UNIVERSITY
Faculty of Engineering and Technology
Department of Electronics and communication Engineering
BEI704- VIRTUAL INSTRUMENTATION
Seventh Semester, (Odd Semester)

Course (catalog) description

- To provide knowledge on design of process control by using virtual instrumentation techniques
- To provide knowledge in process analysis by VI tools.
- To give basic knowledge in describing function analysis.
- Get adequate knowledge VI tool sets

Compulsory/Elective course : Compulsory for all circuit branch students
Credit hours : 3 credits
Course Coordinator : Dr Latha, Professor

Instructors :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
Dr .Latha	Final Year Students	EI Block		**lathad@gmail.com**	9.00-9.50 AM
Mr.Vijayan	Final Year Students	EI Block		**Vijayan1987@gmail.com**	12.45-1.15 PM

Relationship to other courses:

Pre –requisites : Nil

Assumed knowledge : The students will have a electronics and instrumentation background obtained at a high school (or Equivalent) level. In particular, working knowledge of basic instrumentation including Gates,Diodes,Transistors are assumed.

Following courses : Biomedical instrumentation

UNIT – I D.C. AND A.C CIRCUITS 6

Ohm's law – Kirchoff's Laws, V – I Relationship of Resistor (R) Inductor (L) and capacitor (C).Series parallel combination of R, L&C – Current and voltage source transformation – mesh current & node voltage method –superposition theorem – Thevenin's and Norton's Theorem - Problems.

UNIT – II ELECTRICAL MACHINES 6

Construction, principle of operation, Basic Equations and applications - D.C.Generators and D.C.Motors. -Single phase Induction Motor - Single Phase Transformer.

UNIT – III BASIC MEASURMENT SYSTEMS 6

Introduction to Measurement Systems, Construction and Operating principles of PMMC, Moving Iron, Dynamometer Wattmeter, power measurement by three-watt meter and two watt method – and Energy meter.

UNIT IV – SEMICONDUCTOR DEVICES 6

Basic Concepts of semiconductor devices – PN Junction Diode Characteristics and its Application – HWR, FWR – Zener Diode – BJT (CB, CE, CC) configuration & its characteristics.

UNIT V – DIGITAL ELECTRONICS 6

Number system – Logic Gates – Boolean Algebra – De-Morgan's Theorem – Half Adder & FullAdder – Flip Flops.

Total No. of Periods: 30

TEXT BOOKS:

1. N.Mittle "Basic Electrical Engineering". Tata McGraw Hill Edition, New Delhi, 1990.
2. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation',Dhanpat Rai and Co, 2004.
3. Jacob Millman and Christos C-Halkias, "Electronic Devices and Circuits", Tata McGraw Hill

REFERENCE BOOKS:

1. Edminister J.A. "*Theory and problems of Electric Circuits*" Schaum's Outline Series. McGraw Hill Book Compay, 2nd Edition, 1983.
2. Hyatt W.H and Kemmerlay J.E. "*Engineering Circuit Analysis*", McGraw Hill Internatinal Editions, 1993.
3. D. P. Kothari and I. J. Nagrath "Electric machines" Tata McGraw-Hill Education, 2004
4. Millman and Halkias, "Integrated Electronics", Tata McGraw Hill Edition,2004.

Computer usage: Nil

Professional component

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

Broad area : Circuit Theory | Electronics | Transmission Lines and Networks | Linear Integrated Circuits

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

To develop problem solving skills and understanding of circuit theory through the application of techniques and principles of electrical circuit analysis to common circuit problems. This course emphasizes:	Correlates to program outcome		
	H	M	L
1. To develop an understanding of the fundamental laws and elements of electric circuits.	d	a,,b,c,g,l	J,k
2. To develop the ability to apply circuit analysis to DC and AC circuits	b,c,g,l	a,d,e	J,k
3. To understand the measuring instruments of electrical quantities and its constructions.	a,d,e	b,g,l	j,k
4. Introduce students to construction of machines.	a,d,e	b,c,g,l	f,j
5. To learn the working operation of logic gates, flip flops and registers	e	a,b,c,d,g	j,k

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

Draft Lecture Schedule

Session	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I	**INTRODUCTION**		
1.	Virtual Instrumentation: Historical perspective- advantages	No	[T1]
2.	block diagram and Architecture of a virtual instrument -	No	
3.	Conventional Instruments versus Traditional Instruments	No	
4.	Data-flow techniques	No	
5.	Graphical programming in data flow	No	
6.	comparison with conventional programming	No	
UNIT II	**VI PROGRAMMING TECHNIQUES**		
7.	VIs and sub-VIs, loops and charts	No	[T1]
8.	Arrays, clusters and graphs	No	
9.	case and sequence Structures,	No	
10.	Formula nodes, local and global variables	No	
11.	State machine, string and file I/O	No	
12.	Instrument Drivers, Publishing measurement data in the web	No	
UNIT III	**DATA ACQUISITION**		
13.	Introduction to data acquisition on PC, Sampling fundamentals	No	[T1]
14.	Input/output techniques And buses.	No	
15.	Latest ADCs, DACs, Digital I/O, counters and timers, DMA	No	
16.	Software and Hardware installation, Calibration, Resolution, Data acquisition interface requirements	No	
17.	Issues involved in selection of Data acquisition cards	No	
18.	VISA and IVI.	No	
UNIT IV	**VI TOOLSETS**		
19.	Use of Analysis tools, Fourier transforms, power spectrum	No	[T1]
20.	correlation methods, Windowing and filtering. Application of VI in process control	No	
21.	Designing of equipments like oscilloscope, Digital multimeter,	No	
22.	Design of digital Voltmeters with	No	

	transducer input Virtual Laboratory		
23.	Web based Laboratory	No	
UNIT V	**APPLICATIONS**		
24.	Distributed I/O modules- Application of Virtual Instrumentation: Instrument Control	No	[T1]
25.	Development of process database management system, Simulation of systems using VI	No	
26.	Development of Control system, Industrial Communication, Image acquisition and processing,	No	
27.	Motion control. Development of Virtual Instrument using GUI,	No	
28.	Real-time systems, Embedded Controller, OPC,	No	
29.	HMI / SCADA software, Active X programming.	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	-	10%
Cycle Test – II	-	10%
Model Test	-	25%
Attendance	-	5%
Final exam	-	50%

Prepared by: Dr.Latha, Professor , Department of EI **Dated : 10 -7-2017**

Addendum

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

(a) an ability to apply knowledge of mathematics, science, and engineering

(b) an ability to design and conduct experiments, as well as to analyze and interpret data

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

(d) an ability to function on multidisciplinary teams

(e) an ability to identify, formulate, and solve engineering problems

(f) an understanding of professional and ethical responsibility

(g) an ability to communicate effectively

(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

(i) a recognition of the need for, and an ability to engage in life-long learning

(j) a knowledge of contemporary issues

(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program Educational Objectives

PEO1: Graduates will gain knowledge regarding the various laws and principles associated with instrumentation systems.

PEO2: Graduates will gain knowledge regarding instruments and apply them for practical problems.

PEO3: Graduates will gain knowledge on electronic systems and various types' semiconductors.

PEO4: Graduates will acquire knowledge in using the concepts in the field of instrumentation engineering and digital electronics.

Course Teacher	Signature
Dr.Latha, Professor	

Course Coordinator	Academic Coordinator	Professor In-Charge	HOD/EI
(Dr.Latha, Professor)	( )	(Dr.)	(Dr.Latha, Professor)