GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT COURSE CURRICULUM

Course Title: Basic Instrumentation (Code: 3311701)

Diploma Programmes in which this course is offered	Semester in which offered
Instrumentation & Control Engineering	First Semester

1. RATIONALE

Any student of diploma in instrumentation engineering will be required to select various instrumentation devices when he reaches the industry. As most of the devices are electrical and electronics based products, the student is required to develop a basic understanding of the concepts and related terms of electricity, electronics, magnetism & electromagnetism and it is in this backdrop that this course has been designed.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competency:

i. Select and use the various instrumentation devices.

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Total	Examination Scheme				
(I	(III IIUui S)		Credits (L+T+P) Theory Marks		Practical	Marks	Total Marks	
L	T	P	C	ESE	PA	ESE	PA	
4	0	4	8	70	30	40	60	200

Legends: L-Lecture; T – Tutorial/Teacher Guided Student Activity; P - Practical; C – Credit; ESE - End Semester Examination; PA - Progressive Assessment.

4. COURSE DETAILS

Unit	Major Learning	Topics and Sub-topics
	Outcomes	
Unit – I	1a. Classify instruments	1.1 Scope of Instrumentation in industries
Basics of	used in the	1.2 Significance of Instrumentation & control.
instrumentation	instrumentation	1.3 Evolution of Instrumentation
	industry	a Brief journey from manual control to automation
	1b. Explain the basic	b Simple block diagram of Instrumentation system
	terms related to	c Basic terms related to instrumentation & control viz. process
	instrumentation and	variable, system, control variable, error, input, output, feedback
	control	1.4 a Definitions of characteristics of instruments & Measurement
		System
		Static: accuracy, sensitivity, resolution, precision, drift, dead

Basic electronics working of half and full wave rectifiers 4.2Select appropriate types of electronic filters 4.3 Explain the working of opamps and terms related to it. Unit- V Essential parameters for instrumentation Unit- VI Introduction to latest innovation in advanced industrial 4.1Sexplain the darget and full wave rectifiers 4.2 Simple block diagram of power supply introduction to single phase Rectifier- Half & without derivation) 4.2 Simple block diagram of power supply introduction to single phase Rectifier- Half & Full wave (without derivation) 4.2 Simple block diagram of power supply introduction to single phase Rectifier- Half & Full wave (without derivation) 4.3 Explain the working of opamps and terms related to it. 4.4 Introduction to voltage regulator, List types of Filters 4.5 Introduction to voltage regulator, List types of Filters 4.6 Simple Block diagram, advantages & comparison of SMPS & UPS 4.7 OPAMP IC 741: Symbol, PIN diagram, Application (only List) Terms- Voltage gain, bandwidth, input impedance, output impedance 5.1 Introduction to various process parameters: Definitions of Terms- Pressure, Flow, Level, temperature List various techniques for level measurements List various techniques for level measurements 6.1 Explain the block diagram of DCS (Introductory) diagram of DCS, PLC and industrial application of controllers (only List) Introduction to industrial application of controllers (only List)	Unit	Major Learning		Topics and Sub-topics
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instrumentation	industrial			
	instrumentation			

5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS

			Distribution of Theory Marks			
Unit	Unit Title	Teaching				
No.		Hours	R	U	A	Total
			Level	Level	Level	
1.	Introduction to basics of	10	2	6	2	14
	instrumentation					
2.	Basic electricity	12	4	6	2	14
3.	Magnetism & electromagnetism	10	2	6	2	14
4.	Basic electronics	10	2	6	2	14
5.	Introduction to essential parameters for	07	2	4	1	07
	instrumentation					
6.	Introduction to latest innovation in	07	2	5	0	07
	advanced industrial instrumentation					
	Total	56	25	23	08	70

Legends

R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxomonoy)

6. SUGGESTED LIST OF EXERCISES/PRACTICAL/EXPERIMENTS

The exercises/practical/experiments should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency. Following is the list of exercises/practical/experiments for guidance

S.No.	Unit	Practical Exercises/ Experiment			
	No.				
1		Study various laboratory equipments viz. power supply, CRO, Function generator, Multimeter etc.			
2		Use Multimeter for measuring voltage, current & resistance.			
3		Use CRO for measuring voltage, current & frequency.			
4	II	Verify Ohm's law.			
5	II	Verify Kirchhoff's current law.			
6	II	Verify Kirchhoff's Voltage law.			
7	II	Measure unknown resistance using Wheatstone bridge.			
8	II	Measure resistance value of series combination of resistors.			
9	II	Measure resistance value of parallel combination of resistors.			
10	II	Obtain various parameters related to given A.C. waveform.			
11	III	Demonstrate the working of electromagnet.			
12	III	Demonstrate the working of solenoid.			
13	III	Study relay & its operation.			
14	IV	Select Diode, Transistor, SCR, DIAC, TRIAC, UJT from the given components & identify their terminals.			
15	IV	Assemble half wave rectifier & measure output voltage waveform on CRO.			
16	IV	Assemble Full wave rectifier & measure output voltage waveform on CRO.			
17	IV	Connect filter circuit at the output of rectifier & measure output voltage waveform on CRO.			
18	V	Study and use Pressure sensing elements,			
19	V	Study and use Flow measuring instruments			
20	V	Study and use level measuring instruments.			
21	V	Study and use temperature measuring instruments.			

S.No.	Unit No.	Practical Exercises/ Experiment	
22	VI	Study block diagram of DCS.	
23	VI	Study block diagram of PLC.	
24	VI	Study applications of controllers.	

NOTE: At least 16 experiments/practical exercises have to be performed form the above

7. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Students are required to prepare and submit a laboratory report on instruction/demonstration given by instructor and workshop activities done by students as a part of term work.

8. SUGGESTED LEARNING RESOURCES

A. List of Books

Sr	Author	Title of Books	Publication
1.	Murthy D. V. S.	Transducers and Instrumentation	PHI Learning 2011
2.	Ernest Doebelin	Measurement Systems	Mcgraw hill Publishers
3.	Helfrick & Cooper	Modern Electronic Instrumentation & Measurement Techniques	PHI Learning
4.	Robert L. Boylestad, Louis Nashelsky	Electronic Devices and Circuit Theory	PHI Learning
5.	Patranabis	Sensors and Transducers	PHI Learning
6.	A.K. sawhney	A Course In Electrical And Electronic Measurements And Instrumentation	Dhanpat Rai & Sons.
7.	Bell, D.A.	Electronic Instrumentation and Measurements	PHI Learning 2011
8.	Carr, Joseph J.	Elements of Electronic Instrumentation and Measurements	Pearson Education, 2010
9.	S. K. Singh	Industrial Instrumentation & Control	Mcgraw hill Publishers
10.	R. K. jain	Electronic Instrumentation	Tata Mcgrawhill
11.	Kalsi, H.S.	Measurement Systems	Mcgraw hill Publishers 2011

B. List of Major Equipment/ Instrument:

Multimeter, Megger, Clamp-on meter, CRO, soldering iron, desoldering pump, pliers, cutters, L-end key, spanner(ring/open/box/adjustable), stripper, screw driver, pointer remover, tube bender, tube cutter, flaring tools etc.

C. List of Software/Learning Websites

- i. http://www.instrumentationworld.com/instrumentation_tutorial.htm
- ii. http://www.pc-education.mcmaster.ca/Instrumentation/go_inst.htm

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- Prof. M. K. Parikh, HOD IC dept, Government Polytechnic, Ahmedabad
- Prof. R. R. Manchiganti, HOD IC dept, Government Polytechnic, Gandhinagar

- Shri. A. K. Bilkhiya, Lecturer IC dept, Government Polytechnic, Gandhinagar
- Mrs. M. M. Mulchandani, O.S.D., CEC, RCTI Campus, Ahmedabad
- Shri. Ashvin M. Patel, Lecturer IC Dept, Government Polytechnic, Palanpur
- Shri. M. M. Shah, Lecturer IC Dept, Government Polytechnic, Palanpur
- Shri. S. K. Raval, Lecturer IC Dept, Government Polytechnic, Ahmedabad
- Shri. H. P. Patel, Lecturer IC Dept, Government Polytechnic, Ahmedabad
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- Shri. M. B. Vanara, Lecturer IC Dept, Government Polytechnic, Ahmedabad
- Shri. N. J. Dehalvi, Lecturer IC Dept, Government Polytechnic, Gandhinagar
- Shri. Manan A. Modi, Lecturer IC Dept, Government Polytechnic, Palanpur
- Prof. Hirenbala Vachhani I/C HOD IC dept, Christ Polytechnic Institute, Rajkot
- Prof. Priyal Thummar, Lecturer IC dept, Christ Polytechnic Institute, Rajkot

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. Joshua Earnest,** Professor and Head, Dept. of Electrical & Electronics Engg, NITTTR, Bhopal.
- Prof. A.S. Walkey, Associate Professor, Dept. of Electrical & Electronics Engg, NITTTR, Bhopal.