MAHATMA GANDHI UNIVERSITY

Kottayam, Kerala

Undergraduate Programmes (HONOURS)
2024 Admission Onwards

SYLLABUS						
SIGNATURE COURSE						
Name of the College	Bishop Abraham Memorial College, Thuruthicaud					
Faculty/ Discipline	Physics					
Programme	BSc (Hons) Physics					
Course Coordinator	Ens Mathews					
Contributors						
Course Name	Measurement and Process Control					
Type of Course	VAC					
Specialization title	This Signature Course does not have a specialization.					
Course Code	MG4VACPHYA00					
Course Level	200					
Course Summary	This course gives students a basic understanding on the science of making instruments for measuring, indicating and recording physical quantities. This course also discusses about various transducers, principles behind their working and how process control is implemented.					
Semester	4	**Credits**			3	**Total Hours**
Course Details	**Learning Approach**	Lecture	Tutorial	Practical	Others	
		2	1	0	0	45
Pre-requisites, if any	Nil					

Course Outcomes (CO)

Number of COs		**6**	
CO No.	**Expected Course Outcome**	**Learning Domains ***	**PO No**
1	Learn about different measurement systems	K	PO1
2	Understand about measurement and its application	U	PO1
3	Classify instruments into different categories	U	PO1, PO3
4	Evaluate the choice of a transducer for a particular application	E	PO3, PO4
5	Identify applications where a particular transducer is used	AN, I	PO2, PO3, PO4
6	Distinguish between different process control systems	AN, I	PO2, PO3

**Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)*

CO-PO Articulation Matrix

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	-	-	-	-	-	-	-	-	-
CO 2	3	-	-	-	-	-	-	-	-	-
CO 3	3	-	3	-	-	-	-	-	-	-
CO 4	-	-	3	2	-	-	-	-	-	-
CO 5	-	3	2	1	-	-	-	-	-	-
CO 6	-	3	3	-	-	-	-	-	-	-

'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).

Course Content

Content for Classroom transaction (Units)

Module	Units	Course Description	Hrs	CO No.
1	Introduction to Instrumentation			
	1.1	Instruments and Measurement Systems, Classification of Instruments - Absolute Instruments and Secondary Instruments, Analog Instruments and Digital Instruments, Mechanical, Electrical and Electronics Instruments, Deflection Instruments and Null Output Instruments, Self-operated and Power-operated Instruments.	3	["1"]
	1.2	Measurement - Methods of Measurements, Methods of Measurements, Elements of Measurement Systems	3	["2"]
	1.3	Process Control - Control Systems, Controllers, Programmable Logic Controller (PLC), Distributed Control System (DCS)	3	["6"]
	1.4	Primary Sensing Elements - Mechanical Devices as Primary Detectors, Mechanical Spring Devices, Pressure Sensitive Primary Devices	3	["3"]
	1.5	Flow Rate Sensing Elements - Inferential Meters, Positive displacement meters	3	["3"]
2	Transducers			
	2.1	Classification of Transducers Based on Principle of Transduction, Primary and Secondary Transducers, Passive and Active Transducers, Analog and Digital Transducers, Transducers and Inverse Transducers	5	["4"]
	2.2	Characteristics of Transducers - Input, Transfer and Output Characteristics, Static and Dynamic Characteristics, Choice of Transducers	5	["4"]
	2.3	Characterization of Sensors - Electrical Characterization, Optical Characterization, Chemical/Biological Characterization, Mechanical and Thermal Characterization	5	["4"]
3	Types of Transducers			
	3.1	Resistive Transducers - Potentiometers, Strain Gauges, Resistance Thermometer Detector (RTD), Thermistors	4	["5"]
	3.2	Inductive Transducers - Self-Inductive Transducers, Mutual Inductive Transducers, Variable Reluctance Transducers, Linear Variable Differential Transformer, Rotary Variable Differential Transformers, Applications	4	["5"]
	3.3	Capacitive Transducers - Variable Area, Variable Air Gap and Variable Permittivity Capacitive Transducers, Applications	3	["5"]
	3.4	Miscellaneous Transducers - Light Transducers, Piezoelectric Transducers, Hall Effect Transducers, Digital Encoding Transducers, Applications	4	["5"]

Teaching and Learning Approach	Classroom Procedure (Mode of transaction) Lecture, Tutorial, Group Discussion

Assessment Types	**MODE OF ASSESSMENT** Mode of Assessment: Theory **A. Continuous Comprehensive Assessment (CCA)** **• Theory – 25 Marks** Assignment, Seminar, Test Paper **B. End Semester Evaluation (ESE)** **• Theory – 50 Marks** Assessment Methods – Written Examination Duration of Examination – 2.00 Hrs Pattern of examination for Theory – Non-MCQ Different parts of written examination – Part - A , B Answer Type: ◦ PART - A ◦ One or two Sentences - (7 out of 12) – 7 × 2 = 14 ◦ PART - B ◦ Short Essays/Problems - (6 out of 12) – 6 × 6 = 36

References

- Ens Mathews, Instrumentation, Media House, Delhi, 2021

Suggested Readings

- Sawhney A K, A Course in Electrical and Electronics Measurements and Instrumentation, Dhanpal Rai and Co Pvt Ltd, 2007
- Patranabis, D., Sensors and Transducers, PHI, 2015

Affidavit

- We, Bishop Abraham Memorial College, Thuruthicaud and Ens Mathews, agree to permit the use of our proposed course syllabus by other faculty members within the same discipline for course delivery at their respective institutions.
- We, Bishop Abraham Memorial College, Thuruthicaud, agree to appoint a new course coordinator for the proposed Measurement and Process Control in the event of the unavailability of the currently nominated coordinator. This appointment will ensure the continued coordination of course delivery, assessments, and all related academic responsibilities necessary for the successful implementation of the signature course, for as long as the college offers this programme.
- We, Bishop Abraham Memorial College, Thuruthicaud and Ens Mathews, declare that no part of this signature course submitted here for approval has been taken from the course content developed by, or from any of the course titles prepared by, the BoS/expert committee in the same discipline under our University.