GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3171719
Semester – VII
Subject Name: INSTRUMENTATION FOR AGRICULTURE AND FOOD PROCESSING

Type of course: Open Elective

Prerequisite: Fundamental knowledge of sensors & transducers, Basic concept of SCADA, PLC and DCS systems

Rationale: Agricultural industries are mostly dependent on nature behavior. To avoid crop failure, increasing crop quantity and quality, protecting crop, etc is a big challenge for farmers as well as for agro industries. There for it will be very appropriate to provide knowledge of a automation and sensing technology associated with agriculture and food processing plants/ systems to instrumentation and control engineers.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
2	0	2	3	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	Necessity of instrumentation & control for agriculture and food processing requirement, remote sensing, biosensors in agriculture, standards for food quality. Guidelines and regulations for Industries by Food Safety and Standards Authority of India (FSSAI)	**08**
2	Application of SCADA for DAM parameters & control, Irrigation canal management up- stream & down - stream control systems, Water distribution and management control, Auto drip irrigation systems	**04**
3	Automation in earth moving equipments & farm equipments, application of SCADA & PLC in packing industry and cold storage systems, implementation of hydraulic, pneumatic & electronics control circuits in harvesters cotton pickers, tractor etc.	**08**
4	Green houses & instrumentation: ventilation, cooling & heating, wind speed, temperature & humidity, rain gauge, carbon dioxide enrichment measurement & control. Leaf area length evaportranspiration, temperature, wetness & respiration measurement & data logging, electromagnetic radiations photosynthesis, infrared & UV bio sensor methods in agriculture, agro-metrological instrumentation weather stations	**04**

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Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
7	14	14	14	14	7

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Text Books:

1. Industrial Instrumentation by D. Patranabis, Tata Mcgraw Hill pub
2. Process control and instrumentation technology by C.D. Johnson, 7th edition, Pearson education
3. Process Instrumentation and control handbook by Considine D. M., McGraw Hill pub.
4. Mineral Processing Technology by Wills B.A., Pergamon Press, 4th Ed.
5. G.S. Sawhney ―Non-Conventional Energy Resources, PHI Learning Private Limited, 1st ed., 2012
6. Food Safety Management Systems (FSMS) Guidelines Issued by FSSAI

Reference Books:

1. Instrumentation Engineers Handbook- Process measurement volume I and Process control volume II, by B.G.Liptak, Chilton Book Company, 2001

Course Outcome:

After learning this course, the students should be able to:

CO1. Characterize problems and possible technological solution of agro industries.
CO2. Familiarize with current literature, research in agricultural instrumentation
CO3. Analyze and design of automation system by evaluating agricultural parameter measurement constraint.

List of Experiments:

1. To test soil pH, conductivity, resistivity, temperature, moisture and salinity
2. To study instrumentation set up for sugar plant
3. To study flow diagram of fermenter and control (Batch process)
4. To study pesticides manufacturing process and control
5. To study flow diagram of dairy industry & confectionary industry and instrumentation set up
6. To study juice extraction control set up.

7. To study application of SCADA for DAM and irrigation system.
8. To study automation in farm equipment.
9. To study instrumentation and control in Green house
10. To study different bio sensors used in agro automation.

Design based Problems (DP)/Open Ended Problem:

Industrial visit of any Food processing/ Agro plant

Major Equipment:

Sensors, SCADA software, Computers, etc.

List of Open Source Software/learning website:

http://nptel.ac.in/video.php

https://nptel.ac.in/courses/126/105/126105011/

https://nptel.ac.in/courses/126/105/126105009/

https://nptel.ac.in/courses/126/105/126105013/