GUJARAT TECHNOLOGICAL UNIVERSITY

INSTRUMENTATION & CONTROL ENGINEERING (17)
INSTRUMENTATION FOR AGRICULTURE AND FOOD PROCESSING
– Department Elective - III

SUBJECT CODE: 2181707
B.E. 8th SEMESTER

Type of course: Core Engineering

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:

TeachingScheme			Credits	Examination Marks						Total Marks
L	T	P	C	TheoryMarks			PracticalMarks			
				ESE (E)	PA(M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Content:

S. N.	Content	Total Hrs	% Weight age
1	Necessity of instrumentation & control for agriculture and food processing requirement, remote sensing, biosensors in agriculture, standard for food quality.	06	16
2	Soil science and sensors: Engineering properties of soil pH, conductivity, resistivity, temperature, soil moisture and salinity, ion concentration measurement, method of soil analysis, Instrumentation for environmental conditioning of seed germination and growth	06	
3	Flow diagram of sugar plant & instrumentation set up for it, flow diagram of fermenter & control (batch process), flow diagram of dairy industry & instrumentation set up for it, Juice extraction control process & instrumentation set up for it Oil extraction plant and instrumentation set up for it. Pesticides manufacturing process and control	08	16
4	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	06	16
5	Automation in earth moving equipments & farm equipments,	08	16

	application of SCADA & PLC in packing industry and cold storage systems, implementation of hydraulic, pneumatic & electronics control circuits in harvesters cotton pickers, tractor etc.		
6	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,	10	
7	Non-conventional energy sources: Wind power, solar power, tidal power, smart grid, energy harvesting	08	20

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

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:

Agro sensors, SCADA software, Computers, etc.

List of Open Source Software/learning website:

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

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.