SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology

Bachelor of Technology (B. Tech.)
Instrumentation and Control

B. Tech.III Semester – VI

Subject Name: Instrumentation For Agriculture And Food Processing **Subject Code: BTIC14602**

Type of course: Open Elective Course

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

List of Courses where this course will be prerequisite: Not applicable

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				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
3	0	2	4	60	25	15	30	20	150

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests CA2: Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems TEE: Term End Examination TEP: Term End Practical Exam (Performance and viva on practical skills learned in course) CA3: Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

BSC: basic science course /ESC: Engineering Science Course /HSM: Humanities and management /PCC: Professional Core course /PEC: professional Elective course /OEC: Open Elective course/ MD: mandatory non-credit course

Content:

Sr. No.	Content	Total Hrs	Module Weightage
1	**Introduction** Necessity of instrumentation & control for agriculture and food processing requirement, remote sensing, biosensors in agriculture, standard for food quality, Guidelines and regulations for Industries by Food Safety and Standards Authority of India (FSSAI).	6	13%
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.	7	16%
3	**Process Plant Instrumentation** Flow diagram of sugar plant & instrumentation set up for it, 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. Flow diagram of food process plant & instrumentation set up for it Pesticides manufacturing process and control.	8	18%
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.	8	18%
5	**Automation in Packing Industry & Farm Equipments** Application of SCADA & PLC in packing industry and cold storage systems, Implementation of control circuits in harvesters cotton pickers, tractor etc.	6	13%
6	**Green Houses & Instrumentation** Different types of green house structures, ventilation, Cooling & Heating, Wind speed, Temperature & Humidity, Rain gauge, Carbon Dioxide enrichment measurement & control & Data logging, Electromagnetic radiations photosynthesis, Agro-metrological instrumentation weather	10	22%

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	stations.		

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10 %	**40 %**	**20 %**	**10 %**	**10 %**	**10 %**

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.

Reference Books:

Sr no	**Title of book /article**	**Author(s)**	**Publisher and details like ISBN**	**Year of publication**	**Publication Edition**
1	Bioanalysis And Biosensors In Agriculture Science	Sandhya Agrawal	ABD Publisher ISBN 978-8189473723	2009	
2	Process Control Instrumentation Technology	C.D. Johnson	Pearson Education ISBN-13 978-9332549456 India	2015	8th Edition
3	Process Industry Instrumentation and Control Handbook	D. M Considine	McGraw-Hill Education (ISE Editions) ISBN-978-0071132527	1994	
4	Mineral Processing Technology	Wills B.A	Pergamon Press ISBN-13 978-0080311593	2013	3rd Edition

5	Greenhouse Design and Control	Pedro Ponce, Arturo Molina, Paul Cepeda, Esther Lugo, Brian MacCleery	CRC Press ISBN-13 978-1138026292	2015	1st Edition
6	Instrumentation Engineers Handbook-Process measurement volume I and Process control volume II	B.G.Liptak	Chilton Book Company,	2001	

Course Outcomes:

After learning the course the students should be able to:

Sr. No.	CO statement	Marks % weightage
CO1	characterize problems and possible technological solution of agro industries.	20%
CO2	familiarize with current literature, research in agricultural instrumentation.	30%
CO3	analyze and design of automation system by evaluating agricultural parameter measurement constraint.	20%
CO4	designing of PLC and SCADA of various agriculture automation systems.	30%

Mapping with POs:

	PO 1	PO2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PS O2	PSO 3
CO-1	3	3	3	3	2	0	0	0	2	0	1	2	3	3	2

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CO-2	1	2	2	3	1	1	0	2	1	1	1	1	3	2	2
CO-3	3	3	3	3	1	1	2	0	2	0	1	0	1	2	2
CO-4	2	1	0	2	3	0	1	0	0	0	2	1	3	3	2

List of Open Source Software/learning website:
http://nptl.ac.in/video.php

List of Open Source Software: Not applicable

FOR LAB SESSIONS:

List of Experiments and Design based Problems (DP)/Open Ended Problem:

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 food industry and control.
4. To study pesticides manufacturing process and control.
5. To study flow diagram of dairy industry & confectionery industry and instrumentation set up
6. To study juice extraction control set up.
7. To study application of PLC programming and SCADA for DAM automation 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.
11. To study application of PLC programming and SCADA for green house automation system.
12. To study application of PLC programming and SCADA for packaging system.
13. To study application of PLC programming and SCADA for product mixing and packaging system.
14. To study application of PLC programming and SCADA for cold storage system.

Major Equipment Needed: Agro sensors, SCADA software, Computers, etc..