GUJARAT TECHNOLOGICAL UNIVERSITY

RUBBER TECHNOLOGY (26)
AUTOMATION & CONTROL IN RUBBER INDUSTRIES
SUBJECT CODE: 2182604
B.E. 8TH SEMESTER

Type of course: BE

Prerequisite: NA

Rationale: NA

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	2	5	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1.	**Instrumentation & Process Control:** Industrial managements for measurement & Control of process variables such as temp., pressure, gas, Concentration, Sp. gravity, pH, liquid level, liquid flow, humidity etc., Principles of automatic control, Proportional, Integral & derivative modes of control, elements of analogue & digital computer application, microprocessor control.	**6**	**10**
2.	**Specifications:** The writing of specifications, Materials, Subcomponents, Machine settings, Manual Operations, products.	**6**	**10**
3.	**Process-Capability Studies:** Utility & General Considerations, Design of processing trails, Empirical modeling & statistical analysis of process performance, Representation & optimization of process performance, tolerance bands & process precision.	**6**	**15**
4.	**Process Monitoring:** General considerations temp. Measurement pressure measurement, position, Displacement & viscosity measurement, product Dimensions & wt., energy & power measurement, Data acquisition system, Data analysis & presentation.	**6**	**10**
5.	**Process Control:** General consideration, Local automatic & closed-loop control, adaptive control, sequence control, safety & machine integrity, computer control systems.	**6**	**10**
6.	**Quality Control:** General considerations, sampling inspection, patrol inspection & Validation, subjective inspection etc. New methods like Six sigma.	**6**	**10**
7.	**Automation and Control in the Rubber Industry:** Introduction, Background, Reasons to Institute Change, Reasons to Postpone Change, Component Testing, Dimensional and Destructive Testing, Vehicle	**6**	**15**

	Testing.		
8.	**Computer Integrated Manufacturing (CIM):** Introduction, Process, Sensors, Computer, Measurements, Control, Display, CIM.	**6**	**10**
9	**Improving Rubber Testing with Microcomputers:** Introduction, Microcomputers and Hardware for Data Acquisition, Sensors used in Rubber testing, Signal Conditioning, Analog to digital Conversion, Interfacing to Microcomputers.	**6**	**10**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**15**	**15**	**15**	**15**	**0**

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:

1. Rubber Processing & Production Organisation By: Philip K. Freakley
2. Rubber Products Manufacturing Technology By: Anil K. Bhowmick
3. Industrial Instrumentation By: Donald Eckman
4. Automatic Process Control By: Donald Eckman

Course Outcome:

After learning the course the students should be able to:

- Know about the Principles of automatic control.
- Learn about machine settings.
- Able to understand the importance of Process Monitoring.
- Understand the importance of Quality Control.
- Learn about the dimensional and destructive testing.
- Learn the importance of Computer Integrated Manufacturing.
- Know about microcomputers and hardware for data acquisition.
- Know & study about analog to digital Conversion

List of Experiments:

Tutorials/Presentation/Practicals based on above topics.

Design based Problems (DP)/Open Ended Problem:

- Automation and Safety Infrastructure for Rubber Production.
- Role of Automation in improvement in cable industry.
- How quality can improved by using automation in footwear industry?.

Major Equipment:
PID Controllers, Computers, Viscometers etc

List of Open Source Software/learning website:

- http://www.sciencedirect.com/
- http://www.mncautomation.com/
- https://www.zeppelin-systems.com

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.