GUJARAT TECHNOLOGICAL UNIVERSITY

RUBBER TECHNOLOGY (26)
RUBBER PRODUCT & PROCESS COMPUTER AIDED DESIGN
SUBJECT CODE: 2182605
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.	**Introduction :** Introduction to CAD- Design, optimization and simulation.	**6**	**10**
2.	**Optimization:** Objectives, methods of optimization- graphical method, linear programming- simplex method, dual simplex. Modeling, fitting models to data, Least square method.	**8**	**15**
3.	**Algorithms :** for interpolation, extrapolation, curve fitting of polynomials, numerical differentiation & integration, solution of engineering/technological/design problems relating to polymer/monomer synthesis, polymeric reactions, polymer & Rubber processing, Rubber & polymer products etc. Newton's method, secant method.	**8**	**15**
4.	**Genetic Algorithm:** Introduction, concept, theory, history, methods and applications specifically to Rubber extruder design.	**8**	**15**
5.	**Finite Element Analysis:** Introduction, history, general description of the method, advantages & disadvantages of FEA. Application of FEA in Rubber products and process design.	**8**	**15**
6.	**Artificial Neural Network:** Introduction, Concept, methods and its application in rubber technology especially to rubber properties prediction.	**8**	**15**
7.	**Software for Data Acquisition & Analysis :** Applications of Data Acquisition in a Rubber Factory, Device Drivers, Menu-Driven Software, "Virtual Instrument" Software, Turn-Key Software, Data Reduction Software, Errors in Data Acquisition & Analysis, Evaluating Test Instrumentation, Networking Microcomputers, Applications of LANs to	**8**	**15**

	Rubber Factories, Attaching a LAN to Laboratory Information Management System(LIMS), Incorporating Microcomputers into a Laboratory.		

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:

- Rubber Products Manufacturing Technology By : Anil K. Bhowmick
- Numerical Methods in Science and Engineering By : Dr. B. S. Grewal

Course Outcome:

After learning the course the students should be able to:

- Learn about the optimization and simulation.
- Learn about Newton's method, secant method.
- Able to understand the interpolation, extrapolation, curve fitting of polynomials.
- Learn about Genetic Algorithm & its applications in rubber extruder design.
- Learn about the Finite Element Analysis & its applications in Rubber products and process design.
- Learn about the Concept, methods and applications of Artificial Neural Network in rubber technology
- Know & study about Software for Data Acquisition & Analysis.

List of Experiments:

Tutorials/Presentation/Practicals based on above topics.

Design based Problems (DP)/Open Ended Problem:

- Finite Element procedure in modeling the dynamic properties of rubber
- Artificial Neural Network Modeling and Mechanism Study for Relaxation of Deformed Rubber
- Rubber seal development via computer simulation

Major Equipment:
Computers, Software etc.

List of Open Source Software/learning website:

- http://www.sciencedirect.com/
- https://joblesssale8263.wordpress.com
- http://www.byggmek.lth.se/
- http://pubs.acs.org/

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.