

GUJARAT TECHNOLOGICAL UNIVERSITY

RUBBER TECHNOLOGY (40) OPTIMIZATION IN RUBBER INDUSTRIES SUBJECT CODE: 2724003 SEMESTER: II

Type of course: Core-III (M.E.Rubber Technology)

Prerequisite: NA

Rationale: NA

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	ESE (V)		PA (I)			
		ESE			OEP	PA	RP			
3	2#	0	4	70	30	30	0	10	10	150

Content:

Sr. No	Course Content	Total Hrs	% Weightage
1.	Introduction to Optimization: Basic concept of optimization, formulation of optimization problems, problem dressing, feasible region, Classification of Optimization Problems: single variable- multivariable problems, optimization without constraints - with constraints, Maximization and minimization problems, Convex and concave functions, unimodal-multimodal, single objective-multiobjective optimization.	9	15
2.	Analytical Optimization Techniques: Stationary points, Optimization of unconstrained Functions One-dimensional Search, direct substitution, constrained variation, penalty function, Lagrangian Multiplier, Kuhn-Tucker theorem, Simplex Method of Linear Programming, Duals in optimization, Quadratic programming, Geometric Programming.	9	15
3.	Numerical Optimization Techniques: General principles of numerical search, region elimination techniques, direction of search, final stage in search, direct search, pattern search, acceleration in direct search, gradient methods, the complex method of Box.	8	15
4.	Application of Optimization In Rubber Industries: Design of product mixes, optimization in mould design, product shape-size design, screw design, optimization in Mixing, Extrusion, Curing.	10	20
5.	Optimal design and scheduling: Single product batch plants, Multiple product batch plants, Parallel units and intermediate storage, Sizing in batch plants, Inventories, flow shop and jobshop plants, constraints and formulation of design models for optimization, formulations for discrete sizes.	8	15
6.	Advanced Optimization Techniques: Genetic Algorithm, Mematic Algorithm, Simulated Annealing, Differential Evolution, Ant Colony Optimization, Particle Swam Optimization and recent developments.	10	20

Reference Books:

- Optimization Theory and Practice by Gordon S.G. Beveridge and Robert S. Schechter, by McGrawHill Publication.
- Product and Process Design Principles by Warren D Seider, J. D. Seader, Daniel R Lewin, by John Wiley and Sons, Inc.
- New optimization techniques in engineering by Godfrey C. Onwubolu and B. V. Babu.

Course Outcome:

After learning the course the students should be able to:

- Understand the Basic concept of optimization.
- Identify the Classification of Optimization Problems.
- Learn the General principles of numerical search.
- Learn about the Simplex method of Linear programming.
- Learn about the Quadratic programming, Geometric Programming etc.
- Design the Single product batch plants & Multiple product batch plants etc.
- Learn about advanced Optimization Techniques.
- Understand the Optimal design and scheduling.

Major Equipments:

Computers, Different Software etc.

List of Open Source Software/learning website:

- www.iiste.org/Journals/index.php/MTM/article/download/2603/2618
- <http://www.crcpress.com>
- <http://penerbit.uthm.edu.my/>

Review Presentation (RP): The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website