

# GUJARAT TECHNOLOGICAL UNIVERSITY

## TEXTILE PROCESSING (28) PROCESS CALCULATIONS IN TEXTILE WET PROCESSING SUBJECT CODE: 2142810 B.E. SEMESTER IV

**Type of course:** Textile Processing Engineering

**Prerequisite:** Zeal to learn the subject

**Rationale:** This gives knowledge essential for efficient working of machineries and equipments in the industries with optimum utilization of materials and energy. This ultimately helps in running the industry economically with the best utilization of resources.

### Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA (M)		PA (V)		PA (I)		
				PA	ALA	ESE	OEP			
3	2	0	5	70	20	10	30	0	20	150

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment; OEP-Open Ended problem; AL-Active learning;

### Content:

Sr. No.	Course content	Total Hrs.	Weightage (%)
01.	General Introduction: Scope of process calculation studies involving fluid flow and heat transfer in textile processing. Various processes and process equipments in textile processing industries.	1	2
02.	Dimensions and units : Dimensions and system of units, Numericals based on the conversion factors of various units, Basic chemical calculations	2	5
03.	Material balance without chemical reactions: Process flow sheet, materials around equipments related unit operations like driers, evaporators, extractors etc.	4	10
04.	Material balance involving chemical reactions: Concept of limiting and excess reactants percentage conversion and yield, material balance involving chemical reactions with special reference to dyestuff and textile processing industries.	4	10
05.	Stoichiometry and unit operations: industrial applications, Related calculations and numerical	2	5
06.	Fluid flow: definition, classification of fluids, fluid properties like density, viscosity, surface tension, vapour pressure etc., Its importance in textile processing industries, numericals based on above topics.	4	10
07.	Fluid statics: Principle and application of fluid statics, Newton's law of viscosity, Newtonian and non-Newtonian fluids, numerical based on it.	2	5
08.	Fluid dynamics: Study of flow patterns, Reynolds experiments,	5	12

	Reynolds number, rheological behavior of fluids, Poiseuille's equation, Bernoulli's equation, Pump work calculations, equations and numerical, Fluid flow for discharge through pipe, a small orifice and pumps		
09.	Fluid pressure and flow measurements: Manometer, mechanical gauges, numerical based on pressure measurement Ventury meter, Orifice meter, Rota meter, Pitot tubes and wires, numerical based on it	4	10
10.	Heat transfer in Textile Processing Industries: modes of heat transfer, Textile Processing Machineries based on various modes of heat transfer such as open vessel dyeing machine, close vessel dyeing machines, agitated vessels, boiler, heat exchangers, stenters, driers based on conduction, convection and radiation, steamers and pressure agers, etc., principles, calculations and numerical related to all modes of heat transfer.	9	20
11.	Heat Exchangers suitable in a Textile Process house, Fouling factor, log-mean temperature difference, effectiveness of heat exchangers, economizers, numerical based on these topics.	5	11

**Suggested Specification table with Marks (Theory):**

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level
10	10	14	22	14

**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate 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	Author
1.	Introduction to chemical engineering	W. L. Badger & J. L. Banchero
2.	Unit operations of chemical engineering	W.L. Mc Cabe, J.C.Smith & Peter Harriot
3.	Engineering in textile coloration	C. Duckworth
4.	Process heat transfer	Kern

**Course outcome:**

After learning the course the students should be able to:

1. Understand the various unit operations, unit process and process equipments used in textile processing industry.
2. Thoroughly understand the principles of material balance and stoichiometry.
3. Calculate the numericals related to material balance and stoichiometry
4. Understand the significance of studying principles of fluid flow and heat transfer for textile processing industries.
5. Get detail knowledge of various properties of fluids and their importance in textile processing industry.

6. Calculate out the numericals related to fluid properties like density, viscosity, surface tension, vapor pressure etc.
7. Understand fluid static and fluid dynamics.
8. Solve numerical problems related to static and fluid dynamics.
9. Get thorough knowledge of fluid flow measuring devices and calculations related to them.
10. Understand principles and modes of heat transfer and its significance in textile industry.
11. Solve the numerical problems related to efficiency of heat exchangers, economizers, stenters/driers, steamers, etc.

**Major Equipments: NA**

**List of Open Source Software/learning website:**

1. <http://www.wto.org/>
2. <http://www.wtin.com/>
3. <http://textileinformation.blogspot.in/>
4. <http://www.fibre2fashion.com/>
5. <http://textilelearner.blogspot.in/>
6. <http://www.fashion-era.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.