GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN TEXTILE PROCESSING TECHNOLOGY
SEMESTER: V

Subject Name: **Management of Energy and Environment in Wet Processing**

Sr. No.	Course content
1.	**Introduction to the Management of Energy and Environment :** 1.1 Energy management in wet processing: 1.1.1 Need of energy conservation. 1.1.2 Sources and types of energy. 1.1.3 Classification of energy sources. 1.1.4 Properties, merits and demerit of different energy sources. 1.1.5 Different types of energy such as Thermal (Heat) energy, Electrical Energy and Solar energy. 1.1.6 Energy units and Conversion factors. 1.2 Environment management in wet processing: 1.2.1 Availability of water on earth, sources of water, its storage and distribution, Properties of water, Various impurities in water and their effects on wet processing. 1.2.2 Management of pollution control: Control of water pollution, air pollution and noise pollution.
2.	**Analysis of Water and Fuels for Steam Generation:** 2.1 Analysis of water to find out Colour, Turbidity, pH Value, Total Solids, Total Dissolved Solids (TDS), Suspended Solids, Total Hardness, Alkalinity, Chlorides, Sulphates, Free Carbon Dioxide, Measurement of metallic impurities like Iron, Manganese etc. 2.2 Analysis of various fuels such as coal, oil and gas used for steam generation.
3.	**Quality of Water and Its Treatment:** 3.1 Quality of Water available at different centers in India. 3.2 Quality of Water required for Boiler Plants and wet processing. 3.3 Removal of Colour, Turbidity, Iron and Manganese from water. 3.4 Removal of Hardness by Softening Processes like Precipitation (Lime-Soda) Process, Ion-Exchange Process, Softening by Sequestering Agents, Demineralization Process, Reverse-Osmosis Process.
4.	**Conservation of Water and Energy:** 4.1 Water consumption pattern in textile mills.. 4.2 Water consumption at different stages in wet processing. 4.3 Water conservation by Water Audit, Elimination of Squeeze Liquor and Counter-

	Current Washing, Reuse of Water and Control devices. 4.4 Energy conservation in wet processes like Preparatory, Dyeing, Printing and Finishing. 4.5 Energy conservation by energy audit.
5.	**Conservation of Steam:** 5.1 General properties of steam and its costing technique. 5.2 Conservation of steam through efficient distribution and common problems in steam distribution. 5.3 Role of lagging and steam traps for steam conservation. 5.4 Efficient use of steam and conservation measures at different wet processing machines like yarn dyeing plants, kiers, cylinder dryers, stenters etc. 5.5 Conservation of steam through waste heat recovery considering waste heat sources, different forms of waste heat and waste heat available from various machines.
6.	**Effluents and its Treatment:** 6.1 Characteristics of effluents from various departments of wet Processing. 6.2 Characteristics of composite effluents. 6.3 Tolerance limits for industrial effluents. 6.4 Fish toxicity test. 6.5 Stages of effluent treatment process such as Physical Treatment, Chemical Treatment and Biological Treatment. 6.6 Effluent Treatment plant and recent advancement in it. 6.7 Analysis of effluent.
7.	**Steam Generation:** 7.1 Various fuels used in steam generation with their characteristics. 7.2 Different types of boilers used for steam generation with their working mechanism.
8.	**Recent Developments for Energy Saving:** 8.1 Principle and working mechanism of direct gas firing system and its application on stenters and different dryers. 8.2 Advantages and disadvantages of direct gas firing system. 8.3 Special features and advantages of thermic fluid heating system with precautions required for its smooth operation. 8.4 Single stage preparatory process in textile wet processing with respect to energy and cost saving. 8.5 The environment protection act. 8.6 Concept of clean technologies.
9.	**Practicals:** 9.1 To find out Total Solids, Total Dissolved Solids (TDS), Suspended Solids in a given sample of water. 9.2 To find out alkalinity in a given sample of water. 9.3 To find out total hardness of a given sample of water.

	9.4 To find out chloride content in a given sample of water. 9.5 To find out Biochemical Oxygen Demand (BOD) of a given sample of an effluent. 9.6 To find out Chemical Oxygen Demand (COD) of a given sample of an effluent. 9.7 To study the energy conservation in Conventional Preparatory Process and Single Stage Preparatory Process of cotton. 9.8 To study the energy conservation in dyeing of different class of dyes on cellulosic fabrics. 9.9 To study the energy conservation and cost control in different vat dyeing methods. 9.10 To compare the energy conservation in case of polyester heat setting and optical whitening combined process with conventional approach. 9.11 To study the energy conservation in dyeing of cellulosic fibre/fabrics with different dyes using different MLR. 9.12 To study the energy conservation in exhaustion method and padding methods of dyeing. 9.13 To study the energy conservation in printing of cellulosic fabrics with reactive dyes by different methods.

Reference Books:

Sr. No.	Name of Books	Authors
1.	Water and effluent in textile mills	P. B. Jhala, M. M. Vyas & K. Subrahmanyam
2.	Water used in textile processing	N. Manivasakam
3.	Treatment of textile processing effluents	N. Manivasakam
4.	Energy conservation in textile wet processing	M. L. Gulrajani & Sanjay Gupta
5.	Fuel and steam economy, Textile Engineering Tablet-III	J. S. Parajia & M. M. Vyas
6.	Heat economy in Textile Mills	M. Ratna Prabhu, J. S. Parajia, M. M. Vyas & K. Subrahmanyam