**B E III Textile Technology: Semester – VI**

**Subject Name: Textile Effluents & its Management** **Subject Code: BTTT14606**

**Type of course: Professional Elective Course III**

**Prerequisite (if any):** Basic Knowledge of Physics, Mathematics, Chemistry of 10+2 level & Textiles.

**List of Courses where this course will be prerequisite**

**Rationale:** This course gives an understanding of the importance and relevant of environmental aspects related to sustainability in textile wet processing and the effluent parameters. It also covers the various techniques of treating and analysis of the textile effluents as well as methods of reducing the same.

**Teaching and Examination Scheme:**

| TEACHING SCHEME | | | | Theory Marks | | | Practical Marks | | Total |
|---|---|---|---|---|---|---|---|---|---|
| L | T | P | C | TEE | CA1 | CA2 | TEP | CA3 | |
| 3 | 0 | 2 | 4 | 60 | 25 | 15 | 30 | 20 | 150 |

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests CA2: Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems TEE: Term End Examination TEP: Term End Practical Exam (Performance and viva on practical skills learned in course) CA3: Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

**Content:**

| Sr. No. | Content | Total Hrs |
|---|---|---|
| 1 | **Introduction & Environmental Impact of Textile Effluents:** Sources of Textile Waste, Cause of Water, Air & Noise Pollution in textile industry, Water requirement by textile industry, quality of incoming process water & waste water problems, chemicals used in textile industry, effect of air pollution on human health, vegetation, animals, materials and structures; effect of noise on human beings, Health hazards. | 6 |
| 2 | **Characterisation, Testing & Standardization of Textile Effluents:** Textile Wastes Characteristics - colour, pH, hardness TSS, TDS, COD, BOD, alkalinity, estimation of metal ions; Classification and properties of air pollutants, sources of emission, greenhouse gases; Plume behavior and fate of air pollutant, Standards for Textile Effluent & Ambient air quality standards, Government Regulations for Effluents. | 9 |
| 3 | **Primary Effluent treatment methods**: Screening, sedimentation, equalisation, neutralisation, coagulation and flocculation. | 6 |
| 4 | **Secondary Effluent treatment methods**: Trickling filtration, Activated sludge process, aerated lagoons, secondary sedimentation, oxidation ponds, Anaerobic Digestion, sludge disposal, removal of interfering substances in secondary biological treatment. | 6 |
| 5 | **Tertiary Effluent treatment methods**: Multimedia Filtration and Reverse Osmosis Analysis of effluents, Multi effect evaporator. Design of typical ETP and concept of common effluent treatment plant. | 6 |
| 6 | **Control of Air & Noise Pollution:** Analysis & control of air pollutants, Air pollution control equipment, Emission limits at chimney level, Types of noise (Steady state noise – Impulse noise), Noise | 6 |

| | | |
|---|---|---|
| | measurement , Control of noise pollution, methods of reducing noise and vibrations, Shape noise levels in decibels. | |
| **7** | **Reducing Effluent Load:**<br>Water and Chemical Recovery and Reuse, Wastewater Treatment & application of the concept of 3 R's –Reduce, Reuse & Recycle, Means to reduce effluent load by modification in machine, alternative chemicals and process sequence such as: use of biotechnology in pretreatments, electrolytic reduction of vat and sulphur dyes, Supercritical CO2 and Ultrasound assisted dyeing, use of natural dyes, Printing thickeners and auxiliaries, Use of Plasma and Nano technology, Solid Waste Management, Zero Discharge options. | **6** |

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

| **Distribution of Theory Marks** | | | | | |
|---|---|---|---|---|---|
| **R Level** | **U Level** | **A Level** | **N Level** | **E Level** | **C Level** |
| 20 | 20 | 05 | 05 | 05 | 05 |

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:**

| Sr. no. | Title of book /article | Author(s) | Publisher and details like ISBN | Year of publication | Publication Edition |
|---|---|---|---|---|---|
| 1. | Treatment of Textile Processing Effluents | N. Manivasakam | Chemical Publishing Co Inc.,U.S.; ISBN: 9780820601755 | 2013 | 1st edition |
| 2 | Wastewater Treatment for Pollution Control and Reuse | Shyam. R. Asolekar, Soli. J. Arceivala | McGraw-Hill Professional; ISBN- 9780070620995 | 2006 | 3rd |
| 3 | Environmental chemistry of dyes and pigment | Reife, A., and Freeman, H.S., (Ed). | Wiley., London, ISBN: 047158276. | 2000 | |
| 4 | Environment Pollution control Engineering, | Rao, C.S. | New age International Ltd. and Publishers, N.Delhi | 2004 | |
| 5 | Advances in Treating Textile Effluent | Edited by Peter J. Hauser | InTech, ISBN 9789533077048 | | |

**Course Outcomes:**

| Sr. No. | CO statement | Marks % weightage |
|---|---|---|
| CO-1 | Explain the sources, causes and environmental impact of different types of pollutions caused by the textile industry. | 12 |
| CO-2 | Characterise and identify different types and parameters of textile effluents and compare the same with the standards. | 20 |
| CO-3 | Describe the various methods for treatment of effluent. | 40 |
| CO-4 | Describe the various means to control air and noise pollution in the textile industry. | 12 |
| CO-5 | Describe the various means of reducing the effluent load due to processing in the textile industry. | 12 |

Mapping with POs:

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O1 | PS O2 | PS O3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 1 | 1 | 1 | 2 | 3 | 3 | 3 |
| CO-2 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 1 | 1 | 1 | 2 | 3 | 3 | 3 |
| CO-3 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 1 | 1 | 1 | 2 | 3 | 3 | 3 |
| CO-4 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 1 | 1 | 1 | 2 | 3 | 3 | 3 |
| CO-5 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 1 | 1 | 1 | 2 | 3 | 3 | 3 |
| Rationale* | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 1 | 1 | 1 | 2 | 3 | 3 | 3 |

Rationale*: Explaining why it is matching this particular program outcome

The knowledge of the sources, causes and environmental aspects, different types, parameters as well as treatment and reduction of the textile effluent leads to the achievement of the various PO.

**List of Open learning website:** https://nptel.ac.in, World Wide Web, Google Search Engine etc.

**FOR LAB SESSIONS:**

**List of Experiments:**

1. To determine pH of given unknown solution.
2. To determine Total dissolved solids (TDS) of given sample.
3. To determine Total suspended solids (TSS) of given sample.
4. To determine Suspended solids of given sample.
5. To determine Settleable solids of given sample.
6. Determination of Thermal Conductivity of a given sample by conductivity meter.
7. To determine Chemical Oxygen Demand (COD) of biochemical oxidisable matter.
8. To determine Biochemical Oxygen Demand (BOD) of sample by Winkler method.
9. Determination of Sulphate as SO4 in given sample.
10. Determination of Copper in given sample.
11. Determination of Zinc in given sample.
12. Determination of Phosphate in given sample.
13. Determination of Iron in given sample.
14. Determination of Total nitrogen Kjeldhal NTK or NK in given sample.
15. Complexometric method to estimate hardness of given effluent sample.
16. Determination of Oil & Grease in given sample.
17. Report of visit to any ETP.

**Major Equipment Needed:** Colorimeter, pH meter, Conductivity meter, spectrophotometer, separating flask, etc.