### 3. Third Semester:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Code</th>
<th>Board of Studies</th>
<th>Subject</th>
<th>Periods per week</th>
<th>Scheme of Exam</th>
<th>Total</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
<td>ESE</td>
</tr>
<tr>
<td>1</td>
<td>653311(53)</td>
<td>Environmental Science &amp; Engg.</td>
<td>Environmental Policies and Legislations</td>
<td>4</td>
<td>2</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>653312 (53)</td>
<td>Environmental Science &amp; Engg.</td>
<td>Science &amp; Engineering of Water Pollution Control</td>
<td>4</td>
<td>2</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>Refer Table –I</td>
<td></td>
<td>Elective – I</td>
<td>4</td>
<td>2</td>
<td>-</td>
<td>100</td>
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<tr>
<td>4</td>
<td>653321 (53)</td>
<td>Environmental Science &amp; Engg.</td>
<td>Science &amp; Engineering of Water Pollution Control Lab</td>
<td>-</td>
<td>-</td>
<td>6</td>
<td>100</td>
</tr>
</tbody>
</table>

**Total 12 6 6 400 140 60 600 18**

L = Lecture, T = Tutorial, P = Practical or Term Work

Each period of 50 minutes, with 4 periods per day (6 to 9.20 PM) for six days in a week

### Table - I

#### Elective - I

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Code</th>
<th>Board of Studies</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>653331 (53)</td>
<td>Environmental Science &amp; Engg</td>
<td>Applied Statistics for Environmental Engineers</td>
</tr>
<tr>
<td>2</td>
<td>653332 (53)</td>
<td>Environmental Science &amp; Engg</td>
<td>Energy and Environment</td>
</tr>
<tr>
<td>3</td>
<td>653333 (53)</td>
<td>Environmental Science &amp; Engg</td>
<td>Groundwater Contamination and Pollution Transport</td>
</tr>
<tr>
<td>4</td>
<td>653334 (53)</td>
<td>Environmental Science &amp; Engg</td>
<td>Environmental Auditing &amp; EMS</td>
</tr>
</tbody>
</table>

**Note (1)**

1/4th of total strength of students subject to minimum of twenty students is required to offer an elective in the college in a particular academic session

**Note (2)**

Choice of an elective course once made for an examination cannot be changed in future examinations.
Chhattisgarh Swami Vivekanand Technical University, Bhilai (C. G.)

Semester:        M.E. III Sem.          Subject:  Environmental Policies and Legislations
Total Theory Periods: 50         Specialization: Environmental Science & Engg.
Total Marks in End Semester Exam: 100          Code: 653311 (53)
Minimum number of class tests to be conducted: 02   Total Tutorial Periods: 28

Unit-1  Introduction: Role of national, international, and UN agencies in dealing with the environmental aspects. Standards and setting criteria.


Unit–V  Related Issues: Principles of sustainable development and implications of finite biosphere and complexities for engineering design and decision-making. Design of controlled environments to enhance health and protection of natural resources for sustainable development. Resource problems and design with ecological, economic, demographic and social dimensions. Techniques to integrate knowledge and define policy.

TEXT


REFERENCE

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C. G.)

Semester: M.E. III Sem.  Subject: Science & Engineering of Water Pollution Control
Total Theory Periods: 50  Specialization: Environmental Science & Engg.
Total Marks in End Semester Exam: 100  Code: 653312 (53)
Minimum number of class tests to be conducted: 02  Total Tutorial Periods: 28


Unit-II  Water Quality Monitoring: Mineral analysis, Demand analysis, and Nutrient analysis, metal analysis, organic analysis.

Unit-III  Microbiological Examination: Rapid detection method. Heterotopic plate count. Multiple tube fermentation technique, Membrane filters technique.

Unit-IV  Microbiological Examination: Biological treatment of water pollution, Equalization: Volume requirement and effect of BOD mass loading rate, Coagulation does and aggregation Kinetics, Sedimentation: setting analysis, infiltration: Head Loss, Chlorination, water and wastewater adsorption.

Unit-V  Related Chemistry: Equilibrium and Kinetics, Aeration, Ion exchange Activated sludge: Rate of Substrate utilization rate, sludge growth rate, oxygen uptake rate and kinetics.

Text


REFERENCE

Unit – I
**EMPIRICAL STATISTICS:** Measures of Central tendency, dispersion, skewness and kurtosis - Principle of least squares - Correlation and regression - rank correlation.

Unit – II
**SAMPLING DISTRIBUTIONS AND ESTIMATION:** Sampling distributions - Point and interval estimates for population proportions, mean and variance - Maximum likelihood estimate method - Method of moments.

Unit – III
**TESTING OF HYPOTHESIS:** Sampling distributions - Tests based on Normal, t, Chi-square and F distributions - Analysis of variance – oneway and two-way classifications.

Unit – IV
**DESIGN OF EXPERIMENTS:** Completely randomized design - Randomized block design - Latin square design - 2 power 2 factorial design.

Unit – V
**LINEAR PROGRAMMING:** Basic concepts - Graphical and Simplex methods - Transportation problem - Assignment Problem.

**Text Books:**

**Reference Books:**
Chhattisgarh Swami Vivekanand Technical University, Bhilai (C. G.)

Semester: M.E. III Sem.                     Subject: Energy and Environment
Total Theory Periods:50                      Specialization : Environmental Science & Engg.
Total Marks in End Semester Exam: 100       Code: 653332 (53)
Minimum number of class tests to be conducted: 02  Total Tutorial Periods: 28

Unit – I  **Energy Conversions** : Principles of energy conversion methods: Thermal nuclear, hydro solar Energy

Unit – II  **Fuels** : Introduction to fuels, combustion fundamentals, thermodynamics of combustion rates and properties of combustion products.

Unit – III  **Pollutants in the Energy Sector** : Formation of pollutants, measurement and controls; Physical phenomena governing the transport of contaminants in different environments: advection, dispersion, diffusion, sorption, ion exchange, precipitation, dissolution, volatilisation, equilibrium partitioning of contaminants amongst air, water, soil, sediments and biota.

Unit- IV  **Automobile Pollutants** : Fundamental of engine processes, sources of emissions from automobiles, effects of operating and design parameters on emissions; Exhaust emissions test, procedures standards and legislation;

Unit – V  **Related Issues** : Combustion in stationary sources, power production, cogeneration. Alternative energy sources utilization, economics, environmental impacts and management.

**TEXT**


**REFERENCE**

Unit – I

Unit – II
Hydrologic Cycle And Flownet: Flow nets-Graphical construction-Flow nets by numerical simulation, steady state Regional Ground water Flow-Steady state hydrologic-budgets-Fluctuations in ground water levels.

Unit – III

UNIT – IV

Unit – V

Text Books:
**Unit – I**

Concepts of Environmental Audit, Objectives of audit. Types of audits, Features of effective auditing, Programme Planning, Organisation of auditing programme, Pre-visit data collection, Audit protocol, Onsite audit, Data Sampling: Inspections, Evaluation and presentation, Exit interview.

**Unit – II**


**UNIT – III**


**Unit – IV**

Principles and elements of successful environmental management: Leadership, Environmental management planning, Implementing an environmental management system, Measurement and evaluations required for an environmental management system, Environmental management reviews and improvements.

**Unit – V**

Legal and regulatory concerns. Integrating ISO 9000 and ISO 14000.

**Text Books:**


**Reference Books:**

List of Experiments to be conducted:

1. Use of water test kits for the determination of various water pollution parameters
2. To measure common parameters using Ion Selective Methods
3. To measure common parameters using other conventional methods
4. Analysis of water quality
5. Analysis of water samples for metals using AA Spectrometer
6. Analysis of Phosphate by using ascorbic acid method
7. Field visit to an analytical laboratory
8. Field visit to a water treatment plant
9. Field visit to a wastewater treatment plant
10. Preparation of project report of the filed visit
11. Delivering a seminar on field visit

TEXT


List of Equipments:
Fully equipped chemical analysis laboratory with relevant Instruments reagents, Calibration and Standardization facility, pH Meter, Conductivity meter, ORP Meter, DO Meter, Temperature meter, Ion meter, ISE Electrodes, AA Meter, Light intensity meter, Biodisc etc.