**5-**

| Course Title: **Environmental Science** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Semester** | **I/II** | **Teaching Scheme** | | | | **Evaluation Scheme** | | | | |
| | | | | | | **Theory** | | | | |
| Term | Odd/Even | Th. | Tu. | Pr. | Credits | IA (IA1, 2, 3, 4) | CAT1 & CAT 2, CAT3 | CAT3 (Activity based evaluation) | | |
| Course Category | Basic | 2 hr | NA. | 0 | 0 | 20 | 30 | | | |
| Course Code | BBSUCT1004 | | | | | | | | | |
| Teaching Mode | Offline/Online | 2 hrs | | | Total | 50 | | | | |
| Duration of End Term Exam | 2 hrs | | | | | | | | | |

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|---|---|
| Course Objectives | Demonstrate various methods of water treatment for domestic and industrial purpose. |
| | Explanation of different types of batteries and its commercial applications |
| | Demonstration and familiarization of impact of waste on environmental degradation. |
| Course Outcomes | Upon successful completion of this course, student will be able to: |
| | **CO1:** Understand various methods of water treatment for domestic and industrial use |
| | **CO2:** Differentiate various categories of waste and its disposal techniques |
| | **CO3:** Identify various batteries and recognize its commercial applications |
| | **CO4:** Understand different tools of Green Chemistry towards generating a zero waste environment |
| | **CO5:** Apply the knowledge of environmental pollution and degradation to solve related problems |

**Mapping of Course Outcomes with Program Outcomes:**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1 | **1** | | | | | | **2** | | | | | **1** |
| CO2 | **1** | | | | | | **3** | | | | | **1** |
| CO3 | **1** | | | | | | **2** | | | | | **1** |
| CO4 | **1** | | | | | | **2** | | | | | **1** |
| CO5 | **1** | | | | | | **3** | | | **3** | **3** | **1** |

**Course Contents:**

| Unit | Contents | Hours |
|---|---|---|
| I | **Water Technology:** Purification of Domestic water, Boiler troubles, softening methods of industrial water. | 6 |

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|---|---|---|
| II | **Solid Waste Management and treatment Technology:** Introduction to E-Waste, Biomedical waste and Solid waste. Treatment: Collection, segregation, transportation and its disposal techniques | 4 |
| III | **Battery Technology & Sustainable Energy Sources:** Introduction to Battery, reversible and irreversible batteries. Examples: Lead-acid battery, Nickel-Cadmium Battery, Lithium ion battery and fuel cell<br>Conventional and Non-Conventional sources - Hydro Electric, Fossil Fuel based, Nuclear, Solar, Biomass and Geothermal energy and Bio-gas. | 4 |
| IV | **Green Chemistry**<br>Introduction, Basic principles of green technology, concept of Atom economy, Tools of Green technology, zero waste technology. | 4 |
| V | **Environmental Pollution & Current Environmental Issues:** Air pollution- Urban air quality standards as per WHO, its sources and controlling methods. Water pollution- water quality index as per WHO, its sources and controlling methods, Climate Change and Global warming: Effects, Acid Rain, Ozone Layer depletion, Photochemical Smog, | 4 |

**Suggest Teaching-Learning Materials:**

| | | |
|---|---|---|
| Text Books | 1. | Text Book of Engineering Chemistry, S. S. Dara, S. Chand & company,2013, 11th Edition |
| | 2. | Engineering Chemistry, Jain &Jain, Dhanpatrai&Dhanpatrai,2015, sixteenth edition |
| | 3. | A Test Book of Environmental Chemistry & Pollution Control, S.S. Dara, S. Chand & Co., 2006, 11th edition |
| | 4 | Environmental Studies, Ranu Gadi, Sunita Rattan, Sushmita Mohapatra, S.K. Kataria and Sons, 2008, ISBN: 81-89757-98-9. |
| E books | 1 | Water purification, Alexandru Grumezescu, First edition |
| | 2 | Solid waste management by Stephen Burnley, Willey publication,2014 |
| | 3 | Air Pollution, S. K. Agarwal, APH Publishing, 2005 |
| Reference Books | 1. | Environmental Chemistry, B.K. Sharma & H. Kaur, Goel Publishing House,2014, 14th edition |
| | 2. | Environmental Studies, R. Rajgopalan, Oxford Publication,2016, 3rd edition |
| | 3. | Environmental Studies , Benny Joseph , Tata McGraw Hill Education Private Limited, 2009, ISBN: 987-0-07-064813-5. |
| Online TL Material | 1 | Introduction to Household Water Treatment and Safe Storage,https://www.coursera.org/learn/water-treatment/home/welcome |
| | 2. | Electronic waste Management-Issues and challenges by Dr. Brajesh Kumar Dubey, http://nptel.ac.in/courses/120108005/ |
| | 3 | Integrated Waste Management for a Smart City, https://onlinecourses.nptel.ac.in/noc19_ce31/course |
| | 4 | Air pollution-Global threat to our Health https://www.coursera.org/learn/air-pollution-health-threat/home/welcome |