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| **Walchand College of Engineering, Sangli**  *(Government Aided Autonomous Institute)* | | | | | | | | | |
| **AY 2022-23** | | | | | | | | | |
| **Course Information** | | | | | | | | | |
| **Programme** | | | | B. Tech. (Other than Civil Engg.) | | | | | |
| **Class, Semester** | | | | Third Year, Semester II | | | | | |
| **Course Code** | | | | 6OE309 | | | | | |
| **Course Name** | | | | Open Elective 2: Solid Waste Management | | | | | |
| **Desired Requisites:** | | | |  | | | | | |
|  | | | | | | | | | |
| **Teaching Scheme** | | | | **Examination Scheme (Marks)** | | | | | |
| **Lecture** | | | 3 Hrs./week | **ISE** | **MSE** | **ESE** | **Total** | | |
| **Tutorial** | | | - | 20 | 30 | 50 | 100 | | |
| **Practical** | | | - |  | | | | | |
| **Interaction** | | | - | **Credits: 3** | | | | | |
|  | | | | | | | | | |
| **Course Objectives** | | | | | | | | | |
| **1** | Provide knowledge on functional elements, rules and Government initiatives for SWM. | | | | | | | | |
| **2** | Provide knowledge about different waste processing and disposal methods. | | | | | | | | |
| **Course Outcomes (CO) with Bloom’s Taxonomy Level** | | | | | | | | | |
| **CO1** | ***Explain*** fundamental elements of SWM and associated rules and government initiatives regarding solid waste disposal. | | | | | | | Understand | |
| **CO2** | ***Identify*** proper method of collection, transportation, and processing of Solid Waste. | | | | | | | Analyse | |
|  | | | | | | | | | |
| **Module** | | **Module Contents** | | | | | | | **Hours** |
| I | | **Fundamentals of Solid Waste Management**  Sources, Types, Composition, Physical, Chemical and Biological properties. Impact of solid waste on environment, Solid waste management hierarchy, Factors affecting solid waste generation rate. | | | | | | | 7 |
| II | | **Storage, Collection and Transportation of Municipal Solid Waste**  Storage and collection: General considerations for waste storage at source, Collection components, Types of collection systems and its design, Transportation of solid waste: Means and methods, Routing of vehicles. | | | | | | | 7 |
| III | | **Waste Processing techniques & Material recovery**  Waste Processing Techniques: Purpose, Mechanical volume and size reduction, component separation techniques.  Material recovery and recycling: Objectives, recycling program elements,  commonly recycled materials and processes, energy recovery from solid waste | | | | | | | 7 |
| IV | | **Thermal Processing**  Fundamentals of thermal processing, combustion, effects of combustion, pyrolysis, incineration, refuse derived fuels, energy recover | | | | | | | 7 |
| V | | **Biochemical Processes**  Factors affecting, properties, benefits, aerobic and anaerobic digestion, composting, vermi-composting and other biochemical processes | | | | | | | 5 |
| VI | | **Landfills and solid waste management rules**  Landfills: Site selection, Types, Processes, Land filling methods, Leachate and landfill gas management, Waste Management legislation in India, Solid waste management and handling rule 2016 | | | | | | | 7 |
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| **Text Books** | | | | | | | | | |
| 1 | | Bhide. A. D. and Sundaresan. B. B., “Solid Waste Management”, Indian National Scientific Documentation Centre, 1st Edition, 1983. | | | | | | | |
| 2 | | CPHEEO, "Manual on Municipal Solid waste management”, Central Public Health and Environmental Engineering Organization, Government of India, New Delhi, 2000 | | | | | | | |
| 3 | | Tchobanoglous G., “Integrated Solid Waste Management”, Tata McGraw-Hill Publishing Company Limited, 1st Edition, 1993. | | | | | | | |
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| **References** | | | | | | | | | |
| 1 | | Vesilind, Worrell and Reinhart, “Solid Waste Engineering”, Cengage Learning India Pvt. Ltd., | | | | | | | |
| 2 | | Masters G., “Introduction to Environmental Engineering and Science”, Pearson Education, 2004 | | | | | | | |
| 3 | | Peavy, Rowe and Tchobanoglous, “Environmental Engineering”, Tata McGraw-Hill Publishing Company Limited, 1st Edition, 1985. | | | | | | | |
| 4 | | “SWM Rules 2016”, Swachh Bharat Mission and Smart Cities Program of India. | | | | | | | |
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| **Useful Links** | | | | | | | | | |
| 1 | | https://www.youtube.com/channel/UCCDzHkpuIuD1ZC0wsCXUuPQ | | | | | | | |
| 2 | | <https://www.youtube.com/watch?v=STcFSthSJWo&list=PL3MO67NH2XxIYo>UFN8csPPnEiYVyR0TO | | | | | | | |
| 3 | | <https://www.youtube.com/watch?v=ri9Op5vQfA&list=PLL9jm6CAGn2Uz>ZZfZzSycEANAQUkc5E\_e | | | | | | | |

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| **CO-PO Mapping** | | | | | | | | | | | | | | |
|  | **Programme Outcomes (PO)** | | | | | | | | | | | | **PSO** | |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| **CO1** | 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **CO2** |  | 2 |  |  |  |  |  |  |  |  |  |  | 1 |  |

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| **Assessment** |
| The assessment is based on 1 in-semester evaluations (ISE) of 20 marks, 1 mid-semester examination (MSE) of 30 marks and 1 end-semester examination (ESE) of 50 marks.  MSE is based on the modules taught till MSE (typically Module 1-3) and ESE is based on all modules with 30-40% weightage on modules before MSE and 60-70% weightage on modules after MSE. |