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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:** |  |
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| **Teaching Scheme** | **Examination Scheme (Marks)** |
| **Lecture** | 3 Hrs./week | **ISE** | **MSE** | **ESE** | **Total** |
| **Tutorial** | - | 20 | 30 | 50 | 100 |
| **Practical** | - |  |
| **Interaction** | - | **Credits: 3** |
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| **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 |
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| **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.  |