Programme	B.Sc. (Hons) Agriculture (Major: Soil Science)	Course Code	SS-403	Credit Hours	3(3-0)
Course Title	**MUNICIPAL AND AGRO WASTE MANAGEMENT**				

Course Introduction

Knowledge regarding the types and extent of municipal and agro wastes generation and their transformation into useful products is given due consideration. The students should be able to utilize the knowledge attained for the conversion of waste material into useful products.

1. Learning Outcomes

2. Understand the different sources, types, and compositions of municipal and agro-based waste.
3. Comprehend the nature of waste water and the various treatment methods used to manage it effectively.
4. Gain knowledge of traditional and modern methods, as well as technologies used in solid waste management.
5. Learn the processes and benefits of utilizing municipal waste as organic fertilizer and soil conditioner.
6. Understand the methods of producing energy from municipal waste.
7. Gain hands-on experience in waste management techniques.
8. Apply knowledge of waste utilization in practical scenarios, such as the production of organic fertilizers and energy.

Course Content (Theory)		Assignments/Readings
Week 1	**Unit 1** 1. Municipal and agro based waste: sources, types and composition 1.1.1. Overview of course content and objectives 1.1.2. Introduction to municipal and agro-based waste: definitions and significance	
Week 2	1.1.3. Sources, Types, and Composition of Municipal Waste	**Reading**: "Waste Management Practices:

	1.1.4. Identification of sources of municipal waste	Municipal, Hazardous, and Industrial" by John Pichtel (Chapters 1 & 2)
Week 3	1.1.5. Types and composition of municipal waste 1.1.6. Sources, Types, and Composition of Agro-Based Waste	
Week 4	1.1.7. Identification of sources of agro-based waste 1.1.8. Types and composition of agro-based waste	
Week 5	**Unit 2** 2.1. Nature and management of waste water 2.1.1. Characteristics of waste water 2.1.2. Waste water treatment processes and technologies	Write a report detailing the sources, types, and composition of municipal waste in your local area. Include statistics and local waste management practices.
Week 6	2.1.3. Advanced waste water treatment techniques 2.1.4. Case studies of effective waste water management	
Week 7	**Unit 3** 3.1. Solid waste management and role of community 3.1.1. Overview of solid waste management 3.1.2. Community involvement and awareness in waste management	
Week 8	**Unit 4** 4.1. Methods and Technologies in Solid Waste Management 4.1.1. Traditional and modern methods of solid waste management	Prepare a case study on a waste water treatment plant, describing the processes used and their effectiveness. Include diagrams and process flowcharts.

	4.1.2.Technological advancements in waste management	
Week 9	**Unit 5** 5.1. Utilization of municipal waste as organic fertilizer and soil conditioner 5.1.1. Benefits of using municipal waste as fertilizer 5.1.2. Processes involved in converting waste to fertilizer	
Week 10	5.1.3. Role of municipal waste in soil conditioning 5.1.4. Case studies and practical applications	
Week 11	**Unit 6** 6.1. Production of energy from municipal waste 6.1.1. Methods of energy production from waste	
Week 12	6.1.2. Technologies and innovations in waste-to-energy conversion	
Week 13	**Unit 7** 7.1. Ethical issues of municipal and agro based waste management 7.1.1. Ethical considerations in waste management practices 7.1.2. Environmental justice and equity issues	Write an argumentative essay on the ethical considerations of waste management practices. Discuss environmental justice, equity, and the impact on marginalized communities.
Week 14	**Unit 8** 8.1. International waste management strategies 8.1.1. Global approaches to waste management	
Week 15	8.1.2. Comparative analysis of waste management strategies in different countries	Compare and contrast waste management strategies in two different countries. Analyze the effectiveness of each

	8.1.3. Case studies of successful international waste management programs	approach and suggest improvements.
Week 16	Review of key concepts and topics covered in the course Student presentations on projects or research	

Textbooks and Reading Material

- Cheremisioff, N.P. 2002 Handbook of Solid Waste Management and Waste Minimization Technologies. Elsevier Science, Burlington, MA, USA.
- Dhamija, U. 2006. Sustainable Solid Waste Management: Issues, Policies, and Structures. Academic Foundation, New Delhi, India.
- Ghafoor, A. 2010. Environmental Pollution: Types, sources and management. Allied Book Centre, Lahore.
- Pepper, I.L., C.P. Gerba and M.L. Brusseu (eds.). 2006. Environmental and Pollution Science. 2nd Ed. Elsevier / Academic Press, San Diego, CA, USA.
- Pichtel, J. 2005. Waste Management Practices: Municipal, Hazardous and Industrial. CRC Press, Taylor and Francis Group, Boca Raton, FL, USA.
- Tchobanoglous, G., H. Theisen and S. Vigil. 1993. Integrated Solid Waste Management. Irwin McGraw-Hill. USA.

Teaching Learning Strategies

- Multimedia
- White Board
- Group discussion
- Quiz/Assignments
- Demonstration/Activity

Assignments: Types and Number with Calendar

1. Reading: "Waste Management Practices: Municipal, Hazardous, and Industrial" by John Pichtel (Chapters 1 & 2)
2. Write a report detailing the sources, types, and composition of municipal waste in your local area. Include statistics and local waste management practices.
3. Prepare a case study on a waste water treatment plant, describing the processes used and their effectiveness. Include diagrams and process flowcharts.
4. Write an argumentative essay on the ethical considerations of waste management practices. Discuss environmental justice, equity, and the impact on marginalized communities.
5. Compare and contrast waste management strategies in two different countries. Analyze the effectiveness of each approach and suggest improvements.

Assessment			
Sr. No.	Elements	Weightage	Details
•	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
•	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
•	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.