**SSL 3209 WASTE MANAGEMENT**

**Lecturers Dr. Alice Amoding-Katusabe (B.Sc. Agric., M.Sc. Agric (Soil Science), PhD)**

**Course Type**: **ELECTIVE (B.Sc. LUM)**

**1. COURSE STRUCTURE**

**Course Credits (CU)**: **2 CU i.e. 30 Contact Hours per semester**

**Course Duration**: **15 weeks (30 hours) i.e. 15 LH, 30 PH**

**COURSE DESCRIPTION**

Introduction to the concept of waste management. Definition of terms.Classification of wastes: By physical state, by origin. Type and characteristics of wastes. Municipal solid wastes and their management: Landfills, Sanitary landfill, Incineration plants, Industrial/hazardous wastes, Biomedical/Hospital wastes. Collection systems. Waste disposal methods and sites and impact assessment. Solid waste management: Segregation, Recycling and the recycling process, Agricultural wastes: Livestock wastes, Fertilizers, Pesticides. Introduction to waste treatment processes and return of treated wastes to the environment. Management of livestock manure, Composting: Definition of terms in composting, the composting procedure. Liquid wastes: Fundamentals of waste water treatment processes. Sewerage and waste water treatment. Other forms of wastes: Liquid manure, Petroleum products as wastes, Gaseous wastes, nuclear wastes. Ecological sanitation (ECOSAN): Definition of terms, Advantages of ECOSAN, Disadvantages of ECOSAN, Construction of ECOSAN, Operation and maintenance of ECOSAN. Climate change: Definition of terms. Opportunities for mitigating and adapting to climate change.

**2. COURSE OBJECTIVES**

**The overall objective**

Students will be able to acquire skills and knowledge regarding various aspects of waste management in relation to the management of the Environment.

**Thespecific objectives**

By the end of this course, the students will be able to:

1. Define relevant concepts related to waste management;
2. Identify and classify the various types of wastes
3. Gain thorough insights into how wastes are managed;

**3. RECOMMENDED REFERENCES FOR READING**

Brady, N. C. and Ray .R. Weil. The Nature and Properties and Soils. 14th edition. Pearson

 Education Ltd. Prentice Hall. 975 pages.

Calabrese, J. Kostecki., P.T. and Dragun. J. 2006. Contaminated Soils, Sediments and Water. Volume 10: Successes and Challenges. Springer link. 508 pages.

Handbook of Solid Waste Management. 2002. [George Tchobanoglous](http://mhprofessional.com/contributor.php?id=49346) and [Frank Kreith](http://mhprofessional.com/contributor.php?id=13683). 2nd Edition. ISBN 0071356231 / 9780071356237. UNIV OF CALIFORNIADAVIS.

McGraw-Hill. 950 pages.

Organic Resource Management in Kenya. Perspectives and Guidelines. Canon E.N. Savala, Musa N. Omare and Paul. L. Woomer. Forum for Organic Resource management and Agricultural Technologies. , Nairobi, Kenya. 184 pages.

Pollution Control and Waste Management in Developing Countries. 2000. [G. E. Ekosse](http://publications.thecommonwealth.org/g-e--ekosse-38-a.aspx), [Gotlop Y. Bogatsu,](http://publications.thecommonwealth.org/gotlop-y--bogatsu--39-a.aspx) [M. B. Darkoh](http://publications.thecommonwealth.org/m-b--darkoh-40-a.aspx), [O. Totolo](http://publications.thecommonwealth.org/o--totolo-41-a.aspx) and [Rogers W'O Okot-Uma](http://publications.thecommonwealth.org/rogers-w-o-okot-uma-33-a.aspx) (Eds) I**SBN No:**978-0-85092-557-9. 462 pages.

[Waste Management: A Reference Handbook (Contemporary World Issues)](http://www.amazon.com/Waste-Management-Reference-Handbook-Contemporary/dp/1598841505/ref%3Dsr_1_1?s=books&ie=UTF8&qid=1299143790&sr=1-1) 2008. [Jacqueline Vaughn](http://www.amazon.com/Jacqueline-Vaughn/e/B001IR19PY/ref%3Dsr_ntt_srch_lnk_1?qid=1299143790&sr=1-1). 111 pages.

**4. COURSE CONTENT, METHODS OF INSTRUCTION, TOOLS AND EQUIPMENT REQUIRED**

|  |  |  |  |
| --- | --- | --- | --- |
| **TOPIC** | **CONTENT** | **METHOD OF INSTRUCTION / Time allocated** | **TOOLS / EQUIPMENT NEEDED** |
| 1. Introduction | * Introduction to the concept of waste management
* Definition of terms
 | Interactive lectures (1 hr) | Chalk/BB or Markers/ Flip charts/LCD Projector |
| 2. Classification of wastes | Type and characteristics of wastes* By physical state
* By origin
* Municipal solid wastes
* Industrial/hazardous wastes
* Biomedical/Hospital wastes
* Agricultural wastes (Livestock wastes, Fertilizers, Pesticides)
 | Interactive lectures (3 hrs) | Chalk/BB or Markers/ Flip charts/LCD Projector |
| 3. Other forms of wastes | * Liquid manure
* Petroleum products as wastes
* Gaseous wastes
* Nuclear wastes
 | Interactive lectures (1 hr) | Chalk/BB or Markers/ Flip charts/LCD Projector |
| 4. Collection systems | Kerbside vs. Bring SystemsCollection Facilities – Skips, plastic bags, Refuse chutes, Depots/refuse banks | Interactive lectures (1 hr) | Chalk/BB or Markers/ Flip charts/LCD Projector |
| Test one |  | 1.5 hrs |  |
| 5. Waste disposal methods and sites and impact assessment | * Landfills
* Sanitary land fill
* Incineration plants
 | Interactive lectures (2 hrs). Field excursion (3 hrs) | Chalk/BB or Markers/ Flip charts/LCD ProjectorTransport |
| 6. Solid waste management | * Segregation
* Recycling and the recycling process
 | Interactive lectures (1 hr) | Chalk/BB or Markers/ Flip charts/LCD Projector |
| 7. Introduction to waste treatment processes and return of treated wastes to the environment  | * Management of livestock manure
* Composting
* Definition of terms in composting
* The composting procedure
 | Interactive lectures (2 hrs)Practical (6 hrs) | Chalk/BB or Markers/ Flip charts/LCD Projector |
| 8. Fundamentals of waste water treatment processes | * Sewerage and waste water treatment
 | Interactive lectures (1 hr)Field excursion (3 hrs) | Chalk/BB or Markers/ Flip charts/LCD ProjectorTransport |
|  Test two |  | 1.5 hrs |  |
| 8.Ecological sanitation (ECOSAN) | * Definition of terms
* Advantages of ECOSAN
* Disadvantages of ECOSAN
* Construction of ECOSAN
* Operation and maintenance of ECOSAN
 | Interactive lectures (2 hrs) Field excursion (3 hrs) | Chalk/BB or Markers/ Flip charts/LCD Projector |
| 9. Climatic change and Waste management | * Definition of terms
* Opportunities for mitigating and adapting to climate change
 | Interactive lectures (1 hr) | Chalk/BB or Markers/ Flip charts/LCD Projector |

**5. SUMMARY OF TIME NEEDED**

Interactive lectures covering theory 15 hrs

Class and station-based practicals 3 hrs

Field visits 9 hrs

Evaluation 3 hrs

**6. OVERALL COURSE EVALUATION**

Continuous Assessment Test 20%

Class practicals, Field work, Write-ups 20%

Final examination 60%