

GENERIC ELECTIVES (GE-EVS-8): E-WASTES: LEGISLATION, TRADE AND MANAGEMENT

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
E-WASTES: LEGISLATION, TRADE AND MANAGEMENT	4	2	0	2	Class XII pass	NA

Learning objectives

The Learning Objectives of this course are as follows:

- Define and explain e-waste and its category
- Learn effective mechanisms to regulate the generation, collection, storage, transport, import, and export,
- Empower with methods of recycling, treatment, and disposal of e-waste
- Current legislative rules for managing e-waste in the environment

Learning outcomes:

After the course, students will be able to

- Apply various concepts for e-waste management hierarchy with a holistic understanding of the environmental impacts of e-waste
- Decipher the roles of the various national and internal acts and laws applicable for e-waste management
- Evolve plans for handling e-waste to comply with its management proposed under national and global legislation
- Develop a holistic understanding of environmental impacts of e-waste, application of

SYLLABUS OF GE-EVS-8

Theory (02 Credits: 30 lectures)

UNIT – I E-waste Composition, Generation and Management (4 Weeks) (8 lectures)

Definition, Composition and generation, Global and national perspective, Co-pollutants, Hazardous properties, Effects on human health and environment, Domestic e-waste disposal, E-waste Management: Basic principles, Components, Resource recovery potential, Technologies for recovery of resources, Steps in recycling and recovery of materials-mechanical processing, Occupational and environmental health effects (8 Lectures)

UNIT – II Global trade of E-waste (3½ Weeks) (7 lectures)

Factors in global waste trade economy, Waste trading and electronic recycling, Free trade agreements as a means of waste trading. Import of hazardous e-waste in India; India's stand on liberalizing import rules, E-waste economy in the organized and unorganized sector, Production and recycling of e-wastes in Indian metro cities. (7 Lectures)

UNIT – III Control measures (3½ Weeks) (7 lectures)

Need for stringent health safeguards and environmental protection laws in India, Extended Producers Responsibility (EPR), Import of e-waste permissions, Producer-Public-Government cooperation, Administrative Controls & Engineering controls, monitoring of compliance of Rules, Effective regulatory mechanism strengthened by manpower and technical expertise, Reduction of waste at source
(7 Lectures)

UNIT – IV Relevant legislation (4 Weeks) (8 lectures)

Hazardous Waste Rules, 2008, E-waste (Management and Handling) Rules, 2011; and E-Waste (Management) Rules, 2016 - Salient Features and its likely implication. Government assistance for TSDFs. The international legislation: The Basel Convention; The Bamako Convention. The Rotterdam Convention. Waste Electrical and Electronic Equipment (WEEE) Directive in the European Union, Restrictions of Hazardous Substances (RoHS) Directive. (8 Lectures)

Teaching and learning interface for theoretical concepts

To achieve the course objectives and match with the contents, a wide range of teaching and learning tools will be employed, including (a) Formal lectures; (b) Interactive sessions using visual aid; (c) Case study analyses; (d) Hypothetical scenario building; (e) Group discussion on key topics; and (f) documentary screening and critical analyses.

Practicals/Hands-on Exercises – based on theory (02 Credits: 60 hours)

1. Prepare inventory and estimate the magnitude of electrical and electronic waste from the home, college, or the selected site (hospitals/company/manufacturing facilities) (example, air conditioners, heaters, microwaves, batteries, digital cameras, calculators, circuit boards, monitors, VCRs/DVD players, telephone equipment, etc.)
2. Categorize e-waste into different types as per international and national guidelines
3. Prepare a list of certified electronics recyclers in your city and transport e-waste to it, and have an interactive session to learn from the processes being followed.
4. Find out the composition of e-waste and segregate it from the given materials. Recommend the internationally acceptable shredding processes for each type of e-waste.
5. Prepare a poster showing salient features of the e-waste management act of India
6. Sort electronics and prepare a list of valuables that can be extracted from electronics, such as fluorescent light and toner cartridges (metals, plastics, glass,

- compounds, and other elements). Identify and remove e-waste that may carry hazardous materials (like cathode ray tubes) before sending the objects for recycling.
7. Visit a nearby e-waste handling facility and learn about the dismantling of e-waste and the handling process
 8. Discuss with students in groups the plausible ways and implementation of e-waste reduction at the source and how regulatory mechanisms can be utilized in the management of e-waste in educational institutions.
 9. Evaluate the status of e-waste handling at your institution. Suggest potential solutions as per the existing norms of E-Waste (Management) Rules, 2016 and beyond.
 10. Decipher the methods of dust extractions, magnetic and water separation, purification, and preparation for sale. Identify the material that can be repurposed.
 11. Study the evolutionary history of e-waste management rules and their implementation- Hazardous Waste Rules, 2008; E-waste (Management and Handling) Rules, 2011; and E-Waste (Management) Rules, 2016
 12. Compare and analyze international laws on e-waste management- the international legislations: The Basel Convention; The Bamako Convention; The Rotterdam Convention; Waste Electrical and Electronic Equipment (WEEE) Directive in the European Union; Restrictions of Hazardous Substances (RoHS) Directive
 13. Develop an understanding and itinerary of the process for procuring e-waste import permissions and inventory of the e-waste disposal mechanisms.

Teaching and learning interface for practical skills

To impart training on technical and analytical skills related to the course objectives, a wide range of learning methods will be used, including (a) laboratory practicals; (b) field-work exercises; (c) customized exercises based on available data; (d) survey analyses; and (e) developing case studies; (f) demonstration and critical analyses; and (h) experiential learning individually and collectively.

Essential/recommended readings

- Hester, R.E. and Harrison, R.M., 2009. Electronic Waste Management: Design, Analysis and Application. Royal Society of Chemistry Publishing. Cambridge, UK.
- Fowler, B.A., 2017. Electronic Waste: Toxicology and Public Health Issues. Academic Press.
- Eduljee, G.H. and Harrison, R.M. eds., 2019. Electronic Waste Management. Royal Society of Chemistry.

Suggested readings

- Janyasuthiwong, S., 2020. Metal Removal and Recovery from Mining Wastewater and E-waste Leachate. CRC Press.
- Gaidajis, G., Angelakoglou, K. and Aktsoglou, D., 2010. E-waste: environmental problems and current management. Journal of Engineering Science and Technology Review, 3(1), pp.193-199.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.