**Vision of the institute**

Development of academically excellent, culturally vibrant, socially responsible and globally competent human resources.

**Mission of the institute**

To keep pace with advancements in knowledge and make the students competitive and capable at the global level.

To create an environment for the students to acquire the right physical, intellectual, emotional and moral foundations to shine as torch bearer of tomorrow’s society.

To strive to attain ever-higher benchmarks of educational excellence.

**Vision of the Department**

The department will be recognised for its value based teaching, associated activities pertaining to research and entrepreneurship.

**Mission of the Department**

* To provide quality education through faculty and state of art infrastructure
* To identify the current problems in society pertaining to Civil Engineering disciplines and to address them effectively and efficiently
* To inculcate the habit of research and entrepreneurship in our graduates to address current infrastructure needs of society

**PEO’s**

**Graduates who complete their UG through our institute will be,**

**PEO 1**- Engaged in professional practices, such as construction, environmental, geotechnical, structural, transportation, water resource engineering by using technical, communication and management skills.

**PEO 2**- Engaged in higher studies and research activities in various civil engineering fields and life time commitment to learn ever changing technologies to satisfy increasing demand of sustainable infrastructural facilities.

**PEO 3**- Serve in a leadership position in any professional or community organization or local or state engineering board

**PEO 4**- Registered as professional engineer or developed a strong ability leading to professional licensure being an entrepreneur.

**PSO’s**

**PSO 1** – To apply science, mathematics and mechanics to solve problems in engineering realm

**PSO 2** – To analyse the techniques, skills and modern engineering tools necessary for engineering practices

**PSO 3** – To develop ability to function as a leader and a team player in multidisciplinary teams

**PSO 4** – To recognize of the need for and an ability to engage in research and life-long learning for developing sustainable construction practices

**PSO 5** – To design and conduct experiments as well as to analyse and interpret data

**Unit – 8**

**Recycle and Reuse**

**Structure**

8.0 Introduction

8.1 Objectives

8.2 Reuse and recycling of solid waste material

8.3 Re-use and recycling of paper, plastic and glass

8.4 Assignment questions

8.5 Outcomes

8.6 Further Reading

**8.0 Introduction**

Recycling involves the collection of used and discarded materials processing these materials and making them into new products. It reduces the amount of waste that is thrown into the community dustbins thereby making the environment cleaner and the air fresher to breathe.

**8.1 Objectives**

1. Explain the processing of recycling techniques
2. Discuss the need for recycling
3. Assess technical viability of various recycle processing techniques.

**8.2 Reuse and recycling of solid waste material**

Reduction: Reduction in generation, reduction in amount of material, increase lifetime, or eliminate the need Recycle - used, reused, or reclaimed, use of the material as a source raw material, involves physical transformation Reused: The direct use or reuse of a secondary material without prior reclamation Reclaimed: regeneration of wastes or recovery of usable materials from wastes (e.g., regenerating spent solvents in a solvent still). Wastes are regenerated when they are processed to remove contaminants in a way that restores them to their usable condition materials that must be reclaimed/recycled prior to use or reuse Recovery - Process to recover useful material from mixed waste (energy is an example) Materials are solid wastes (and potentially hazardous waste) if they are recycled in the following ways: Used in a manner constituting disposal - Directly placing wastes or products containing wastes on the land is considered to be use constituting disposal.

– If, however, direct placement on the land is consistent with its normal use (e.g., pesticides), then the material is not regulated as a solid waste.

– For example, heptachlor can potentially be a P-listed waste. This pesticide is not regulated as a solid waste, however, when it is used as a pesticide.

Burned for energy recovery Reclaimed (with some exceptions) - materials that must be reclaimed/ recycled prior to use or reuse Accumulated speculatively Materials that are not solid waste (and therefore not hazardous wastes) when recycled: (i) Used or reused as ingredients in an industrial process to make a product, provided the materials are not being reclaimed; or (ii) Used or reused as effective substitutes for commercial products; or Returned to the original process from which they are generated, without first being reclaimed or land disposed

**8.3 Re-use and recycling of paper, plastic and glass**

Paper Recycling

 ~ 50% of consumed material and growing

 Goal 55% by 2012

 Strong markets for old corrugated cardboard (OCC) and newsprint (ONP)

 Expanding domestic and international demand

 Office paper lower demand

 Expanding economy – increased steel demands; China and India biggest markets

 36.4% of steel is recycled

 Use of plastic for automobiles is a problem

 One ton steel recycled saves 2500 lb of iron ore, 1000 lb of coal, 40 lb of limestone, and significant energy savings

Glass Recycling

 Glass always lags other recyclables

 Alternative markets needed – grind for construction fill, “glassphalt,” fiberglass

 Transportation of heavy glass is expensive

 Raw materials are inexpensive

 Contamination is an issue

 Reuse used to be common practice; however as manufacturing plants became larger and decreased in number, bottles had to be carried further for refilling.

 More colored glass is imported than used domestically

Plastic Recycling

– Light weight, bulky, low density

– Wide variety of polymers

– Concerns over contamination for reuse

– Difficult to differentiate among types

– PET and HDPE have high prices due to domestic and international demand

– Curbside recycling is down, driving prices up

**8.4 Recommended Questions**

1. Describe the reuse and recycling of solid waste material
2. Explain re-use and recycling of paper, plastic and glass

**8.5 Outcomes**

1. Materials and resource recovery/recycling, transport
2. Identify recycling and reuse options

**8.6 Further Reading**

1. https://www.ppd.ufl.edu/departments/refuse.shtml
2. https://recycling.arlingtonva.us/solid-waste-management-plan/
3. https://www.wm.com/location/california/san-diego/city/environment/index.jsp