



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3171406

Semester – VII

Subject Name: By- Product Utilization and Management

Type of Course Professional Elective Course

Prerequisite

Nil

Rational:

- By-product utilization is the study of food industry waste utilization for preparing by products
- Management of waste material is treatment of waste to safely dispose the waste materials.
- It includes study of food waste generation, their characteristics and requirements of disposal.
- Case studies of byproducts utilization.
- Food waste treatment methods.
- Legal and statutory requirement of waste disposal and handling.

Teaching Scheme & Examination Scheme

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		C	Theory Marks		Practical Marks	
					ES (E)	PA (M)	ESE (V)	PA (I)
3	0	2	4	70	30	30	20	150

Contents;

Sr No	TOPICS	Total Hrs
1.	Food industry By-products and Waste: Introduction, status in India, definition, origin and type of waste and by products, their identification, classification, composition and characterization, need for treatment and utilization, impact on environment, food wastes as source of biogenic raw material and energetic utilization	10
2.	Introduction to Food Waste Treatment: Basic unit operations, techniques & equipment for treatment, primary treatments like screening, sedimentation, skimming, floatation coagulation & flocculation, flow equalization, filtration, adsorption, chemical oxidation, membrane separation, ion exchange. Anaerobic & aerobic digestion of organic wastes, activated sludge process, biomass generation & its utilization.	10
3	Food Wastes and By-products Related to Specific Processing: Industries: Like fruit and vegetables (apple, orange, mango, potato etc.), dairy industry, oil and oil seeds industry, sugar industry, grains and milling industry, fermentation (alcohol and beer), livestock and poultry, fish, meat.	11
4.	Brief Case Studies: (i) utilization of whey from dairy industry, (ii) Utilization of specific plant by-products for recovery of proteins, pectins, dietary fibers, antioxidants, colorants etc. (iii) Utilization of biomass for production of animal feed, compost and bio-gas. Introduction to legal and statutory requirements for food waste handling, treatment and disposal.	11

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
30	20	30	10	10	

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)



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Reference Books

1. Waste Management for the Food Industries, by Ioannis S. Arvanitoyannis, First edition 2008, Elsevier Inc, USA.
2. Food and Agricultural Wastewater Utilization and Treatment, Sean X. Liu, First edition 2007 Blackwell Publishing, Iowa 50014, USA.
3. Managing Food Industry Waste, ROBERT R. ZALL, First edition, 2004, Blackwell Publishing Professional, Iowa, USA.
4. The Treatment and Handling of Waste by Bradshaw AD Chapman & Hali.
5. Alternative Strategies for the Treatment of Food Processing Waste by Rockey J.
6. Food Processing Waste Management by Green J.H. AVI Publication
7. Post harvest Technology of Fruits and Vegetables by L.R. Verma. Indus Pub.

Course Outcome

At the end of this module, the student will be able to:

- a. Identify various waste from food industries and understand their characteristics
- b. Understand various methods of waste treatment and disposal
- c. Understand various by products from food industry waste
- d. Design and develop a functional ETP plant to suit requirement.
- e. Understand legal aspects related to food waste disposal.

List of Practical

Sr. No.	Name of experiments
1.	Isolation of leaf protein from green I
2.	Isolation of leaf protein from green II
3.	Production of Banana fiber from banana pseudostem
4.	Production of ethyl alcohol from molasses I
5.	Production of ethyl alcohol from molasses II
6.	Isolation of starch from mango kernels.
7.	Extraction of pectin from fruit waste I
8.	Extraction of pectin from fruit waste II
9.	Extraction of oil from citrus peel I
10.	Extraction of oil from citrus peel II
11.	Production of cellulosic polymers from agricultural waste I

Major Equipments

1. Soxhlet apparatus
2. Centrifuge
3. Distillation Unit
4. PH Meter
5. Grinder

List of Open Source Software/learning website

- a. <http://www.fpeac.org/fruit/WasteMinimizationUtilization-BerryProcessing.pdf>
- b. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3614052/>
- c. http://foodseg.linux15.webhome.at/fileadmin/userdaten/pres_symp_I/symp1_pres_WG_4_Schreibgeschuetzt_.pdf