



## FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

**Programme:** Bachelor of Technology (Food Processing Technology)

**Semester:** VII

**Course Code:** 202070705

**Course Title:** Food By-Product Utilization and Management

**Course Group:** Professional Elective Course - III

**Course Objectives:** Apply knowledge of basic science and engineering to achieve food bio-waste utilization and management. Identify, formulate and design engineered solutions for bio-waste management problems to cater needs of society. Apply best waste management practices for securing ecologically sustainable development while promoting justifiable economic and social development.

### Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
3	0	2	4	50/18	50/17	25/9	25/9	150/53

\* J: Jury; V: Viva; P: Practical

### Detailed Syllabus:

Sr.	Contents	Hours
1	<b>Introduction:</b> Objectives, Types of wastes & their properties and characteristics.	07
2	<b>Food Processing Industry Wastes:</b> Waste generation from Fruits & Vegetables, Grains, Milk, & Oilseed processing. Need for waste treatment, Concept of organic pollution and impact on stream water quality.	09
3	<b>Food By-product Treatment and Management Techniques:</b> Primary treatment, processes of effluent, BOD and COD concept. Aerobic- activated sludge process, Trickle filter, Aerated lagoons, Waste stabilization ponds, and Anaerobic- Fluidized bed filters, Up-flow anaerobic sludge-blanket process (USABP) Fermentation, Biomass Availability, Liquid and Solid waste handling and up-gradation.	13
4	<b>Utilization of Food Wastes:</b> Energy production from waste, energy from Biomass Gasification, Biogas Plants.	07



5	<b>Waste Disposal and Management Regulations:</b> Indian Standards and Acts. Strategic waste management: Alignment with sustainable development.	07
	Total	45

**List of Practicals / Tutorials:**

1	Estimation of Residual Chlorine in a food bio-waste stream.
2	Determination of pH and conductivity of wastewater sample and illustration by an example to control pH of a waste water sample.
3	Estimation of Nitrogen (Different Forms like Ammonia, Nitrite, Nitrate) in food bio-waste.
4	Estimation of Solids (TDS, DS, TSS, VS), Acidity, Alkalinity, Hardness, Chlorides and Fluorides.
5	Determination of BOD <sub>5</sub> of a food waste water stream.
6	Determination of COD of a food waste water stream.
7	Evaluate the techniques and methods used in recovery of materials and energy from food bio-waste.
8	Design of Biogas plant - Estimate the amount of gas produced from the organic fraction of waste under anaerobic conditions. (Food bio-mass gasification plant).
9	To understand the operation and do practical calculations of different operating variables (MCRT, NHRT, MLVSS, BOD <sub>5</sub> , F/M Ratio etc.) of Aerobic Activated Sludge Process (AASP) plant for food-waste stabilization.
10	Design of composting plants- Estimate the oxygen requirements for the aerobic conversion of food bio- waste.

**Reference Books:**

1	Waste: A Handbook for Management, Letcher, T.M., Vallero, D.A. (2011), 1st Ed, Academic Press, USA.
2	The Treatment and Handling of Waste by Bradshaw AD Chapman & Hali
3	Alternative Strategies for the Treatment of Food Processing Waste by Rockey J.
4	Food Processing Waste Management by Green J.H. AVI Publications.
5	Post-Harvest Technology of Fruits and Vegetables by L.R. Verma. Indus Pub.
6	Bio-energy News by Ministry of Non-Conventional Energy Sources New Delhi.
7	Hygiene & sanitation in Food Industry, Roday S., Tata Mc Graw Hill, New Delhi.

**Supplementary learning Material:**

1	<a href="https://nptel.ac.in/content/storage2/courses/105106056/Introduction.pdf">https://nptel.ac.in/content/storage2/courses/105106056/Introduction.pdf</a> 2. <a href="https://nptel.ac.in/courses/105/103/105103205/">https://nptel.ac.in/courses/105/103/105103205/</a>
2	Standard methods for the examination of water and wastewater, 21st Edition, Washington: APHA., 2012
3	B. Kotaiah and Dr. N. Kumara Swamy, Environmental Engineering Laboratory Manual, Charotar Publishing House Pvt. Ltd., 1st Ed., 2007

**Pedagogy:**

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment



- Interactive methods
- Industrial/ Field visits
- Course Projects

#### Internal Evaluation:

The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

#### Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
15%	35%	20%	10%	10%	10%	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

#### Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Apply knowledge of basic sciences and engineering to understand and achieve food bio-waste management.	20
CO-2	Formulate and design engineered solutions for food bio- waste management problems.	20
CO-3	Apply best food bio-waste management practices for securing sustainable development of food industry.	24
CO-4	Design feasible solutions for bio-waste treatment, utilization and management which are legally, ethically, socially and economically acceptable.	17
CO-5	Plan bio-waste management strategies for tackling problems at local, regional and global scales.	19

#### Curriculum Revision:

Version:	2
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	
Next Review on (Month-Year):	June-2025