

- De Ávila, M. D. R., Cambero, M. I., Ordóñez, J. A., de la Hoz, L., & Herrero, A. M. (2014). Rheological behaviour of commercial cooked meat products evaluated by tensile test and texture profile analysis (TPA). *Meat science*, 98(2), 310-315.

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DISCIPLINE SPECIFIC ELECTIVE COURSE

DSE FT 09: FOOD PLANT DESIGN SANITATION

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITE OF THE COURSE

Course Title & Code	Credits	Credit Distribution of the Course			Eligibility Criteria	Pre-requisite of the Course
		Lecture	Tutorial	Practical/Practice		
Food Plant Design Sanitation DSE FT 09	4	2	0	2	Studied Semester VI	Nil

Learning objectives

- To study the principles and design of plant and processing equipment.
- To understand the concepts of food storage, warehousing and Cold chain Management.
- To develop comprehensive understanding of waste product handling, management, cleaning and sanitation processes.

Learning Outcomes

- To understand the principles and draw/design food processing plant and processing equipment.
- To get an understanding of warehousing and cold chain management used for storage and transportation of foods.
- To be able to develop waste management and sanitation schedules and designs for food industry and Effluent treatment plant.

SYLLABUS OF DSE FT 09

Theory
(Credits 2; Hours 30)

UNIT I Food Plant Layout and Design	8 Hours
<ul style="list-style-type: none"> General principles of food plant Design and layout , Principles of Site Location, Planning and selection. Types of layout, Construction materials and design principles, Illumination, Ventilation and Maintenance of food plant. Design of Food Service Areas. 	
UNIT II Processing Equipment Design	4 Hours
<ul style="list-style-type: none"> Design of food processing equipment : Size Reduction, Mixing, Extraction, Filtration, Centrifugation, Heat exchanger, Dryer, distillation and, Gas absorption equipment. 	
UNIT III Warehousing and Cold Chain Management	8 Hours
<ul style="list-style-type: none"> Food hygiene and safety in transportation, with a focus on warehouse storage and refrigerated ships- Safe food storage at shopping outlets: use of coolers/chillers/freezers. Scope of Cold Chain for enhancing marketing potentials of perishables in domestic and international markets. Principles of Cold Chain Creation and Management. Aerated, refrigerated and controlled atmospheric storage. Economics of warehouse storage. 	
UNIT IV Food Plant Hygiene and Sanitation	10 Hours
<ul style="list-style-type: none"> Waste disposal, Control methods using Physical and Chemical Agents, Pest and Rodent Control. Good Manufacturing Practices and Personal Hygiene. Detergents, Sanitizers. Sanitation Schedule, CIP, COP. Classification of waste: Wastewater and solid waste characterization. BOD, COD Waste water Treatment : Physical, Chemical, Biological, Aerobic, Anaerobic, Primary, Secondary and Tertiary (advanced) treatments. 	

PRACTICAL
(Credit 2; Hours 60)

1. Design and layout of food processing Plant (Dairy/ fruit and Vegetable/Bakery/Meat)
2. Design and layout of cold storage and warehouse.
3. Design of Food Processing Equipment.
4. Preparation of a sanitation schedule for food preparation area.
5. Testing of sanitizers and disinfectants.
6. Study of Phenol coefficient of sanitizers.
7. Determination of BOD (biological oxygen demand)/ COD in waste water.
8. Study of waste water treatment system/ETP.
9. Study of CIP Layout

Essential Readings

- Norman G. Marriott and Robert B. Gravani. (2006). Principles of Food Sanitation,5th edition
- Rao, D. G. (2010). Fundamentals of Food Engineering, PHI learning Private Ltd.

- Fellows P. (2000). Food Processing Technology, 2nd Edition. Woodhead Publishing Limited and CRC Press LLC
- James A (2013) The supply chain handbook, distribution group.
- Singh, R. P., & Heldman, D. R. (2014). Introduction to food engineering (5th ed.). Academic Press.

Suggested Readings

- Forsythe, S.J. and Hayes, P.R. (1998). Food Hygiene, Microbiology and HACCP. Gaitersburg, Maryland: Aspen.
- Hui, Y.H., Bruinsma, B., Gorham, R., Nip, W.-K. (2003). Food Plant Sanitation. New York: Marcel Dekker.
- Rees, N. and D. Watson. (2000). International Standards for Food Safety. Gaitersburg, Maryland: Aspen
- Saravacos, G. D., & Kostaropoulos, A. E. (2016). Handbook of food processing equipment (2nd ed.). Springer.
- Ghosh, P. (2015). Cold chain: Principles and practices. Tata McGraw-Hill.
- Fick, R. J. (2005). Environmental management of wastewater treatment plants. John Wiley & Sons

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