

Appendix-LXXIV
Resolution No. 18 [18-1(18-1-3)]

UNIVERSITY OF DELHI
Department of Home Science
Bachelor of Science in Food Technology
(SEMESTER - I)

based on

Undergraduate Curriculum Framework 2022 (UGCF)

(Effective from Academic Year 2022-23)



University of Delhi

DSC FT01 FUNDAMENTALS OF FOOD TECHNOLOGY
(Credits 3+1)

LEARNING OBJECTIVES:

1. To understand the basic principles of food science and technology.
2. To understand the structure, composition, nutritional value, changes during processing and storage of various plant and animal foods.

COURSE OUTCOMES:

1. Appreciate the principles of food science and technology.
2. Attain knowledge of the structure, composition, nutritional quality and post-harvest changes in various plant foods
3. Comprehend the structure and composition of various animal foods.
4. Understand the fundamentals of various plant and animal food processing.

Credit: 3+1Total Lecture (Nos): **45 hours****Course Coverage (in % of the total):**

Theory: 3 hours/ week

Practical/ Field work/Hands-on-learning: 2 hours/week

Unit I: Introduction to Food Science and Technology	(No. of lectures) 4
Unit II: Structure, Nutritional Composition and Technological aspects of Plant foods	(No. of lectures)
Unit Description: Cereals, Millets and Pulses	12
<i>Subtopics:</i>	
Introduction to cereals, nutri-cereals (millets), pseudo cereals.	
<ul style="list-style-type: none"> ● Wheat- Structure and composition, types of wheat, Diagrammatic representation of longitudinal structure of wheat grain. ● Malting, dextrinization, gelatinization, types of browning-Maillard & caramelization. ● Rice- types of rice, parboiling of rice- advantages and disadvantages. ● Pulses- Introduction to pulses and legumes. ● Naturally occurring toxic constituents in pulses, types of processing- soaking, germination, 	

decortication, cooking and fermentation.	
Unit III: Structure, Nutritional Composition and Technological aspects of Plant foods	(No. of lectures)
Unit Description: Edible Oils, Fruits and Vegetables	13
<p><i>Subtopics:</i></p> <p>Fats & Oils- Classification of lipids, saturated fatty acids, unsaturated fatty acids, essential fatty acids, trans fatty acids.</p> <ul style="list-style-type: none"> ● Refining of oils-different methods, hydrogenation ● Rancidity –Types- hydrolytic and oxidative rancidity and its prevention. <p>Fruits & Vegetables- Classification of fruits and vegetables, composition, pigments, types of fibre.</p> <ul style="list-style-type: none"> ● Enzymatic browning and its prevention, ● Post-harvest changes in fruits and vegetables – Climacteric and non-climacteric, ripening, physicochemical changes-physiological and horticultural maturity, pathological changes, during the storage of fruits and vegetables. 	
Unit IV: Nutritional Compositional and Technological aspects of Animal foods	(No. of lectures)
Unit Description: Flesh Foods - Meat, Fish, Poultry and Milk and Milk products	16
<p><i>Subtopics:</i></p> <ul style="list-style-type: none"> ● Meat – Definition of carcass, composition of meat, post-mortem changes in meat- rigor mortis, tenderization of meat, curing and ageing of meat. ● Fish - Classification and composition of fish, aquaculture, characteristics of fresh fish, Types of spoilage in fish- microbiological, physiological, biochemical. ● Poultry - Structure and composition of egg, egg proteins, characteristics of fresh egg, deterioration of egg quality. difference between broiler and layers. ● Milk & Milk Products- Definition of milk, composition of milk and types of market of milk, milk processing- homogenization, pasteurization. 	

PRACTICAL

DURATION: 30 HRS (CREDIT 1)

1. To study enzymatic browning in fruits & vegetables.
2. To study different types of non-enzymatic browning.
3. To study gelatinization behavior of various starches.
4. To study the concept of gluten formation of various flours.
5. To study germination.
6. To study dextrinization in foods.
7. To perform quality inspection of egg.

COMPULSORY READINGS

1. Bawa. A.S., Chauhan, O.P, Raju. P.S. (2013) ed. *Food Science*. New India Publishing Agency
2. Potter, N. N., & Hotchkiss, J. H. (2012). *Food science*. Springer Science & Business Media.
3. Srilakshmi, B. (2018). *Food science*. New Age Publishers. 7th edition.

SUGGESTED READINGS:

1. De, Sukumar. (2007). *Outlines of Dairy Technology*. Oxford University Press
2. Kent, N.L.(2018). *Kent's Technology of Cereals: An introduction for students of food science and agriculture*. Elsevier. 5th edition.
3. Meyer. (2006). *Food Chemistry*. CBS publishers and distributors.
4. Stewart, G.F., & Amerine, M.A.(2012). *Introduction to Food Science and Technology*. Elsevier, 2nd Edition.
5. Rao, E.S. (2019) *Fundamentals of Food Technology and Preservation*, Variety Books, New Delhi

TEACHING LEARNING PROCESS

- Lecture method
- Power point presentation
- Projects
- Practical's

ASSESSMENT METHODS

- As per University of Delhi norms
- Continuous evaluation of practical's
- Assessment methods - quiz, identification tests, assignments
- End semester exams for theory and practical
- Feedback given to students for improving

KEYWORDS

Food Technology, nutri- cereals, millets, pulses, edible oils, meat, fish, poultry, milk.

DSC FT02 PRINCIPLES OF FOOD SCIENCE
(Credit 3+1)

LEARNING OBJECTIVES:

1. To impart basic concepts of food science, food chemistry and food sanitation.
2. To introduce the concept of food microbiology, sensory science and food packaging.

COURSE OUTCOMES:

Understand the basic concepts of

1. Structure and composition, food science and food sanitation.
2. Food microbiology, sensory science and food packaging

Credit: 3+1

Total Lecture (Nos): **45 hours**

Course Coverage (in % of the total):

Theory: 3 hours/week

Practical/ Field work/Hands-on-learning: 2 hours/week

Unit 1: Surface Chemistry and Structural properties of foods Unit Description: Surface Chemistry and Structural properties of foods	(No. of lectures-12)
<i>Subtopics:</i> <ul style="list-style-type: none"> ● Introduction to engineering properties of food and biomaterials, structure and chemical composition of foods, physical properties and surface chemistry (colloids, emulsions, foam, sols, gels, pectin gels) and application 	
Unit II: Sensory properties of foods Unit Description: Sensory properties of foods	(No. of lectures-10)
<i>Subtopics:</i> <ul style="list-style-type: none"> ● Basic description of taste, flavour, odour, colour and texture. ● Theories of gustation, olfaction, colour and texture. ● Techniques of sensory evaluation (Descriptive and Discriminative tests) 	
Unit III: Basic Food Microbiology Unit Description: Basic food microbiology	(No. of lectures-8)

<p><i>Subtopics:</i></p> <p>Introduction to types of microorganisms, Food as a substrate for microorganism, bacterial growth curve, Factors affecting growth of microbes : Intrinsic and Extrinsic</p>	
<p>Unit IV: Waste management and sanitation</p> <p>Unit Description: Waste water treatment and sanitation</p>	(No. of lectures-9)
<p><i>Subtopics:</i></p> <ul style="list-style-type: none"> • Properties of Waste water, hardness of water, break point chlorination, physical and chemical nature of impurities, BOD, COD, waste water treatment, detergents and sanitizers used in food industry, CIP and COP system with reference to food industry. 	
<p>Unit V: Introduction to Food Packaging</p> <p>Unit Description: Food packaging</p>	(No. of lectures-6)
<p><i>Subtopics:</i></p> <ul style="list-style-type: none"> • Objectives of packaging, types of packaging materials (paper, glass, plastic, metal and wood, rigid and flexible packaging) and properties 	

PRACTICAL**DURATION: 30 HRS (CREDIT 1)**

1. Preparation and standardization of reagents
2. Determination of moisture content of food samples
3. Demonstration of fat/ protein estimation
4. Preparation of degree brix solution
5. Application of colloidal chemistry to food preparation
6. To perform sensitivity / threshold tests for basic taste
7. Introduction to microscopy and study of morphology of bacteria, yeast and mold using permanent slides.
8. Determination of alkalinity/ hardness of water
9. Determination of BOD/COD and total dissolved solids of water samples
10. Identification and testing (Thickness, GSM) of different types of packaging materials

COMPULSORY READINGS

- Coles, R., McDowell, D., & Kirwan, M. J. (Eds.). (2003). *Food packaging technology* (Vol. 5). CRC press.

- De, S. (1996). *Outlines of dairy technology*. Oxford University Press.
- DeMan, J. M., Finley, J. W., Hurst, W. J., & Lee, C. Y. (2018). *Principles of food chemistry*, 4th ed. Springer.
- Frazier, W.C. and Westhoff, D.C.(2004). *Food Microbiology*.New Delhi. TMH Publication
- Shadaksharaswamy, M., & Manay, N. S. (2011). *Food, facts and principles*. 4th ed. *New Age international publisher. New Age International*.
- Meyer LH.(2006). *Food Chemistry*, CBS Publication, New Delhi.
- Potter N.N., Hotchkiss J.H. (2007). *Food Science*,5th ed. CBS Publication, New Delhi
- Ranganna, S. (2002). *Handbook of Analysis of quality control for fruit and Vegetables products* 2nd Ed. Tata Mcgraw Hill pub. *Co. Ltd. New Delhi*.

Additional Resources

- Jenkins, W.A. and Harrington, J.P. (1991). *Packaging Foods with Plastics*, Technomic Publishing Company Inc., USA.
- Norman, G. Marriott. and Robert, B. Gravani. (2018). *Principles of Food Sanitation*,6th ed. New York, Springer.

TEACHING LEARNING PROCESS

- Power point presentations
- Experiential learning through demonstrations

ASSESSMENT METHODS

- As per University of Delhi norms
- Continuous evaluation of practicals
- Assessment methods - quiz, identification tests, assignments
- End semester exams for theory and practical
- Feedback given to students for improving

KEYWORDS

- colloidal chemistry
- Food microbes
- Hurdle Technology
- Food Packaging
- Minimal processing

DSC FT03 MILK & MILK PRODUCTS TECHNOLOGY
(CREDITS: 3+1)

LEARNING OBJECTIVES:

1. Processing of milk and milk products at industry level
2. To know the compositional and technological aspects of milk
3. To study processed milk products

COURSE OUTCOMES:

1. Understand the importance of Dairy industry
2. Understand the various properties and composition of milk.
3. Understand the technology of manufacturing of various products like Butter, ghee, Yoghurt, Dahi, Shrikhand, Ice-cream, Milk powder, channa, Paneer, Cheese (cheddar), Khoa
4. Understand market milk industry stages of milk processing and working of a few Dairy equipment's

Credit: 3+1Total Lecture (Nos): **45 hours****Course Coverage (in % of the total):**

Theory: 3 hours/week

Practical/ Field work/Hands-on-learning: 2 hours/week

Unit I: Physical properties of milk Unit Description: Understanding of the physical properties of milk.	(No. of lectures 7)
<i>Subtopics:</i> <ul style="list-style-type: none"> • Color • Taste • pH and buffering capacity • Refractive index • Viscosity • Surface tension • Freezing & boiling point • Specific heat and electrical conductivity 	
Unit II: Composition of milk Unit Description: Macro nutrients and micronutrients of milk; milk sugar, fat and protein.	(No. of lectures 16)
<i>Subtopics:</i> <ul style="list-style-type: none"> • Lactose (alpha and beta forms and their differences) • Significances of lactose in dairy industry • Composition and structure • Fat constants (Saponification value, Iodine value, RM value, Polenske value, peroxide value) • Difference between casein and serum protein • Different types of casein (acid and rennet) • Uses of casein 	

<p>Unit III: Market milk industry and milk products Unit Description: Processing of milk and milk products.</p>	<p>(No. of lectures 22)</p>
<p><i>Subtopics:</i></p> <ul style="list-style-type: none"> • Systems of collection of milk reception • Platform testing • Various stages of processing; Filtration, Clarification Homogenization, Pasteurization • Description and working of clarifier, cream separator, homogenizer and plate heat exchanger • Principle of processing of following milk products -Butter, ghee, yoghurt, dahi, shrikhand, ice-cream, milk powder, channa, paneer, cheese (cheddar), khoa 	

PRACTICAL

DURATION: 30 HRS (CREDIT 1)

1. To determine specific gravity of milk
2. To determine acidity of milk
3. To perform COB test in milk
4. To estimate milk protein by Folin method
5. To estimate milk fat by Gerber method
6. To prepare casein and calculate its yield
7. To perform MBRT test in milk
8. Schematic diagram of pasteurization of milk in dairy industry
9. Study energy regeneration in dairy industry
10. Study and schematic diagram of CIP in dairy industry

COMPULSORY READINGS

- De, Sukumar. (2007). Outlines of dairy technology. Oxford University Press.
- Webb B.H.and Alford (2005). Fundamentals of dairy chemistry. CBS Publisher.

SUGGESTED READINGS:

- P.F. Fox, T. Uniacke-Lowe and J.A.O' Mahony (2005). Dairy Science and Technology. Taylor & Francis.
- P. Walstra, Jan T.M. Wouters and Tom J. Geurts (2015). Dairy chemistry and Biochemistry. Springer

TEACHING LEARNING PROCESS

- Power point presentations
- Experiential learning through demonstrations

ASSESSMENT METHODS

- As per University of Delhi norms
- Continuous evaluation of practicals

- Assessment methods - quiz, identification tests, assignments
- End semester exams for theory and practical
- Feedback given to students for improving

KEYWORDS

- Food technology
- Dairy technology
- Milk processing

GE FT01 FOOD PROCESSING AND PRESERVATION
(Credits 3+1)

LEARNING OBJECTIVES:

1. To impart basic concept of Food colloids, Freezing, Dehydration processes and equipment used during the processing
2. To understand the Principles of thermal processing, Minimal Processing and hurdle technology
3. To understand the concepts of water disposal and sanitation.

COURSE OUTCOMES:

1. Understand the basic concepts of Food colloids, Freezing, Dehydration processes and equipment used during the processing
2. Understand the Principles of thermal processing, Minimal Processing and hurdle technology
3. Understand the concepts of water disposal and sanitation.

Credit: 3 +1**Total Lecture (Nos):** 45 hours**Course Coverage (in % of the total):** 100**Theory:** 3 hours/ week**Practical/ Field work/Hands-on-learning:** 2 hours/week

UNIT I Food Processing Operations Unit Description: Food Processing operations	(No. of lectures) 20
<i>Subtopics</i> <ul style="list-style-type: none"> • Refrigeration and Freezing Requirements of refrigerated storage - controlled low temperature, air circulation and humidity, changes in food during refrigerated storage, progressive freezing, changes during freezing Freezing methods -direct and indirect, still air sharp freezer, blast freezer, fluidized freezer, plate freezer, spiral freezer and cryogenic freezing. • Dehydration Normal drying curve , effect of food properties on dehydration, change in food during drying, drying methods and equipments: air convection dryer, tray dryer, tunnel dryer ,continuous belt dryer , fluidized bed dryer, dryer, drum dryer, vacuum dryer , freeze drying, foam mat drying. • Thermal Processing of Foods Classification of thermal processes, Principles of thermal processing, commercial canning operations, Aseptic Processing, UHT Irradiation and microwave heating. Principles, Dosage, Applications of Irradiation, Mechanism of microwave heating and applications. 	
UNIT II Technology of Colloids in Food Unit Description: Technology of Colloids in Food	(No. of lectures) 10

<i>Subtopics:</i> Surface chemistry (colloids, emulsions, foam, sols, gels, pectin gels)	
Unit III: Water Disposal and Sanitation Unit Description: Water Disposal and Sanitation	(No. of lectures) 10
<i>Subtopics:</i> Waste water , hardness of water, break point chlorination, physical and chemical nature of impurities, BOD, COD, waste water treatment, milk plant sanitation, CIP system, sanitizers used in food industry	
Unit IV: Minimal processing and hurdle technology Unit Description: Minimal processing and hurdle technology	(No. of lectures) 5

PRACTICAL**DURATION: 30 HRS (CREDIT 1)**

- Study of canning equipment (Forming, Flanging, Seaming, Exhausting and Retort)
- Canning of foods
- Preservation of food by the process of freezing
- Drying of food using Tray dryer/other dryers
- Study of thawing characteristics of frozen foods
- Preparation of brix solution and checking by hand refractometer
- Analysis of water
- Minimal Processing of food
- Application of colloidal chemistry in food preparation

ESSENTIAL READINGS:

1. Deman, J.M. (2007).Principles of Food Chemistry, 3rd Ed. Springer.
2. Potter, N. and Hotchkiss H. (2007).Food Science. New Delhi: CBS Publication.
3. Ramaswamy, H. and Marcotte, M. (2009).Food Processing Principles and Applications.CRC Press.

SUGGESTED READINGS:

1. Fellows' Food Processing Technology Principles and Practice 5th Edition

(2022)Elsevi

TEACHING LEARNING PROCESS

- Lectured based teaching
- Power point presentations
- Experimental learning through practicals
- Along with pedagogy of flipped classroom students are encouraged to participate actively in theclassroom through regular presentations on curriculum based topics, peer assessment

ASSESSMENT METHODS

- As per University of Delhi norms

- Assessment methods - quiz, identification tests, assignments
- End semester exams for theory and practical
- Feedback given to students for improving
- Continuous evaluation of practicals

KEYWORDS

Food Preservation, Food Processing, Colloidal chemistry, BOD, COD, Sanitation, Effluent system.