

DEPARTMENT OF HOME SCIENCE

SEMESTER 4

B.Sc. Hons (Food Technology)

DISCIPLINE SPECIFIC CORE COURSE

DSC FT10: Food Quality Management

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 (if any)
		Theory	Tutorial	Practical/Practice		
FOOD QUALITY MANAGEMENT	4	3	0	1	XII Pass with PCM/PCB	NIL

Learning Objectives

- To appreciate the significance of food quality assurance in food processing.
- To comprehend approaches to Food Quality Management.
- To understand Food Quality Management during food production.

Learning Outcomes

After completing this course, students will be able to:

- Apply knowledge of food quality management in food value chain.
- Understand the dynamics and Techno- managerial approaches in the agri- food chain.
- Apply food recall and traceability protocols to assure food quality.
- Identify different contaminants formed during food production.

SYLLABUS OF DSC FT10

THEORY **Credits: 3; Hours: 45**

UNIT I: Introduction to Food Quality

15 Hours

Unit Description: This unit will provide concept of food quality management and assurance in the agri- food chain.

Subtopics:

- Definition of food quality: concepts, perception, attributes.
- Quality control and quality assurance.
- Food quality management functions.
- Food quality relationship and its management in the agri- food production chain.

UNIT II: Approaches to Food Quality Management.

15 Hours

Unit Description: This unit will provide insights on different approaches of quality management, food recall and traceability in the agri -food production chain.

Subtopics:

- Dynamics in the agri- food chain.
- Techno- managerial approach in Food Quality Management.
- Core developments in food quality management
- Food Recall
- Food Traceability

UNIT III: Food Quality Management during food production.

(15 Hours.)

Unit Description: This unit will provide information on contaminants formed during processing and packaging of foods. Major focus will be on emerging concerns with food contaminants.

Subtopics:

- Contaminants formed during processing & packaging – nitrosamines, acrylamide, aldehydes, benzene, dioxins, 3- mono chloro 1,2-propanediol (3-MCPD), furans, and methyl furans, VOCs.
- Persistent organic pollutants, PAH (Polycyclic Aromatic Hydrocarbons), Heterocyclic amines (HCAs), fumigants, autoxidation products.
- Emerging concerns in food- Microplastics, Bisphenol A, Endocrine Disruptors, hypersensitivities from food additives.

PRACTICAL
Credit : 1, Hours: 30

1. Determination of quality standards and inspection of various food grains- cereals and -nutri - cereals/milletts.
2. Determination of quality standards and inspection of pulses.
3. Determination of quality standards and inspection of spices and condiments.
4. Perform qualitative tests for fats and oils.
5. Determination of non-permitted colours in fruits and vegetables.
6. Estimation of ammonia nitrogen in water.
7. Prepare an effective HACCP plan for any food commodity or process in the food chain.

Essential Readings

- Pieterneel A, Luning. & Willem, J. Marcelis. (2009). *Food Quality Management Technological and Managerial principles and practices*. Wageningen.
- Lawley, R., Curtis, L., & Davis, J. (2012). *The food safety hazard guidebook*. Royal Society of Chemistry.
- DeMan. (2007). *Principles of Food Chemistry*. Springer, 3rd edition.

Suggested Readings

- Carol, E., Steinhart, M. and Ellin, D. (1995). *Food Safety*, Food Research Institute. New York: Marcel Dekker, Inc
- Shapton, D.A. and Shapton, N.F. (1998). *Principles and Practices for the safe processing of Foods*. CRC Press.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

DISCIPLINE SPECIFIC CORE COURSE**DSC FT11: Poultry & Egg Processing Technology****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 (if any)
		Theory	Tutorial	Practical/Practice		
Poultry & Egg Processing Technology	4	3	0	1	XII Pass with PCM/PCB	NIL

Learning Objectives

- To understand primary processing of poultry, chicken quality and by-product utilization.
- To understand HACCP models for poultry processing.
- To understand egg production practices, and egg preservation methods.
- To understand egg quality and development of value-added products.

Learning Outcomes

After completing this course, students will be able to:

- Understand the need and importance of egg and poultry industry.
- Comprehend egg production and poultry product processing.
- Acquire knowledge about application of HACCP model for poultry processing.
- Understand value-addition and by-product utilization

SYLLABUS OF DSC FT011**THEORY****Credits: 3; Hours: 45****Unit 1 Introduction****5 Hours**

Unit Description: The unit will provide an understanding of the status and development of the Poultry industry, chicken quality, and processing of poultry and by-products.

Subtopics:

- Development of Poultry industry in India and its need in nation's economy,
- Chicken Quality - Color, Flavor, Texture, Water-Holding Capacity (WHC), Emulsification capacity.

Poultry products processing**15 Hours**

- Primary processing of poultry,
- Inspection, Grading, Cut Up and Composition, ante-mortem and post-mortem inspection of poultry,
- A Generic HACCP model for poultry slaughter.
- Processing of enrobed poultry products, HACCP for a Cooked Product Model.
- Poultry by-products.

UNIT II: Egg Industry and Egg Production Practices**12 Hours**

Unit Description: The unit will provide knowledge on the status and development of the Egg industry, and management of poultry farms.

Subtopics:

- The egg industry , Production of shell eggs
- Laying stock, Brooding period
- General management of Poultry farm.

UNIT III: Quality identification of shell eggs**5 Hours**

Unit Description: The unit will provide an understanding of the factors that affect egg quality. Measures of egg quality will also be covered.

Subtopics:

- Grading of shell eggs
- Factors affecting egg quality
- Measures of Albumen and Yolk quality

UNIT IV: Preservation of eggs**8 Hours**

Unit Description: The unit will provide information on the functional properties of eggs and different egg product processing and preservation techniques.

Subtopics:

- Refrigeration and freezing, egg powder manufacture, egg coatings.
- Functional properties of eggs and development of value-added products

PRACTICAL**Credit : 1, Hours: 30**

1. To study the shelf-life of eggs by different methods of preservation
2. Evaluation of eggs for quality parameters (market eggs, branded eggs)
3. To perform freezing of yolk/albumen
4. Egg product formulation.
5. Cut out analysis of canned chicken/retort pouches (external parameters).
6. Cut out analysis of canned chicken/retort pouches (internal parameters).
7. Planning generic HACCP model for poultry.
8. To prepare flow chart of enrobed chicken products/evaluate the quality of enrobed chicken products (chicken nuggets).

Essential Readings

- Shai, Barbut. (2016). Poultry Products Processing. An Industry Guide. CRC Press.
- Stadelman, W. J., Newkirk, D., & Newby, L. (2002). *Egg science and technology*. 4th ed. New Delhi: CBS Publication.
- Isabel Guerrero-Legarreta, Hui, Y.H .et.al.(2010)Handbook of Poultry Science and Technology, Volume 2:Secondary Processing. Wiley Publication

Suggested Readings

- Owens, C. M. (2010). *Poultry meat processing*. CRC Press.
- Richardson, R.I.,Mead,G.C(2005)Poultry meat Science New Delhi:CABI Publishing
- Parkhurst, C., &Mountney, G. J. (1997). *Poultry meat and egg production*. New Delhi: CBS Publishers

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DISCIPLINE SPECIFIC CORE COURSE

DSC FT12: Food Engineering- I

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 (if any)
		Theory	Tutorial	Practical/Practice		
Food Engineering- I	4	3	0	1	XII Pass with PCM/PCB	Nil

Learning Objectives

- To understand the concept of unit operation, units and dimensions.
- To comprehend the different Heat and mass transfer, refrigeration and Freezing operations.
- To understand the fundamentals of food engineering systems and its process.

Learning Outcomes

After completing this course, students will be able to:

- Understand the principle of unit operation.
- Apprehend the different methods of separation in the food industry.
- Acquire the basic knowledge of thermal properties, methods of heat transfer and mass transfer, principles of refrigeration and freezing.
- Apply these principles for solving numerical problems.

SYLLABUS OF DSC FT12

THEORY

Credits: 3; Hours: 45

UNIT I: Introduction

6 Hours

Unit Description: The unit will provide information on the concept of unit operation, mass balance and energy balance system.

Subtopics:

- Concept of Unit operation
- Units and dimensions, Unit conversions, dimensional analysis
- Mass and Energy Balance

UNIT II: Separation Processes

12 Hours

Unit Description: The unit will provide an insight into the principle and equipment design of various separation processes like distillation, extraction, centrifugation, filtration and sedimentation.

Subtopics:

- Distillation principles and methods: steam, batch, continuous distillation with rectification and stripping.
- Extraction : Hildebrandt, Bollman, SCF extraction
- Filtration : Plate and frame, pressure leaf, continuous rotary vacuum, batch and continuous filtration
- Centrifugation: Tubular, disc bowl and basket centrifuge
- Sedimentation : continuous thickener

UNIT III: Heat and Mass Transfer

15 Hours

Unit Description: The unit will provide knowledge of thermal properties of food, design and derivation of heat and mass transfer systems and applications.

Subtopics:

- Systems for heating and cooling food products
- Thermal Properties of Food
- Modes of heat transfer- Conduction, Convection and Radiation
- Applications of steady state heat transfer, estimation of conductive heat transfer coefficient, convective heat transfer coefficient, overall heat transfer coefficient and design of tubular heat exchanger
- Fick's Law of Diffusion
- Related basic numerical
- Membrane separation systems-Electrodialysis system , Reverse Osmosis, Ultra filtration, Microfiltration
- Membrane devices used for RO and UF: Plate and Frame, Tubular, Spiral wound and hollow fiber devices

UNIT IV: Refrigeration and Freezing

12 Hours

Unit Description: The unit will provide concept of refrigerants, VCR cycle, components of Refrigeration system and freezing time calculations

Subtopics:

- Concept, properties and selection of refrigerants
- Description of Vapor compression refrigeration (VCR) cycle
- Pressure Enthalpy charts and Tables
- Mathematical expressions useful in analysis of VCR cycle
- Numerical on VCR system using R -134a, R-717, R-12; Saturated cycle and deviations from the standard
- Freezing time calculation using Plank equation
- Frozen food storage

PRACTICAL
Credit : 1, Hours: 30

1. Mass and Energy Balance Calculations
2. Determination of alcohol insoluble solids using extraction process
3. Determination of the osmotic pressure of the given sample
4. Estimation of sedimentation rate
5. Determination of thermal properties of the given samples
6. Mathematical Design of Heat exchanger
7. Cooling refrigeration load calculations.
8. Determination of Convective heat transfer coefficient and freezing time
9. Determination of freezing point depression in given solution

Essential Readings

- Rao, D.G. (2010). *Fundamentals of food engineering*. PHI learning private ltd.
- Singh, R.P. and Heldman, D.R. (2009) *Introduction to food engineering* 2nd edition. 4th edition Academic press.
- Singh, R.P. and Heldman, D.R. (2014) *Introduction to food engineering* 5th edition. Academic press

Suggested Readings

- Earle, R.L. (1983). *Unit Operations in Food Processing*, 2nd edition. Pergamon press.
- Fellows, P. (2009). *Food processing technology*. Woodhead publication, 3rd edition
- Garg, M., Chaturvedi, S., Sadhu, S.D. and Barwa, M. and Pani. B ., (2020) *Practical Handbook of Food Engineering* Aryush Education, ISBN NO. 978-81-930437-5-2

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DISCIPLINE SPECIFIC ELECTIVE COURSE**DSE FT02 A: Bakery Technology****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 (if any)
		Theory	Tutorial	Practical/Practice		
Bakery Technology	4	2	0	2	XII Pass with PCM/PCB	Nil

Learning Objectives

- To understand the fundamentals of baking and technology of various bakery products.
- To understand basic knowledge, importance, quality and safety concerns in bakery industry.
- To understand technology used in modified bakery products for different health conditions.

Learning Outcomes

After completing this course, students will be able to:

- Understand the fundamentals of baking.
- Acquire the knowledge of technologies of bakery products.
- Understand trends in bakery industry.
- Get an overview of modified bakery products for different health conditions

SYLLABUS OF DSE FT03**THEORY**

Credits: 2; Hours: 30

UNIT I: Introduction

5 Hours

- Bakery industry, current status and economic importance of bakery Industry in India.

- Nutritional quality and safety, pertinent standards & regulations, safety concerns

UNIT II: Bakery products

18 Hours

- Bread, Buns and Pizza base: Ingredients & processes for breads, buns, pizza base, changes taking place during baking, product quality characteristics, faults and corrective measures
- Cakes: Ingredients & processes for cakes, product quality characteristics, faults and corrective measures. Different types of icings.
- Pastry: Ingredients & processes for pastry, product quality characteristics, faults and corrective measures.
- Biscuits and Cookies: Ingredients & processes, product quality characteristics, faults and corrective measures.

UNIT III: Modified bakery products

7 Hours

- Modification of bakery products for people with special nutritional requirements e.g. high fibre, sugar free, low sugar, low fat, gluten free bakery products, use of fat and sugar replacers, enzymes, egg replacers and natural preservatives in bakery products.

PRACTICAL

Credit: 2, Hours: 60

1. Introduction of tools and equipment used in preparation of bakery products.
2. Quality assessment of wheat flour used in the preparation of baked products.
3. Preparation and acceptability of yeast leavened baked products (bread/ bun/ pizza base).
4. Preparation and acceptability of biscuits.
5. Preparation and acceptability of cookies.
6. Preparation of different types of cakes and their acceptability.
7. Preparation of different types of icings.
8. Development of any bakery product with special nutritional requirement.

Essential readings:

- Zhou, W., Hui, Y. H., Leyn, I. De., Pagani, M. A. , Rosell, C. M. , Selman, J. D., & Therdthai, N. . (2014). *Bakery Products Science and Technology* (Second ed.): John Wiley & Sons, Ltd.
- Dubey, S.C. (2007). *Basic Baking* 5th Ed. Chanakya Mudrak Pvt. Ltd.

Suggested readings:

- Khetarpaul, N. (2005). *Bakery Science and Cereal Technology*. India: Daya Publishing House.
- Edwards, W. P. (2015). *The Science of Bakery Products*. United Kingdom: Royal Society of Chemistry.
- Samuel, A. Matz (1999). *Bakery Technology and Engineering*. PAN-TECH International Incorporated
- Barndt, R. L. (1993). *Fat & Calorie – Modified Bakery Products*.US: Springer

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GENERIC ELECTIVE COURSE
GE FT04- Microbes in Food and Food Safety

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

CourseTitle & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of thecourse (if any)
		Lecture	Tutorial	Practical		
Microbes in Food and Food Safety	4	3	0	1	Grade XII Pass	

Learning Objectives

1. To understand the important genera of microorganisms associated with food and their characteristics.
2. To understand the role of microbes in fermentation, spoilage and food borne diseases.
3. To understand the principles of food preservation.
4. To understand Food safety , types of hazards associated with food and current regulatory regime along with food safety management systems.

Learning Outcomes

1. Acquaint the knowledge of the important genera of microorganisms associated with food and their characteristics.
2. Able to explain the role of microbes in fermentation, spoilage and food borne diseases and their role in food preservation
3. Understand Food safety and types of hazards associated with food
4. Introduction to current Food Regulatory regime and Food Safety Management Systems.

SYLLABUS

THEORY
(Credits 3; Hours 45)

Unit I: Introduction to Food Microbiology

10 Hours

Covers genera of microorganisms associated with food and their characteristic features , growth pattern and enumeration

- Definition and Scope of food microbiology
- Types of Microorganisms in food (bacteria, fungi and viruses)
- Sources of Microorganisms in foods
- Bacterial growth curve, Factors affecting the growth of micro- organisms in food

- Enumeration of microorganisms

Unit II: Role of microorganisms in Food and their control

15 Hours

Role of microbes in fermentation, spoilage and food borne diseases is the focus of this unit along with food preservation principles and techniques (

- Food Spoilage , Spoilage in different food types
- Beneficial Role of Microorganisms -Microorganisms used in food fermentations, Common Fermented Foods
- Food borne diseases and types – food infections, food borne intoxications and toxin infections
- Principles of Food preservation and common methods used in food industry, Effect of preservation methods such as thermal processing, freezing and irradiation on microbes
- Introduction to Novel Techniques of Food Preservation- HHP,PEF, Ohmic heating, Microwaves etc. and Hurdle Technology

Unit III: Food Safety and Regulations

10 Hoous

Covers food safety , types of hazards associated with food , current regulatory regime and

- Food safety: Definition, Types of hazards, biological, chemical, physical hazards and allergens
- Food Safety Management Tools: GHP, HACCP and ISO series
- National Regulatory Regime
- International Regulatory bodies

PRACTICAL (Credit 1; Hours 30)

- Introduction to the Basic Microbiology Laboratory Practices and equipments used in a microbiology laboratory-autoclave , laminar air flow chamber, incubators, hot air oven ,colony counter
- Cleaning and sterilization of glassware
- Working and handling of a compound microscope
- Simple staining
- Gram's staining
- Preparation and sterilization of culture media
- Standard Plate Count Method
- Bacteriological Analysis of Water using MPN method

Essential Readings

1. Forsythe, S J. (1987) Microbiology of Safe Food. USA: Blackwell Science, Oxford, 2000 65 & Sons.
2. Frazier, William C. and Westhoff, Dennis C. (2004). Food Microbiology. New Delhi: TMH.
3. Garbutt, John.(1997). Essentials of Food Microbiology. London: Arnold.
4. Jay, James M. (2000). Modern Food Microbiology. New Delhi: CBS Publication.