

BSc. (Hons.) Food Technology

DISCIPLINE SPECIFIC CORE COURSE DSC FT07: Meat and Fish 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		
Meat and Fish Processing Technology	4	3	0	1	XII Pass	DSC FT01, DSC FT02, DSC FT03, DSC FT04, DSC FT05, DSC FT06

Learning Objectives

1. To comprehend the meat quality and slaughter processes for meat animals.
2. To understand the concept and methods of processing and preservation of animal foods and by-product utilization.
3. To acquire the knowledge of fish preservation and value-added fish products.

Learning Outcomes

After completing this course, students will be able to:

1. Understand the need and importance of livestock industry.
2. Comprehend the structure, composition and nutritional quality of animal products.
3. Acquire the concept and methods of processing and preservation of animal foods.
4. Know the technology behind preparation of various animal food products and by-product utilization.
5. Apprehend the importance of fishery industry, the techniques that can be used for preservation of fish and manufacturing of various value-added fish products

SYLLABUS OF DSC FT07

THEORY Credits 3 (45 Hrs.)

UNIT I: Introduction, meat quality, Slaughter process and By-products

Unit Description: The unit will provide information on the status and development of livestock industry, meat quality, ante-mortem and post-mortem examination, and by-products

Subtopics:

- Status of livestock industry in India, Development of meat industry in India and its need in nation's economy
- Effects of feed breed and stress on production of meat animals and their quality.
- Meat Quality-color, flavor, texture, Water-Holding Capacity (WHC), Emulsification capacity of meat.
- Layout of abattoir, Slaughter, Antemortem examination of meat animals, slaughter of buffalo, sheep/ goat.
- Post-mortem examination of meat, Grading, Post-mortem changes of meat.
- Importance of by-products utilization, classification and uses of by-products, Manufacture of Natural casings

UNIT II: Preservation of meat

Unit Description: The unit will provide knowledge of different meat preservation techniques.

Subtopics:

- Refrigeration and freezing, thermal processing- canning of meat, retort pouch, dehydration, irradiation, meat curing, Sausages-processing, types and defects, Packaging of meat

UNIT III: Introduction, Chilling and Freezing of fish

Unit Description: The unit will provide an understanding of the status of fishery industry in India. Fish chilling, storage, freezing will also be covered.

Subtopics:

- Status of fishery industry in India. Relationship between chilling and storage life, MAP, general aspects of freezing, freezing systems (air blast freezing, plate or contact freezing 36 spray or immersion freezing, freezing on board, onshore processing, changes in quality in chilled and frozen storage, thawing.

UNIT IV: Fish Curing, Smoking and Canning, By-products, fermented fish and concept of other seafoods

Unit Description: The unit will provide an knowledge of the different fish products processing and preservation techniques.

Subtopics:

- Drying and salting of fish, water activity and shelf-life , salting process, salting methods (brining, pickling, kench curing, gaspe curing), types of salts, dried and
- Salted fish products- pindang, fishwood, dried shrimp. Preservation by smoking, smoke production , smoke components, quality, safety and nutritive value of
- Smoked fish, processing and equipment, pre-smoking processes, smoking process control. Traditional chimney kiln, modern mechanical fish smoking kiln, examples of smoked and dried products. Principles of canning, classification based on pH groupings, effect of heat processing on fish, storage of canned fish, pre-process operations, post process operations, cannery operations for specific canned products.(Tuna, Mackerel, Sardine).
- Surimi- Introduction, fish muscle proteins, the surimi process, traditional and modern surimi production lines, quality of surimi products, comparison of surimi and fish mince products.
- Fish protein concentrates (FPC), fish protein extracts (FPE), fish protein hydrolysis (FPH) Flowchart of Indigenous products- Fish sauce and Paste
- Crabs, lobsters, prawns, shrimps.

PRACTICAL 1 Credits (30 Hrs)

- Estimation of moisture content of meat.

- Cut out analysis of canned meat/retort pouches (external parameters).
- Cut out analysis of canned meat/retort pouches (internal parameters).
- Analysis of frozen meat/meat emulsion product.
- Meat/fish product formulation (Ideation/development of product).
- Quality evaluation of fish/prawn.
- Subjective evaluation of Fresh Fish.
- Cut out analysis of canned fish (Sardine/Mackerel/Tuna) (external parameters).
- Cut out analysis of canned fish (Sardine/Mackerel/Tuna) (internal parameters).

Essential Readings

1. Lawrie, R. A. (2017). Lawrie's meat science. 8th ed. England: Woodhead Publishing Ltd.
2. Sen, D.P. (2005). Advances in Fish Processing Technology. Allied Publishers Pvt.Limited.
3. Hall, G.M. (1997). Fish Processing Technology. 2nd edition NY: VCH

Suggested Readings

1. Paul D. Warriss. (2010). Meat Science: An introductory text. 2nd Edition. CABI Publishers, Wallingford, UK (2010)
2. Borda D., Nicolau. A. I and Raspor P (2017). Trends in Fish Processing Technology (Contemporary Food Engineering). 1st edition 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 FT08 : Nutrition Science

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
		Theory	Tutorial	Practical/Practice		
Nutrition Science	4	3	0	1	XII Pass	DSC FT01, DSC FT02, DSC FT03, DSC FT04, DSC FT05, DSC FT06

Learning Objectives:

1. To understand the relationship between food, nutrition and health.
2. To learn the digestion, absorption, functions and food sources of various nutrients.
3. To comprehend the concept of balanced diet.
4. To know the different methods of cooking and ways to prevent nutrient losses.
5. To plan and prepare nutritious dishes for various age groups.
6. To assess nutritional status of adults.

Learning Outcomes:

After completing this course, students will be able to:

1. Students will be able to interpret and apply nutrition concepts to evaluate and improve nutritional health of individuals and communities
2. Comprehend the role of digestion, absorption, functions and food sources of various nutrients.
3. Understand the concept of balanced diet and exchange system.
4. Describe different methods of cooking and ways to prevent nutrient losses.
5. Plan and prepare nutritious dishes for various age groups.
6. Assess nutritional status of adults.

SYLLABUS OF DSC FT08

THEORY
Credits 3 (45 Hrs.)

UNIT 1: Introduction to Food and Nutrition

6 hrs

Unit Description: This unit will introduce the basic knowledge of food and nutrition, its functions. It will also help in understanding the inter-relationship between food, nutrition and health.

Subtopics:

- Basic terms used in study of food and nutrition
- Methods of assessment of nutritional status
- Functions of food-physiological, psychological and social
- Understanding relationship between food, nutrition and health

UNIT II: Nutrients

20 hrs

Unit Description: This unit will provide an understanding on functions, dietary sources and clinical manifestations of deficiency/excess of the following nutrients

Subtopics:

- Classification, digestion, absorption, functions, dietary sources, RDA, clinical manifestations of deficiency and excess of the following in brief:
- Energy
- Carbohydrates, lipids and proteins
- Fat soluble vitamins-A, D, E and K
- Water soluble vitamins – thiamine, riboflavin, niacin, folate, vitamin B12 and vitamin C
- Minerals – calcium, iron, iodine, fluorine, sodium, potassium, and zinc

Unit III: Planning Balanced Meals and Selection of Healthy Foods

6 hrs

Unit Description: This unit will help in understanding the concepts of food groups and balanced diet.

Subtopics:

- Food Groups
- Concept of Balanced Diets
- Understanding Nutrition labelling of foods

UNIT IV: Methods of Cooking and Nutrient Retention

13 hrs

Unit Description: This unit will help in developing know-how of different methods of cooking and ways to prevent nutrient losses

Subtopics:

- Dry, moist, frying and microwave cooking - Advantages, disadvantages
- Effect of various methods of cooking on foods and nutrients.
- Preventing nutrient losses

PRACTICAL 1 Credits (30 Hrs)

- Assessment of nutritional status using BMI and waist circumference.
- Identification of food sources for various nutrients using food composition tables.
- Introduction to meal planning, concept of food exchange system.
- Planning and preparation of nutritious snacks for adults using different methods of cooking.
- Planning and preparation of nutritious snacks for pregnant women.
- Planning and preparation of nutritious snacks for lactating women
- Planning and preparation of nutritious snacks for pre-schoolers.

- Planning and preparation of nutritious snacks for adolescents.
- Critical analysis of nutritional labelling of food products.

Essential Readings

1. Byrd-Bredbenner, C., Moe, G., Beshgetoor, D. & Berning, J. (2022). Wardlaw's Perspectives in Nutrition, International Edition, 12th edition, New York: McGraw- Hill 29
2. Chadha, R. and Mathur, P. eds. (2015). Nutrition: A Lifecycle Approach. Hyderabad: Orient Blackswan.
3. Longvah, T., Ananthan, R., Bhaskarachary, K. and Venkaiah, K. (2017). Indian Food Composition Tables. Hyderabad: National Institute of Nutrition, Indian Council of Medical Research, Department of Health Research, Ministry of Health and Family Welfare, Government of India.
4. Seth, V., Singh, K. & Mathur, P. (2018). Diet Planning Through the Lifecycle Part I: Normal Nutrition- A Practical Manual. 6th Edition. Delhi: Elite Publishing House.

Suggested Readings

1. Manay NS and Shadaksharaswamy M (2008). Food-Facts and Principles, Third Edition. New Age International (P) Ltd. Publishers, New Delhi.
2. Srilakshmi, B. (2021). *Nutrition Science*. 7th edition. New Age International.
3. Rekhi T and Yadav H (2014). Fundamentals of Food and Nutrition. New Delhi: Elite Publishing House Pvt Ltd.

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 FT09: Cereals, Pulses & Oilseed 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		
Cereals, Pulses & Oilseed Processing Technology	4	3	0	1	XII Pass	DSC FT01, DSC FT02, DSC FT03, DSC FT04, DSC FT05, DSC FT06

Learning Objectives

1. To impart knowledge of different methods of Cereal, Pulse & Oilseed processing.
2. To learn about processing of various products & by-products.

Learning Outcomes

After completing this course, students will be able to:

1. Understand the concept of quality (composition & types) of Cereals, Pulses & oilseeds for developing good quality end products.
2. Comprehend the processing and preservation of Cereals, Pulses & Oilseeds using various techniques.
3. Comprehend the processing of by-products.

SYLLABUS OF DSC FT09

THEORY
(Credits 3; Hours 45)

UNIT I: Introduction of Cereals

Subtopics:

Cereal Processing Technology

Introduction & chemical composition of cereals

- Wheat—Types, milling, flour grade, flour treatments (bleaching, maturing), flour for various purposes
- Rice: Types, Physicochemical properties, milling (mechanical & solvent extraction), parboiling, ageing of rice, utilization of by- products
- Corn: Milling (wet & dry), cornflakes, corn flakes, corn flour
- Barley: Milling (pearl barley, barley flakes)
- Oats: Milling (oatmeal, oatflour & oatflakes), By-products of oat processing
- Rye & Triticale: Milling (flour), uses

UNIT II: : Processing of Coarse Grains

Subtopics:

- Sorghum and Millets (Traditional & commercial milling)

UNIT III: Pulse Processing Technology

Subtopics:

- Introduction to pulses
- Milling of pulses
- Dry milling
- Wet milling
- Improved milling method

UNIT IV: Oilseed Processing Technology

Unit Description: The unit will provide an knowledge of the different fish products processing and preservation techniques.

Subtopics:

- Introduction
- Extraction of oil (Mechanical & Solvent Extraction Milling)
- Refining of oil
- Sources of protein (defatted flour, protein concentrates and isolates, properties and uses)
- Protein texturization, fibre spinning

PRACTICAL 1 Credits (30 Hrs)

- Physical characteristics of Wheat.
- Estimation of Gluten Content of flour.
- Estimation of Pelenske Value of flour.
- Fermenting power of yeast.
- Physical Characteristics of Rice and paddy.
- Cooking characteristics of rice.
- Determination of sedimentation power of flour
- Preparation of Dairy Analogue (Soymilk from Soybeans)

Essential readings:

1. Kent, N.L. 2003. Technology of Cereal, 5th Ed. Pergamon Press.
2. Chakraverty. 1988. Post Harvest Technology of Cereals, Pulses and Oilseeds, revised Ed., Oxford & IBH Publishing Co. Pvt Ltd.

Recommended readings:

1. Marshall, Rice Science and Technology. 1994. Wadsworth Ed., Marcel Dekker, New York.
2. Manay, S. and Sharaswamy, M. 1987. Food Facts and Principles. Wiley Eastern Limited.

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

DISCIPLINE SPECIFIC ELECTIVE
DSE FT01: Novel Food Processing Technologies

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		
Novel Food Processing Technologies	4	2	0	2	XII Pass	NIL

Learning Objectives

1. To enable students to learn the basics of novel processing techniques.
2. To impart knowledge about the mechanism of microbial inactivation by various processing techniques.
3. To acquire knowledge about the effects of various novel processing techniques on food quality.

Learning Outcomes

After completing this course, students will be able to:

1. Understand the principles and mechanism of microbial inactivation by various techniques in order to preserve food and provide safe food for consumption.
2. Comprehend the effects of various novel processing techniques on the food quality.

SYLLABUS OF DSE FT01

THEORY

Credits 2 (30 Hrs.)

Unit I: High pressure processing and Hurdle technology

(10 hrs)

Unit Description: The unit will provide an understanding of the High-pressure processing used in food industries. The unit will deal with its principle and effects on food quality. The unit will also provide knowledge of the hurdle technology and its use in food preservation.

Subtopics:

- **High Pressure Processing:** Definition, principles of high-pressure processing and effects of high pressure on food quality.
- **Hurdle Technology:** Concept and effect on preservation of food.

UNIT II: Pulsed electric fields processing

(8 hrs)

Unit Description: The unit will introduce fundamentals of pulsed electric field processing. It also deals with concept of e-beam.

Subtopics:

- **Pulsed electric fields processing:** Definition, PEF treatment systems, main processing parameters, mechanisms of microbial inactivation.
- **Concept of E-beam**

UNIT III: Ultrasound and radiofrequency processing

(6 hrs)

Unit Description: The unit will help in understanding the use of ultrasound and radiofrequency processing in food industry.

Subtopics:

- Ultrasound as a food preservation and processing aid, effects of ultrasound on food properties
- Radio-frequency processing.

UNIT IV:

(6 hrs)

Unit Description: The unit will provide and insight to various other novel processing techniques such as microwave heating, dielectric heating, ohmic heating, irradiation that aids in food preservation.

Subtopics:

- Microwave heating
- Dielectric heating
- Ohmic heating
- Irradiation
- UV-C radiation
- Ozone
- Plasma technology

PRACTICAL (2 Credits, 60 Hrs)

- Market survey of novel processed foods available
- Concept of hurdle technology
- Blanching using UV light
- Ultrasonication
- Setting up of Ohmic heater
- Applications of Microwave processing
- Layout of irradiation unit
- Ohmic heating process calculations
- Quality analysis of novel processed foods vs conventionally processed foods

Essential readings:

1. P J Fellows (2009). Food Processing Technology: Principles and Practice. Third edition. Wood Head Publishing in Food Science, Technology and Nutrition.
2. Howard Q. Zhang, Gustavo V. Barbosa-Cánovas, V. M. Bala Balasubramaniam, C. Patrick Dunne, Daniel F. Farkas, James T. C. Yuan (2011). Nonthermal Processing Technologies for Food. Wiley-Blackwell.
3. Ortega-Rivas, Enrique (2012). Non-thermal Food Engineering Operations. Springer.
4. Chauhan, O. P. (Ed.). (2019). *Non-thermal processing of foods*. CRC Press.
5. Potter NN and Hotchkiss H J (1996). Food Science, Fifth Edition. CBS Publication, New Delhi.

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

GE 02: CHEMISTRY OF FOOD

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
CHEMISTRY OF FOOD	4	3	0	1	XII with PCM/PCB	NIL

Learning Objectives

The Learning Objectives of this course are as follows:

- To understand the chemistry of foods - composition of food, role of each component
- To understand the different macromolecules and micro molecules in food
- To understand how food components contribute to overall quality of foods

Learning outcomes

The Learning Outcomes of this course are as follows:

- To understand the chemistry of foods - composition of food
- To understand the role of each component, their properties and reactions in food
- To comprehend how dietary components influence total food quality

SYLLABUS OF GE 02

Unit1: Introduction to chemistry of Food (5 Hours)

Introduction to Food Chemistry

Brief composition of food (Carbohydrates, fats, proteins, vitamins, minerals and pigments)

Unit2: Chemistry of Macromolecules (20 Hours)

Water: Definition of water in food, Structure of water and ice, Types of water, Role of water activity in shelf life and packaging Carbohydrates: Introduction, Classification, and Chemical reactions of carbohydrates Protein: Introduction, classification and structure, types of food protein (meat, egg, milk and wheat)

Lipids: Introduction, classification and structure of triglycerides, types of fatty acid, deterioration of fats and oils. (Autooxidation and lipolysis)

Unit3: Chemistry of Micro molecules (10 Hours)

Vitamins: Introduction, types (water soluble and fat soluble vitamins)

Minerals: Introduction, major and minor minerals, Toxic minerals in food

Unit4: Flavors and Pigments (10 Hours)

Definition and basic tastes

Description of some common food flavors

Introduction and classification of pigments

Practical Exercises: 30 Hours

The learners are required to:

- Preparation of primary and secondary solutions
- Estimation of moisture content
- Determination of gelatinization temperature range (GTR) of different starches
- Determination of effect of additives on GTR of starches
- Estimation of total nitrogen content by Kjeldahl method
- Estimation of fat
- Estimation of total ash and acid insoluble ash
- Estimation of reducing sugar

Essential/recommended readings

- DeMan, John M. (1995). Principles of Food Chemistry. 3rd Ed., Springer.
- Fennema, Owen R. (2008). Fennema's Food Chemistry-CRC Press (2008) - 4th Edition.
- Potter, N.N. and Hotchkiss, J.H. (2007). Food Science 5th Ed. New York: Chapman & Hall.
- Richard Owusu-Apenten. (2002) Introduction to Food Chemistry. CRC press
- Hans-Dieter Belitz, Werner Grosch, Peter Schieberle. (2009) Food Chemistry. Springer link

- **Note: Learners are advised to use the latest edition of readings.**

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