Department of Home Science
Semester -VIII
B.Sc (Honours) Food Technology

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DISCIPLINE SPECIFIC CORE COURSE

DSC FT 20: FOOD STANDARDS AND REGULATIONS

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)
		Lecture	Tutorial	Practical		
Food Standards And Regulations DSC FT 20	4	3	0	1	Studied XII	Nil

Learning Objectives

- To understand the concept of food standards and food safety.
- To comprehend the need for Regulations pertaining to the safety of food, their implementation and the agencies involved in this process at the National and International levels.
- To know the requirements for the Food Business Operators in terms of licensing, registration and labeling

Learning Outcomes

After completing this course, students will be able to understand:

- The food standards, their types, their formulation process,and relevance in consumer safety
- Food categories and groups mentioned as per the FSSA act
- Transition of various acts and orders to one single National food regulatory system in India
- Role of agencies for exporting food commodities from India
- Requirements for the Food Business Operators in terms of licensing , registration and labeling
- Global standards related to food safety and the role of international organizations

SYLLABUS OF DSC FT 20

Theory
(Credit 3; Hours 45)

Unit I: Food Standards **8 Hours**

Unit Description: This unit shall introduce students to types of standards and specifications related to food commodities. The various stages that are involved in the formulation of food standards shall be discussed. The various types of foods that are discussed under our current regulations will also be covered for a better understanding of the regulations.

Subtopics:

- Difference between food standards and specifications
- Types of Standards- vertical and horizontal
- Stages for Formulation of Food Standards
- Definitions of Proprietary food, non-specified foods, Nutraceuticals, Functional Food, Novel Food, bioactive compounds, antioxidants, food allergens, fortified foods

Unit II: National Food Regulatory Status 17 Hours

Unit Description: The transition of various acts and orders to one single National food regulatory system shall be covered in this unit. Students shall understand the difference between accreditation and certification process. To make students understand the requirements for exporting food commodities from India, the role of export promotion organizations shall be taken up.

Subtopics:

- FSSAI – (transition from PFA, FPO, MMPO, MFPO), composition and role
- Qualification and duties of public analyst and Food Safety Officers
- FSS Act, Rules and Regulations – Schedule 4(basic requirements and significance)
- Accreditation, Certifications (BIS, QCI, AGMARK, etc.)
- Role of Export Promotion Organizations / Commodity Boards in food safety (APEDA, MPEDA, Spices Board, etc.) and Export Inspection Council

Unit III: Requirements for Food Business Operators 10 Hours

Unit Description: A "food business operator" in relation to food business means a person by whom the business is carried on or owned and ensures compliance of the rules and regulations of FSS Act. In this unit, the requirements for food business operators shall be taken up.

Subtopics :

- Licensing and Registration of Food Businesses
- The Legal Metrology (Packaged Commodities Rules)
- Labelling requirements, Advertising and Claims
- Food recall procedure

UNIT IV: International Food Standards 10 Hours

Unit Description: This unit shall deal with the global standards related to food safety. These standards are developed through the consensus of experts from several countries, allowing users to achieve similar products every time.

Subtopics:

- WTO, Agreements on Sanitary and Phytosanitary Measures (SPS) and Technical Barriers to Trade (TBT),
- International Organization for Standardization (ISO)
- CODEX, FAO, WHO ,JECFA, JEMRA, OIE

PRACTICAL
(Credit 1; Hours 30)

1. Analysis of food labels of commonly consumed foods for compliance to standards.
2. Case study of a food recall/ export rejection.
3. Understanding the process of auditing using a checklist.

4. Market survey of different food types understanding their categorization.
5. Comparative study of Codex, USDA, EFSA and FSSAI standards for selected food types.
6. Understanding the concept of harmonisation of standards using any one food type.

Essential Readings

- Hester, R. E. & Harrison, R. M. (2001) Food Safety and Food Quality :Issues in Environmental Science and Technology ,Cambridge.
- Paster, T. (2007) The HACCP Food Safety Training Manual, John Wiley and Sons Inc. 2007
- Roday, S (1999) Food Hygiene and Sanitation, Tata McGraw Hill.
- Ilbco's (2017) Food Safety and Standards Act 2006, Rules 2011, Regulations 2011 with comments, short notes, gazette notifications, Advisories, Digest of food safety case laws, Images/banners on Food Safety, Commodity & Word Index -International Law Book Company, India, 18 th edition.
- Boisrobert, C., Stjepanovic, A., Oh, S. & Lelieveld, H. (2009) Ensuring global food safety: Exploring global harmonization ,Academic Press.

Important Websites

- Food Safety and Standards Authority of India-http://www.fssai.gov.in/home#
- Bureau of Indian Standards http://www.bis.gov.in/
- Agricultural and Processed Food Products Export Development Authority (APEDA) http://apeda.gov.in
- Spices Board of India http://www.indianspices.com/
- Export Inspection Council of India https://www.eicindia.gov.in/
- Codex Alimentarius Commission -http://www.fao.org/fao-who-codexalimentarius/en/
- Quality Council of India http://www.qcin.org/#
- International Organization for Standardization https://www.iso.org/home.html
- International Laboratory Accreditation Cooperation (ILAC) http://ilac.org/
- International Accreditation Forum (IAF) http://www.iaf.nu/

Suggested Readings

- Mathur, P. (2018). *Food Safety and Quality Control*. Hyderabad: Orient BlackSwan Pvt. Ltd.
- Agarwal, P. & Mathur, P. (Eds) (2021). *Eat Right: A Food Systems Approach*. Food Future Foundation. ISBN 978-93-5526459-6.
- Codex Guidelines on Nutrition Labelling 2021

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

DISCIPLINE SPECIFIC ELECTIVE COURSE

DSE FT 08: FOOD RHEOLOGY

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)
		Lecture	Tutorial	Practical		
Food Rheology DSE FT 08	4	2	0	2	Studied XII	Nil

Learning Objectives

- To appreciate the significance of food rheology in food product designing and development.
- To understand the chemistry and rheology of cereal based and meat and dairy food products.
- To study the various instrumental techniques/ measurements used in evaluating rheological properties.

Learning Outcomes

- Apply the principles of food rheology in product development and optimization of process parameters.
- Evaluate food quality attributes of final products in relation to rheological properties.

SYLLABUS OF DSE FT08

Theory
(Credit 2; Hours 30)

UNIT I: Introduction to Rheology of Foods **10 Hours**

- Definition of rheology, viscosity, viscoelasticity, and plasticity of foods.
- Classification of texture- based on chemical composition and physical structure of foods.
- Essential elements of texture measuring devices.
- Approaches to Instrumental Measurement of Texture- Fundamental, Empirical, and Imitative tests.
- Basic rheological models and forces involved in texture measurement.
- Importance and rheological applications in food measurements.
- Texture profile Analysis.

UNIT II: Rheological Applications in Cereal food products (Breads, biscuits, cookies, breakfast foods and pastas) **10 Hours**

- Chemistry of bread and biscuit/ cookie making- type of flours, protein content etc.
- Rheological properties of Dough- Effect of stress on dough, Viscosity Modulus Quotient.
- The three – phase concept of bread making.
- Instrumental measurement of rheological properties of dough- mixing, load extension, viscosity measurements.

UNIT III: Rheological Applications in Animal food products (Meat, Dairy- butter, cheese) 10 Hours

- Compositional and textural attributes influencing meat quality.
- Instrumental measurement of meat quality: compression, shear, torsion etc.
- Texture profile analysis of meat
- Rheology of Cheese: structure, model of cheese rheology, texture and factors affecting structure of Cheddar cheese.
- Instrumental measurement of cheese quality.
- Rheology of Milk fat and Butter: Body and texture, rheological properties- spreadibility, plasticity.

PRACTICAL
(Credit 1; Hours 30)

1. Determine the flow properties of Newtonian and Non-Newtonian fluids using two tube capillary viscometers.
2. Study the viscosity of various food products using Brookfield's Viscometer.
3. Determine the force required to penetrate butter/ ghee/ margarine using penetrometer.
4. Study the pasting behaviour of various starches.
5. Study the rheological properties of dough (Viscosity Modulus Quotient).
6. Study the consistency of various foods using Bostwick consistometer.
7. Texture Profile Analysis of any given food product- Biscuits/ cookies/ chips/ fruits.
8. Textural evaluation of various food products.

Essential Readings

- Rao, E. S. (2013). *Food Quality Evaluation* (I ed.). Variety Book Publishers, New Delhi.
- Fox, P.F., Guinee, T.P., Cogan, T.M. & McSweeney, P.L.H. (2017). Cheese: Structure, Rheology and Texture. In: Fundamentals of Cheese Science. Springer, Boston, MA.

Suggested Readings

- Wright, A. J., Scanlon, M. G., Hartel, R. W., & Marangoni, A. G. (2001). Rheological properties of milkfat and butter. *Journal of food science*, *66*(8), 1056-1071.
- 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 Equipment Design **12 Hours**

- 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.
- Design of food processing equipment : Size Reduction, Mixing, Extraction, Filtration, Centrifugation, Heat exchanger, Dryer, distillation and, Gas absorption equipment.

UNIT II Warehousing and Cold Chain Management 8 Hours

- 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 III Food Plant Hygiene and Sanitation 10 Hours

- Waste disposal, Control methods using Physical and Chemical Agents, Pest and Rodent Control.
- Good Manufacturing Practices and Personal Hygeine.
- 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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DISCIPLINE SPECIFIC CORE COURSE

DSE FT10: FOOD TOXICOLOGY

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITE OF THE COURSE

Course Title & Code	Credit	Credit Distribution of the Course			Eligibility Criteria	Pre-requisite of the Course (if any)
		Lecture	Tutorial	Practical		
Food Toxicology DSE FT10	4	2	0	2	XII Pass	Nil

Learning Objectives

- To understand the principles of food toxicology.
- To learn about the various toxins found in food.
- To understand the effect of toxins on human health.
- To comprehend the management of risks associated with common food toxicants and contaminants.

Learning Outcomes

- Recognise different types of food toxicants of biological origin.
- Understand the chemical contaminants introduced/ produced during food processing.
- Comprehend the principles and techniques of toxicological testing of food.
- Evaluation of food toxicity and management of related risks

SYLLABUS OF DSE FT 10

Theory
(Credit 3; Hours 30)

UNIT I: Principles of Food Toxicology **10 Hours**

In this unit students will learn the definition, scope and general principles of food toxicology; manifestation of toxic effects; classification of food toxicants; factors affecting toxicity of compounds; methods used in safety evaluation/risk assessments

- Classification of food toxicants according to source
- Factors affecting toxicity of compounds (nature, chemical structure, dose)
- Characteristics of exposure (frequency-acute and chronic, route)
- Spectrum of undesirable effects- (carcinogenicity, mutagenicity, reproductive toxicity, acute and chronic effects on metabolism)
- Definitions of LD50, TD50, NOAEL, LOAEL, ADI, TUL, ALARA, Benchmark Dose
- Basics of experimental design and evaluation of toxicity (in vitro and in vivo studies)
- Steps of Risk Assessment

UNIT II: Toxins of Biological Origin **10 Hours**

In this unit the students will be able to understand about toxicity and management of biological toxins and food allergens.

- Common plant toxins
- Microbial toxins (e.g., bacterial toxins and fungal toxins)
- Marine toxins
- Algal toxins
- Food allergens

UNIT III: Toxins of Chemical Origin **10 Hours**

The students will understand adverse effects of different chemical contaminants, associated risks and their regulation.

- Environmental contaminants (pesticide residues, heavy metals, dioxins and furans; persistent organic pollutants, radionuclides, microplastics)
- Veterinary drug residues in food
- Toxicants generated during food processing (heterocyclic amines, polycyclic aromatic hydrocarbons, acrylamides and trans fats)
- Food contact material
- Toxicity of common food adulterants, food additives and dietary supplements

PRACTICAL
(Credit 2; Hours 45)

1. Sampling for detection and quantification of toxicants in food.
2. Sample preparation and extraction of toxic substances from food samples for toxin analysis.
3. Detection of fungal toxins from food.
4. Instrumental techniques used in the analysis of toxins present in foods (HPLC, AAS and LCMS)
5. Exposure assessment of common chemical contaminants found in food.
6. Designing animal experiments to study toxicity of microbial toxins in food.
7. Antibiotic sensitivity pattern and MIC for different food pathogens.

8. Understanding a Material Safety Data Sheet and a risk assessment form.

Essential Readings

- Helferich, W., and Winter, C.K "Food Toxicology", CRC Press, LLC. Boca Raton, FL. 2007.
- Shibamoto, T., and Bjeldanes, L. "Introduction to Food Toxicology", 2009, 2ndEdition. Elsevier Inc., Burlington, MA. 3.Watson, D.H. "Natural Toxicants in Food", CRC Press, LLC. Boca Raton, FL1998.
- Mathur, P. (2018). Food Safety and Quality Control. Hyderabad: Orient BlackSwan Pvt. Ltd.
- Lawley, R., Curtis, L.and Davis,J (2012) The Food Safety Hazard Guidebook, The Royal Society of Chemistry, Cambridge, CB4 0WF, UK

Suggested Readings

- Duffus, J.H., and Worth, H.G. J. "Fundamental Toxicology", The Royal Society of Chemistry. 2006.
- Stine, K.E., and Brown, T.M. "Principles of Toxicology", 2nd Edition. CRC Press. 2006.
- Tönu, P. "Principles of Food Toxicology". CRC Press, LLC. Boca Raton, FL. 2007.
- A.W. Hayes. CRC Press, Press, New York, Principles and Methods in Toxicology. 2008.
- T. Shibamoto, L. F. Bjeldanes. Essentials of Environmental Toxicology(Third edition, 2009

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