Appendix-10
AC - 11.08.2023

INDEX

BSC (Hons.) Food Technology (SEM- VI)

SEMESTER VI

B.Sc. Hons Food Technology

DISCIPLINE SPECIFIC CORE COURSE

DSC FT16: Food Packaging

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 Packaging	4	3	0	1	XII Pass with PCM/PCB	Nil

Learning Objectives

- To impart comprehensive overview of the scientific and technical aspects of food
- packaging.
- To instil knowledge on packaging machinery, systems, testing and regulations of food packaging
- To acquire knowledge of package designing for different food groups

Learning Outcomes

After completing this course, students will be able to:

- Comprehend the overview of scientific and technical aspects of food packaging
- Understand packaging machinery, systems and testing of material and package
- Acquire an insight into food packaging laws and regulations
- Apprehend the requirement of packaging material and package designing of food.

SYLLABUS OF DSC FT16

THEORY
Credits: 3; Hours:45

UNIT I: Introduction to Food Packaging 15 Hours

Unit Description: The unit will provide information on the status and concept of packaging, different packaging materials, their manufacturing process and applications

Subtopics:

- Status of Packaging industry, concept of food packaging
- Flexible packaging material (paper, plastic films, laminate and Aluminum foil)-manufacturing process and applications
- Semi rigid packaging material (paper board, corrugated board and composite carton)-manufacturing process and applications
- Rigid packaging material (metal, glass and plastic containers)-manufacturing process and applications
- Aseptic, active and intelligent packaging systems

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UNIT II: Package Designing for Foods **15 Hours**

Unit Description: The unit will provide knowledge of factors affecting shelf life of food, packaging system requirement and package designing

Subtopics:

- Fresh horticultural produce
- Animal foods
- Dry and moisture sensitive foods
- Frozen foods
- Fats and oils
- Thermally processed food

UNIT III: Testing of Food Packaging Material and Package **8 Hours**

Unit Description: The unit will provide an understanding of the testing and quality evaluation of packaging material and package.

Subtopics:

- Testing procedures for packaging materials- thickness, tensile properties, puncture resistance, bursting strength, seal strength, water vapor permeability, gas transmission rate (CO_2 and O_2 permeability), grease resistance
- Compatibility and shelf-life studies
- Evaluation of transport worthiness of filled packages

UNIT IV: Regulatory Aspects of Food Packaging 7 Hours

Unit Description: The unit will provide knowledge of the food packaging and labelling regulations, environment issues and life cycle analysis (LCA)

Subtopics:

- Food Packaging and Labelling regulations (FSSAI)
- Sustainable and green packaging-environment issues
- LCA definition and methodology, carbon foot print and its significance in packaging material

PRACTICAL
Credit: 1, Hours: 30

1. Identification of plastic using floatation method.
2. Demonstration of the operation of Shrink wrapping/Vacuum packaging/Form Fill and Seal packaging machinery

3. Testing of packaging material and package: COBB / tensile strength /bursting strength / tear resistance/ drop/ leakage
4. Testing of thermal shock resistance of glass.
5. Study of water vapor transmission rate of packaging material.
6. Development of biodegradable film.
7. Design a package label
8. Study porosity of tinplate.
9. Examination of can double seam

Essential Readings

- Saha, N. C. (2022). *Food Packaging: Materials, Techniques and Environmental Issues*. Springer Nature.
- Robertson, G.L. (2012) *Food Packaging – Principles and Practice*. CRC Press Taylor and Francis Group
- Coles, R., McDowell, D.& Kirwan, MJ. (2003). *Food Packaging Technology*. Blackwell publication
- Paine, F.A. and Paine, H.Y. (1992). *A Handbook of Food Packaging*. Blackie Academic and Professional.

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Suggested Readings

- Daniel, Lu. and Wong, D. (Eds). (2017). *Materials for Advanced Packaging. S*pringer
- Garg, M., Meena, P.L., Sadhu, S.D. and Alam, T. (2020) *Food Packaging: A Practical Guide,* The Computype Media (Publishing Division), ISBN No.614027934-9

DISCIPLINE SPECIFIC CORE COURSE

DSC FT 17: Food Chemistry II

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 Chemistry II	4	3	0	1	XII Pass with PCM/PCB	Nil

Learning Objectives

- To understand the chemistry of food components and their interactions.
- To know about the role of enzymes and its application in food industry.
- To co-relate the quality changes during different processing methods of food.
- To understand the concept of new food product development.

Learning Outcomes

After completing this course, students will be able to:

- Determine approaches that may be used to control the reactivity of those food components that are likely to impact the overall quality of finished products.
- Interpret the reasoning of changes occurring in food during different processing treatments.
- Learn basic methods of food product development.

THEORY
Credits: 3; Hours:45

Unit I: Sensory Aspects (Colour & Flavour)

Natural Food Pigments **6 Hours**

- Introduction and classification

- Food pigments (Sources, Structure, Stability and Interactions)
- Chlorophyll
- Carotenoids
- Anthocyanins and flavonoids
- Beet pigments
- Myoglobin

Flavour **5 Hours**

- Definition and basic tastes
- Chemical structure and taste
- Description of food flavours , Flavour enhancers

Unit II : Enzymes

- Introduction, classification **10 Hours**
- General characteristics
- Enzymes in food processing
- Industrial Uses of Enzymes
- Immobilized enzymes

Unit III: **Changes occurring during food processing treatments.**

Physico-chemical and nutritional changes occurring during food processing treatments **9 Hours**

- Drying and dehydration
- Irradiation
- Freezing
- Canning

Browning Reactions In Food **7 Hours**

- Enzymatic browning
- Non – Enzymatic browning:
- Maillard reaction
- Caramelization
- Ascorbic acid oxidation

Unit IV: **New Food product development** **8 Hours**

- Definition
- Importance
- Need of product development
- Stages of product development
- Product development tools
- Reasons for failure
- Product Life Cycle

PRACTICAL

Credit: 1; Hours: 30

1. Determination of thermal inactivation time of spoilage enzymes (Blanching time) in fruits and vegetables.
2. Estimation of minerals -demo
3. Estimation of iodine value

4. Estimation of peroxide value
5. Estimation of reducing and non-reducing sugars using potassium ferricyanide method.
6. Determination of carotenoids w.r.t flour pigments.
7. Extend of non-enzymatic browning by extraction methods.
8. Introduction of the concept of new product

Essential Readings

- DeMan, J.M.(2018).Principles of Food Chemistry.NewYork: AVI.
- Fellows, P. J. (2009). *Food processing technology: principles and practice*. Elsevier.
- Rahman, M. S. (2020). Handbook of Food Preservation. 3rd Edition. India: CRC Press.
- Fennema, Owen. R. (2017). Food Chemistry, 3rd Ed., New York: Marcell Dekker.
- Whitehurst and Law (2002).Enzymes in Food Technology. Canada: CRC Press.
- Graf, E & Saguy,I.S (2011). Food Product Development. Newyork, AVI pub.Co.

Suggested Readings

- Wong, Dominic W.S. (1996). Food Enzymes. New York: Chapman and Hall.
- Desrosier, Norman W. and Desrosier, James.N. (2018). The technology of food preservation, 4th Ed.Westport, Conn.: AVI Pub. Co.
- Hui, Y. H., & Evranuz, E. Ö. (Eds.). (2015). Handbook of vegetable preservation and processing. CRC press.
- Eskin, N. M., & Shahidi, F. (2012). Biochemistry of foods.
- Simpson, B. K., Nollet, L. M., Toldrá, F., Benjakul, S., Paliyath, G., & Hui, Y. H. (Eds.). (2012). Food biochemistry and food processing. John Wiley & Sons.

DISCIPLINE SPECIFIC CORE COURSE

DSC FT18: Food Safety

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 SAFETY	4	3	0	1	XII Pass with PCM/PCB	Nil

Learning Objectives

- To understand the concept of safe food and types of hazards associated with food.
- To control the potential threats to the safety of food.
- To familiarize with Good Hygienic Practices, Food Safety Management Systems and the Indian regulatory regime

Learning Outcomes

After completing this course, students will be able to:

- Understand the concept of food safety, types of hazards, and their control measures
- Identify and prevent potential sources of food contamination
- Comprehend the need for hygiene and sanitation for ensuring food safety
- Knowledge of Food Safety Management tools and introduction to the Indian regulatory regime
- Practical knowledge to detect and quantify microorganisms from various routes of contamination of food

SYLLABUS OF DSC FT18

THEORY
Credit: 3; Hours: 45

UNIT I Introduction to Food Safety 6 Hours

Unit Description: This unit introduces the concept of safe food. It focuses on the significance of food safety, common types of hazards associated with food, and factors that affect the safety of food, especially in a developing country like India.

Subtopics:

- Definition of safe food
- Types of hazards
- Factors affecting Food Safety
- Importance of Safe Foods

UNIT II Hazards associated with food 14 Hours

Unit Description: This unit begins with how various hazards gain entry into the food chain, then gradually delves into each hazard type, its example, and its impact. The unit also covers the chemical and biological hazards in depth keeping in view their public health significance. Topics like mycotoxins, indicator organisms, and allergens are also included for a better understanding of their relationship to food safety.

Subtopics:

- Mode of entry of hazards into food
- Physical hazards –common examples and control measures
- Chemical hazards (naturally occurring, environmental including radioactive components and intentionally added), packaging material as a threat
- Biological hazards (Foodborne pathogens: bacteria, viruses, and eukaryotes) , Seafood and Shellfish poisoning, Mycotoxins, Indicator Organisms
- Food Allergens

UNIT III Management of Hazards 16 Hours

Unit Description: This unit covers all the key factors which influence food safety in depth and provides hands-on information on managing hazards in the food industry. This unit helps the students not only to understand the significance of hygiene and sanitation but also the critical role of water and food handlers in maintaining food safety. The recent food safety management tools have also been included to emphasize the applied aspects of food safety.

Subtopics:

- Factors influencing food safety -Design of food plant, Temperature Danger Zone and

Storage of Food, Food handler and personal hygiene, Quality of Water

- General Principles of Hygiene, Sanitation and methods of control using physical and chemical agents, Waste Disposal, Pest and Rodent Control

- Food Safety Management Tools -Basic Concept, HACCP, ISO series, TQM - components of TQM, Risk Analysis

UNIT IV Trends in Food Safety **9 Hours**

Unit Description: Food safety is a dynamic area of food science where new challenges recurrently appear and finding solutions to them is the key to safe food. This unit covers the current status of Food Safety Regulations in the country and all the emerging hazards in food. The new advances in food safety pertaining to the detection of hazards, food-borne pathogens, and preservation methods are also discussed.

Subtopics:

- Food Safety Regulations and their current status in India
- New and emerging pathogens and chemical hazards
- Genetically Modified Foods \ Transgenics, Organic foods
- Newer approaches to hazard and pathogen detection
- Recent technologies in food preservation and pathogen detection

PRACTICAL
Credit: 1, Hours: 30

1. Preparation of different types of media (complex, differential and selective)
2. Enumeration of aerial microflora using PDA
3. Identification of Molds by lactophenol blue staining
4. Bacteriological Analysis of Water by MPN method
5. Assessment of surface sanitation by swab / rinse method
6. Assessment of Personal Hygiene
7. Preparation of a HACCP plan
8. Testing of foods for microbiological hazards

Essential Readings

- Forsythe,S.J. (2020).The Microbiology of Safe Food , 3rd edition. UK: Willey.
- Lawley, R., Curtis L. and Davis,J.(2015) The Food Safety Hazard Guidebook. London: RSC.
- Marriott, N G. and Gravani RB (2006).Principles of Food Sanitation. 5th edition New York: AVI
- Mathur, P. (2018). Food Safety and Quality Control. Hyderabad: Orient BlackSwan Pvt. Ltd.

Suggested Readings

- de Blackburn, C and Mc Clure P.(2009).Food borne pathogens. Hazards,risk analysis & control. 2nd edition. Washington,US: CRC Press.
- De Vries. (2014). Food Safety and Toxicity.New York: CRC.
- Mortimore S.and Wallace C. (2013).HACCP-A Practical Approach 3rd edition. London: Springer.

DISCIPLINE SPECIFIC ELECTIVE
DSE HS 6-1: Research Methods in Home Science

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		
Research Methods in Home Science	4	3	0	1	NIL	NIL

Learning Objectives

- To provide students understandings about the basic concepts, approaches and methods in conducting Home Science research.
- To enable learners to appreciate and critique the nuances of designing a research study well.
- To sensitize students towards ethical concerns while conducting Home Science research.

Learning Outcomes

- Demonstrate knowledge of the scientific method, purpose and approaches to research in Home Science
- Compare and contrast quantitative and qualitative research approaches
- Explain different types of research design and their applicability in Home Science research
- Understand the key elements of a research process
- Explain ethical principles, issues and procedures

SYLLABUS DSE HS 6-1

THEORY
Credits: 3; Hours: 45

UNIT I: Research Purpose and Design **10 Hours**

This unit will deal with meaning and importance of research in various areas of Home Science. Exposure to different types of research designs and measurement in Home Science research would also be given.

- Meaning, purpose and significance of research
- Research as a scientific method
- Types of research
- Quantitative, Qualitative and mixed method approaches

- Research Designs –Experimental and Non-Experimental; Descriptive and Observational; Participatory research
- Internal and external validity of research design
- Variables, concepts and measurement in research
- Levels of measurement
- Units of analysis

UNIT II: Sampling and Research tools & techniques 15 Hours

This unit will introduce the student to the concept of sampling and methods used to draw sample from population using examples from Home Science discipline. Students would also learn about types of data, its collection and reliability and validity concerns.

- Role of sampling in research
- Sampling techniques and their applicability, Sample size and sampling error
- Types of data: Primary and Secondary
- Tools of data collection; types, construction and administration- Interview, Questionnaire, Observation, Focus group discussion and other methods
- Validity and reliability of data collection tools

UNIT III: The Research Process 15 Hours

This unit will elaborate upon the various steps involved in conducting and reporting researches in Home Science.

- Defining the problem, research questions, objectives, hypotheses
- Review of related literature and originality in writing
- Systematic research: concept and methodology
- Planning the research
- Identifying variables and constructing hypothesis
- Selecting appropriate research methodology and tools
- Data analysis: coding and tabulation
- Writing a research report: styles and formats
- Citation formats: in medical sciences, social sciences

UNIT IV: Values, Social Responsibility and Ethics in Research 5 Hours

This unit will apprise the students about ethical concerns while conducting and reporting research.

- Ethical principles guiding research: from inception to completion and publication of research
- Plagiarism and Academic integrity in research: plagiarism tools and software
- Ethical issues relating to research participants and the researcher
    - Rights, dignity, privacy and safety of participants
    - Informed consent, confidentiality, anonymity of respondents, voluntary participation, harm avoidance

PRACTICAL
(Credits 1; 30 Hours)

1. Data visualization
2. Levels of Measurement

3. Types of research designs
    a. Experimental and non-experimental; Descriptive and observational
    b. Qualitative, Quantitative and mixed method
4. Sampling techniques and sample size calculation
    a. Probability sampling method
    b. Non-Probability sampling methods
5. Tools of data collection- Interview schedule, questionnaire and FGD
    - Designing/ Construction
    - Preparation of tools for ethical review
    - Pilot testing/ validity and reliability of the tool\
6. Data collection and analysis process: conducting interviews, administering questionnaire
7. Coding and tabulation of data for analysis
8. Citation formats and Plagiarism
9. Reviewing a research paper from a specific area of specialization in Home Science

Essential Readings:

- Kerlinger F. N. and Lee, H.B. (2017). *Foundations of Behavioral Research* 4th Ed. Harcourt College Publishers.
- Kothari, C. R. (2019). *Research Methodology: Methods and Techniques*. New Age International Pvt Ltd, New Delhi.
- Kothari, C. R. (2022). *Shodh Padhati* 1st Ed. New Age International Pvt Ltd, New Delhi.
- Kumar, R. (2019) Research Methodology: A Step-by-Step Guide for Beginners. 5th Ed. Sage Publications, New Delhi.

Suggested Readings:

- Bernard, H. R. (2000). *Social research methods: Qualitative and quantitative approaches.* Thousand Oaks, CA.: Sage.
- Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches.* Thousand Oaks, CA: Sage Publications.
- Davis, A. M., Treadwell, D. (2019). Introducing Communication Research: Paths of Inquiry. United Kingdom: SAGE Publications.
- Flynn, J.Z., Foster, I.M. (2009). *Research Methods for the Fashion industry.* Fairchild books, Bloomsbury publishing.
- Indian National Science Academy (INSA) (2019). *Ethics in Science Education, Research and Governance*. ISBN:978-81-939482-1-7. http://www.insaindia.res.in/pdf/EthicsBook.pdf
- Jacobsen, K. H. (2020). *Introduction to health research methods: A practical guide*. Jones & Bartlett Publishers.
- UGC (2021) *Academic Integrity and Research Quality*. New Delhi: UGC, Retrieved from https://www.ugc.ac.in/e-book/Academic%20and%20Research%20Book_WEB.pdf