INDEX

Department of Home Science

Semester -VII

B.A (PROG) WITH FOOD TECHNOLOGY (FT)

Semester -VIII

B.A (PROG) WITH FOOD TECHNOLOGY (FT)

POOL OF DISCIPLINE SPECIFIC ELECTIVE (DSE) FOR ODD AND EVEN SEMESTERS

B.A. (Prog) with Food Technology (FT) as Major
Category-II

DISCIPLINESPECIFICCORECOURSE–DSC- 13
FOOD SAFETY AND QUALITY TESTING

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

CourseTitle & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Food Safety and Quality Testing	4	3	0	1	Class XII	Nil

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LEARNING OBJECTIVES:

- To sensitize students regarding the significance of quality testing in ensuring food safety
- To provide knowledge on regulatory aspects of quality testing
- To facilitate understanding of some commonly used methods of quality testing

LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Appreciate the scope of regulations governing food safety and quality testing
- Describe various methods of objective and subjective evaluation of food
- Perform key food quality testing methods

SYLLABUS OF DSC-13-FT

THEORY
(Credits: 3; Hours: 45)

UNITI: Introduction to Food Safety and Quality Testing **(10 Hours)**

Unit Description: It will introduce to the students the concept of quality and the scope of quality testing for ensuring food safety. It will also help them understand the various physical, chemical and biological parameters based on which safety/quality of food can be judged.

Subtopics:

- Key terms, significance of quality testing in ensuring food safety
- Characteristics of quality
- Commonly assessed parameters for quality testing – physical, chemical, biological
- Objective and subjective evaluation of food

UNIT II: Regulations and Standards **(10 Hours)**

Unit Description: This unit will help students to understand the protocols laid down by national regulatory authority for collection and analysis of food samples, cutoff values for judging the quality, food recall and auditing. It will also briefly introduce to the

scope of certain international organizations which promote food safety through quality testing.

Subtopics:

- Food Safety and Standards (Laboratory and Sampling Analysis) regulations, 2011
- Food Safety and Standards (Food Product Standards and Food Additives) regulations, 2011
- Food Safety and Standards (contaminants, toxins and residues) regulations, 2011
- Food Safety and Standards (Food Recall Procedures) regulations, 2017
- Food Safety and Standards (Food Safety Auditing) regulations, 2018
- ISO, IUPAC, AOAC, WTO and Codex – brief introduction

UNIT III: Sensory Evaluation of Food (10 Hours)

Unit Description: This unit will help students learn and apply various sensory evaluation tests at laboratory as well as industry level.

Subtopics:

- Sensory characteristics of food
- Human senses in sensory evaluation
- Applications of sensory evaluation
- Pre-requisites for sensory testing procedure
- Methods of sensory evaluation

UNIT IV: Quality Testing – Commonly used Methods (15 Hours)

Unit Description: In this unit, the student will learn about salient methods commonly employed for assessing physical, chemical and microbiological quality of ingredients/food products.

Subtopics:

- Physical such as oflactometer, electronic nose and tongue, viscometer, penetrometer, farinograph, extensograph, amylograph, biscuit texture meter, bake-spread
- Chemical or proximate analysis such as moisture, ash, protein, fat content, presence of adulterants , pH, TSS, acidity.
- Microbiological: plate count, direct microscopic count (sauce, puree, pastes), fermentation (incubation) test, MBRT.

PRACTICAL
(Credit: 1; Hours: 30)

No. of Students per Practical Class Group: 10-15

1. Prepare a presentation on any one FSSAI regulation related to food quality testing/standards
2. Assess adulteration in commonly consumed foods (field study)
3. Learn to perform various types of sensory evaluation of food
4. Conduct consumer acceptability trial for any one canteen dish
5. Perform any two tests for assessing physical characteristics of food/ water
6. Perform any two tests for assessing chemical characteristics of food/ water
7. Perform any two tests for assessing microbial load of food/ water

ESSENTIAL/ RECOMMENDED READINGS (Theory and Practical):

- Suri, S. & Malhotra, A. (2014). Food Science Nutrition and Safety. Delhi: Pearson India Ltd.
- Mathur, P. (2018). Food Safety and Quality Control. Delhi: Orient Blackswan.
- Rao, E.S. (2013). Food Quality Evaluation. First Edition. Variety Books Publisher's Distributors.
- FSSAI (2019). Compendium of the Food Safety and Standards Act, 2006. Universal India Publishers.
- Rao, M.K (2007). Food and Dairy Microbiology.

SUGGESTED READINGS:

- Kumar, A(2024). Fundamentals of Food Hygiene, Safety and Quality. Wiley India
- Kuddus, M., Ashraf, S.A. & Rahman, P. (2024). Food Safety: Quality Control and Management. CRC Press LLC.
- Ahmad, R.S., Munawar, H., Saima, H. & Siddique, F (2023). Food Safety- New Insights. IntechOpen
- Ali, I (2004). Food Quality Assurance: Principles and Practices. CRC Press LLC.
- Food Safety and Standards (Laboratory and Sampling Analysis) regulations, 2011. Internet: https://www.fssai.gov.in/upload/uploadfiles/files/Compendium_Lab_Sample_Regulations_04_03_2021.pdf (Accessed on 15 December 2024).
- Food Safety and Standards (Food Product Standards and Food Additives) regulations, 2011. Internet: https://www.fssai.gov.in/upload/uploadfiles/files/Compendium_Food_Additives_Regulations_20_12_2022.pdf (Accessed on 15 December 2024).
- Food Safety and Standards (contaminants, toxins and residues) regulations, 2011. Internet: https://www.fssai.gov.in/upload/uploadfiles/files/Compendium_Contaminants_Regulations_20_08_2020.pdf (Accessed on 15 December 2024).
- Food Safety and Standards (Food Recall Procedures) regulations, 2017. Internet: https://www.fssai.gov.in/upload/uploadfiles/files/Guidelines_Food_Recall_28_11_2017.pdf (Accessed on 15 December 2024).
- Food Safety and Standards (Food Safety Auditing) regulations, 2018. Internet: https://fssai.gov.in/upload/uploadfiles/files/Gazette_Notification_Food_Safety_Auditing_07_09_2018.pdf (Accessed on 15 December 2024)
- FSSAI (2024). FSSAI Manual on Methods of analysis- Microbiological examination of food and water. https://fssai.gov.in/upload/uploadfiles/files/Manual%20on%20Microbiological%20Examination%20of%20Food%20and%20Water_compressed.pdf (Accessed on 15 December 2024)
- Association of Official Chemical Analysts (AOAC). (1990). Official Methods of Analysis. 15th Edition. Internet: https://law.resource.org/pub/us/cfr/ibr/002/aoac.methods.1.1990.pdf (Accessed on 15 December 2024).
- International Union for Pure and Applied Chemistry (IUPAC). (2017). IUPAC Standards. Internet: https://iupac.org/iupac-standards-online/ (Accessed on 15 December 2024).

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

B.A. (Prog) with Food Technology (FT) as Major
Category-II

DISCIPLINESPECIFICCORECOURSE–DSC-14
APPLIED FOOD CHEMISTRY

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

CourseTitle & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Applied Food Chemistry	4	3	0	1	Class XII	Nil

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LEARNING OBJECTIVES:

- To impart students' basic knowledge related to the principles of food chemistry and their applications on food systems.
- Highlight the importance of knowledge in food chemistry for the production of nutritious and wholesome foods in benefit of consumers and the food industry.
- Introduce students to food additives and their applications in food preservation, flavor enhancement, and texture improvement.
- Encourage the practical application of theoretical knowledge to address real-world food industry challenges.

LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Describe the chemical composition of food and the functional roles of major and minor food components.
- Understand key food reactions such as Maillard browning, caramelization, lipid oxidation, and enzymatic processes, and their practical applications.
- Assess the roles of food additives like emulsifiers, sweeteners, stabilizers, and preservatives in enhancing food quality, safety, and shelf life.
- Apply theoretical knowledge to address practical challenges in food processing and product development.

SYLLABUS OF DSC-14-FT

THEORY
(Credits 3; Hours 45)

UNIT I: Introduction to Applied Food Chemistry **(4 Hours)**

Unit Description: This unit introduces the chemical composition of foods and the functional roles in quality, safety, nutrition and new food product development.

Subtopics:

- Definition and scope of food chemistry
- Difference between basic and applied food chemistry

UNIT II: Major Food Components and their Functional Applications (14 Hours)

Unit Description: This unit explores the properties, functional roles, and applications of major food components—water, carbohydrates, proteins, and lipids in maintaining food quality, stability, and texture.

Subtopics:

- Water: Properties of water, Water activity and its role in food stability.
- Carbohydrates: Properties, functions, and food applications. Role of starches, gums, and fibers in food thickening and stabilization. Modified starches in processed foods.
- Proteins: Functional properties and applications, role in texture development of gels, foams, and emulsions.
- Lipids: Functional properties, and role in food systems: Shortening, emulsification, and flavor carriers. Applications in margarine, chocolate, and frying oils. Modification of lipids.

UNIT III: Minor Food Components and their Functional Applications (6 Hours)

Unit Description: This unit focuses on the functional roles of minor food components like vitamins, minerals, and phytochemicals in enhancing nutritional value and promoting health. It emphasizes their applications in fortified and functional foods.

Subtopics:

- Vitamins: Application as nutritional additives in food.
- Minerals: Essential minerals and their application as nutritional additives in food.
- Phytochemicals: Antioxidants, polyphenols, flavonoids; applications in functional foods.

UNIT IV: Food Reactions and their Practical Implications (10 Hours)

Unit Description: This unit examines key food reactions like Maillard browning, caramelization, lipid oxidation, and enzymatic processes, focusing on their impact on food quality, flavor, and texture.

Subtopics:

- Maillard Browning and Caramelization: Applications in baked goods, coffee, and confectionery.
- Lipid Oxidation and hydrogenation.
- Enzymatic Reactions: Use of enzymes in clarification of fruit juices, baking, and dairy products.

UNIT V: Food Additives and their Applications (11 Hours)

Unit Description: This unit explores the role of food additives such as emulsifiers, stabilizers, sweeteners, and preservatives in enhancing food quality, texture, and shelf life. It also covers the use of natural and synthetic flavor and color enhancers.

Subtopics:

- Emulsifiers and stabilizers in processed foods.
- Flavor and Color Enhancers: Natural vs. synthetic.
- Sweeteners: Use of artificial and natural sweeteners in low-calorie products.
- Chemical preservatives in shelf-life extension.
- Leavening agents.

PRACTICAL
(Credit: 1; Hours: 30)

No. of Students per Practical Class Group: 10-15

1. Measurement of the moisture content of a given food sample.
2. Estimation of reducing and non-reducing sugars using potassium ferricyanide method.
3. Determination of smoke point and percent fat absorption for different fat and oils.
4. Determination of percent free fatty acids.
5. Estimation of saponification value.
6. Estimation of total ash content.
7. Preparation and testing stability of fruit juice with added stabilizers
8. Preparation and testing stability of oil-in-water emulsions using different emulsifiers (e.g., lecithin, gum arabic)
9. Effect of enzymes (e.g., pectinase, pectic enzymes) in juice clarification.

ESSENTIAL/ RECOMMENDED READINGS (Theory and Practical):

- O. R. Fennema. (2003) Food Chemistry, 3rd Ed, Tata McGraw-Hill, New York.
- DeMan. (2007). Principles of Food Chemistry. Springer, 3rdedition.
- Suri, S., & Malhotra, A. (2013). *Food science, nutrition and safety*. Pearson Education India
- Whitehurst and Law. (2002). Enzymes in Food Technology. Canada: CRC Press.
- Brannen and et al., Food Additives, Marcel Dekker, New York,1990

SUGGESTED READINGS:

- Potter, N.N. and Hotchkiss, J.H. (1999). Food Science, 5th Ed., Chapman & Hall.
- Wong, Dominic WS. (2018). Food Enzymes. New York: Chapman and Hall.
- Meyer, L.H. (2004). Food Chemistry. CBS Publishers & Distributors Pvt Ltd, India.
- 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.

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

B.A. (Prog) with Food Technology (FT) as Major & Non-Major
Pool DSE: Odd Semester

DISCIPLINE SPECIFIC ELECTIVE – DSE-6-FT: 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 Methodology	4	3	0	1	Class XII	Nil

LEARNING OBJECTIVES:

1. To provide students understandings about the basic concepts, approaches and methods in conducting Home Science research.
2. 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:

Upon successful completion of this course, students will be able to:
1. Demonstrate knowledge of the scientific method, purpose and approaches to research in Home Science
2. Compare and contrast quantitative and qualitative research approaches
3. Explain different types of research design and their applicability in Home Science research
4. Understand the key elements of a research process
5. Explain ethical principles, issues and procedures

SYLLABUS OF DSE-6-FT

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
(Credit: 1; Hours: 30)

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 (Theory and Practical):

- 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). *ShodhPadhati* 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

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

DISCIPLINE SPECIFIC ELECTIVE COURSE – DSE-7-FT: DATA ANALYSIS AND STATISTICAL TOOLS

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credits	Credit distribution of the course			Eligibility Criteria	Prerequisite of the course
		Lecture	Tutorial	Practical/ Practice		
Data Analysis and Statistical Tools	4	3	0	1	Class XII	Nil

LEARNING OBJECTIVES

- To provide an understanding of the fundamental concepts of statistics.
- To enable learners to collect, organize, and summarize data using appropriate tables, graphs, and statistical methods.
- To gain the ability to compute, analyse and interpret results of datasets using basic statistical tools.

LEARNING OUTCOMES

After completing this course, the learner will be able to:

- Explain fundamental statistical concepts and their relevance to research.
- Summarize and visualize data effectively using descriptive statistics.
- Apply inferential statistical techniques to draw meaningful conclusions from sample data.
- Interpret and communicate statistical findings in the context of research.

SYLLABUS OF DSE-7-FT

THEORY
(Credits: 3; Hours: 45)

UNIT I: Fundamentals of Statistics (15 Hours)

Unit Description: This unit establishes the foundational principles of statistics, focusing on its application in social sciences.

Subtopics:

- Definition and scope of statistics in social science and market research
- Types of Statistics: Descriptive and Inferential
- Types of Data: QualitativeandQuantitative
- Measurement Scales: Nominal, Ordinal, Interval, Ratio
- Importance of Reliability and Validity

UNIT II: Data Organization and Summarization (15 Hours)

Unit Description: This unit focuses on summarizing and visualizing data for analysis and interpretation.

Subtopics:

- Organising data: frequency distributions tables
- Types of statistical graphs and their interpretation: Histogram, Pie Chart, Bar Graph, Line Graph, Frequency Polygon, Ogive
- Measures of Central Tendency:Mean, Median, Mode for ungrouped and grouped data
- Measures of Dispersion for ungrouped and grouped data:Absolute dispersion (Range, Quartile deviation, Mean deviation, Standard Deviation, Variance) and Relative dispersion (Coefficient of Range, Coefficient of Quartile deviation, Coefficient of Mean deviation, Coefficient of Variance)
- Measures of Shape: Skewness and Kurtosis
- Measures of partition values – Quartile, Decile, Percentile, Percentile Rank for ungrouped and grouped data

UNIT III: Inferential Statistics (15 Hours)

Unit Description: This unit equips students with techniques for making inferences about population from sample data.

Subtopics:

- Introduction to Probability: Basic concepts, Law of addition and multiplication
- Properties of Normal Distribution
- Correlation and Regression
- Sampling and Hypothesis testing:
    - Null and Alternative Hypotheses.
    - Errors in Sampling: Type I and Type II Errors.
    - Level of Significance (α) and Confidence (c)
    - One-tailed vs Two-tailed tests.

- Statistical Tests:
    - Parametric Tests: Z-test, t-tests for means (One-sample, Two-sample), F test for variance, ANOVA (One way), Karl Pearson's Coefficient of Co-relation
    - Non-Parametric Tests: Chi-square test, Spearman's Rank (repeated and Non-repeated) Correlation Coefficient

- Introduction to Computer-Aided Statistical Analysis:
    - Software: Excel, SPSS, Atlas.ti, JASP, Jamovi, NVIVO
    - Real life Application, Analysis, and Interpretation

PRACTICAL
(Credit:1; Hours: 30)

1. **Introduction to Statistical Software**: Using spreadsheet application such as Excel for statistical analysis by inputting basic data and performing essential Excel functions.
2. **Construction of Frequency Distributions**: Organize raw data into grouped and ungrouped frequency tables using a given dataset.
3. **Diagrammatic Representation of Data**: Visualize data using bar charts, pie charts, line graphs, histograms, and frequency polygons, and interpret the results for a given dataset.
4. **Measures of Central Tendency**: Calculate mean, median, and mode for grouped and ungrouped data in Excel, and compare central tendencies between two datasets.
5. **Measures of Dispersion**: Compute range, variance, and standard deviation in Excel to analyse the spread of two different datasets.
6. **Area under the Curve**: Calculate the area under the curve using standard scores.

7. **Correlation Analysis**: Measure the strength of relationships between two variables by calculating Pearson's and Spearman's correlation coefficients.
8. **Hypothesis Testing (One-sample and Two-sample t-test)**: Test the significance of means for single, independent, and dependent datasets using t-tests.
9. **Chi-Square Test for Independence**: Test the independence between categorical variables by analysing and interpreting a contingency table.

ESSENTIAL/ RECOMMENDED READINGS (Theory and Practical):

- Minium,E.W.,King,B.M.,&Bear,G.(2017).*Statistical Reasoning for Psychology and Education*. New York: Wiley and Sons.
- Gupta,S.P.(2022) *Statistical Methods*, 46th Edn. S.Chandand Sons.
- Agresti,A.,Christine Franklin,C.and Klingenberg, B.(2017).*Statistics:TheArtand Science of Learning from data*, Pearson, Boston

SUGGESTED READINGS

- Schmuller,J.(2016).*Statistical Analysis with Excel forDummies*, 5th Edition, NewYork, USA.
- Gupta,S.C.andmKapoor,V.K.(2020).*FundamentalsofMathematicalStatistics*,12thEdn., S. Chand and Sons.
- Ross,Sheldon M.(2010): *Introductory Statistics*, 3rdEdition, Academic Press.
- Derek Rowntree,(2018). *Statistics Without Tears, An Introduction for Non-Mathematicians*, Penguin Books

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

DISCIPLINE SPECIFIC ELECTIVE COURSE – DSE-9-FT: FOOD SAFETY AND QUALITY MANAGEMENT

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		
Food Safety and Quality Management	4	3	0	1	Class XII	Nil

LEARNING OBJECTIVES:

1. Understand key food quality management systems facilitating food safety.
2. Learn application of standards like ISO, HACCP, and GMP in the food industry.
3. Develop skills to develop and implement food safety plans and audits.
4. Understand the importance of regulatory compliance, food traceability and newer concepts in this area.

LEARNING OUTCOMES:

Students will be able to**:**

1. Apply food safety and quality management system in food processing operations.
2. Develop food safety plans that meet National & International standards and certifications.
3. Conduct food safety audits.
4. Use new technologies to improve food traceability and manage risks.
5. Manage compliance with food safety regulations and maintain proper documentation.

SYLLABUS OF DSE- 9-FT

THEORY
(Credits: 3; Hours: 45)

UNIT I: Introduction to Food Quality Management (10 Hours)

Unit Description: This unit covers food quality management, focusing on quality concepts, food safety, and the principles of quality control and assurance. It also introduces Good Manufacturing Practices (GMP) and Pre-Requisite Programs (PRPs).

Subtopics:

- Introduction to food quality management – Key terms such as quality, food safety, quality planning, quality assessment. Concept of quality attributes - traditional, modern and consumer concepts of quality
- Concepts of quality management- Objectives, importance and functions of quality control and quality assurance,
- Principles of Good Manufacturing Practices (GMP), Pre-Requisite Program (PRP's)

UNIT II: Total Quality Management Systems (13 Hours)

Unit Description: This unit covers key quality and safety concepts being applied in the food industry, including principles of TQM, TQMS, HACCP, ISO standards as well as, Sanitary and Phyto-sanitary Measures.

Subtopics:

- Total Quality Management (TQM)
- Total Quality Management System
- Sanitary and Phyto-sanitary Measures (SPS)
- HACCP (Hazard Analysis Critical Control Points)- Definition, Benefits, Principles, Guidelines for applying HACCP principles, HACCP Plan format

UNIT III: Compliance of TQMS (12 Hours)

Unit Description: This unit covers the key elements of ISO 22000:2005, along with certification systems. It also introduces standardization, accreditation bodies, and the importance of audit procedures and documentation for regulatory compliance.

Subtopics:

- Certification systems in food sector
- Introduction & application of
  i. ISO 9001:2000,
  ii. ISO 14001:2004,
  iii. OHSAS 18001:1999
  iv. ISO 27001:2005
  v. ISO 22000:2005
- Introduction to Standardization and accreditation- International Accreditation Forum (IAF), Quality Council of India (QCI), National Accreditation Board for Testing and Calibration Laboratories (NABL)
- Audit procedures and maintaining documentation for regulatory compliance.

UNIT IV: Risk Analysis and Food Traceability (10 Hours)

Unit Description: This unit covers food safety risk analysis, assessment, management, and communication, along with the role of food traceability systems in recalls. It also explores new technologies in food safety.

Subtopics:

- Concept of food safety risk -analysis, assessment, management, and communication.
- Food traceability systems and their role in food recalls.
- Role of training in effective implementation of total quality management system
- Understanding New technologies in food safety: blockchain, AI, and IoT applications, non-destructive testing solutions, machine vision.

PRACTICALS
(Credit: 1; Hours: 30)

1. Develop an HACCP plan for a small food processing unit or for the preparation of a food product in a canteen.
2. Prepare a process audit checklist for any one operation in a small food business.
3. Case study on food recall.
4. Identify and document common food hazards in a home or restaurant setup.
5. Identify key quality control points during the preparation of a dish.
6. Identify key points of quality assurance during receiving of ingredients by a small food processing unit.
7. Prepare a total quality management system for a bakery specializing in cakes.

ESSENTIAL/ RECOMMENDED READINGS (Theory and Practical):

- International Organization for Standardization. (2022). *ISO 22000:2005 Food safety management systems - Requirements for any organization in the food chain*. International Organization for Standardization.
- Rao, E. S. (2013). *Food quality evaluation*. Variety Books Publishers Distributors.
- Suri, S., & Malhotra, A. (2014). *Food science, nutrition and safety*. Pearson India Ltd.
- Mathur, P. (n.d.). *Food safety and quality control*. Orient Blackswan.
- Alli, I. (2021). *Food quality assurance: Principles and practices*. CRC Press.

SUGGESTED READINGS:

- David, A. H. (2020). *Introduction to food quality management*. Wiley-Blackwell.
- Pieternel A, Luning. &Willem, J. Marcelis. (2009). *Food Quality Management Technological and Managerial principles and practices*. Wageningen. Chapter 1, pg.19-31, Ch 3 pg. 93-139, Ch 9 pg. 391-395
- Williams, P. M. (2021). *Total quality management in the food industry*. Springer.
- Raj, K. K. N. N., & P. R. K. (2020). *Food safety and quality systems in developing countries*. CRC Press.
- Prewitt, A. A. (2021). *Food traceability: A practical guide*. Wiley.
- R., S. C. (2022). *ISO 9001:2015: A complete guide to quality management systems*. CreateSpace Independent Publishing Platform.
- Motarjemi, Y., & Lelieveld, H. (2020). Food safety management: A practical guide for the food industry. Academic Press.
- Sharma, S., Aggarwal, M., & Sharma, D. (Eds.). (2019). *Food frontiers*. New Delhi Publishers. ISBN: 978-93-86453-84-6.

SUGGESTED WEB LINKS:

- [FSSAI Official Website] (https://www.fssai.gov.in)
- [Codex Alimentarius](https://www.fao.org/fao-who-codexalimentarius/en/)
- [WHO Food Safety Guidelines] (https://www.who.int/foodsafety)

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

DISCIPLINE SPECIFIC ELECTIVE COURSE – DSE-11-FT: INSTITUTIONAL FOOD ADMINISTRATION

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		
Institutional Food Administration	4	3	0	1	Class XII	Nil

LEARNING OBJECTIVES:

- This course equips students with knowledge and skills to plan, organize, and manage food services in institutions like schools, hospitals, and corporate settings.
- It combines principles of nutrition, menu planning, food safety, resource management, and cost control for effective institutional food administration.

LEARNING OUTCOMES:

After completion of the course the students will be able to-

- Understand the essentials of institutional food service management.
- Plan balanced menus for diverse populations.
- Ensure food safety and hygiene in institutional settings.
- Manage human and material resources effectively.
- Control costs and apply sustainable practices in food services.

SYLLABUS OF DSE-11- FT

THEORY
(Credits: 3; Hours: 45)

UNIT I: Introduction to Food Service (10 Hours)

Unit Description: This unit covers key factors driving the growth of the food service industry, including lifestyle changes and technology, while exploring various food establishments. It also highlights management tools and essential entrepreneurial skills like creativity, leadership, and financial knowledge for success.

Subtopics:

- Factors contributing to the growth of the food service industry.
- Kinds of food service establishment.

- Tools of management, Planning, Organizing, Staffing, Directing, Coordinating, Reporting, and Budgeting (POSDCORB).
- Requisite skills for a good entrepreneur.

UNIT II: Food Production (15 Hours)

Unit Description: This unit covers menu planning, food purchasing, storage, recipe standardization, and portion control. It also emphasizes hygiene practices like HACCP and GMP to ensure food safety and cleanliness.

Subtopics:

- Menu Planning - Importance of menu, factor affecting menu planning, menu planning for different kinds of food service units.
- Food purchase, storage and record keeping - methods of purchase, types of storage, various records
- Quantity food production - Standardization of recipes, quantity Food preparation and its various methods of cooking, recipe adjustment, portion control.
- Hygiene and sanitation- HACCP, GMP, GHP

UNIT III: Basics of effective utilization of resources (10 Hours)

Unit Description: This unit focuses on budgeting, manpower management, including recruitment, job roles, and motivation, as well as staff scheduling and performance analysis. It also covers facility types, equipment, and how layout design affects operational efficiency.

Subtopics:

- Money & Budget
- Manpower - Organization chart, Job description, Job specification, work schedule, Production schedule, Staff and service analysis, managing manpower (appraisal, motivation), Recruitment criteria.
- Facilities and types of equipment
- Effective Layout designs

UNIT IV: Planning of a Food Service Unit (10 Hours)

Unit Description: This unit covers preliminary planning, including market surveys, client identification, menu design, and pricing, along with developing a project plan and budget allocation. It also explores guidelines from regulatory bodies and labor laws essential for compliance in the food service industry.

Subtopics:

- Preliminary planning - market survey, identifying clients, menu card, four P's of planning, operation and delivery.
- Developing project Plan - Identifying resources, developing project Plan, Budget allocation, project proposal making.

- Guidelines of important regulatory bodies, labour laws.

PRACTICAL
(Credits 1: 30 Hours)

No. of Students per Practical Class Group: 10-15

1. Conduct a local market survey to understand customer preferences and identify target clients for a new food service business. (Hint: Summarize findings and suggest a suitable menu based on the survey).
2. Evaluate and plan a menu for a school or hospital cafeteria or design a detailed birthday party menu for 20-25 guests.
3. Plan a seven days cyclic menu for girls' hostel in a college.
4. Create a menu for a specific type of food service establishment (like a quick-service restaurant buffet, or café menu or an event like a seminar/ conference) considering food cost, customer preferences, and feasibility.
5. Prepare an organizational chart for a small food service unit, then create a weekly work schedule for the staff based on the business's needs and peak hours.
6. PPT/Simulate the purchase of ingredients for a menu and demonstrate how to properly store perishable and non-perishable items. Discuss the impact of storage methods on food quality and shelf life.
7. Set up a roleplay scenario to demonstrate proper hygiene and sanitation practices in the kitchen. Focus on food handling, cleaning protocols, and safety standards like HACCP and GMP.
8. Create a layout design for a food service unit, such as a café or restaurant. Focus on optimizing space for efficient kitchen workflow, customer seating, and equipment placement.

ESSENTIAL/ RECOMMENDED READINGS (Theory and Practical):

- Sethi Mohini (2005) Institution Food Management. New Age International Publishers.
- West B Bessie & Wood Levelle (1988) Food Service in Institutions 6th Edition Revised By Hargar FV, Shuggart SG, & Palgne Palacio June, Macmillian Publishing Company New York.
- Bill Wentz (2008) Food Service Management: How to Succeed in the High-risk Restaurant Business, Atlantic Publishing Group.
- Douglas R. Brown and Shri Henkel (2007) The Non-Commercial Food Service Manager's Handbook: A Complete Guide for Hospitals, Nursing Homes, Military, Prisons, Schools and Churches. Atlantic Publishing Group Inc.
- Sari Edelstein (2008) Managing Food and Nutrition Services for Culinary, Hospitality, and Nutrition Professions. By Sari Edelstein, editor. Jones and Bartlett Learning, publisher.

SUGGESTED READINGS:

- Kazarian E A (1977) Food Service facilities Planning 3rd Edition Von Nostrand Reinhold
- New York.
- Kotler Philip. (2001) Marketing management Millennium Edition Prentice Hall of India
- Taneja S and Gupta SL (2001) Entrepreneurship development, Galgotia Publishing.
- Food Service Management: How to Succeed in the High-risk Restaurant Business by Someone Who Did. By Bill Wentz. Atlantic Publishing Group.
- Kotas Richard & Jayawardardene. C (1994) Profitable Food and Beverage Management
- Hodder & Stoughton Publication
- Dessler Gary (2007) Human Resource Management 11th edition Prentice Hall New Jersey.

- Luthans Fred (2004) Organisational Behaviour 10th Edition McGraw Hill International.

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

DISCIPLINE SPECIFIC ELECTIVE COURSE – DSE-13 –FT: DAIRY TECHNOLOGY

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		
Dairy Technology	4	3	1	0	Class XII	Nil

LEARNING OBJECTIVES:

The learning objectives of this course are

- To understand the importance of dairy industry and processing of milk.
- To gain knowledge of compositional and technological aspects of milk and milk products.

LEARNING OUTCOMES:

After completing the course, students will be able to:

- Describe the physico-chemical properties of milk.
- Develop understanding about composition of milk.
- Gain knowledge of milk processing techniques and various types of market milk.
- Develop an understanding of the processing of milk and milk products.

SYLLABUS OF DSE:13-FT

THEORY
(Credits: 3; Hours: 45)

Unit I: Introduction and Physical Properties of Milk (7 Hours)

Unit Description: This unit covers the historical development of the dairy industry in India and the production and utilization of milk. It also explores the key physical properties of milk that are essential for understanding milk quality and behavior.

Subtopics:

- Historical development of dairy industry in India
- Production and utilization of milk
- Properties of milk (Color, Taste, pH, Refractive index, Viscosity, Surface tension,
- Freezing & boiling point, specific heat and electrical conductivity

Unit II: Composition and Spoilage of Milk **(15 Hours)**

Unit Description: This unit covers the composition of milk. It also discusses the factors responsible for milk spoilage, focusing on microbial, enzymatic, and environmental influences on milk quality.

Subtopics:

- Milk carbohydrates
- Milk proteins and enzymes
- Milk fat
- Micronutrients present in milk
- Milk spoilage and factors responsible for spoilage

Unit III: Milk Processing **(8 Hours)**

Unit Description: This unit covers the techniques and technologies involved in liquid milk collection and processing. It also explores different types of milk available in the market.

Subtopics:

- Liquid milk collection
- Platform testing
- Various stages of processing; Filtration, Clarification Homogenization, Pasteurization, Packaging
- Types of market milk- toned, full cream, skim, homogenized, standardized, sterilized, recombined, reconstituted/ rehydrated and flavoured milk.

Unit IV: Milk Products **(15 Hours)**

Unit Description: This unit focuses on the processing and storage of fermented milk and other milk products. It covers the definition, manufacturing process of milk cream, paneer, and cheese, including the classification and production methods for various types of cheese and cream.

Subtopics:

- Processing and storage of fermented milk and fermented milk products.
- Milk Cream: definition and manufacturing
- Paneer: definition and manufacturing
- Cheese: definition, classification and manufacture of different types of cheese

Tutorial
Credit: 1; Hours: 30

1. Formula and calculation for: Saponification value, Iodine value, RM value, Polenske value, peroxide value, Pearson square, casein protein
2. Schematic diagram of pasteurization of milk in dairy industry.
3. Study critical control points in milk processing.
4. Study and prepare schematic diagram of CIP in dairy industry
5. Make an effective layout for the dairy plant or dairy plant visit with the report.

ESSENTIAL/ RECOMMENDED READINGS:

- De, Sukumar. (2007). Outlines of dairy technology. Oxford University Press.
- Webb, B. H., Johnson, A. H., & Alford, J. A. (2005). Fundamentals of Dairy Chemistry. CBS Publisher.
- A. Kanekanian. 2014. Milk and Dairy Products as Functional Foods. John Wiley & Sons, Ltd., UK.
- Singh, S (2014). Dairy Technology: Milk and Milk Processing. New India Publishing Agency.
- https://fssai.gov.in/upload/uploadfiles/files/2_%20Chapter%202_1%20(Dairy%20products%20and%20analogues).pdf

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.
- Y.H. Hui. 1993. Dairy Science and Technology Handbook, Vol. I, II and III. Wiley-VCH, USA.
- Deeth, H. & Kelly, P. (2020). Processing and Technology of Dairy Products. MDPI.
- https://fssai.gov.in/upload/uploadfiles/files/Gazette_Notification_Milk_Products_24_10_2017.pdf

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

B.A. (Prog) with Food Technology (FT) as Major & Non-Major
Pool DSE: Even Semester

DISCIPLINE SPECIFIC ELECTIVE COURSE – DSE-8 –FT: APPLIED FOOD MICROBIOLOGY

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		
Applied Food Microbiology	4	3	0	1	Class XII	Nil

LEARNING OBJECTIVES:

- To provide students with a comprehensive understanding of food microbiology, including the applications of various microorganisms in food product development and potential sources of food spoilage.
- To equip students with practical skills in microbiological techniques, such as microbial cultivation, staining, and enumeration.

LEARNING OUTCOMES:

After completion of the course the students will be able to -

- Understand the role of microorganisms in food industry
- Analyse microbial growth and growth factors.
- Understand the microbial spoilage and their contribution to contribution to the occurrence of foodborne diseases
- Understand the beneficial role of microorganism along with food product development.

SYLLABUS OF DSE -8 -FT

THEORY
(Credits: 3; Hours: 45)

UNIT I: Microorganisms in Food 10 Hours

Unit Description: This unit provides an overview of applied food microbiology, focusing on the role of microorganisms in food systems. It explores the classification, types, and morphology of microorganisms commonly associated with foods, including bacteria, fungi, and viruses. The unit also examines the various sources from which microorganisms can enter food.

Subtopics:

- Introduction and scope of applied food microbiology.
- Classification and types of microorganisms (bacteria, fungi and viruses) in foods and their morphology.
- Sources of microorganisms in foods.

UNIT II: Growth and Cultivation of Microorganism 10 Hours

Unit Description: This unit delves into the dynamics of microbial growth in food systems, focusing on the bacterial growth curve and the various factors that influence the growth of microorganisms in foods. It also provides a comprehensive understanding of the techniques used for cultivating and enumerating microorganisms.

Subtopics:

- Bacterial growth curve and factors affecting growth of microorganisms in foods
- Techniques for cultivation of microorganisms
- Enumeration of microorganisms

UNIT III: Role of Microorganisms in Food: Spoilage and Diseases 12 Hours

Unit Description: This unit examines the role of microorganisms in food systems, with a focus on their involvement in food spoilage and their contribution to the occurrence of foodborne diseases.

Subtopics:

- Food microbial spoilage
- Spoilage in different food types (milk, meat, fruits and vegetables)
- Food borne diseases and types, food borne intoxications, infection and food borne toxic infections

UNIT IV: Application of Microorganisms in Food Development and Preservation 13 Hours

Unit Description: This unit offers a comprehensive insight into the beneficial roles of microorganisms in food production and preservation.

Subtopics:

- Type and role of microorganisms in development of: probiotic foods (yoghurt, curd), fermented food (bread, beer, wine, cheese, vinegar)
- Role of microorganism in food preservation (pickling, sauerkraut, kimchi)
- Role of microorganisms in enzyme production

PRACTICAL
(Credit: 1; Hours: 30)

No. of Students per Practical Class Group: 10-15

1. Introduction to the Basic Microbiology Laboratory Practices and Equipments
2. Functioning and handling of microscope
3. Morphological study of bacteria using permanent slides
4. Morphological study of fungi using permanent slides

5. Simple staining /Gram's staining
6. Cleaning and sterilization of glassware
7. Preparation and sterilization of culture media (nutrient agar/ nutrient broth)
8. Standard Plate Count Method for bacteria
9. Standard Plate Count Method for fungi

ESSENTIAL/ RECOMMENDED READINGS (Theory and Practical):

- Frazier William C and Westhoff, Dennis C. (2004) Food Microbiology, TMH, New Delhi,
- Jay, James M. Modern (2000) Food Microbiology, CBS Publication, New Delhi.
- Pelczar MJ, Chan E.C.S and Krieg, Noel R. (1993) Microbiology, 5th Ed., TMH, New Delhi.
- W. M. Foster. (2020) Food Microbiology. CBS Publishers & Distributors Pvt Ltd.
- Nehra, M., & Nain, V. (2024). Handbook of Industrial Food Microbiology. CRC Press.

SUGGESTED READINGS:

- Bibek Ray and Arun Bhunia. (2014) Fundamentals food microbiology, 5th Ed, CRC Press.
- K.R. Aneja. (2018) Experiments in microbiology, plant pathology, tissue culture and microbial biotechnology, New age international publishers.
- Roger Y. Stanier. (1987) General Microbiology, Macmillan.
- K.R. Aneja. (2018) Modern Food Microbiology, Medtech.
- Kieliszek, M., & Kowalczewski, P. L. (2023). Recent Advances in Applied Microbiology and Food Sciences (p. 218). MDPI-Multidisciplinary Digital Publishing Institute.
- Reddy, S. M., Girisham, S., & Babu, G. N. (2017). Applied Microbiology (agriculture, environmental, food and industrial microbiology). Scientific Publishers.
- Garbutt, John. (1997) Essentials of Food Microbiology, Arnold, London.

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

DISCIPLINE SPECIFIC ELECTIVE COURSE – DSE-10 –FT: SUGAR AND CONFECTIONERY TECHNOLOGY

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		
Sugar and Confectionery Technology	4	3	0	1	Class XII	Nil

LEARNING OBJECTIVES:

- To equip the students with scientific base for preparing and conducting quality analysis of different types of confectionary products
- Facilitate student to explore the technologies involved in the production of confectionery products.
- Help student gain insights into the industry's growth, technological advancements and emerging trends that are shaping its future.

LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Know the current status of sugar and confectionery industry in India.
- Attain knowledge of the standards and regulations.
- Understand the principles of sugar cookery
- Understand the technologies for confectionery product preparations.

SYLLABUS OF DSE:10-FT

THEORY
(Credits: 3; Hours: 45)

UNIT I: Introduction **(6 Hours)**

Unit Description: This unit covers the history and current status of sugar processing in India, the economic significance of the confectionery industry, and the classification of confectionery products alongside relevant food safety standards and regulations.

Subtopics:

- History and current status of sugar processing in India
- Economic importance of Confectionery Industry in India.
- Confectionery products - types and their relevant standards and regulations.

UNIT II: Sugars **(12 Hours)**

Unit Description: This unit explores the chemistry of sugar, its various types and sources and the processing methodologies for different kinds of sugars. It also examines the refining processes and technologies used at each stage.

Subtopics:

- Chemistry of sugar
- Types and sources
- Methodology of processing of different kinds of sugars (raw, khandsari, brown, bura, rock, jaggery)
- Methodology of refining the sugar.

UNIT III: Sugar Cookery (12 Hours)

Unit Description: This unit focuses on the principles of sugar cookery. It examines the impact of heat, acids and other additives on sugar behaviour. This unit also covers the methodology for preparing liquid sweeteners and syrups, along with an exploration of different types of candies.

Subtopics:

- Principles of sugar cookery (inversion, melting, caramelization, crystallization and hydrolysis)
- Role of heat, acid and other ingredients on sugar behaviour
- Methodology of preparation of liquid sweeteners/ syrup
- Types of candies: crystalline and non-crystalline

UNIT IV: Confectionery Products (15 Hours)

Unit Description: This unit covers confectionery additives, production processes, quality parameters, and troubleshooting for various confectionery items like candies, toffees, caramels and traditional Indian sweets. It also includes the preparation of cake icings, required ingredients, equipment and corrective measures for common faults.

Subtopics:

- Confectionery additives
- Hard-boiled candies, toffees, jujubes, caramel, fondant, fudge and brittles: ingredients, processes, product quality parameters, faults and corrective measures.
- Indian confectionery items like chenna-murki, shakkarpara etc: ingredients, processes, product quality parameters, faults and corrective measures.
- Cake icing: preparation of different icings, ingredients, equipments required, faults and corrective measures.
- Chocolate: ingredients, processing, fat bloom

PRACTICAL
(Credit: 1; Hours: 30)

No. of Students per Practical Class Group: 10-15

1. Estimation of solubility, moisture and ash content of sugar and jaggery.
2. Determine the effect of various thermal temperatures on sugar solution and perform the thread and ball test.
3. To study the process of inversion, melting, caramelization and crystallization in sugar.
    - Preparation and quality evaluation of
    - Shakarpara
    - Chena-murki
    - Fondant
    - Fudge
    - Brittles
    - Hard boiled candy
    - Toffee
    - Fruit candy
    - Caramel syrup and chocolate sauce

- Butter scotch

4. Decoration/ frosting of cake with royal icing/ butter cream icing

ESSENTIAL/ RECOMMENDED READINGS (Theory and Practical):

- Manay, S. and Shadaksharaswami, M. (2004). Foods: Facts and Principles. New Age Publishers.
- Marion Bennion, Barbara Scheule. (2016). Introductory foods, 13th edition. Pearson, Kent State University.
- Mohini, Sethi. &Eram, Rao. (2011). Food science- Experiments and applications, 2nd ed., CBS publishers &Distributors Pvt ltd.
- Raina et.al. (2003). Basic Food Preparation-A complete Manual. 3rd Ed. Orient Longman Pvt. Ltd.
- Minifie, B.W. (1999). *Chocolate, Cocoa and Confectionary*. Aspen Publication.

SUGGESTED READINGS:

- Edwards, William. P. (2000). The Science of Sugar Confectionery, The Royal society of Chemistry
- Lees, R. (2012). *Sugar confectionery and chocolate manufacture*. Springer Science & Business Media.
- Lees, R. & Jackson, EB. (1992). *Sugar Confectionery and Chocolate Manufacture.* Springer.

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

DISCIPLINESPECIFICELECTIVECOURSE–DSE-12-FT: PUBLIC HEALTH NUTRITION: CURRENT CONCERNS

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		
Public Health Nutrition: Current Concerns	4	3	1	0	Class XII	Nil

LEARNING OBJECTIVES:

- To understand the varied dimensions of nutritional issues and identify different approaches that can be applied at the community level to improve nutritional well-being.
- To attain knowledge about the policies and intervention programs in India aimed at addressing

malnutrition.

- To understand the concept of food and nutrition security and identify its determining factors.

LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Comprehend the complex and diverse nature of nutritional challenges.
- Gain awareness of the various strategies that can be implemented at the community level to enhance nutritional status.
- Acquire knowledge of the policies and intervention programs in India designed to combat malnutrition.
- Develop an understanding of the concept and key factors influencing food and nutrition security.

SYLLABUS OF DSE: 12-FT

THEORY
(Credits:3; Hours 45)

UNIT I: Nutritional Problems at the Community Level (12 Hours)

Unit Description: Students will be explained about the existing nutritional problems in the community in the present scenario.

Subtopics:

- Introduction to Public Nutrition
  Etiology, prevalence, clinical features and preventive strategies for-
  - Undernutrition - Protein energy malnutrition, Moderate Acute Malnutrition, Severe Acute Malnutrition, Iron Deficiency Anaemia, Vitamin A Deficiency, Iodine Deficiency Disorders
  - Obesity
  - Coronary heart disease, Diabetes

UNIT II: Approaches to Enhance Community Nutrition and Health (9 Hours)

Unit Description: This unit will deal with the different approaches and strategies that could help alleviate the nutrition and health status of the community.

Subtopics:

- Assessment of Nutritional Status
- Appropriate interventions involving different sectors such as Food, Health, and Education – diet diversification, food fortification, supplementation, genetic modification, improved water and sanitation, immunization, promotion of optimal infant and young child feeding practices, growth monitoring and promotion (GMP)

UNIT III: Nutrition Policy and Programmes (12Hours)

Unit Description: Students will be introduced to all the major ongoing national level interventions and strategies and goals to combat malnutrition in the nation.

Subtopics:

- National Nutrition Policy
- Ongoing national nutrition programmes – Integrated Child Development Services (ICDS) Scheme, Mid-day Meal Programme (MDMP), Anaemia Mukt Bharat, National programmes for prevention of Vitamin A deficiency, National Programme for Prevention and Control of Cancers, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS), POSHAN Abhiyaan, POSHAN 2.0

UNIT IV: Food and Nutrition Security **(12 Hours)**

Unit Description: Students will be taught the concept of food and nutrition security and the associated national level intervention and programs

Subtopics:

- Concept, components, determinants
- Overview of the ongoing public sector programmes for improving food and nutrition security

TUTORIAL
(Credit 1: Hours 30)

1. Anthropometric assessment (Height, Weight, BMI, MUAC, Waist and Hip circumference)
2. Market survey of Ready to use Therapeutic Food products for combating nutritional deficiencies
3. Development of Educational aid for addressing nutritional problems of community
4. Visit to on-going nutrition programmes

ESSENTIAL/ RECOMMENDED READINGS (Theory and Practical):

- Vir, S. C. (Ed.). (2023). Child, Adolescent and Woman Nutrition in India: Public Policies, Programmes and Progress. Taylor & Francis.
- Bamji, MS, Krishnaswamy, K. &Brahmam, G N(Eds.). (2017). Textbook of Human Nutrition (4th ed.). New Delhi, India: Oxford and IBH Publishing Co. Pvt. Ltd.
- Park, K (2017). Park Textbook of Preventive and Social Medicine (24th ed.). Jabalpur, India: Banarasidas Bhanot Publishers.
- Khanna K, Gupta S, Seth R, Passi SJ, Seth R, Mahna R, Puri S (2013). Textbook of Nutrition and Dietetics. 2nd Edn. Phoenix Publishing House Pvt. Ltd.

SUGGESTED READINGS:

- Gibney, M J, Margetts, B M, Kearney, J M & Arab, L (Eds.). (2005). Public Health Nutrition. Oxford, UK: Blackwell Science.
- ICMR (2011) Dietary Guidelines for Indians – A Manual. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad.
- Kishore, J (2016). National Health Programs of India (12th ed.). New Delhi, India: Century Publications.
- Chadha, R and Mathur, P (eds.) (2015). Nutrition A Lifecycle Approach. New Delhi, India: Orient Blackswan Pvt. Ltd.
- Ministry of Women and Child Development (MWCD), Government of India. POSHAN

Abhiyaan [online]. Available at: https://www.mygov.in/campaigns/poshan-abhiyaan-2024/(Accessed: December 14, 2024).
- Ministry of Women and Child Development (MWCD), Government of India. POSHAN Abhiyaan [online] https://wcd.delhi.gov.in/sites/default/files/WCD/generic_multiple_files/final_saksham_anganwadi_and_mission.pdf (Accessed: December 14, 2024).
- National Health Mission [online] https://nhm.gov.in/index1.php?lang=1&level=3&sublinkid=1448&lid=797 (Accessed: December 14, 2024).

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

DISCIPLINE SPECIFIC ELECTIVE – DSE-14-FT: FUNCTIONAL FOODS AND NUTRACEUTICALS

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		
Functional Foods and Nutraceuticals	4	3	0	1	Class XII	Nil

LEARNING OBJECTIVES:

- To develop comprehensive understanding of different functional foods and nutraceuticals
- To describe the role of nutraceuticals and functional foods in preventing chronic diseases and enhancing overall health
- To understand the regulatory aspects pertaining to marketing and labelling of functional foods and nutraceuticals

LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Elucidate the different types of nutraceuticals and functional foods
- Comprehend the effectiveness of nutraceuticals and functional foods in promotion of human health
- Understand food sources amalgamated with functional and bioactive compounds
- Acquire knowledge about the regulatory aspects of functional foods and nutraceuticals

SYLLABUS OF DSE-14-FT

THEORY
(Credits: 3; Hours: 45/)

UNIT I: Introduction to Functional Foods and Nutraceuticals (6 Hours)

Unit Description: This unit provides an overview of the definitions, historical evolution, and distinctions between functional foods and nutraceuticals, along with insights into their current status and market trends in India.

Subtopics:

- Definitions and history
- Difference between functional foods and nutraceuticals
- Current status of functional foods and nutraceuticals in India
- Market trends of functional foods and nutraceuticals

UNIT II: Functional Foods in Health Promotion (15 Hours)

Unit Description: This unit will describe the types of functional foods with their potential health benefits.

Subtopics:

- Types of functional foods - Cereal and cereal products, milk and milk products, egg, oils, meat and products, sea foods, nuts and oilseeds, functional fruits and vegetables, herbs and spices, beverages (tea, wine), fermented foods
- Potential health benefits and role in cardiovascular diseases, hypertension and diabetes

UNIT III: Nutraceuticals in Health Promotion (18 Hours)

Unit Description: This unit will describe the types of nutraceuticals with their potential health benefits.

Subtopics:

- Types of nutraceuticals: phytochemicals- isoprenoids, polyphenolics, phytosterols; carbohydrates- (dietary fibers, oligosaccharides and resistant starch); proteins and peptides, lipids- conjugated linoleic Acid, omega-3 fatty acids, fat replacers; vitamins and minerals; microbial- probiotics, prebiotics and synbiotic; sources and stability of nutraceuticals
- Health benefits- cardiovascular diseases, cancer, diabetes, cholesterol management, obesity, joint pain, immune enhancement, age-related macular degeneration, endurance performance and mood disorders – compounds and their mechanisms of action

UNIT IV: Regulatory Aspects (6 Hours)

Unit Description: This unit addresses the safety, labeling, marketing, and regulation of functional foods and nutraceuticals, alongside consumer acceptance and future trends.

Subtopics:

- Safety, consumer acceptance and health claims
- Labeling, marketing and regulatory aspects
- Future prospects

TUTORIAL
(Credit: 1; Hours: 30)

1. Survey of available nutraceuticals in the market.
2. Design a food label for a nutraceutical product.
3. Draft a review paper on any selected functional food or phytochemical with its potential health promotional aspects.

ESSENTIAL READINGS (Theory and Practical):

- Wildman, R. E. and Bruno, R.S. (2021). Handbook of nutraceuticals and functional foods. (3rd edn.). CRC press
- Egbuna, C., & Dable-Tupas, G. (2020). Functional foods and nutraceuticals. Springer Nature Switzerland AG, 1, 1-632.
- Bagchi, D., Preuss, H. G., & Swaroop, A. (Eds.). (2015). Nutraceuticals and functional foods in human health and disease prevention. CRC Press.
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SUGGESTED READINGS:

- Bashir, K., Jan, K., & Ahmad, F. J. (2024). Functional Foods and Nutraceuticals: Chemistry, Health Benefits and the Way Forward. Springer.
- Bulathgama, U., Lakshman, N., & Bulugahapitiya, V. P. (2022). Recent Trends in Functional Foods and Nutraceuticals as Health-Promotive Measures: A Review. *globe*, *7*, 9.
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- Yadav, V., Pandey, P., Mittal, V., Khatkar, A., & Kaushik, D. (2015). Marketing nutraceuticals in India: An overview on current regulatory requirements. *Asian Journal of Pharmaceutical and Health Sciences*, *5*(1).
- Noomhorm, A., Ahmad, I., & Anal, A. K. (Eds.). (2014). Functional foods and dietary supplements: processing effects and health benefits. John Wiley & Sons.
- Brar, S. K., Kaur, S. & Dhillon, G. S. (Eds.) (2014). Nutraceuticals Functional Foods- Natural Remedy, Nova Science Publishers, Inc.
- Williams, M., Pehu, E., & Ragasa, C. (2006). Health enhancing foods: opportunities for strengthening the sector in developing countries. The International Bank for Reconstruction and Development/ The World Bank. Washington, DC.

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

DISCIPLINESPECIFICC ELECTIVECOURSE–DSE-16-FT: SPICE AND HERB TECHNOLOGY

CREDIT DISTRIBUTION, ELIGIBILITYAND 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		
Spice and Herb Technology	4	3	1	0	Class XII	Nil

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LEARNING OBJECTIVES:

- Introduce the role of spices and herbs in history, culture, and cuisine.
- Explore the processing, and applications of key spices and herbs.
- Discuss the role of spices and herbs in health, food preservation, and the economy.

LEARNING OUTCOMES:

After completion of the course, the students will be able to:

- Understand the historical and economic importance of herbs and spices.
- Learn about the characteristics of spices and herbs and their culinary uses.
- Gain knowledge about the processing techniques and industrial uses of spices and herbs.
- Understand the nutraceutical properties of spices and herbs.

SYLLABUS OF DSE –16- FT

THEORY
(Credits 3: Hours 45)

UNIT I: Introduction to Spices and Herbs **(5 Hours)**

Unit Description: This unit will introduce the students to various spices and herbs, exploring their historical significance, and economic value.

Subtopics:

- Definition and Classification: Understanding the difference between spices and herbs.
- Historical Significance: Spice routes, cultural exchange, and colonial trade.

- Economic Importance: Global spice market trends, exporting countries.

UNIT II: Common Spices and Herbs and their Culinary Uses (16 Hours)

Unit Description: This unit will introduce the students to various spices and herbs, their characteristics and culinary uses.

Subtopics:

- Major spices of India: Pepper, cardamom, ginger, chilies, turmeric.
- Minor spices of India: carom seeds, coriander, cumin, fenugreek, garlic, mustard, mace, nutmeg, onion, saffron, tamarind, cloves, mint, vanilla, asafetida, allspice.
- Popular Herbs: Basil, chervil, chives, coriander, dill, lemon grass, mint, parsley, rosemary, sage, thyme, terragon.
- Regional spice blends.

UNIT III: Processing and Industrial use of Spices and Herbs (16 Hours)

Unit Description: This unit focuses on the various techniques and standards involved in the post-harvest handling and processing of spices and herbs. This unit also introduces the industrial use of spices and herbs.

Subtopics:

- Post-Harvest Handling: Drying, cleaning, and storage techniques.
- Processing Techniques: Grinding, oil extraction, solvent extraction and packaging.
- Quality Standards: ISO standards, adulteration detection, and shelf life.
- Industrial Uses: Cosmetics, essential oils, and food preservation.

UNIT IV: Spices, Herbs, and Health (8 Hours)

Unit Description: This unit explains the health-promoting and nutraceutical properties of spices and herbs.

Subtopics:

- Bioactive compounds in spices and herbs.
- Nutraceutical value.
- New product development like herbal tea blends/spice mixes.

TUTORIAL
(Credits 1; hours 15)

1. Group discussion/Question Answer session/Problem solving exercises.
2. Presentation of project/Assignment by students.
3. Any other scholastic work related to application of conceptual understanding of the subject.
4. Evaluation and feedback by the teacher.

ESSENTIAL/ RECOMMENDED READINGS:

- Patil, D. A. (2013). *Spices and condiments: Origin, history and applications*. Daya Publishing House.
- Manay, S. (2001). *Foods: Facts and principles*. New Age International (P) Ltd., Publishers
- Srilakshmi, B. (2018). *Food science*. New Age International Publishers.

SUGGESTED READINGS:

- Achaya, K.T. (2003).*The story of our food.* Universities Press.
- Parry, J.W. (1953). *Spices: Their morphology, histology, and chemistry*. Chemical Publishing Co.
- Peter, K.V. (2012). *Handbook of herbs and spices*. Woodhead Publishing
- Ravindran, P.N. (2000). *Black pepper: Piper nigrum*. Harwood Academic Publishers.
- Pruthi, J.S. (1980). *Spices and condiments*. Academic Press Inc.
- Aggarwal, B.B., Sundaram, C., Malani, N., & Ichikawa, H. (2007). *The molecular targets and therapeutic uses of curcumin in health and disease*. Springer.

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