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UNIVERSITY OF DELHI

Bachelor of Arts (Programme) with Food Technology

(Effective from Academic Year 2019-20)

SYLLABUS AND SCHEME OF EXAMINATION FOR B.A. (PROGRAMME) WITH FOOD TECHNOLOGY

Three Year Full Time Programme

Choice Based Credit System (CBCS)

Syllabi applicable for students seeking admission from 2019 onwards

DEPARTMENT OF HOME SCIENCE

UNIVERSITY OF DELHI

Approved in AC meeting 15.7.2019

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Preamble

The objective of any programme at Higher Education Institute is to prepare their students for the society at large. The University of Delhi envisions all its programmes in the best interest of their students and in this endeavour it offers a new vision to all its Under-Graduate courses. It imbibes a Learning Outcome-based Curriculum Framework (LOCF) for all its Under Graduate programmes.

The LOCF approach is envisioned to provide a focused, outcome-based syllabus at the undergraduate level with an agenda to structure the teaching-learning experiences in a more student-centric manner. The LOCF approach has been adopted to strengthen students' experiences as they engage themselves in the programme of their choice. The Under-Graduate Programmes will prepare the students for both, academia and employability.

Each programme vividly elaborates its nature and promises the outcomes that are to be accomplished by studying the courses. The programmes also state the attributes that it offers to inculcate at the graduation level. The graduate attributes encompass values related to well-being, emotional stability, critical thinking, social justice and also skills for employability. In short, each programme prepares students for sustainability and life-long learning.

The new curriculum of B.A. (Programme) with Food Technology offers flexibility of programme structure while ensuring that the students get a strong foundation in the subject and gain in depth knowledge of all aspects of the field. It attempts to approach new areas of learning, develop competencies of the students for food science and technology and thereby open avenues for academic understanding, skill development, entrepreneurship and employment in food industry.

The University of Delhi hopes the LOCF approach of the B.A. (Programme) with Food Technology will help students in making an informed decision regarding the goals that they wish to pursue in further education and life, at large.

1. Introduction to B.A. (Programme) with Food Technology

The Choice Based Credit System (CBCS) offers flexibility of programme structure while ensuring that the students get a strong foundation in the subject and gain in depth knowledge of all aspects of the field. It attempts to approach new areas of learning, develop competencies of the students for food science and technology and thereby open avenues for academic understanding, skill development, entrepreneurship and employment in food industry. The framework has been developed to allow flexibility, creativity and innovation in programme design teaching-learning process, as well as assessment of student learning levels.

The contents have been drawn keeping the advancements in the discipline of Food Technology in mind. They reflect the current changing needs of students and the demands of evolving food industry. The option of project/dissertation has been offered to strengthen the knowledge and skills of students. For each paper, the objectives have been listed and the contents divided into units.

Under the Choice Based Credit System the course would be of 3 year duration, divided into 3 parts - Part I, Part II and Part III. Each part would consist of 2 semesters. The course comprises of 4 Discipline Specific Core (DSC) papers which are compulsory and are from the same stream, 2 Discipline Specific Electives (DSE), 4 Skill Enhancement Courses (SEC), and 2 Generic Electives (GE). The students will be given a pool of papers in DSE, SEC and GE from which they can choose their options as per their needs and preferences.

2. Learning Outcome-based Curriculum Framework in B.A. (Programme) with Food Technology

2.1 Nature and Extent of the Programme in B.A. (Programme) with Food Technology

The Learning Outcomes based Curriculum Framework (LOCF) for the B.A. (Programme) with Food Technology is designed to afford a skeletal structure within which the programme can be developed to suit the need of the hour, in keeping with the emergence of new areas of food processing. The framework is architected to allow for flexibility in programme design and course content development, while at the same time maintaining a basic uniformity in structure. The B.A. (Programme) with Food Technology covers a wide range of courses. The core courses that are a part of the programme are designed to build a strong knowledge base in the student. The programme offers a wide range of elective courses to the student. These include skill enhancement courses that prepare the student for entrepreneurship or eventual job in industry.

2.2 Aims of Bachelor Degree Programme in B.A. (Programme) with Food Technology

The overall aims of bachelor's degree programme with food technology are to:

- Provide students with learning experiences that help instill deep interests in learning food technology; develop broad and balanced knowledge and understanding of concepts, principles, and theories related to food technology; and equip them with appropriate tools of analysis to tackle issues and problems in the field of food technology.
- Develop in students the ability to apply the knowledge and skills they have acquired.
- Provide the students with the knowledge and skill base that would enable them to be entrepreneur, and take up employment

3. Graduate Attributes in B.A. (Programme) with Food Technology

Following are some of the characteristic attributes of a graduate in B.A. (Programme) with Food Technology:

- **Disciplinary knowledge and skills**: Capable of demonstrating comprehensive knowledge and understanding of major concepts of food processing and its sub fields

- **Communication skills**: Ability to express thoughts and ideas effectively in writing and orally and communicate with others using appropriate media.

- **Critical thinking:** Capability to apply analytical thought to a body of knowledge, analyse and evaluate evidence.

- **Problem solving:** Capacity to extrapolate from what one has learnt and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply ones learning to real life situations.

- **Research related skills:** Ability to recognize and define problems, formulate hypotheses and draw conclusions. Ability to plan, execute, report the results of an experiment or an investigation.

- **Cooperation/ Team work:** Ability to work effectively with diverse teams, act together as a group or a team and work efficiently as a member of team.

- **Scientific reasoning:** Ability to analyse, interpret and draw conclusions from quantitative/ qualitative data.

- **Information/ Digital literacy**: Capability to use ICT in a variety of learning situations.

- **Self directed learning:** Ability to work independently, identify appropriate resources required for a project and manage a project.

4. Qualification Descriptors for Graduates for B.A. (Programme) with Food Technology

The qualification description for B.A. (Programme) with Food Technology include:

- Demonstrate an understanding of the academic field of food technology and its linkages with related disciplinary areas.
- Use knowledge, understanding and skills required for identifying food technology related issues and problems and drawing on a wide range of information and its application in addressing those issues.
- Meet one's own aim of setting up an entrepreneurial venture.
- Communicate the result of studies undertaken in an academic field accurately.
- Demonstrate subject related and transferable skills that are relevant to job and employment opportunities.

5. Programme Learning Outcomes for B.A. (Programme) with Food Technology

Students of B.A. (Programme) with Food Technology will:

- Demonstrate the understanding of fundamentals of food processing, preservation and nutrition.
- Demonstrate the scope of the food industry especially food preservation and bakery industry.
- Recognize the importance of preservation and food processing to reduce the post-harvest losses and guide them to start their own entrepreneurial ventures.
- Recognize the significance of (i) food safety, food quality, food laws and regulations (ii) technologies for improving food and nutritional security (iii) understanding on food hygiene.
- Illustrate the post-harvest changes in fruits and vegetable.
- Demonstrate skills in preparing various baked and preserved products and evaluating the products based on consumer preferences.
- Demonstrate the importance of food labeling, packaging, marketing and costing of prepared products.
- Demonstrate skill in planning and preparing balanced diets for normal persons and in states of malnutrition/ disease.
- Demonstrate entrepreneurship skills for setting up a home-based catering unit.
- Implementation of research based knowledge in producing new food products.
- Demonstrate the Communication skills including ICT Skills.
- Plan and execute food technology related experiments or investigations/analyse and interpret information collected using appropriate methods.

6. Structure Of B.A. (Programme) with Food Technology

The programme will consist of six-credit courses and four-credit courses. All six credit courses will comprise of theory classes (four credits) and practicals (two credits). Four credit courses will comprise of theory classes (four credits) or practicals (four credits). For theory classes, one credit indicates a one hour lecture per week while for practicals, one credit indicates a two-hour session per week. Each practical batch will be of 15-20 students.

The programme includes Core Courses (CC) and elective courses. The core courses are all compulsory courses. There are three kinds of elective courses: Discipline-Specific Elective (DSE), Generic Elective (GE) and Skill Enhancement Course (SEC). In addition there are two Ability Enhancement Compulsory Courses (AECC).

The students will study one Core Course in each Semesters I, II, III and IV. Each Core paper will be of six credits (four credits theory and two credits practicals). The programme offers four Discipline Specific Electives (DSE), of which the student can choose any one discipline in each of the Semesters V and VI. The DSE will be of six credits each (four credits theory and two credits practicals). The DSE course that is project/ dissertation will also carry six credits. The number of students who will be allowed to opt for project/ dissertation can vary depending upon the infrastructural facilities and may vary each year. Project/ dissertation may involve field/ experimental work and the student will have to do this in the time after their regular theory and practical classes. The final evaluation of the project work will be through a committee involving internal and external examiners.

The department will offer two Generic Elective (GE) courses. The GE will be of six credits each (four credits theory and two credits practicals). The department will offer these GE courses for students of other departments in V and VI semester. The students can undertake one Skill Enhancement Course (SEC) of four credits each in semesters III, IV, V and VI which they can choose from the list of SEC offered by their college. The SEC will be of four credits each (four credits theory or four credits practicals). The department is offering six such courses.

The B.A. (Prog.) with Food Technology will be of three years duration. Each year will be called an academic year and will be divided into two semesters. Thus, there will be a total of six semesters. Each semester will consist of sixteen weeks. The teaching-learning will involve theory classes (lectures) of one hour duration and practical classes. The curriculum will be delivered through various methods including chalk and talk, power point presentations, audio, video tools, E-learning/E-content, field trips/Industry visits, seminars (talks by experts), workshops, projects, models and class discussions. The assessment broadly will comprise of Internal Assessment and End Semester Examination. Each theory paper will be of 100 marks with 25% marks for Internal Assessment and 75% for End Semester examination. The Internal Assessment will be through MCQ, test, assignment, oral presentation, power point presentations and short project. For practical based Skill Enhancement Courses, the assessment will be by continuous evaluation.

6.1 Credit Distribution

Category of Paper	Name of Papers	Course Code	Theory Credits	Practical/ Tutorial Credits
Discipline Specific Course (DSC)	**1. Fundamentals of Food Science and Technology Part I**	DSC-FT 1	4	2
	2. Fundamentals of Food Science and Technology Part II	DSC-FT 2	4	2
	3. Basic Baking Technology	DSC-FT 3	4	2
	4. Introduction to Food Safety and Preservation	DSC-FT 4	4	2
Discipline Specific Electives (DSE)	**1. Advanced Baking Technology**	DSE-FT 1	4	2
	2. Advanced Fruit and Vegetable Preservation Technology	DSE-FT 2	4	2
	3. Food Safety, Hygiene and Quality Testing	DSE-FT 3	4	2
	4. Project / Dissertation	DSE-FT 4	-	6
Skill Enhancement Course (SEC)	**1. Food Product Development**	SEC-FT 1	-	4
	2. Entrepreneurship Development	SEC- FT 2	4	-
	3. Confectionary Technology	SEC- FT 3	-	4
	4. Nutrition and Wellbeing	SEC- FT 4	-	4
	5. Milk and Milk Product Technology	SEC- FT 5	-	4
	6. Home Based Catering	SEC- FT 6	4	-
Generic Electives (GE)	**1. Baking Technology**	GE- FT 1	4	2
	2. Fruit and Vegetable Preservation Technology	GE- FT 2	4	2

6.2 Semester-wise Distribution of Courses

7 **Semester**	**Core Course (CC) (12 papers)**	**Ability Enhancement Compulsory Course (AECC) (2 papers)**	**Skill Enhancement Course SEC) (4 papers)**	**Discipline Specific Elective (DSE) (4 papers)**	**Generic Elective (GE) (2 papers)**
I	CC 1: English / MIL (Hindi) CC 2: Discipline Course - 1A CC 3: Discipline Course – 2 A	AECC 1: English/MIL / (Hindi, Sanskrit) Communication/ Environmental Science	-	-	-
II	CC 4: MIL (Hindi)/ English CC 5: Discipline Course - 1B CC 6: Discipline Course - 2B	AECC 2: English/MIL / (Hindi, Sanskrit) Communication/ Environmental Science	-	-	-
III	CC 7: English / MIL (Hindi) CC 8: Discipline Course - 1C CC 9: Discipline Course - 2C	-	SEC-1	-	-
IV	CC 10: MIL (Hindi)/ English CC 11: Discipline Course – 1D CC 12: Discipline Course – 2D	-	SEC-2	-	-
V	-	-	SEC-3	DSE-1A DSE-2A	GE-1
VI	-	-	SEC-4	DSE-1B DSE-2B	GE-2

12 DSC +2 AECC+4 SEC +4 DSE+2 GE =Total Credits 132

7. Courses for B.A. (Programme) with Food Technology

DISCIPLINE SPECIFIC COURSES (DSC):
CREDITS – 6 (4 Credit Theory and 2 Credit Practical)

DSC-FT 1: Fundamentals of Food Science and Technology Part I (Theory + Practical) (Semester I)
DSC-FT 2: Fundamentals of Food Science and Technology Part II (Theory + Practical) (Semester II)
DSC-FT 3: Basic Baking Technology (Theory + Practical) (Semester III)
DSC-FT 4: Introduction to Food Safety and Preservation (Theory + Practical) (Semester IV)

DISCIPLINE SPECIFIC ELECTIVES (DSE) (Any 2) (one in Semester V and one in Semester VI):
CREDITS – 6 (4 Credit Theory and 2 Credit Practical)

DSE-FT 1: Advanced Baking Technology (Theory + Practical) (Semester V)
DSE-FT 2: Advanced Fruit and Vegetable Preservation Technology (Theory +Practical) (Semester VI)
DSE-FT 3: Food Safety, Hygiene and Quality Testing (Theory + Practical) (Semester VI)
DSE-FT 4: Project/Dissertation (Semester V/VI)

SKILL ENHANCEMENT COURSES (SEC) (Any 4) (one each in Semester III, IV, V and VI):
CREDITS – 4

SEC- FT 1: Food Product Development (Practical) (Semester III/ IV/ V/VI)
SEC- FT 2: Entrepreneurship Development (Theory) (Semester VI)
SEC- FT 3: Confectionery Technology (Practical) (Semester III/ IV/ V/ VI)
SEC- FT 4: Nutrition and Wellbeing (Practical) (Semester III/ IV/V/VI)
SEC- FT 5: Milk and Milk Product Technology (Practical) (Semester III/ IV/ V/VI)
SEC- FT 6: Home Based Catering (Theory) (Semester V)

GENERIC ELECTIVES (GE)
CREDITS – 6 (4 Credit Theory and 2 Credit Practical)

GE-FT-1: Baking Technology (Theory + Practical) (Semester V)
GE-FT-2: Fruit and Vegetable Preservation Technology (Theory + Practical) (Semester VI)

DSC-FT 1: FUNDAMENTALS OF FOOD SCIENCE AND TECHNOLOGY PART I

(CREDITS- THEORY: 4; PRACTICAL: 2)

COURSE OBJECTIVES:

- To introduce the students to the vibrant field of food science, food technology and nutrition.
- To sensitize them on issues related to food safety.
- To introduce the concept of weights and measurement of food.
- To provide insights on the uses of various foods and the effect of processing.
- To impart theoretical and practical knowledge about basic processing of cereals, pulses, fruits, vegetables, cocoa and chocolate.

COURSE LEARNING OUTCOMES:

After successfully completing the course, the students will be able to:

- Define food science and describe its association with other related fields
- Illustrate the scope and role of food science in food and health industry
- Describe composition, nutritive value and processing of cereals, pulses, fruits, vegetables, cocoa and chocolate
- Justify scientifically the changes occurring in food during processing, handling and storage
- Describe enzymatic and non-enzymatic browning reactions along with the preventive measure and applications
- Weigh and measure food correctly
- Demonstrate the effect of processing on cereals, pulses, fruits and vegetables

THEORY PERIODS: 60 (CREDITS 4)

UNIT I INTRODUCTION TO FOOD SCIENCE AND TECHNOLOGY 5

- Definition, scope and current trends in food science and technology

Suri, S. & Malhotra, A. (2014). *Food Science Nutrition and Safety*. Delhi: Pearson India Ltd, Chapter 1, pg 3-11
Sethi, P. & Lakra, P. (2015). *Aahar Vigyan, Poshan Evam Suraksha.* Delhi: Elite Publishing House Pvt. Ltd, Chapter 23, pg 407-419

UNIT II INTRODUCTION TO BASIC NUTRITION 15

- Definitions: food, nutrient, health, balanced diet
- Macro nutrients: classification, sources and functions of carbohydrates, fat, protein
- Micro nutrients: sources and functions of vitamins and minerals (Calcium, Iron and Zinc)

Effect of processing on nutrients

Suri, S. & Malhotra, A. (2014). *Food Science Nutrition and Safety*. Delhi: Pearson India Ltd, Chapter 11, pg 123-130; Chapter 13, pg 145-162; Chapter 14, pg 168-202; Chapter 16, pg 216-217; Chapter 17, pg 230-233

Sethi, P. & Lakra, P. (2015). *Aahar Vigyan, Poshan Evam Suraksha.* Delhi: Elite Publishing House Pvt. Ltd, Chapter 1, pg 1-7, Chapter 14, pg 232-242' Chapter 15, pg 247-257, Chapter 16, pg 267-277; Chapter 17, pg 284-300, Chapter 18, pg 304-327; Chapter 19, pg 334-339; Chapter 20, pg 350-356, 370-372

UNIT III BROWNING REACTIONS IN FOODS 8

- Classification (enzymatic, non-enzymatic and metallic browning), causes and prevention of Browning
  - Suri, S. & Malhotra, A. (2014). *Food Science Nutrition and Safety*. Delhi: Pearson India Ltd, Chapter 10, pg 110-120
  - Sethi, P. & Lakra, P. (2015). *Aahar Vigyan, Poshan Evam Suraksha.* Delhi: Elite Publishing House Pvt. Ltd, Chapter 6, pg 105-111

UNIT IV CEREALS AND PULSES 12

- Composition and nutritive value, types of cereals, processing of cereals and pulses (gelatinization of starch and the factors affecting it, germination and fermentation), toxic constituents in pulses, milling of pulses

Srilakshmi, B. (2012). *Food Science*. Delhi: New Age International Pvt. Ltd, Chapter 2-3, pg 26-83

Sethi, P. & Lakra, P. (2015). *Aahar Vigyan, Poshan Evam Suraksha.* Delhi: Elite Publishing House Pvt. Ltd, Chapter 4, pg 44-68; Chapter 5, pg 69-81

UNIT V FRUITS AND VEGETABLES 10

- Classification of fruits and vegetables, composition and nutritive value; effect of processing on pigments

Srilakshmi, B. (2012). *Food Science*. Delhi: New Age International Pvt. Ltd, Chapter 8, pg 171-202

Sethi, P. & Lakra, P. (2015). *Aahar Vigyan, Poshan Evam Suraksha.* Delhi: Elite Publishing House Pvt. Ltd, Chapter 6, pg 88-105

UNIT VI CHOCOLATE AND COCOA PRODUCTS 10

- Cocoa bean processing, preparation of chocolate liquor, cocoa butter and chocolate

Srilakshmi, B. (2012). *Food Science*. Delhi: New Age International Pvt. Ltd, Chapter 12, pg 274-278

PRACTICAL: PERIODS: 60 (CREDITS 2)

- Weights and measures, selection of raw material
- Gelatinization of starch and the factors affecting it
- Factors affecting gelatinization in preparation of custard/boiled rice/*halwa*

- Germination of pulses and its applications
- Preparation of products using sprouts – salads/fruit *chaat*/*poha*/others
- Fermentation of cereals and pulses and its applications
- Preparation of cereal-pulse fermented products – *idli/dosa/dhokla*/others
- Effect of heat, acid and alkali on various plant pigments
- Enzymatic browning of fruits and vegetables
- Non-enzymatic browning reactions in food
- Chocolate preparation

COMPULSORY READING:

- Sethi, P. & Lakra, P. (2015). *Aahar Vigyan, Poshan Evam Suraksha*. Delhi: Elite Publishing House Pvt. Ltd.
- Srilakshmi, B. (2012). *Food Science*. Delhi: New Age International Pvt. Ltd.
- Suri, S. & Malhotra, A. (2014). *Food Science Nutrition and Safety*. Delhi: Pearson India Ltd.

ADDITIONAL RESOURCES:

- Longvah, T., Ananthan, R., Bhaskarchary, K. & Venkaiah, K. (2017). *Indian Food Composition Tabl*es. Hyderabad: National Institute of Nutrition.
- Mahan, K.L. and Raymond, J.L.R. (2016). *Krause's Food and the Nutrition Care Process*, 14th Edition. USA: Saunders.
- McWilliams, M. (2016). *Foods: Experimental Perspectives*. USA: Pearson.
- Potter, N., & Hotchkiss, J.H. (2007). *Food Science*. 5th Edition. Delhi: CBS Publishers.
- Reddy, S.M. (2015). *Basic Food Science and Technology*. Delhi: New Age International Publishers.
- Staci Nix, M. (2016). *William's Basic Nutrition and Diet Therapy*. 15th Edition. USA: Elsevier.
- Vaclavik, V.A. & Elizabeth, C. (2014). *Essentials of Food Science*. 4th Edition. New York: Springer.

WEBSITES:

- Central Food Technology Research Institute: http://www.cftri.com
- Food Safety and Standards Authority of India: http://www.fssai.gov.in
- International Food Information Council: http://www.ific.org
- International Union of Food Science and Technology: http://www.iufost.org
- National Institute of Nutrition: http://www.nin.res.in

TEACHING LEARNING PROCESS:

- Use of interactive ICT (such as PowerPoint presentations)
- Lecture
- Group discussions
- Assignments
- MOOCs, Videos etc.
- Interactions with industry (optional)
- Conduct of Practicals

ASSESSMENT METHODS:

As per University of Delhi norms for each course the assessment is as follows:

For theory (maximum marks 100):
-End semester exam: 75 marks
-Internal Assessment: 25 marks (Class test- 10 marks; Assignment- 10 marks; Attendance – 5 marks)

For practical (where applicable) (maximum marks 50):
-End-semester practical exam: 25 marks
-Continuous evaluation of practical: 25 marks

Result is declared in terms of letter grade and grade points for each course.

KEYWORDS:

- Department of Food Technology
- Food Science
- Nutrition
- Cereals and Pulses
- Fruits and Vegetables
- Cocoa and Chocolate

Facilitating the Achievement of Course Learning Objectives

Unit No.	Course Learning Outcomes	Teaching and Learning Activities	Assessment Tasks
1	Students would have learnt food science and its association with other related fields	Lecture, activity of finding newer developments in the field on food science and nutrition through use of appropriate e-resources	Group discussion, Quiz, Viva-voce
2	The students would illustrate the scope and role of food science in food and health industry	Lecture, e-resources and books.	Assignment/project work, oral/written exam such as multiple choice questions.

3	Students will have gained knowledge related to desirable and undesirable changes due to enzymatic and non-enzymatic browning	Lecture, demonstration of enzymatic and non-enzymatic browning, use of e-resources	Assignment, multiple choice questions, oral/written exam.
4	Students will have gained information regarding processing of cereals and pulses and put it into practice	Lecture, demonstration/practical on gelatinization of starch/germination/fermentation, use of e-resources and books	Oral/written test, evaluation of applied project/practical work
5	Students will have gained the knowledge on effect of processing on pigments present in fruits and vegetables	Lecture, demonstration/practical on effect of heat, acid, alkali on pigments,	Oral/written test, evaluation of applied project/evaluation of practical work
6	Students will have gained the knowledge on processing of cocoa beans to chocolate liquor, cocoa butter and chocolate.	Lecture, Market survey, video related to processing of cocoa beans to chocolates	Oral/written test, applied project/evaluation of practical work, group discussions

***Assessment tasks listed here are indicative and may vary.**

DSC-FT 2: FUNDAMENTALS OF FOOD SCIENCE AND TECHNOLOGY PART II (CREDITS- THEORY: 4; PRACTICAL: 2)

COURSE OBJECTIVES:

- To familiarize the students with the composition and processing of milk, egg, meat, sugars and fats
- To impart concept of sugar refining, egg foam stages, milk products, emulsions
- To impart knowledge about food adulteration.

COURSE LEARNING OUTCOMES:

After successfully completing the course, the students will be able to:

- Describe the composition and nutritive value of milk, meat, egg, sugar and fats and their role in cookery
- Develop understanding about basic processing of milk and eggs.
- Illustrate the basic techniques of manufacturing /refining of sugar and demonstrate the behavior of sugar at various temperatures.
- Describe spoilage of fat scientifically, determine the smoke point of different fats and illustrate the ways to prevent fat rancidity.
- Test common adulterants in food and illustrate the deleterious effects of common adulterants

THEORY **PERIODS: 60 (CREDITS 4)**

UNIT I MILK AND MILK PRODUCTS **10**

- Composition and nutritive value
- Introduction to liquid milk technology (clarification, pasteurization, homogenization, fortification, sterilization)
- Types of milk
- Effect of processing on milk,
- Introduction to milk products.

Srilakshmi, B. (2012). *Food Science*. Delhi: New Age International Pvt. Ltd. Chapter 5, pg 98-123

Sethi, P. & Lakra, P. (2015). *Aahar Vigyan, Poshan Evam Suraksha*. Delhi: Elite Publishing House Pvt. Ltd, Chapter 7, pg 118-137

UNIT II EGGS **12**

- Composition and nutritive value
- Structure of an egg
- Egg quality and deterioration
- Green ring formation in boiled egg, preservation of eggs
- Egg foams – stages of preparation and factors affecting them
- Effect of heat on egg proteins; functions of eggs in cookery.

Srilakshmi, B. (2012). *Food Science*. Delhi: New Age International Pvt. Ltd. Chapter 6, pg 124-146

Sethi, P. & Lakra, P. (2015). *Aahar Vigyan, Poshan Evam Suraksha*. Delhi: Elite Publishing House Pvt. Ltd, Chapter 8, pg 138-160

UNIT III MEAT, FISH AND POULTRY **8**

- Composition and nutritive value
- Selection/purchasing criteria for meat, fish and poultry
- Tenderization of meat.

Srilakshmi, B. (2012). *Food Science*. Delhi: New Age International Pvt. Ltd. Chapter 7, pg 147-170

Sethi, P. & Lakra, P. (2015). *Aahar Vigyan, Poshan Evam Suraksha*. Delhi: Elite Publishing House Pvt. Ltd, Chapter 9, pg 161-177

UNIT IV SUGAR **12**

- Composition and nutritive value
- Properties of sugars
- Manufacturing/refining of sucrose

• Sugar cookery – crystalline and non-crystalline candies, sugar-based products.

Srilakshmi, B. (2012). *Food Science*. Delhi: New Age International Pvt. Ltd. Chapter 9, pg 211-219

Sethi, P. & Lakra, P. (2015). *Aahar Vigyan, Poshan Evam Suraksha*. Delhi: Elite Publishing House Pvt. Ltd, Chapter 11, pg 201-215

UNIT V FATS AND OILS 13

• Composition and nutritive value
• Types of fats/oils and their functions
• Rancidity in fat and its prevention
• Changes in fat during heating
• Care of fat used for frying, emulsions.

Srilakshmi, B. (2012). *Food Science*. Delhi: New Age International Pvt. Ltd. Chapter 10, pg 225-243

Sethi, P. & Lakra, P. (2015). *Aahar Vigyan, Poshan Evam Suraksha*. Delhi: Elite Publishing House Pvt. Ltd, Chapter 10, pg 178-200

UNIT VI INTRODUCTION TO FOOD ADULTERATION 5

• Adulteration, adulterants and their effects on health.

Srilakshmi, B. (2012). *Food Science*. Delhi: New Age International Pvt. Ltd. Chapter 14, pg 322-330

Sethi, P. & Lakra, P. (2015). *Aahar Vigyan, Poshan Evam Suraksha*. Delhi: Elite Publishing House Pvt. Ltd, Chapter 22, pg 381-387

PRACTICAL: PERIODS: 60 (CREDITS 2)

- Effect of heat, acid and alkali on coagulation and precipitation of milk.
- Preparation of milk products using prolonged heating/heat and acid technique.
- Determination of pH of different foods.
- Egg white foam formation and factors affecting its stability
- Egg foam products – omelets/meringues/soufflé
- Green ring formation in boiled eggs and its prevention
- Behavior of sugar at various temperatures
- Preparation of crystalline and non-crystalline candies
- Determination of smoke point of various oils and factors affecting the smoke point.
- Preparation of emulsions – mayonnaise
- Detection of adulterants in food

COMPULSORY READING:

- Potter, N. & Hotchkiss, J.H. (2007). *Food Science.* 5th Edition. Delhi: CBS Publishers.
- Rekhi,, T. & Yadav, H. (2014). *Fundamentals of Food and Nutrition.* Delhi: Elite Publishing House Pvt. Ltd.

- Sethi, P. & Lakra, P. (2015). *Aahar Vigyan, Poshan Evam Suraksha*. Delhi: Elite Publishing House Pvt. Ltd.
- Sharma, A. (2010). *Textbook of Food Science and Technology*. 2nd Edition. Delhi:IBDC Publishers.
- Srilakshmi, B. (2012). *Food Science*. Delhi: New Age International Pvt. Ltd.
- Suri, S. & Malhotra, A. (2014). *Food Science Nutrition and Safety*. Delhi: Pearson India Ltd.

ADDITIONAL RESOURCES:

- Manay, N. S. & Shadakashraswamy. *Foods: Facts and Principles.* 3rd Edition. New Age International Pvt Ltd.
- McWilliams, M. (2016). *Foods: Experimental Perspectives*. USA: Pearson.
- Roday, S. (2018). *Food Science and Nutrition.* 3rd Edition. Delhi: Oxford University Press.
- Vaclavik, V.A. & Elizabeth, C. (2014). *Essentials of Food Science*. 4th Edition. New York: Springer.

WEBSITES:

- Central Food Technology Research Institute: http://www.cftri.com
- Food Safety and Standards Authority of India: http://www.fssai.gov.in

TEACHING LEARNING PROCESS:

- Lectures
- Use of prescribed textbooks and handouts.
- Power Point Presentation
- Technology enabled learning
- Laboratory based practical component.

ASSESSMENT METHODS:

As per University of Delhi norms for each course the assessment is as follows:

For theory (maximum marks 100):
-End semester exam: 75 marks
-Internal Assessment: 25 marks (Class test- 10 marks; Assignment- 10 marks; Attendance – 5 marks)

For practical (where applicable) (maximum marks 50):
-End-semester practical exam: 25 marks
-Continuous evaluation of practical: 25 marks

Result is declared in terms of letter grade and grade points for each course.

KEYWORDS:

- Department of Food Technology
- Nutritive value
- Processing
- Pasteurization
- Meat tenderization
- Rancidity
- Sugar cookery
- Adulteration

Facilitating the Achievement of Course Learning Objectives

Unit No.	Course Learning Outcomes	Teaching and Learning Activities	Assessment Tasks
1.	Students will have gained knowledge regarding the composition and nutritive value of milk. They will acquire information regarding basic liquid milk technologies, types of milk and effects of processing on milk.	Theory classes on milk composition and nutritive value, basic liquid milk technology explained with power point presentation. Uses of reactions and diagrams to understand effect of processing. Visual representation of various milk products.	Question answer, MCQs on nutritive value, processing and liquid milk technology. Short test on the concept of processing effect, use of internet like You tube to visualize various products making.
2.	Students will have acquired knowledge regarding structure of an egg, its role in cookery, nutritive value and composition and egg quality and preservation methods. Students will gain understanding regarding egg foam formation and green ring formation on boiled egg and factors causing these.	Diagrammatic representation of an egg structure followed by discussion on nutritive value, composition and role of egg in cookery. Theory classes on egg foam formation and green ring formation with practical demonstration of it.	Drawing of egg structure, Student presentation, class tests focusing on short notes and one-word answers.
3.	Students will have gained knowledge regarding nutritive value and selection criteria of meat, fish and poultry. Students will have gained knowledge regarding meat tenderizing methods.	Diagrammatic representation of structure of meat and difference between meat, fish and poultry in structure and nutritive value. Discussions regarding selection criteria of the three. Lecture methods to	Drawing of basic meat structure. Quiz on difference between stale and fresh fish, selection criteria of fish and poultry, tenderizers.

		learn various meat tenderizing methods.	
4.	Students will have gained knowledge regarding properties and nutritive value of sugars, sugar refining and manufacturing process, differentiate between crystalline and non-crystalline candies.	Theory classes cum discussion on properties and nutritive value of sugar. Use of flow chart to depict sugar refining process. Use of temperature ranges to understand various sugar stages and products. use of visual material.	Student presentations, practical demonstration of crystalline and non-crystalline candies and products based on these temperatures.
5.	Students will have developed understanding regarding various classifications of fats and oils, nutritive value of fats and oils and its function, rancidity in fats and oils and changes in fats during heating.	Use of flow chart representations regarding various classifications. lecture methods to understand functions and rancidity in fats and oils. Tabulated information regarding changes in fats during cooking and care in its usage.	Flow chart representations. Test on differences between fats sources origin, saturated and unsaturated fats, essential and non-essential fatty acids. MCQs.
6.	Students will have developed understanding regarding definition of adulterations and various adulterants and its ill effects on health.	Lecture, visual inspection of adulterated sample. Performing of some simple adulteration tests. tabulating observations.	Simple adulteration test results, test/essay on ill effects of adulterants on health.

***Assessment tasks listed here are indicative and may vary.**

DSC- FT 3: BASIC BAKING TECHNOLOGY
(CREDITS- THEORY: 4; PRACTICAL: 2)

COURSE OBJECTIVES:

- To impart students basic knowledge related to the principles of baking
- To introduce them to the techniques and skills of cake and pastry making and their decoration
- To introduce the concept of proximate analysis of wheat flour

COURSE LEARNING OUTCOMES:

After successfully completing the course, the students will be able to:

- Describe the present and future trends of the bakery industry.
- Illustrate the basic ingredients and equipment used for baking along with their significance
- Describe the process of cake and pastry preparation, their decoration and evaluation.

- Demonstrate the skills for making cakes and pastries.
- Test wheat flour and conduct labeling, packaging and costing of prepared bakery products.
- Initiate the entrepreneurial journey in the field of bakery.

THEORY **PERIODS: 60 (CREDITS 4)**

UNIT I: BAKING INDUSTRY **8**

- Baking industry and its scope in the Indian economy
- History of bakery - present trends and prospects
- Nutrition facts about bakery products

https://shodhganga.inflibnet.ac.in/bitstream/10603/53842/10/10_chapter%202.pdf

UNIT II: WHEAT GRAIN, BAKING INGREDIENTS AND EQUIPMENT **22**

- Wheat grain– its structure
- Milling of wheat, types of refined wheat flour; composition of refined wheat flour (gluten, amylose/ amylopectin, enzyme activity, moisture) and its storage
- Ingredients – flour, sugar, fat, egg, leavening agents and other bakery additives
- Equipment- oven, mixing tools and icing tools

Potter, N., & Hotchkiss, J.H. (2006). *Food Science.* Delhi: CBS Publishers, Chapter 17, pg 381-401

UNIT III: CAKE TECHNOLOGY **15**

- Preparation of cakes - types of cakes, methods of batter preparation, steps in cake making, balancing of cake formula, evaluation of the baked cake, operational faults in cake processing and the remedial measures.
- Packaging, labeling, and costing
- Cake decoration- different methods

Dubey, S. C. (2016*). Basic Baking-Science and Craft.* Delhi: Society of Indian Bakers, Unit 2, Chapter 1 – 5, pg 98-121

Dubey, S. C. (2009*). Bakery Vighan.* Delhi: Society of Indian Bakers, Unit 2, Chapter 1 – 5, pg 117-150

UNIT IV: PASTRY TECHNOLOGY **15**

- Preparation of pastry - types of pastries (short crust, puff/flaky and choux pastry), processing and evaluation, faults and remedies.

Dubey, S. C. (2016*). Basic Baking-Science and Craft.* Delhi: Society of Indian Bakers, Unit 2, Chapter 7, pg 138-143

- Dubey, S. C. (2009*). Bakery Vighan.* Delhi: Society of Indian Bakers, Unit 2, Chapter 7, pg 175-182.

PRACTICAL **PERIODS: 60 (CREDITS 2)**

- Quality Testing of Flour
    - Determination of water absorption power (WAP) of refined wheat flour and whole wheat flour
- Determination of ash content in refined wheat flour
- Determination of moisture content of refined wheat flour
- Sensory evaluation (by Hedonic scale) for various processed food products
- Preparation and sensory evaluation of cakes
    - Fatless sponge (pineapple sponge, chocolate sponge and Swiss roll)
    - Shortened cake (plain tea cake, Dundee cake, marble cake, fruit cake and innovative cakes)
    - Eggless cake
- Cake Icing
- Preparation and sensory evaluation of pastry
    - Short crust (jam tarts)
    - Puff/flaky (Bombay khari, vegetable patties)
    - Choux pastry (chocolate éclairs)

COMPULSORY READINGS:

- Dubey, S. C. (2016*). Basic Baking-Science and Craft.* Delhi: Society of Indian Bakers.
- Dubey, S. C. (2009*). Bakery Vighan.* Delhi: Society of Indian Bakers.
- Ketrapaul, N., Grewal, R.B., & Jood, S. (2005). *Bakery Science and Cereal Technology*. Delhi: Daya Publishing House.
- Potter, N., & Hotchkiss, J.H. (2006). *Food Science.* Delhi: CBS Publishers.

ADDITIONAL RESOURCES:

- Cornell, Hugh, J. & Hoveling, Alber. W. (1998). *Wheat Chemistry and Utilization*, Delhi: CRC Press.
- Edward, W. P. (2007). *The Science of Bakery Products*. Cambridge: RSC Publishing.
- Kent, N.L. (2004). *Technology of Cereals*. London: Pergamon Press.
- Khanna, K., Gupta, S., Seth, R., Mahana, R., & Rekhi, T. (2004). *The Art and Science of Cooking.* Delhi: Phoenix Publishing House Private Limited.
- Mathur, P. (2018). *Food Safety and Quality Control*. Delhi: Orient Blackswan.
- Matz A. (2004). *The Chemistry and Technology of Cereals as Food and Feed*. Delhi: CBS Publishers.
- Matz, A. (1998*). Bakery Technology and Engineering.* Delhi: CBS Publishers.

- Raina, U., Kashyap, S., Narula,V., Thomas, S., Suvira, Vir, S., & Chopra, S. (2005). *Basic Food Preparation* – A Complete Manual. Delhi: Orient Longman.
- Srilakshmi, B. (2018*). Food Science*. Delhi: New Age International Publishers.

TEACHING LEARNING PROCESS:

- Lectures
- Power point presentations
- Experiential learning through demonstrations
- Market survey
- Experimental learning

ASSESSMENT METHODS:
As per University of Delhi norms for each course the assessment is as follows:

For theory (maximum marks 100):
-End semester exam: 75 marks
-Internal Assessment: 25 marks (Class test- 10 marks; Assignment- 10 marks; Attendance – 5 marks)

For practical (where applicable) (maximum marks 50):
-End-semester practical exam: 25 marks
-Continuous evaluation of practical: 25 marks

Result is declared in terms of letter grade and grade points for each course.

KEYWORDS:

- Department of Food Technology.
- Baking industry
- Wheat milling
- Bakery ingredients
- Bakery equipment
- Cake technology
- Pastry technology

Facilitating the achievement of course learning objectives

Unit No.	Course learning outcomes	Teaching and learning activities	Assessment tasks
1.	Students will have gained knowledge on the history and scope of the baking industry in	Lecture on the Baking industry in India.	Market survey of bakery products and a class test.

	India.		
2.	Students will have gained understanding about ingredients and equipment required for baking.	Lecture and demonstration of ingredients and equipment required for baking. Diagram of wheat.	Assignment submission.
3.	Students will have gained knowledge on cake making and decoration techniques	Lecture, demonstration; cake making and decoration videos shown in the class. Learning about labeling, packaging and costing of cakes.	Assignment and power point presentations. Evaluating the cakes. Making labels. Class test.
4.	Students will learn about different types of pastries and their evaluation.	Interactive session on pastries, demonstration; audio visual presentation on making short crust pastry, puff pastry and choux pastry.	Preparing and evaluating the different pastries. Class test and quiz on pastries.

***Assessment tasks listed here are indicative and may vary.**

DSC-FT 4: INTRODUCTION TO FOOD SAFETY & PRESERVATION (CREDITS- THEORY: 4; PRACTICAL: 2)

COURSE OBJECTIVES:

- To impart students basic knowledge relating to food safety and principles of preservation
- To introduce them to the concept of processing and preservation of fruits and vegetables
- To familiarize the students with preserved fruit and vegetable products available in the market
- To equip them with skills required for preservation, packaging and evaluation of fruit beverages, ketchup, sauce and chutney

COURSE LEARNING OUTCOMES:

After successfully completing the course, the students will be able to:

- Describe the purpose and scope of the food preservation industry along with a market survey of preserved products.
- Illustrate the post-harvest changes in fruits and vegetables.
- Explain the different objectives, principles and methods of food preservation
- Demonstrate skills for processing of fruits and vegetable chutneys, sauces and beverages along with labeling

- Prepare safe and hygienic preserves using appropriate techniques of preservation
- Be conversant with FSSAI regulations and functions
- Develop the attitude and values imperative for a micro entrepreneur in food industry.

THEORY **PERIODS: 60 (CREDITS 4)**

UNIT I: PURPOSE AND SCOPE OF PRESERVATION **5**

- Objectives of preservation and processing
- Scope of preservation industry in India

Srivastava, S.S. (2011). *Phal Parirakshan*. Lucknow: Kitab Mahal, Chapter 4, pg 72- 88
Srivastava, R.P. & Kumar, S. (2005). *Fruit and Vegetable Preservation*. Lucknow: International Book Distributing Co. Chapter 3, pg 11- 18

UNIT II: POST-HARVEST CHANGES AND SPOILAGE **10**

- Physical, chemical and microbiological changes in fruits and vegetables
- Factors affecting growth of microorganisms and the control measures

Srivastava, R.P. & Kumar, S. (2005). *Fruit and Vegetable Preservation*. Lucknow: International Book Distributing Co. Chapter 9, pg 61-72

UNIT III: FOOD SAFETY **20**

- Key terms, factors affecting food safety, recent concerns
- FSSAI: Regulations and functions
- Food additives and contaminants
- Hygiene and Sanitation
- HACCP

Suri, S. & Malhotra, A. (2014). *Food Science, Nutrition and Safety*. Delhi: Pearson India Ltd, Chapter 20, pg 263-270; Chapter 25, 26, pg 335-357

UNIT IV: PRINCIPLES AND METHODS OF PRESERVATION **12**

- Asepsis
- Use of low temperature
- Use of high temperature
- Removal of moisture
- Removal of air
- Use of chemical preservatives
- Fermentation

- Irradiation
- Gas preservation
- Newer methods

Srivastava, R.P. & Kumar, S. (2005). *Fruit and Vegetable Preservation*. Lucknow: International Book Distributing Co. Chapter 12, pg 85-100

UNIT V: FRUIT AND VEGETABLE PROCESSING – SAUCES AND BEVERAGES **13**

- Chutney and sauces- definition, method of preservation, steps in preparation of chutney and sauces
- Fruit beverages- definition and classification, method of preservation (with special emphasis on pasteurization, use of chemical preservatives, sugar), role of various ingredients

Srivastava, S.S. (2011). *Phal Parirakshan*. Lucknow: Kitab Mahal, Chapter 13, pg 339-400; Chapter 17, pg 482-496

Lal, G., Siddhapa, G.S., & Tandon, G.L. (2016). *Preservation of Fruits and Vegetables.* New Delhi: Indian Council of Agriculture Research, Chapter 9, pg 124-151; Chapter 14, pg 235- 249

PRACTICALS **PERIODS: 60 (CREDITS 2)**

- Sterilization of bottles
- Market survey of preserved fruit and vegetable products
- Preparation, packaging, sensory/objective (TSS, pH) evaluation and costing of:
    - Sauces (chilli sauce and tomato sauce)
    - Ketchup (tomato)
    - Chutney (tomato chutney and *imli* chutney)
    - Squash (lemon squash, orange squash, pineapple squash)
    - Syrup (rose syrup and almond syrup)
    - Fermented beverage (*Kanji*)
- Preparation of labels for preserved foods

COMPULSORY READING:

- Frazier, W.C. & Westhoff, D.C. (2014). *Food Microbiology*. Chennai: Tata McGraw-Hill Publishing Company Limited.
- Srivastava, S.S. (2006). *Phal Parirakshan*. Lucknow: Kitab Mahal.
- Suri, S. & Malhotra, A. (2014). *Food Science Nutrition and Safety*. Delhi: Pearson India Ltd.

ADDITIONAL RESOURCES:

- Khurdia, D.S. (1995). *Preservation of fruits and vegetables*. New Delhi: Indian Council of Agriculture Research.
- Knechtges, L.I. (2012). *Food Safety-Theory and Practice*, USA: Jones and Barlette Learning.
- Lal, G., Siddhapa, G.S., & Tandon, G.L. (2009). *Preservation of Fruits and Vegetables.* New Delhi: Indian Council of Agriculture Research.
- Mathur, P. (2018). *Food Safety and Quality Control*. Delhi: Orient Blackswan.
- Ramaswamy, H. and Marcotte, M. (2009). *Food Processing–Principles and Applications*. Boca Raton : Taylor and Francis.
- Subbalakshmi, G., & Udipi, S.A. (2007). *Food Processing and Preservation*. Delhi: New Age International Publishers.
- *The Food Safety and Standards Act along with Rules and Regulations*. (2011) Delhi: Commercial Law Publishers (India) Pvt. Ltd.

WEBSITES:

- Food Safety and Standards Authority of India. www.fssai.gov.in
- National Center for Home Food Preservation. http://nchfp.uga.edu/
- Ministry of Food Processing Industry website http://mofpi.nic.in/

TEACHING LEARNING PROCESS:

- Lectures
- Power point presentations.
- Market survey
- Experiential learning through demonstrations
- Experimental learning

ASSESSMENT METHODS:

As per University of Delhi norms for each course the assessment is as follows:

For theory (maximum marks 100):
-End semester exam: 75 marks
-Internal Assessment: 25 marks (Class test- 10 marks; Assignment- 10 marks; Attendance – 5 marks)

For practical (where applicable) (maximum marks 50):
-End-semester practical exam: 25 marks
-Continuous evaluation of practical: 25 marks

Result is declared in terms of letter grade and grade points for each course.

KEYWORDS:

- Department of Food Technology
- Postharvest changes
- Principles of preservation
- FSSAI
- HACCP
- Processing of sauces
- Processing of beverages

Facilitating the achievement of course learning objectives

Unit No	Course learning outcomes	Teaching learning activities	Assessment tasks
1.	Students will have gained the understanding of preservation industry in India.	Lecture on the preservation industry in India. Use of e-resource while explaining the scope.	Market survey of preserved products. Class test. Essay writing
2.	Students will have gained understanding on different kind of changes occurring in fruits and vegetables after harvesting and their control measures.	Discussion on physical, chemical and microbiological changes followed by viewing of video.	Written assignment to be submitted.
3.	Students will become conversant with regulations and functions of FSSAI, Food safety and HACCP.	Lectures on Food safety, FSSAI, Food additives and contaminants; hygiene and sanitation and HACCP followed by audio visual presentation.	Quiz and presentations on different aspects of Food safety.
4.	Students will have gained understanding on the Principles and different methods of preservation.	Lectures and Poster presentation on the different techniques of preservation.	Class test, Assignment.
5.	Students will have learnt the methodology of making chutney, sauces and beverages.	Lecture cum demonstration of the methodology of making chutneys sauces and beverages and making their labels.	Practically preparing and evaluating the chutneys sauces and beverages. Assignments on fruit beverages, making labels.

***Assessment tasks listed here are indicative and may vary**

DSE FT 1: ADVANCED BAKING TECHNOLOGY
(CREDITS- THEORY: 4; PRACTICAL: 2)

OBJECTIVES:

- To impart students with knowledge related to processing of breads, biscuits and cookies.
- To familiarize them with basics of food packaging, marketing and cost control.

COURSE LEARNING OUTCOMES:

- Describe the role of ingredients and steps of preparation of bread and biscuits.
- Illustrate techniques of marketing and cost control.
- Compare various food packaging materials and their characteristics.
- Justify label regulations and need for nutritional labeling.
- Demonstrate skills to prepare various kinds of breads and biscuits.
- Conduct sensory evaluation of prepared baked products.
- Perform quality tests of wheat flour and yeast.
- Produce bakery products in bulk and organize an exhibition cum sale.

THEORY **PERIODS: 60 (CREDITS 4)**

UNIT I: BREAD TECHNOLOGY **14**

- Preparation of bread - ingredients used, methods of dough preparation, steps in bread processing, evaluation of the baked bread, staling of bread, diseases of bread

Dubey, S. C. (2016*). Basic Baking-Science and Craft.* Delhi: Society of Indian Bakers. Unit 1, Chapter 1- 8, pg 8-85

Dubey, S. C. (2009*). Bakery Vighan.* Delhi: Society of Indian Bakers, Unit 1, Chapter 1-8, pg 3-97

UNIT II: BISCUIT AND COOKIES TECHNOLOGY **12**

- Preparation of biscuits and cookies – types, ingredients, processing and evaluation
- Crackers

Dubey, S. C. (2016*). Basic Baking-Science and Craft.* Delhi: Society of Indian Bakers. Unit 2, Chapter 6, pg 132- 137

Dubey, S. C. (2009*). Bakery Vighan.* Delhi: Society of Indian Bakers, Unit 2, Chapter 6, pg 166-174

UNIT III: FOOD PACKAGING **14**

- Packaging – its importance, essential features of an ideal package, various food packaging materials and their characteristics
- Recent trends in the field of packaging (active packaging, intelligent packaging, RFID)
- Label regulations and designing labels for packaged foods, nutritional labeling.

Potter, N., & Hotchkiss, J.H. (2006). *Food Science.* Delhi: CBS Publishers, Chapter 21, pg 478-508

Food Safety and Standards Authority of India: http://www.fssai.gov.in

UNIT IV: MARKETING AND COST CONTROL 20

- Marketing - definition, scope, understanding the 4Ps (Product, Price, Place, Promotion), marketing techniques, marketing and distribution of processed products
- Cost control – food cost, labour cost and other costs; costing of processed products

Sethi, M. (2005). *Institutional Food Management*. Delhi: New Age International Publishers. Chapter 22, pg 381-404; Chapter 32, pg 579- 588

PRACTICAL PERIODS: 60 (CREDITS 2)

- Determination of gluten content in refined wheat flour.
- Qualitative assessment of bran content in various wheat flours.
- Determination of dough raising capacity (DRC) of yeast and factors affecting the yeast activity.
- Preparation and sensory evaluation of breads (white and brown bread), buns and dinner rolls, pizza base.
- Preparation and sensory evaluation of various biscuits and cookies: Dropped biscuits, Rolled biscuits, Moulded biscuits
- Preparing any of the baked products in bulk and organizing an exhibition-cum-sale.

COMPULSORY READING:

- Dubey S. C. (2016). *Basic Baking: Science and Craft*. Delhi: The Society of Indian Bakers.
- Dubey S. C. (2009). *Bakery Vigyan*. Delhi: The Society of Indian Bakers.
- Matz A. (2008). *Bakery Technology and Engineering*. 10th Edition. Delhi: CBS Publishers.

ADDITIONAL RESOURCES:

- Athalye, A.S. (1992). *Plastics in Food Packaging*. Delhi: Tata McGraw Hill Publishing Company.
- Booth, G.R. (2003). *Snack Foods*. Delhi: CBS Publishers.
- Faridi, H. (2004). *The Science of Cookie and Crackers Production*. Delhi: CBS Publishers.
- Griffin, S. (1997). *Principles of Food Packaging*. Connecticut: The AVI Publishing Company.
- Ketrapaul, N., Grewal, R.B., Jood, S. (2005). *Bakery Science and Cereal Technology*. Delhi: Daya Publishing House.
- Khanna, K., Gupta, S., Seth, R., Mahana, R., & Rekhi, T. (2004). *The Art and Science of Cooking*. Delhi: Phoenix Publishing House Private Limited.
- Potter, N., & Hotchkiss, J.H. (2006). *Food Science*. Delhi: CBS Publishers.
- Raina, U., Kashyap, S., Narula, V., Thomas, S., Suvira, Vir, S., & Chopra, S. (2005). *Basic Food Preparation – A Complete Manual*. Delhi: Orient Longman.
- Sharma, S., Aggarwal, M. & Sharma, S. (2018). *Food Frontiers.* Delhi: New Delhi Publishers.
- Sethi, M. (2005). *Institutional Food Management*. Delhi: New Age International Publishers.

WEBSITES:

- Food Safety and Standards Authority of India: http://www.fssai.gov.in.
- Baking courses: https://www.udemy.com/topic/baking/.
- Baking guide: http://www.reviewlab.com/baking-guide/.

TEACHING LEARNING PROCESS:

- Lecture
- Demonstration
- Experimental learning
- Market Survey
- Power Point Presentation
- Videos
- Quiz
- Assignments
- Handouts

ASSESSMENT METHODS:

As per University of Delhi norms for each course the assessment is as follows:

For theory (maximum marks 100):
-End semester exam: 75 marks
-Internal Assessment: 25 marks (Class test- 10 marks; Assignment- 10 marks; Attendance – 5 marks)

For practical (where applicable) (maximum marks 50):
-End-semester practical exam: 25 marks
-Continuous evaluation of practical: 25 marks

Result is declared in terms of letter grade and grade points for each course.

KEYWORDS:

- Department of Food Technology
- Bread technology
- Biscuits and cookies technology
- Food packaging
- Marketing
- Cost control
- Qualitative tests of wheat flour and yeast

Facilitating the achievement of Course Learning Objectives

Unit	Course Learning Outcomes	Teaching and Learning	Assessment Tasks

No.		Activities	
1	Students will have gained knowledge on role of ingredients, steps of processing and evaluation of bread. They will be aware of causes of staling and diseases of bread.	Lecture classes on role of ingredients, methods of dough preparation, steps in processing and evaluation of bread, Video and demonstration on processing of bread.	Class test focusing on role of ingredients and steps of processing of bread. Power point presentation by students on topics covered under this unit. Evaluating the breads.
2	Students will have gained knowledge on types on cookies, and biscuits, role of ingredients, processing and evaluation of biscuits. They will also acquire information on crackers.	Theory classes on preparation of biscuits and cookies, ingredients required, steps of processing and evaluation. Discussion about crackers. Video and Demonstration on processing of biscuits and power point presentation.	Assignments, Market surveys on types of biscuits. Evaluating the biscuits
3	Students will have gathered detailed information on importance of packaging, essential features of an ideal package and characteristics of various food packaging materials. Students will have a broad prospective of recent trends in packaging, label regulations and nutritional labeling.	Theory lectures on packaging materials, importance of packaging and essential features of an ideal package. Detailed discussion on recent trends in packaging, label regulations and nutritional labeling.	Quiz on packaging requirements, market survey on packaging of processes foods, Assignment on nutritional labeling.
4	Students will have gained detailed information on marketing and distribution of processed products. They will be aware of different aspects of cost control and costing.	Interactive lectures on techniques of marketing and distribution. Detailed discussion on scope of 4P's of marketing. Discussion about cost control and techniques.	Test on marketing and distribution. Assignment on cost control measures in food industry. Power Point presentation on marketing.

***Assessment tasks listed here are indicative and may vary.**

DSE-FT 2: ADVANCED FRUIT AND VEGETABLE PRESERVATION TECHNOLOGY
(CREDITS- THEORY: 4; PRACTICAL: 2)

COURSE OBJECTIVES:

- To impart knowledge about fruit and vegetable preservation techniques such as dehydration, canning and freezing
- To introduce the concept of food product development
- To equip the students with knowledge and skills for preparing, packaging, evaluating and selling pectin products, preserves and pickles

COURSE LEARNING OUTCOMES:

- Describe the different principles and methods of fruit and vegetable preservation and processing.
- Compare preservation techniques such as Dehydration versus Concentration, Refrigeration versus Freezing and also processed products such as Jams and Jellies versus Marmalades.
- Describe the various steps in dehydration, freezing, canning, pectin products, preserves and pickles.
- State the importance and challenges of new food product development and state its types.
- Prepare, package and label jams, jelly, marmalade, pickles and preserves professionally.
- Use sensory evaluation and objective evaluation techniques (TSS, pH) to test these products.
- Produce a preserved product in bulk, calculate the cost and organize an exhibition-cum-sale.

THEORY: PERIODS: 60 (CREDITS 4)

UNIT I: DEHYDRATION AND CONCENTRATION 16

- Dehydration- definition and objectives, method of preservation, normal drying curve, water activity, factors affecting rate of drying, sun drying, types of dehydrators (air convection, drum, freeze and vacuum driers) steps in dehydration of fruits and vegetables
- Concentration- definition and objectives, techniques

Potter, N., & Hotchkiss, J.H. (2006). *Food Science.* Delhi: CBS Publishers, Chapter 10, pg 200-243

Srivastava, S.S. (2006). *Phal Parirakshan*. Lucknow: Kitab Mahal, Chapter 10, pg 260-305

UNIT II: REFRIGERATION AND FREEZING 8

Definition and objectives, difference between freezing and refrigeration, systems of refrigeration, method of preservation, steps in freezing fruits and vegetables, cryogenic freezing of fruits and vegetable, evaluation

Potter, N., & Hotchkiss, J.H. (2006). *Food Science.* Delhi: CBS Publishers, Chapter 9, pg 163-199

Srivastava, S.S. (2006). *Phal Parirakshan*. Lucknow: Kitab Mahal, Chapter 8, pg 174-196, Chapter 11, pg 306-317

UNIT III: CANNING 9

Definition and objectives, selection of fruits and vegetables, method of preservation, steps of canning fruits and vegetables (with special emphasis on blanching, exhausting and heat processing), spoilage of canned foods

Lal, G., Siddhapa, G.S., & Tandon, G.L. (2009). *Preservation of Fruits and Vegetables.* New Delhi: Indian Council of Agriculture Research, Chapter 2 - 3, pg 8- 32; Chapter 7, pg 83- 92

Srivastava, S.S. (2006). *Phal Parirakshan*. Lucknow: Kitab Mahal, Chapter 9, pg 197-259

UNIT IV: INTRODUCTION TO NEW FOOD PRODUCT DEVELOPMENT 6

Need and importance for developing a new product, types of new products, challenges, failure of new product

Fuller, Gordon W. (2004). *New Product Development- From Concept to Marketplace*. Delhi: CRC Press, Chapter 1, pg 1-30; Chapter 3, pg 67-122

UNIT V: FRUIT AND VEGETABLE PROCESSING –PECTIN PRODUCTS, PRESERVES AND PICKLES

- Jam, Jelly and Marmalade- definition, role of pectin and theory of gel formation, method of preservation, steps of preparation, evaluation. **9**

- Preserves- definition, method of preservation, steps of preparation, evaluation, candied, crystallized and glazed fruits. **6**

- Pickles- definition, classification, method of preservation, steps of preparation of vinegar pickles, evaluation. **6**

Lal, G., Siddhapa, G.S., & Tandon, G.L. (2009). *Preservation of Fruits and Vegetables.* New Delhi: Indian Council of Agriculture Research, Chapter 11, 12, pg 156- 205; Chapter 14, pg 249- 269

Srivastava, S.S. (2006). *Phal Parirakshan*. Lucknow: Kitab Mahal, Chapter 14, 15,16, pg 401-481

PRACTICAL: PERIODS: 60 (CREDITS 2)

- Preparation, packaging, labeling, sensory/objective (TSS, pH) evaluation and costing of:
    - Jam (apple jam and mixed fruit jam)
    - Jelly (guava jelly)

- Marmalade (orange marmalade)
- Pickle (green chilli, lemon, mixed vegetable)
- Preserve (carrot)
- Dehydration of vegetables (green leafy vegetables, other vegetables and tubers)
- Freezing of vegetables.

- Determination of headspace, total soluble solid content and acidity of different preserved foods.
- Preparing any of the preserved product/new product in bulk and organizing an exhibition-cum-sale.

COMPULSORY READING:

- Potter, N., & Hotchkiss, J.H. (2006). *Food Science.* Delhi: CBS Publishers.
- Lal, G., Siddhapa, G.S., &Tandon, G.L. (2009). *Preservation of Fruits and Vegetables.* New Delhi: Indian Council of Agriculture Research.
- Srivastava, S.S. (2006). *Phal Parirakshan*. Lucknow: Kitab Mahal.

ADDITIONAL RESOURCES:

- Khurdia, D.S. (1995). *Preservation of Fruits and Vegetables.* New Delhi: Indian Council of Agriculture Research.
- Hui, Y.H., Evaranuz, E.O. (2015). *Handbook of Vegetable Processing and Preservation*. 2nd Edition. USA: CRC Press.
- Ramaswamy, H. and Marcotte, M. (2009). *Food Processing–Principles and Applications*. Boca Raton: Taylor and Francis.
- Srilakshmi, B. (2018). *Food Science.* Seventh Edition. Delhi: New Age Publications.
- Subbalakshmi, G. & Udipi, S.A. (2007). *Food Processing and Preservation*. Delhi: New Age International Publishers.

WEBSITES:

- National Center for Home Food Preservation. http://nchfp.uga.edu/
- Ministry of Food Processing Industry http://mofpi.nic.in/

TEACHING LEARNING PROCESS:

- Lecture
- Discussion
- Power Point presentation
- Handouts
- Field visits
- Videos

- Demonstration
- Experimental learning

ASSESSMENT METHODS:

As per University of Delhi norms for each course the assessment is as follows:

For theory (maximum marks 100):
-End semester exam: 75 marks
-Internal Assessment: 25 marks (Class test- 10 marks; Assignment- 10 marks; Attendance – 5 marks)

For practical (where applicable) (maximum marks 50):
-End-semester practical exam: 25 marks
-Continuous evaluation of practical: 25 marks

Result is declared in terms of letter grade and grade points for each course.

KEYWORDS:

- Department of Food Technology
- Fruit and vegetable preservation
- Dehydration
- Freezing
- Canning
- Jam, Jelly and Marmalade
- Preserves
- Pickles
- New Food Product Development

Facilitating the achievement of Course Learning Objectives

Unit No.	Course Learning Outcomes	Teaching and Learning Activities	Assessment Tasks
1	Students will have gained knowledge on definition, objectives and techniques of dehydration and concentration. Students will be aware of factors affecting rate of drying and types of dehydrators.	Theory classes on objectives and techniques of dehydration and concentration. Discussion of factors affecting dehydration. Diagrammatic representation of different dehydrators. Videos and power point presentation.	Diagrams of different types of dehydrators. Student presentations. Assignment on normal drying curve and water activity. Evaluating the dehydrated products.
2	Students will have gained	Lectures on objectives,	Flow diagram of

	knowledge on objectives of freezing and refrigeration, steps of freezing, evaluation of frozen fruits and vegetables and cryogenic freezing.	steps of freezing and evaluation of frozen foods. Interactive session and discussion on difference between freezing and refrigeration and systems of refrigeration. Videos on freezing and refrigeration.	steps of freezing. Assignment on difference between freezing and refrigeration. Quiz. Student presentation. Evaluating the frozen products.
3	Students will have gained knowledge about definition, objectives, steps of caning of fruits and vegetables. They will be aware of types of spoilage in canned foods and its causes.	Lectures on definition, objectives, selection of fruits and steps of canning. Diagrammatic representation of steps of canning. Video on canning process, discussion on spoilage in canned foods.	Test on various aspects of canning. Student presentation on steps of canning process and spoilage in canned foods. Market survey on canned products.
4	Students will be acquainted with need and importance for developing a new product types of new products and challenges	Discussion on need and importance of new food product development. Types of new products, challenges and failure of new products.	Assignments focusing on types of new products and their challenges.
5	Students will have gained knowledge on definition, principles of preservation, steps of preparation and evaluation of pectin products, preserves and pickles.	Theory classes on definition, methods of preservation, steps of preparation and evaluation of Jam, Jelly, Marmalade, Preserve and Pickles. Interactive session and discussion on role of pectin and theory of gel formation. Power point presentations and videos on steps of preparation.	Class tests focusing on steps of preparation and evaluation of products covered in this unit. Evaluating the products and labels. Student presentations.

***Assessment tasks listed here are indicative and may vary.**

DSE-FT 3: FOOD SAFETY, HYGIENE AND QUALITY TESTING (CREDITS- THEORY: 4; PRACTICAL: 2)

COURSE OBJECTIVES:

- To support the supply of safe and wholesome food
- To provide in-depth understanding to students regarding food safety and hygiene
- To increase knowledge related to management and enhancement of quality
- To gain knowledge related to food quality assessment tests using simple techniques and equipment

COURSE LEARNING OUTCOMES:

After studying the paper, the students will be able to:

- Gain basic understanding of food safety and its related issues
- Illustrate risk factors and newer challenges associated with food safety
- Understand and apply general principles of food hygiene
- Relate the relevance of various quality management systems/ approaches and training for weaving the culture of food safety at various levels
- Have knowledge regarding the role of various global and national regulatory agencies in maintaining food quality and harmonizing international trade
- Describe salient physical, sensory and chemical methods of food quality testing.
- Scientifically assess the quality of food using sensory, physical and microbiological methods.

THEORY: PERIODS: 60 (CREDITS 4)

UNIT I: FOOD LAWS AND REGULATIONS 12

- Introduction to food acts laws and standards
- National food safety and standard act
- International standards, regulatory agencies
- Consumer protection act

Suri, S. & Malhotra, A. (2014). *Food Science Nutrition and Safety*. Delhi: Pearson India Ltd, Chapter 27, pg 361-375

UNIT II FOOD QUALITY MANAGEMENT 12

- Characteristics of quality
- Quality Control,
- Quality Assurance
- Total Quality Management
- Quality Management System
- Good Manufacturing Practices
- Hazard Analysis Critical Control Point System (HACCP)

Suri, S. & Malhotra, A. (2014). *Food Science Nutrition and Safety*. Delhi: Pearson India Ltd, Chapter 28, pg 376- 390

UNIT III INTRODUCTION TO FOOD SAFETY AND HYGIENE 10

- Food hygiene
- Factors affecting food safety
- Food spoilage
- Food handling
- Special requirements for high-risk foods,
- Safe food cooking temperature and storage techniques.

Suri, S. & Malhotra, A. (2014). *Food Science Nutrition and Safety*. Delhi: Pearson India Ltd, Chapter 20, pg 263-270; Chapter 29, pg 392-400

UNIT IV HYGIENE AND SANITATION IN FOOD SERVICE INSTITUTIONS 8

- Cleaning and disinfection
- Personal hygiene
- Pest control
- Waste disposal

Suri, S. & Malhotra, A. (2014). *Food Science Nutrition and Safety*. Delhi: Pearson India Ltd, Chapter 29, pg 401-406

UNIT V SENSORY METHODS OF FOOD QUALITY TESTING 8

- Sensation of taste, smell, appearance and flavor, sensory evaluation techniques

Suri, S. & Malhotra, A. (2014). *Food Science Nutrition and Safety*. Delhi: Pearson India Ltd, Chapter 6, pg 75-80

UNIT VI OBJECTIVE METHODS OF FOOD QUALITY TESTING 10

- Physical test methods (moisture, acidity, water activity, texture, viscosity, colour)
- Simple methods of chemical analysis (protein, fat, water, ash)
- Microbiological sampling and testing.

Food Safety and Standards Authority of India: http://www.fssai.gov.in
Srilakshmi, B. (2012). *Food Science*. Delhi: New Age International Pvt. Ltd, Chapter 13, pg 289-312

PRACTICAL: PERIODS: 60 (CREDITS 2)

- Presentation on food hygiene and sanitation practices in any local food outlet.
- Sensory evaluation tests for processed foods
- Determination of the quality of an egg (whole and open egg).
- Determination of the moisture content of various flours
- Determination of viscosity of various food gruels (porridge, custards, batters etc.) using viscometer.
- Assessing the texture of raw and cooked food using penetrometer.
- Measurement of the water activity (a_w) of raw and cooked food using AW – meter.
- Detection of pathogens in food using microbiological detection kits

COMPULSORY READING:

- Mathur, P. (2018). *Food Safety and Quality Control.* Delhi: Orient Blackswan.
- Srilakshmi, B. (2016). *Food Science*. 2016. Delhi: New Age International Pvt. Ltd.
- Suri, S. & Malhotra, A. (2014). *Food Science Nutrition and Safety*. Delhi: Pearson India Ltd.

ADDITIONAL RESOURCES:

- Frazier, W.C. & Wethoff, D.C. (2014). *Food Microbiology*. Chennai: McGraw Hill.

- IFST. (2012). *Food and Drink – GMP: a guide to its responsible Management*. UK: UK Institute of Food Science and Technology.
- Marriott, N.G. & Gravani, R.B. (2006). *Principles of Food Sanitation.* USA: Springer.
- Sethi, M. & Malhan, S. (2018). *Catering management – an integrated approach*. Delhi: New Age International Publishers.
- Prabhakar, K. A. (2016). *Practical Guide to Food Laws and Regulations*. Delhi: Bloomsburg India.

WEBSITES:

- Codex Alimentarius: http://www.codexalimentarius.org
- Hand Hygiene Resource Center: http://www.handhygiene.org
- Food Safety and Standards Authority of India: http://www.fssai.gov.in
- International Center of Excellence in Food Risk Communication: http://www.foodriskcommunications.com
- International Food Information Council: http://www.ific.org

TEACHING LEARNING PROCESS:

- Use of ICT especially e graphics such as power point presentations
- Lectures
- Group discussions
- Assignment work
- MOOCs, Videos
- Conduct of practicals by students
- Field visits (optional)

ASSESSMENT METHODS:

As per University of Delhi norms for each course the assessment is as follows:

For theory (maximum marks 100):
-End semester exam: 75 marks
-Internal Assessment: 25 marks (Class test- 10 marks; Assignment- 10 marks; Attendance – 5 marks)

For practical (where applicable) (maximum marks 50):
-End-semester practical exam: 25 marks
-Continuous evaluation of practical: 25 marks

Result is declared in terms of letter grade and grade points for each course.

KEYWORDS:

- Food Safety
- Food Hygiene

- FSSAI
- HACCP
- Food Quality Management
- Food Hygiene

Facilitating the Achievement of Course Learning Objectives

Unit No.	Course Learning Outcomes	Teaching and Learning Activities	Assessment Tasks
1	Students will have gained knowledge about the latest Acts, Laws and Standards related to food safety.	Lecture, website of national and international regulatory bodies, survey, e-resources.	Assignment/project work, quiz, multiple choice questions, oral/written exam.
2	Students will have gained understanding on planning and executing total quality management system for food processing/food service units	Lecture, e-resources, case study approach, planning of quality management system for a food product available in college canteen.	Assignment/project work, oral/written exam, identification of critical control points for a food product.
3	Students will have gained understanding on role and scope of safety and hygiene during handling of food	Lecture, e-resources, group discussions, survey of food service unit.	Assignment work/ oral/written exam, group presentation using e-graphics.
4	Students will have gained knowledge on implementation of various hygiene and sanitation practices	Lecture, group discussions, case study approach, videos.	Problem solving exercises, posters, charts, skit/role play.
5	To apply the knowledge related to sensory methods of food quality testing to conduct/evaluate food.	Lecture, practical on implementing and evaluating the sensory characteristics of food using various test of sensory evaluation.	Oral/written work, Assignment work, evaluation of practical exercise.
6	Students will have gained knowledge on using various physical, chemical and microbiological methods for evaluating food quality.	Lecture, e-resources, Manuals related to methods of food analysis such as FSSAI, Codex etc., perform food quality assessment tests using instruments such as viscometer, penetrometer, water activity meter etc.	Oral/written work, presentation using e-graphics, evaluation of practical work.

***Assessment tasks listed here are indicative and may vary.**

DSE-FT 4: PROJECT/ DISSERTATION
(CREDITS- PRACTICAL:6)

COURSE OBJECTIVES:

- To enable students to design and conduct original and ethical research.
- To develop ability among students to do review of literature.
- To develop ability in students to write a dissertation in the APA format.

COURSE LEARNING OUTCOMES:

- Improved analytical skills
- Better understanding regarding data collection
- Greater skills to write scientific work.

PRACTICAL: **PERIODS: 180 (CREDITS 6)**

FIELD WORK

Write a dissertation in the APA format. The research done can either be empirical/data based (quantitative, qualitative, or mixed-methods) or it can be in the form of a critical review of research and theory.

Gupta, S.C., & Kapoor, V.K., Fundamentals of Mathematical Statistics, eleventh Edition, Delhi; Sultan Chand & Sons. Chapter 1 – 5, pg 1.1-5.72

COMPULSORY READINGS:

- Aggarwal, B.L. (2015). *Basic Statistics.* Sixth Edition. Delhi: New Age International Private Limited.
- Gupta, S.C., & Kapoor, V.K., Fundamentals of Mathematical Statistics, eleventh Edition, Delhi; Sultan Chand & Sons.
- Spectrum. (2018). *Statistical Analysis, Graph and Diagram* (Hindi). Delhi: Spectrums.
- Dharmpalan, B. (2012). *Scientific Research Methodology*. Delhi: Alpha Science International Limited.

ADDITIONAL RESOURCES:

- Chadha, R., & Mathur, P. (2015). *Nutrition: A Lifecycle Approach*. Delhi: Orient Blackswan.
- Khanna, K., Gupta, S., Seth, R., Mahna, R., & Rekhi, T. (2005). *The Art and Science of Cooking: A practical Manual*. Fifth Edition. Delhi: Elite Publishing House Pvt. Ltd.
- Kothari, C.R., & Garg, G. (2019). *Research Methodology: Methods and Techniques.* Delhi: New Age International Publishers.
- Longwah, T., Ananthan, R., Bhaskaracharya, K., & Venkaiah, K. (2017). *Indian Food Composition Tables*. Telangana: National Institute of Nutrition (Indian Council of Medical Research) & Department of Health Research, Ministry of Health and Family Welfare, Government of India.
- Lovegrove, J.A., Hodson, L., Sharma, S., Lanham-New, S.A., & Krebs, L.J. (2015). *Nutrition Research Methodologies.* USA: Wiley Blackwell.
- Mathur, P. (2017). *Food Safety and Quality Control.* Delhi: Orient Blackswan.
- Parija, S.C., & Kate, V. (2017). *Writing and publishing a Scientific Research Paper*. USA: Springer.

- Suri, S., & Malhotra, A. (2014). *Food Science, Nutrition and Safety*. Delhi: Pearson India Education Services Pvt. Limited.
- Turabian, K.L. (2018). *A Manual for Writers of Research Papers, Theses and Dissertations*. Ninth Edition. USA: Chicago Editorial Press.

WEBSITES:

- Codex Alimentarius: http://www.codexalimentarius.org
- Food Safety and Standards Authority of India: http://www.fssai.gov.in

TEACHING LEARNING PROCESS:

- Power point presentation
- Field Work

ASSESSMENT METHOD:

As per University of Delhi norms (Viva jointly conducted by one internal and one external examiner).

KEYWORDS:

- Department of Food Technology

Facilitating the achievement of Course Learning Objectives

Unit No.	Course Learning Outcomes	Teaching and Learning Activities	Assessment Tasks
1	Students will be equipped with analytical skills, better understanding regarding scientific research work, research methodology, data collection and skill to write and present research work.	Interaction and discussions on research method, data collection, analysis and result presentation. Correction of drafts of dissertation writing as per APA Format.	Presentation of research work as per University of Delhi norms (Viva jointly by one internal and one external examiner).

***Assessment tasks listed here are indicative and may vary.**

SEC- FT 1: FOOD PRODUCT DEVELOPMENT
(CREDITS: PRACTICAL- 4)

COURSE OBJECTIVES:

- To understand the concept of development of a new food product.
- To develop new food products scientifically based on special dietary requirements/functionality/convenience/improvisation of existing traditional Indian foods.

COURSE LEARNING OUTCOMES:

- Identify the area/product on which they want to pursue their trials on the basis of their skills, aptitude and acquired knowledge.
- Develop a food product scientifically.
- Understand the concept of market survey and literature review for new product development.
- Standardize a recipe, do packaging and cost analysis of the developed product.
- Write a project report.

PRACTICAL: **PERIODS: 120 (CREDITS 4)**

- Development of New Product: Definition, importance, objectives and need of product development, reasons of failure, types and steps of product development, product development tools and their use.

- Market and literature survey to identify the concepts of new products based on special dietary requirements, functionality, convenience and improvisation of existing traditional Indian foods.
- Screening of product concept on the basis of techno-economic feasibility.
- Development of prototype product and Standardization of formulation process.
- Proximate Analysis of New Product.
- Packaging, labeling and shelf-life studies.
- Cost analysis and final project report.
- Each team/group of students would develop a food product on the basis of above mentioned lines/steps and would submit a project report.

Fuller, Gordon W. (2004). *New Product Development- From Concept to Marketplace*. Delhi: CRC Press, Chapter 1, pg 1-30; Chapter 3, pg 67-122

COMPULSORY READING:

- Fuller, Gordon W. (2004). *New Product Development- From Concept to Marketplace*. Delhi: CRC Press.
- Kumar, A.S., Poornima, S.C., Abraham, M.K. & Jayashree, K. (2004). *Entrepreneurship Development*. Delhi: New Age International Publishers.
- Moskowitz, Howard and Saguy, R. I. Sam. (2009). *An Integrated Approach to New Food Product*. Delhi: CRC Press.

ADDITIONAL RESOURCES:

- Aramouni, F. & Deschenes, K. (2015). *Methods for developing new food products: An instructional guide*. Lancaster: DES Tech Publications Inc.
- Longvah,T., Ananthan, R., Bhaskarchary, K. & Venkaiah, K. (2017). *Indian Food Composition Tables*. Telangana: NIN (ICMR).
- Osborn, S. & Wayne M. (2016). *Developing Food Products for consumers with specific dietary needs*. USA: Woodhead Publishing.
- Sharma, S., Aggarwal, M. & Sharma, D. (2018). *Food Frontiers.* Delhi: New Delhi Publishers.

WEBSITES:

- Food Safety and Standards Authority of India: http://www.fssai.gov.in.
- Central Food Technology Research Institute: http://www.cftri.com.
- Food International Food Information Council: http://www.ific.org.
- International Union of Food Science and Technology: http://www.iufost.org.

TEACHING LEARNING PROCESS:

- Experimental learning

- Lecture
- Demonstration
- Group discussion
- Power Point Presentation
- Videos
- Field visits
- Market survey
- Handouts

ASSESSMENT METHODS:

Continuous evaluation of practical: 100 marks
Result is declared in terms of letter grade and grade points for each course.

KEYWORDS:

- Department of Food Technology
- Food packaging
- Labeling
- Cost analysis
- Shelf life studies
- Food Product Development

Facilitating the achievement of Course Learning Objectives

Unit No.	Course Learning Outcomes	Teaching and Learning Activities	Assessment Tasks
1	Students will have gained knowledge on developing a food product scientifically. They will have gathered insight into concept of market survey, basic review of literature, standardization of a recipe, packaging and cost analysis. They will have learned the technique of writing project reports.	Lectures on definition, importance, objectives of product development, tools and steps of product development. Discussion and interactive session on how to do market survey and review of literature. Interactive lectures and group discussions on screening of product concept, development of prototype product, packaging, cost analysis and project report. Practical's to develop a product and its packaging, labeling, shelf life studies, videos on food product development and power	Report of market survey and review of literature, test on importance, tools and steps of product development. Power point presentation of the product developed. Assessment of experimental skills for developing product. Project report assessment and viva.

		point presentations.	

***Assessment tasks listed here are indicative and may vary.**

SEC- FT 2: ENTREPRENEURSHIP DEVELOPMENT (CREDITS: THEORY- 4)

COURSE OBJECTIVES:

- To learn techniques for development of entrepreneurial skills.
- To learn basic aspects of preparation of business plan and its assessment.

COURSE LEARNING OUTCOMES:

- Describe and identify various case studies of successful entrepreneurs.
- Do SWOT analysis of a food business.
- Prepare a business plan and project report.
- Do market survey for identification of food business opportunities.
- Generate food business ideas.

THEORY **PERIODS: 60 (CREDITS 4)**

UNIT I: ENTREPRENEURIAL DEVELOPMENT 20

- Case studies of successful entrepreneurs.
- Exercises on ways of sensing opportunities – sources of idea, creating efforts, SWOT analysis.
- Entrepreneurial skill assessment test.
- Techniques of development of entrepreneurial skills, positive self image and locus of control.

Taneja, S. & Gupta, S.L. (2017). *Entrepreneur Development, Delhi: Galgotia Publishing Company, Chapter 1-3, pg 1- 46*

UNIT II: FOOD BUSINESS MANAGEMENT 40

- Case studies of food processing business and its aspects.
- Business opportunity identification and assessment techniques.
- Business idea generation and evaluation exercise.
- Market assessment study, analysis of competitive situation.
- SWOT analysis for business and for competitors.
- Preparation of business plan.
- Preparation of project report.
- Methods of arrangement of inputs – finance and material.

Taneja, S. & Gupta, S.L. (2017). *Entrepreneur Development, Delhi: Galgotia Publishing Company. Chapter 11-12, pg 147-192*

COMPULSORY READING:

- Taneja, S. & Gupta, S.L. (2017). *Entrepreneur Development, Delhi: Galgotia Publishing Company.*
- Chandra, P. (1996). *Projects, Planning, Analysis, Selection, Implementation and Review*. Delhi: Tata McGraw-Hill Publishing Company Limited.
- David, H. Holt (2002). *Entrepreneurship – A new Venture Creation*. Delhi: Prentice Hall of India.
- Vasant, D. (2012). *Fundamentals of Entrepreneurship and Small Business Management*. Mumbai: Himalaya Publishing House Pvt. Ltd.

ADDITIONAL RESOURCES:

- Acharya, S. S. and Agarwal, N. L. (1987). *Agricultural Marketing in India*. Delhi: Oxford & IBH Publishing Co.
- David, D. and Erickson S. (1987). *Principles of Agri Business Management*. Delhi: McGraw Hill Book Co.
- Phillip, K. (1994). *Marketing Management*. Delhi: Prentice Hall of India Private Limited.
- Rameshwari, P. (2016). *Skill Development & Entrepreneurship in India*. Delhi: New Century Publications.
- Umesh, S. & Vaibhav, M. (2009). *Entrepreneurship Development & Management.* Chandigarh: Abhishek Publications.

WEBSITES:

- Inc. Magazine Guides: https://www.inc.com/.
- Entrepreneur.com/inspiration: https://www.entrepreneur.com/topic/inspiration.
- Bloomberg.com/leaders/ https://www.bloomberg.com/series/high-flyers.
- A Smart Bear: https://blog.asmartbear.com/.

TEACHING LEARNING PROCESS:

- Lecture
- Power Point Presentation
- Videos
- Quiz
- Assignments
- Handouts

ASSESSMENT METHODS:

As per University of Delhi norms for each course the assessment is as follows:

For theory (maximum marks 100):
-End semester exam: 75 marks

-Internal Assessment: 25 marks (Class test- 10 marks; Assignment- 10 marks; Attendance – 5 marks)

Result is declared in terms of letter grade and grade points for each course.

KEYWORDS:

- Department Food Technology
- Business Management
- Entrepreneurial Development
- Business Plan
- Project Report

Facilitating the achievement of Course Learning Objectives

Unit No.	Course Learning Outcomes	Teaching and Learning Activities	Assessment Tasks
1	Students will have gained knowledge on basics of entrepreneurial development in terms of sensing opportunities and techniques of development of entrepreneurial skills	Interactive lecture and discussion on case studies of successful entrepreneurs. Theory classes and exercises on ways of sensing opportunities. Theory classes on techniques of development of entrepreneurial skills and entrepreneurial skill assessment test.	Assignment on case studies of successful entrepreneurs. Power point presentation on case studies and entrepreneurial skill assessment test.
2	Students will have gained knowledge on business opportunity identification, Business idea generation, market assessment study analysis, SWOT analysis, methods of arrangement of inputs. They will have broad perspective on preparation of business plans and project reports.	Interactive lectures and discussions on case studies of food processing business. Theory lectures on Business opportunities, business idea generation, market assessment studies, methods of arrangement of inputs and SWOT analysis. Use of power point presentations to explain preparation of business plan and project report.	Test on SWOT analysis. Flow chart preparation of steps of business plan/ project report. Assignment on case studies of food processing business, Videos/Power Point Presentation on Business idea generation/ market assessment studies.

***Assessment tasks listed here are indicative and may vary.**

SEC- FT 3: CONFECTIONERY TECHNOLOGY
(CREDITS: PRACTICAL- 4)

COURSE OBJECTIVES:

- To learn basic principles of sugar cookery.
- To develop skills for preparation of confectionery products.

COURSE LEARNING OUTCOMES:

- Demonstrate the effect of heat on sugar solutions at different temperatures.
- Show case skills developed for preparation of various crystalline and non-crystalline candies.
- Exhibit skills learnt for preparation of icing and cake decorations.

PRACTICAL: PERIODS 120 (CREDITS 4)

- Sugars- Types and sources, methods of preparation of sugars, jaggery, khandsari, raw and refined sugar. Principles of sugar cookery, crystalline and non-crystalline candies.
- Confectionery Products: Cake icings, hard-boiled candies, toffees, fruit drops, chocolates and other confections- ingredients, equipment & processes, product quality parameters, faults and corrective measures.
- Determine the effect of heat on sugar solution and perform the thread and cold water test.
- To study the process of inversion, melting and caramelization in sucrose.
- Preparation of fondant, fudge and brittles.
- Preparation of shakarpara/chennamurki/candied Fruit/rock candy/chocolates.
- Preparation of candy and toffee and to perform quality assessment tests.
- Preparation of icing and other cake decorations.

Manay, S. & Shadaksharaswami, M. (2004). *Foods: Facts and Principles*. Delhi: New Age Publishers, Chapter 26, pg 408 -426

Sethi, M., & Rao, E. (2011). Food *Science- Experiments and Applications*, 2nd Edition. Delhi: CBS Publishers and Distributors Pvt. Ltd, Chapter 1-5, pg 2-23

COMPULSORY READING:

- Manay, S. & Shadaksharaswami, M. (2004). *Foods: Facts and Principles*. Delhi: New Age Publishers.
- Minifie, B.W. (1999). *Chocolate, Cocoa and Confectionary*. New York: Aspen Publication.
- Sethi, M., & Rao, E. (2011). Food *Science- Experiments and Applications*, 2nd Edition. Delhi: CBS Publishers and Distributors Pvt. Ltd.

ADDITIONAL RESOURCES:

- Beckette, S.T. (2009). *Industrial Chocolate Manufacture and Use*. New Jersey: Blackwell Publishing Ltd.
- Richard, W., Hartel, Joachim, H. von Elbe, & Randy Hofberger, R. (2018). *Confectionery Science and Technology*. 1st Edition. USA: Springer.
- Raina, U., Kashyap, S., Narula, V., Thomas, S., Suvira, Vir, S., & Chopra, S. (2003). *Basic Food Preparation - A Complete Manual*. 3rd Ed. Delhi: Orient Longman Pvt. Ltd.

WEBSITES:

- Icings: https://nios.ac.in/media/documents/bakery/Lesson%204%20Icings.pdf
- Introduction To Confectionery: https://cbseportal.com/sites/default/files/Download-Vocational-e-Books-Bakery-and-Confectionery.pdf
- Bakery and Confectionery: http://www.eiilmuniversity.co.in/downloads/Bakery_&_confectionery.pdf

TEACHING LEARNING PROCESS:

- Experimental learning
- Lecture
- Demonstration
- Power Point Presentation
- Videos
- Quiz
- Assignments
- Handouts

ASSESSMENT METHODS:

Continuous evaluation of practical: 100 marks
Result is declared in terms of letter grade and grade points for each course.

KEYWORDS:

- Department of Food Technology
- Effect of heat on sugar
- Confectionary Products
- Candy
- Icing
- Cake decorations

Facilitating the achievement of Course Learning Objectives

Unit No.	Course Learning Outcomes	Teaching and Learning Activities	Assessment Tasks

1	Students will have gained knowledge on different types of sugars, their preparation techniques, principles of sugar cookery, crystalline and non crystalline candies, confectionary products and chocolates. Students will be able to demonstrate effect of heat on sugar solutions at different temperatures. They will be able to exhibit skills developed for preparation of various candies and confectionary products.	Lecture on types of sugars and principles of sugar cookery. Discussion about various types of confectionary products. Videos on preparation of various candies, demonstration of confectionary products. Practicals on preparation of various candies and confectionary products.	Class test focusing on types of candies and types of sugar. Quiz on principles of sugar cookery, power point presentations, assignments on confectionary products, exhibition of skills developed during practical classes, file records of practical's and viva related to practical's.

***Assessment tasks listed here are indicative and may vary.**

SEC- FT 4: NUTRITION AND WELLBEING
(CREDITS: PRACTICAL- 4)

COURSE OBJECTIVES:

- To learn basics of meal planning.
- To learn preparation of nutritious snacks
- To learn basics of nutritional labeling and estimation of nutritional status.

COURSE LEARNING OUTCOMES:

- Use Food Composition Tables for identification of food sources for various nutrients.
- Utilize the technique of 24-hour recall for recording diets.
- Use the food exchange system for meal planning.
- Plan and prepare nutritious snacks for different age and income groups.
- Calculate BMI and use other anthropometric methods for assessing nutritional status.
- Read and interpret nutrition information on labels.

PRACTICAL PERIODS 120 (CREDITS 4)

- Identification of food sources for various nutrients using food composition tables.
- Record diet of self using 24 hour dietary recall and its nutritional analysis.
- Introduction to meal planning, concept of food exchange system.
- Planning of meals for adults of different activity levels for various income groups.
- Planning of nutritious snacks for different age and income groups.
- Preparation of nutritious snacks using various methods of cooking.
- Nutritional labeling of food products.
- Estimation of BMI and other nutritional status parameters.

Longvah T, Ananthan R, Bhaskarchary K and Venkaiah K (2017). *Indian Food Composition Tables.* Telangana: NIN (ICMR).
Sethi, P., & Lakra, P. (2015). *Aahar Vigyan, Poshan Evam Suraksha*. Delhi: Elite Publishing House Pvt. Ltd, Chapter 1 - 2, pg 1-21

COMPULSORY READING:

- Wardlaw. (2015). *Perspectives in Nutrition*, 10th Edition. Australia: McGraw- Hill Education.
- Longvah T, Ananthan R, Bhaskarchary K and Venkaiah K (2017). *Indian Food Composition Tables.* Telangana: NIN (ICMR).
- ICMR (2010). *Nutrient Requirements and Recommended Dietary Allowances for Indians*. Hyderabad: NIN (ICMR).

ADDITIONAL RESOURCES:

- Srilakshmi, S. (2007). *Food Science*. Delhi: New Age International Ltd.
- Gibney, M.J., Lanham-New, S.A., Cassidy, A. (2005). *Introduction to Human Nutrition*, New Jersey: Blackwell Publishers.
- Khanna, K., Gupta, S., Seth, R., Mahna, R., & Rekhi, T. (2004). *The Art and Science of Cooking: A Practical Manual*, Revised Edition. Delhi: Elite Publishing House Pvt. Ltd.
- Bamji, M. S., Krishnaswamy, K., & Brahmam, G. N. V. (2009). *Textbook of Human Nutrition*. 3rd edition. Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.
- Seth, V., Singh, K. (2005). *Diet planning through the Life Cycle: Part 1. Normal Nutrition. A Practical Manual*. Fourth edition. Delhi: Elite Publishing House Pvt. Ltd.
- Sethi, P., & Lakra, P. (2015). *Aahar Vigyan, Poshan Evam Suraksha*. Delhi: Elite Publishing House Pvt. Ltd.
- Suri, S. & Malhotra, A. (2014). *Food Science, Nutrition and Safety*. Delhi: Pearson India Ltd.

WEBSITES:

- For labeling guidelines: Food Safety and Standards Authority of India: http://www.fssai.gov.in.
- National Institute of Nutrition: http://www.nin.res.in.

TEACHING LEARNING PROCESS:

- Experimental learning
- Lecture
- Demonstration
- Power Point Presentation
- Videos
- Quiz

- Assignments
- Handouts

ASSESSMENT METHODS:

Continuous evaluation of practical: 100 marks
Result is declared in terms of letter grade and grade points for each course.

KEYWORDS:

- Nutrition and wellbeing
- Nutritional labeling
- BMI
- Meal planning
- Department of Food Technology

Facilitating the achievement of Course Learning Objectives

Unit No.	Course Learning Outcomes	Teaching and Learning Activities	Assessment Tasks
1	Students will have gained knowledge on use of food composition tables, food exchange system, and nutritional labeling. They will have learned to plan and prepare nutritious snacks, utilize techniques of 24 hour recall for recording diets and calculate BMI and use other anthropometric methods for assessing nutritional status.	Lectures on basics of meal planning, food exchange system, nutritional labeling, BMI and other nutritional status parameters. Demonstration on use of food composition tables. Video on nutritional labeling of food products. Quiz on rich sources of different nutrients. Videos on nutritious snacks and demonstration of BMI calculation. Practicals on meal planning, preparation of snacks, nutritional status assessment.	Class test on meal planning. Assignment on techniques of nutritional assessment. Power point presentation on meal planning principles, exhibition of skills developed during practical classes, file records of all practicals and viva related to practical's.

***Assessment tasks listed here are indicative and may vary.**

SEC- FT 5: MILK AND MILK PRODUCT TECHNOLOGY
(CREDITS: PRACTICAL- 4)

COURSE OBJECTIVES:

- To equip students with skills required to purchase, store, process and distribute milk and milk products
- To help students in understanding the unit operations necessary for working or setting up or running a micro-enterprise related to milk/milk products.

COURSE LEARNING OUTCOMES:

After studying the paper, the student will be able to:

- Conduct sensory and objective analysis of milk and milk product quality
- Determine the effect of various factors on shelf life of milk and milk products
- Showcase skills for preparing and packaging various milk products
- Remain updated with current trends in milk industry.

PRACTICAL: **PERIODS: 120 (CREDITS 4)**

- To study the sensory and other quality parameters (SNF and adulterants) of milk
- To study the effect of different temperatures on the keeping quality of pasteurized milk
- To study the factors influencing shelf life of milk products such as paneer, curd, lassi, ice-cream and fermented milk
- To learn the preparation, packaging and storage of following milk products:
    - Curd/Yogurt and products
    - Cottage Cheese and products
    - Khoa, condensed milk and their products
    - Butter and Buttermilk
    - Ice-cream
    - Indian milk based desserts
- To conduct a market survey on milk and milk products with special reference to their packaging, sale and information mentioned on their packs.

FSSAI. (2015). *Manual of Methods of Analysis of Foods: Milk and Milk Products*. Lab Manual 1. Delhi: FSSAI, Chapter 1, pg 7-13, 31-34, 46-48

Frazier, W.C., & Westhoff, D.C. (2003). *Food Microbiology*. New York: Tata McGraw-Hill Publishing Company Limited, Chapter 17, pg 278- 305

Rao, E.S. (2011). *Food Science Experiments and Applications*. Delhi: CBS Publishers. 2nd Edition, Chapter 2, pg 80-100

COMPULSORY READING:

- FAO. (1979). *Practical Manual of Milk Technology*. Spain: AGRIS-FAO.
- FSSAI. (2015). *Manual of Methods of Analysis of Foods: Milk and Milk Products*. Lab Manual 1. Delhi: FSSAI.
- Khanna, K., Gupta, S., Seth, R., Mahna, R., & Rekhi, T. (2005). *The Art and Science of Cooking: A Practical Manual*. Fifth Edition. Delhi: Elite Publishing House Pvt. Ltd.

ADDITIONAL RESOURCES:

- Board, EIRI. (2009). *Milk Processing and Dairy Products Industries*. Delhi: Engineers India Research Institute.
- Frazier, W.C., & Westhoff, D.C. (2003). *Food Microbiology*. New York: Tata McGraw-Hill Publishing Company Limited.
- Knechtges, L.I. (2012). *Food Safety-Theory and Practice*, USA: Jones and Barlette Learning.
- Rao, E.S. (2011). *Food Science Experiments and Applications*. Delhi: CBS Publishers. 2nd Edition.
- Rathore, N.S., Chasta, S.S., & Mathur, G.K. (2008). *Fundamentals of Dairy Technology*. Delhi: Himanshu Publications.
- Sacheti, A.K. (1988). *Dairying: Instructional-cum-Practical Manual. Milk and Milk Products.* Delhi: NCERT.
- The Food Safety and Standards Act along with Rules and Regulations. (2011). *The Food Safety and Standards Act along with Rules and Regulations*. Delhi: Commercial Law Publishers (India) Pvt Ltd.

WEBSITES:

- Indian Dairy Association: http://indairyasso.org/
- Codex Alimentarius: http://www.codexalimentarius.org
- Food Safety and Standards Authority of India: http://www.fssai.gov.in

TEACHING LEARNING PROCESS:

- Power point presentation
- Lectures
- Experimental Learning

ASSESSMENT PROCESS:

Continuous evaluation of practical: 100 marks
Result is declared in terms of letter grade and grade points for each course.

KEYWORDS:

- Analysis of milk and milk product quality
- Shelf life of milk products
- Curd/Yogurt and products
- Cottage Cheese and products
- Khoa, condensed milk and their products
- Butter and Buttermilk
- Ice-cream
- Indian milk based dessert

Facilitating the Achievement of Course Learning Objectives

Practical No.	Course Learning Outcomes	Teaching and Learning Activities	Assessment Tasks
1	Conduct sensory and objective analysis of milk and milk product quality.	Practically assess milk and milk products for various sensory and objective parameters, group discussions.	Quiz, Viva-voce, evaluation of practical work.
2	Demonstrate the effect of temperature on shelf life of milk.	Perform practical to study the impact of different temperatures on the keeping quality of milk, refer books and manuals on methods of food analysis by FSSAI etc., e-resources.	Evaluation of practical work, viva-voce, group presentations using e-graphics.
3	Determine the effect of various factors on shelf life of milk and milk products.	Practically study the impact of different parameters on the shelf life of milk, books and manuals on methods of food analysis by FSSAI etc., e-resources.	Evaluation of /practical work, viva-voce, group presentations using e-graphics.
4	Showcase skills required for preparing and packaging various milk products.	Prepare and package various milk products in laboratory, e-resources (FSSAI, CFTRI, Indian Dairy Association etc.), recipe books,	Evaluation of applied project (such as sale trial)/practical work, viva-voce.
5	Remain updated with current trends in milk industry.	Market survey, books and e-resources especially of national and international regulatory bodies like FSSAI, Codex etc., group discussions, attend educational events etc.	Group presentations using e-graphics, evaluation of applied project/evaluation of practical work, viva-voce

***Assessment tasks listed here are indicative and may vary.**

SEC- FT 6: HOME BASED CATERING
(CREDITS: THEORY-4)

COURSE OBJECTIVES:

- To teach students the importance of food safety, hygiene and sanitation in catering business.
- To enable students to plan a food catering unit, developing the ideology behind good teamwork and hierarchical structures for business development.
- To enable students proposal for a catering unit establishment and menu for an event.

COURSE LEARNING OUTCOMES:

- Identify, develop and determine the factors contributing to the growth and planning of food catering unit.
- Describe the importance of menu planning and also factors affecting it in different food service establishments.
- Determine different food purchasing methods, techniques of food preparation, standardization of recipe, portion control and resources management.
- Understand the importance of food safety, hygiene and sanitation in catering business.
- Write proposal for a catering unit establishment and menu for an event.
- Understand the ideology behind good teamwork and hierarchical structures for business development.

THEORY: PERIODS: 60 (CREDITS 4)

UNIT I: INTRODUCTION TO FOOD SERVICE 8

- Factors contributing to the growth of food service industry
- Kinds of food service establishments

Sethi, M. (2016). *Institutional Food Management*. Delhi: New Age International Publishers, Chapter 1, pg 5-19

UNIT II: RESOURCES 8

- Tangible resources- Money, Manpower, Time, Facilities and Equipment, Utilities

Sethi, M. (2016). *Institutional Food Management*. Delhi: New Age International Publishers, Chapter 5, pg 77-98

UNIT III: FOOD PRODUCTION 10

- Menu planning: Importance and functions of menu, types of menu, skills required for menu planning, factors affecting menu planning, menu planning for different kinds of food service units

Sethi, M. (2016). *Institutional Food Management*. Delhi: New Age International Publishers, Chapter 17, pg 265-273

UNIT IV: FOOD PURCHASE AND STORAGE 14

- Food purchase: definition, principles, function, process and methods. receiving and inspection of deliveries
- Food storage: definition, storage procedure (dry & wet, perishable & non perishable), organization of storage

Sethi, M. (2016). *Institutional Food Management*. Delhi: New Age International Publishers, Chapter 7, pg 130 -136, Chapter 15, pg 231-255

UNIT V: QUANTITY FOOD PRODUCTION 10

- Definition, Standardization of recipes (percentage method), Recipe adjustments and portion control
- Hygiene and Sanitation

Sethi, M. (2016). *Institutional Food Management*. Delhi: New Age International Publishers, Chapter 30, pg 531 -548

UNIT VI: PLANNING OF A FOOD SERVICE UNIT 10

- Preliminary Planning: Management process, Define preliminary planning and Planning, Steps and types of plan, Planning guide/ prospectus, identifying clientele, menu, operations and delivery.

Sethi, M. (2016). *Institutional Food Management*. Delhi: New Age International Publishers, Chapter 2, pg 15-27

COMPULSORY READINGS:

- Sethi, M. (2016). *Institutional Food Management*. Delhi: New Age International Publishers.
- West, B. B. & Wood, L. (1986). *Food Service Institutions*. 6th edition. Australia: MacMillian Publishing Co.
- Taneja, S. and Gupta, S. L. (2001). *Entrepreneurship Development*. Delhi: Galgotia Publishing.

ADDITIONAL RESOURCES:

- Knight, J. B. & Kotschevar, L.H. (2000). *Quantity Food Production Planning and Management.* 3rd edition. New York:John Wiley & Sons.
- Philip, E. T. (2008). *Modern Cookery for Teaching and Trade Part I & II*. Delhi: Orient Longmam.
- Khan, M A. (1987). *Food Service Operations*, Connecticut: AVI Publishing INC,
- Malhotra, R. K. (2002). Food Service and Catering Management. Connecticut. Delhi: Anmol Publication Pvt. Ltd.
- Taylor, E. & Taylor, J. (1990). *Mastering Catering Theory*. London: Macmilan Press Ltd.
- Wood, R. C. (1994). *Organizational Behaviour for Hospitality Management*. First ed. London: Sage Publications Limited.

WEBSITES:

- http://egyankosh.ac.in/bitstream/123456789/33548/1/Unit-2.pdf
- http://ncert.nic.in/textbook/pdf/lehe104.pdf
- http://foodplanning.umich.edu/download/FoodServicePlanningGuidelines.pdf

TEACHING LEARNING PROCESS:

- Power point presentation
- Lecture
- Group discussions
- Assignments
- Videos

ASSESSMENT METHOD:

As per University of Delhi norms for each course the assessment is as follows:

For theory (maximum marks 100):
-End semester exam: 75 marks
-Internal Assessment: 25 marks (Class test- 10 marks; Assignment- 10 marks; Attendance – 5 marks)

For practical (where applicable) (maximum marks 50):
-End-semester practical exam: 25 marks
-Continuous evaluation of practical: 25 marks
Result is declared in terms of letter grade and grade points for each course.

KEYWORDS:

- Department of Food Technology
- Catering
- Food service
- Food production
- Food purchase
- Food storage
- Food service unit

Facilitating the achievement of Course Learning Objectives

Unit No.	Course Learning Outcomes	Teaching and Learning Activities	Assessment Tasks
1	Students will be acquainted with knowledge of factors contributing to the growth of food service industry and with various kinds of food service establishments	Interactive lecture along with videos on how the food industry has evolved over the years and on various kinds of food service establishment	Essay writing on factors contributing to the growth of food service industry and various kinds of food service establishments
2	Students will have gained in-depth knowledge about the various resources used by the food service industry	Theory classes on different tangible resources used by the food service industry.	Multiple choice questions and students presentations.
3	Students will have gained knowledge on various aspects of menu planning. They will be able to do menu planning for different kinds of food service units	Theory classes using power point presentation on menu, menu planning, types of menu, factors affecting menu planning	Quiz, assignment on menu planning and development of menu cards.
4	Students will be aware of general food purchase and	Detailed discussion along with videos on the definition,	Checklist development for market study of how

	storage principles, methods, inspection of deliveries and organization of storage.	methods, principles of food purchase and storage organization.	various grocery stores organize their supplies and their procurement procedure
5	Students will have a broad perspective of the quantity food production including standardization of recipes (percentage method) and portion control. They will learn about the hygiene and sanitation aspects of quantity food production	Discussion on the quantity food production, standardization of recipes using percentage method, and portion control. Power point presentation on role of hygiene and sanitation in maintaining good manufacturing practices.	Flowchart preparation on quantity food production, assignment on hygiene and sanitation.
6	Students will have gather information on the various aspects of planning of a food service unit	Practical example based teaching on preliminary planning. Discussion on steps and types of plan, planning guide/ prospectus, identifying clientele, menu, operations and delivery.	Class test focusing on short notes and definitions. Group activity engaging students on various aspects of preliminary planning.

***Assessment tasks listed here are indicative and may vary.**

GE-FT-1: BAKING TECHNOLOGY
(CREDITS: THEORY-4, PRACTICAL-2)

COURSE OBJECTIVES:

- To impart students with knowledge related to baking technology.
- To introduce and equip students to the techniques and skills of cakes, biscuits and pastry making.

COURSE LEARNING OUTCOMES:

- Familiarize themselves with present and future trends of baking industry.
- Describe the role of ingredients in bakery industry.
- Demonstrate the skills in preparing cakes, pastries and biscuit, cost control and marketing.
- Recognize the significance of factors which influence safety of food. Conduct sensory evaluation of bakery products.
- Be conversant with FSSAI regulations.

THEORY: **PERIODS: 60 (CREDITS 4)**

UNIT I: BAKING INDUSTRY **8**

Baking industry and its scope in the Indian economy.Present Trends andProspects.

https://shodhganga.inflibnet.ac.in/bitstream/10603/53842/10/10_chapter%202.pdf

UNIT II: CAKE TECHNOLOGY **12**

Preparation of cakes - types of cakes; ingredients used; methods of batter preparation; steps in cake making; balancing of cake formula; evaluation of the baked cake; operational faults in cake processing and the remedial measures.

Dubey, S. C. (2016*). Basic Baking-Science and Craft.* Delhi: Society of Indian Bakers, Unit 2, Chapter 1 – 5, pg 98-121

Dubey, S. C. (2009*). Bakery Vighan.* Delhi: Society of Indian Bakers, Unit 2, Chapter 1 – 5, pg 117-150

UNIT III: PASTRY TECHNOLOGY **10**

Preparation of pastry - types of pastries (short crust, puff/flaky and choux pastry); ingredients; processing and evaluation, faults and remedies.

Dubey, S. C. (2016*). Basic Baking-Science and Craft.* Delhi: Society of Indian Bakers, Unit 2, Chapter 7, pg 138-143

Dubey, S. C. (2009*). Bakery Vighan.* Delhi: Society of Indian Bakers, Unit 2, Chapter 7, pg 175-182

UNIT IV: BISCUIT AND COOKIES TECHNOLOGY **10**

Preparation of biscuits and cookies – types; ingredients; processing and evaluation.

Dubey, S. C. (2016*). Basic Baking-Science and Craft.* Delhi: Society of Indian Bakers, Unit 2, Chapter 6, pg 132-137

Dubey, S. C. (2009*). Bakery Vighan.* Delhi: Society of Indian Bakers, Unit 2, Chapter 6, pg 166-174

UNIT V: FOOD SAFETY **8**

- Key terms, factors affecting food safety.
- Food additives used in baking

Suri, S. & Malhotra, A. (2014). *Food Science, Nutrition and Safety*. Delhi: Pearson India Ltd, Chapter 20, pg 264-271

UNIT VI: MARKETING AND COST CONTROL **12**

- Marketing - definition, scope, marketing techniques, marketing and distribution of processed products.
- Cost control – food cost, labour cost and other costs.

Sethi, M. (2005). *Institutional Food Management*. Delhi: New Age International Publishers. Chapter 22, pg 386-400, chapter 32, pg 579-588

PRACTICAL: **PERIODS: 60 (CREDITS 2)**

- Weights and measures, selection of raw material.
- Preparation, sensory evaluation and packaging of cakes.
- Fatless sponge cakes
- Shortened cakes
- Eggless cakes
- Muffins and brownies
- Preparation, sensory evaluation and packaging of pastries-
    - Short crust
    - Puff/flaky
    - Choux pastry
- Preparation, sensory evaluation and packaging of biscuits.

COMPULSORY READING:

- Dubey, S. C. (2016). *Basic Baking: Science and Craft*. Delhi: The Society of Indian Bakers.
- Edward, W. P. (2007). *The Science of Bakery Products*. Cambridge: RSC Publishing.
- Faridi, H. (2004). *The Science of Cookie and Crackers Production*. Delhi: CBS Publishers.
- Ketrapaul, N., Grewal, R.B., Jood, S. (2005). *Bakery Science and Cereal Technology*. Delhi: Daya Publishing House.
- Matz, A. (2008). *Bakery Technology and Engineering*, 10th Edition. Delhi: CBS Publishers.
- Suri, S. & Malhotra, A. (2014). *Food Science, Nutrition and Safety.* Delhi: Pearson India Ltd.

ADDITIONAL RESOURCES:

- Kent, N.L. (2004). *Technology of Cereals*. London: Pergamon Press.
- Khanna, K., Gupta, S., Seth, R., Mahana, R., & Rekhi, T. (2004). *The Art and Science of Cooking*. Delhi: Phoenix Publishing House Private Limited.
- Matz, A. (1998*). Bakery Technology and Engineering.* Delhi: CBS Publishers.
- Raina, U., Kashyap, S., Narula, V., Thomas, S., Suvira, Vir, S., & Chopra, S. (2005). *Basic Food Preparation – A Complete Manual*. Delhi: Orient Longman.
- Dubey, S. C. (2009*). Bakery Vighan.* Delhi: Society of Indian Bakers.
- Sethi, M. (2005). *Institutional Food Management*. Delhi: New Age International Publishers.

WEBSITES:

- Food Safety and Standards Authority of India. www.fssai.gov.in
- https://shodhganga.inflibnet.ac.in/bitstream/10603/53842/10/10_chapter%202.pdf

TEACHING LEARNING PROCESS

- Lectures
- Use of textbooks and handouts Power point presentations Practicum
- Demonstration

ASSESSMENT METHODS:

As per University of Delhi norms for each course the assessment is as follows:

For theory (maximum marks 100):
-End semester exam: 75 marks
-Internal Assessment: 25 marks (Class test- 10 marks; Assignment- 10 marks; Attendance – 5 marks)

For practical (where applicable) (maximum marks 50):
-End-semester practical exam: 25 marks
-Continuous evaluation of practical: 25 marks

Result is declared in terms of letter grade and grade points for each course.

KEYWORDS:

- Department of Food and Nutrition
- Sponge cake
- Cream cake
- Pastry biscuits

Facilitating the achievement of Course Learning Objectives

Unit No.	Course Learning Outcomes	Teaching and Learning Activities	Assessment Tasks
1	Students will be acquainted with the scope of Baking Industry in the Indian economy.	Interactive lecture along with videos on how the baking industry has evolved over the years and on present trends and prospects	Essay writing on scope of baking industry.

2	Students will have gained in-depth knowledge about the ingredients used and steps of cake making and evaluation	Theory classes on types of cakes,ingredients used, steps of processing and evaluation of cakes.. Video and demonstration on cake making	Multiple choice questions and students presentations, Evaluation of the products.
3	Students will have gained knowledge on various types of pastries and their processing	Theory classes using power point presentation on types of pastries, role of ingredients, processing and evaluation. Discussion on faults and remedies. Practical demonstration.	Quiz, assignment on processing and evaluation of pastries.
4	Students will have gained knowledge on preparation of biscuits and cookies. .	Detailed discussion along with videos on different types of biscuits, ingredients used, processing and evaluation of biscuits. Practical demonstration.	Assignment from ingredients and processing of biscuits. Evaluation of biscuits.
5	Students will have a broad perspective of the key terms and factors affecting food safety.	Discussion on the factors affecting food safety. Lecture on food additives used in food industry.	Quiz on factors affecting food safety.
6	Students will have gather information on the various aspects of marketing, distribution and cost control of processed foods.	Detailed discussion on definition, scope and techniques of marketing and distribution and cost control	Class test focusing on short notes. Student presentations

***Assessment tasks listed here are indicative and may vary.**

GE-FT-2: FRUIT AND VEGETABLE PRESERVATION TECHNOLOGY (CREDITS: THEORY-4, PRACTICAL-2)

COURSE OBJECTIVES:

- To impart students with basic knowledge related to fruit and vegetable preservation.
- To impart knowledge of preservation of fruits and vegetables.

COURSE LEARNING OUTCOMES:

After completing this course the learner will be able to:

- Describe the purpose and scope of preservation and processing.
- Have an understanding of the different post-harvest changes in fruits and vegetables.
- Gain knowledge regarding various aspects of food safety including regulations at national level.

- State the principles and methods of processing and preservation of fruits and vegetables.
- Possess skills for preparing, preserving, packaging and evaluating chutneys, sauces, fruit beverages, jam, jelly, marmalade, preserves and pickles.

THEORY **PERIODS: 60 (CREDITS 4)**

UNIT I: PURPOSE AND SCOPE OF PRESERVATION **4**

- Objectives of preservation and processing
- Scope of preservation Industry in India

Srivastava, S.S. (2006). *Phal Parirakshan*. Lucknow: Kitab Mahal, Chapter 3, pg 52-71

Srivastava, R.P. & Kumar, S. (2005). *Fruit and Vegetable Preservation*. Lucknow: International Book Distributing Co. Chapter 3, pg 11- 18

UNIT II FOOD SAFETY REGULATIONS **10**

- Key terms, factors affecting food safety, recent concerns
- FSSAI standards and regulations
- Food additives and contaminants
- Hygiene and sanitation
- HACCP

Suri, S. & Malhotra, A. (2014). *Food Science, Nutrition and Safety*. Delhi: Pearson India Ltd, Chapter 20, pg 263- 272; Chapter 25, pg 335-346; Chapter 27, pg 361-373; Chapter 29, pg 392-404

UNIT III: PRINCIPLS AND METHODS OF PRESERVATION **12**

- Asepsis
- Low temperature
- High temperature
- Removal of moisture
- Use of chemical preservatives
- Fermentation
- Irradiation
- Newer methods

Srivastava, S.S. (2006). *Phal Parirakshan*. Lucknow: Kitab Mahal, Chapter 3, pg 52-71

Srivastava, R.P. & Kumar, S. (2005). *Fruit and Vegetable Preservation*. Lucknow: International Book Distributing Co. Chapter 12, pg 85- 100

UNIT IV: FRUIT AND VEGETABLE PROCESSSING **34**

- Chutney and Sauces- Definition, method of preservation, steps in preparation of chutney and sauces.

- Fruit beverages- Definition and classification, method of preservation (with special emphasis on pasteurization, use of chemical preservatives, sugar) role of various ingredients.
- Jam, Jelly and Marmalade- definition, role of pectin and theory of gel formation, method of preservation, steps of preparation, evaluation.
- Preserves- definition, method of preservation, steps of preservation, evaluation, candied, crystallized and glazed fruits.
- Pickles- definition, classification, method of preservation, steps of preparation of vinegar pickles, evaluation.

Srivastava, S.S. (2006). *Phal Parirakshan*. Lucknow: Kitab Mahal, Chapter 13- 17, pg 339-495

Lal, G., Siddhapa, G.S., & Tandon, G.L. (2009). *Preservation of Fruits and Vegetables.* New Delhi: Indian Council of Agriculture Research, Chapter 9, 11, 12, 14, pg 124-151, 156-213, 235-269

PRACTICAL: **PERIODS: 60 (CREDITS 2)**

- To equip students with skills required for preservation, packaging and evaluation of fruit and vegetable products.
- Preparation, packaging, labeling, sensory and objective (TSS, pH) evaluation of:
    - Sauces and chutnies
    - Ketchup (tomato)
    - Squashes (lemon squash, orange squash, pineapple squash)
    - Syrups (rose syrup and almond syrup)
    - Jams (apple jam and mixed fruit jam)
    - Pickles (green chilli, lemon, mixed vegetable)
    - Preserves (carrot)

COMPULSORY READING:

- Lal, G., Siddhapa, G.S., & Tandon, G.L. (2009). *Preservation of Fruits and Vegetables.* New Delhi: Indian Council of Agriculture Research.
- Potter, N., & Hotchkiss, J.H. (2006). *Food Science.* Delhi: CBS Publishers.
- Srivastava, S.S. (2006). *Phal Parirakshan*. Lucknow: Kitab Mahal.

ADDITIONAL RESOURCES:

- Frazier, W.C. & Westhoff, D.C. (2014). *Food Microbiology*. Chennai: Tata McGraw-Hill Publishing Company Limited.
- Khurdia, D.S. (1995). *Preservation of Fruits and Vegetables*. New Delhi: Indian Council of Agriculture Research.
- Knechtges, L.I. (2012). *Food Safety-Theory and Practice*, USA: Jones and Barlette Learning.
- Ramaswamy, H. and Marcotte, M. (2009). *Food Processing–Principles and Applications*. Boca Raton: Taylor and Francis.

- Srivastava, R.P. & Kumar, S. (2005). *Fruit and Vegetable Preservation*. Lucknow: International Book Distributing Co.
- Subbalakshmi, G., Udipi, S.A. (2007). *Food Processing and Preservation*. Delhi: New Age International Publishers.
- Suri, S. & Malhotra, A. (2014). *Food Science Nutrition and Safety*. Delhi: Pearson India Ltd.
- *The Food Safety and Standards Act along with Rules and Regulations*. (2011) Delhi: Commercial Law Publishers (India) Pvt. Ltd.

TEACHING LEARNING PROCESS:

- Power point presentation
- Lectures
- Experimental Learning

ASSESSMENT PROCESS:

As per University of Delhi norms for each course the assessment is as follows:

For theory (maximum marks 100):
-End semester exam: 75 marks
-Internal Assessment: 25 marks (Class test- 10 marks; Assignment- 10 marks; Attendance – 5 marks)

For practical (where applicable) (maximum marks 50):
-End-semester practical exam: 25 marks
-Continuous evaluation of practical: 25 marks

Result is declared in terms of letter grade and grade points for each course.

KEYWORDS:

- Pectin
- Preserves
- Food safety
- Department of Food Technology

Facilitating the achievement of Course Learning Objectives

Unit No.	Course Learning Outcomes	Teaching and Learning Activities	Assessment Tasks
1	Students will be able to describe the purpose and scope of preservation and processing.	Theory classes on objectives of preservation and processing of fruits and vegetables. Discussion on the scope of	Student presentations. Assignment on comparative study of scope of this industry in other developing countries.

		this industry in India. Case study by videos and power point presentation.	
2	Students will have gained knowledge regarding various aspects of food safety including regulations at national level.	Lectures on Key terms, factors affecting food safety, recent concerns on Hygiene and sanitation, HACCP. Videos and power point presentation National food law (FSSA), standards and regulations Lecture and discussion on Food additives and contaminants.	Assignment on factors affecting food safety, recent concerns on Hygiene and sanitation. Student presentation on HACCP and Food additives and contaminants. Project study on National food law (FSSA), standards and regulations and its implementation.
3	Students will have gained knowledge on definition and principles of preservation of fruits and vegetables. Will have knowledge of different methods of processing and preservation.	Lectures on principles and methods of preservation. Discussion with power point presentations and videos explaining – Asepsis, Low temperature, High temperature, Removal of moisture, Use of chemical preservatives, Fermentation, Irradiation and newer methods.	Assignments and tests on understanding of principles and various methods of preservation. Student presentations on newer methods of preservation.
4	Students will possess skills for preparing, preserving, packaging and evaluating chutneys, sauces, fruit beverages, jam, jelly, marmalade, preserves and pickles.	Theory and practical classes on steps of preparation, preserving, packaging and evaluation of Beverages, Chutney, Sauce, Ketchup, Jam, Jelly, Marmalade, Preserve and Pickles. Power point presentations and videos on various preserved products and theory of gel formation.	Innovative product development from the products prepared. Assignments focusing on steps of preparation and evaluation of products covered in this unit. Test on principles of preservation. Student presentations. Evaluation of products.

***Assessment tasks listed here are indicative and may vary.**

B.A. Programme Food Technology

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