

PROPOSED SYLLABUS

B.A FOOD TECHNOLOGY Choice Based Credit System

**From UGC
2015**

B.A. FOOD TECHNOLOGY

PREAMBLE

This course aims at enriching the minds of those students who have interest in learning the techniques of baking as well as fruit and vegetable preservation in the broader context of food science and food safety. It aims to develop a holistic and multidimensional understanding of the topics. It attempts to approach new areas of learning, develop competencies in the students for food science and technology thereby opening various avenues for skill development, academic understanding, entrepreneurship and employment in food industry.

The ongoing B.A. (Prog) with Food Technology course was introduced as restructured course of Home Science. Until 2014-15, this course was being offered in B.A.(Prog) as a discipline course in five colleges of University of Delhi in semester mode. In 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. There would be 4 core papers (along with 4 language and 4 core papers from some other opted discipline of B.A. Programme), 2 Discipline Centric Electives (2 DSE from other opted discipline), 4 Skill Enhancement Elective courses (SEC), 2 Generic Elective courses (GE) and 2 Ability Enhancement Compulsory Courses. Students will be given a pool of papers in DSE, SEC and GE from which they can choose their preferred papers.

The objectives of the course are-

- To introduce the students to the fundamentals of food science and technology,
- To familiarize them with processing and preservation techniques of cereals, pulses, fruits and vegetables, egg and milk and its products,
- To impart knowledge about the science and techniques of baking as well as fruit and vegetable preservation,
- To emphasize on the importance of food safety, food quality, food laws and regulations, plant sanitation, packaging, marketing and cost control in food industry.

The contents have been drawn-up to accommodate the widening horizons of the discipline of Food Technology. They reflect the current changing needs of the students and the evolving food industry particularly the topics like Food Product Development, Food Safety, Bakery Technology, Entrepreneurship and Food Quality Management. 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.

- The detailed syllabus for each paper is appended with the list of suggested readings.
- Teaching time allotted for each paper shall be 4 periods for each theory paper and 4 periods for each practical class per week .Each practical batch should ideally be between 15-20 students so that each student receives individual attention.

B A (PROG) FOOD TECHNOLOGY

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

**CHOICE BASED CREDIT SYSTEM IN
B.A. (PROG) FOOD TECHNOLOGY**

| SEMESTER | CORE COURSE (12) | ABILITY ENHANCEMENT COMPULSORY COURSE (AECC) (2) | SKILL ENHANCEMENT COURSE (SEC) (2) | DISCIPLINE SPECIFIC ELECTIVE DSE (4) | GENERIC ELECTIVE (GE) (4) |
|-----------------|---|---|---|---|----------------------------------|
| I | English/ MIL-1 | English/MIL Communication / Environmental Science | | | |
| | DSC-FT -1A: Fundamentals of Food Science Technology Part -I (Theory + Practical) | | | | |
| | DSC-2A | | | | |
| II | MIL/English-1 | Environmental Science/ English/MIL Communication | | | |
| | DSC-FT-1B: Fundamentals of Food Science Technology Part -II (Theory + Practical) | | | | |
| | DSC-2B | | | | |
| III | English/ MIL-2 | | SEC-1 | | |
| | DSC-FT-1C: Basic Baking Technology (Theory + Practical) | | | | |
| | DSC-2C | | | | |
| IV | MIL/English-2 | | SEC-2 | | |
| | DSC-FT-1D: Introduction to Food Safety and Preservation (Theory + Practical) | | | | |

| | | | | | |
|----|--------|--|-------|---------|------|
| | DSC-2D | | | | |
| V | | | SEC-3 | DSE-1 A | GE-1 |
| | | | | DSE-2 A | |
| VI | | | SEC-4 | DSE-1 B | GE-2 |
| | | | | DSE-2 B | |

ELECTIVE: DISCIPLINE SPECIFIC DSE (Any 2) (1 in Sem V and 1 in Sem VI):

CREDITS – 6 (4 Period Theory and 4 Period Practical per Week)

- DSE-FT 1: Advanced Baking Technology (Theory + Practical)
- DSE-FT 2: Advanced Fruit and Vegetable Preservation Technology (Theory + Practical)
- DSE-FT 3: Food Safety, Hygiene and Quality Testing (Theory + Practical)
- DSE-FT 4: Project/Dissertation (6th Semester)

SKILL ENHANCEMENT ELECTIVE COURSE

CREDITS – 2 (2 Period Theory or 4 Period Practical per Week)

- SEC-1: Food Product Development*
- SEC-2: Entrepreneurship Development*
- SEC-3: Confectionary Technology*
- SEC-4: Nutrition and Wellbeing
- SEC-5: Milk and Milk Product Technology
- SEC-6: Home Based Catering**
- *Picked from B.Sc. (Hons) Food Technology revised course under CBCS
- ** Picked from B.Sc. (Prog.) Home Science revised course under CBCS

ELECTIVE: GENERIC (GE)

CREDITS – 6 (4 Period Theory and 4 Period Practical per Week)

- GE-FT-1: Baking Technology
- GE-FT-2: Fruit and Vegetable Preservation Technology

DISCIPLINE SPECIFIC COURSES

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

(CREDITS: THEORY-4, PRACTICAL-2)

Objectives

1. To introduce students to the field of food science and technology.
2. To familiarize them with the science and processing of cereals, pulses, fruits and vegetables.

THEORY

LECTURES: 60

| | | |
|-----------------|--|----|
| Unit 1 | Introduction to Food Science and Technology | 5 |
| | <ul style="list-style-type: none">• Definition, scope and current trends in food science and technology | |
| Unit II | Food Groups, Nutrients and Balanced Diet | 15 |
| | <ul style="list-style-type: none">• Definition and meaning of food, nutrition, nutrient, health, concept and characteristics of a balanced diet.• Introduction to basic food groups and nutrients, food pyramid, macro and micronutrients.• Effect of processing on nutrients. | |
| Unit III | Browning reactions in foods | 8 |
| | <ul style="list-style-type: none">• Classification (enzymatic, non-enzymatic and metallic browning), causes and prevention of browning | |
| Unit IV | Cereals and Pulses | 12 |
| | <ul style="list-style-type: none">• 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. | |
| Unit V | Fruits and vegetables | 10 |
| | <ul style="list-style-type: none">• Classification of fruits and vegetables, composition and nutritive value; effect of processing on pigments. | |
| Unit VI | Chocolate and cocoa products | 10 |
| | Cocoa bean processing, preparation of chocolate liquor, cocoa butter and chocolate | |

PRACTICAL

Objectives

1. To incorporate concept of weighing and measurement.
2. To introduce the concept of effects of processing on cereals, pulses, fruits and vegetables.

- 1 Weights and measures, selection of raw material.
- 2
 - Gelatinization of starch and the factors affecting it.
 - Factors affecting gelatinization in preparation of custard/boiled rice/*halwa*.
- 3
 - Germination of pulses and its applications.
 - Preparation of products using sprouts – salads/fruit chat/poha/others.
- 4
 - Fermentation of cereals and pulses and its applications.
 - Preparation of cereal-pulse fermented products – idli/dosa/dhokla/others.
- 5 Effect of heat, acid and alkali on various plant pigments.
- 6
 - Enzymatic browning of fruits and vegetables.
 - Non-enzymatic browning reactions in food.
- 7 Chocolate preparation.

RECOMMENDED READINGS:

- Potter N, Hotchkiss JH. Food Science. 5th edn. Delhi: CBS Publishers, 2007.
- Sethi P and Lakra P. Ahaar Vigyan, Poshan evam Suraksha. Elite Publishing House 2015.
- Srilakshmi B. Food Science. Delhi: New Age International Private Limited, 2012.
- Suri S and Malhotra A. Food Science, Nutrition and Safety, Pearson India Ltd, 2014
- Vaclavik Vickie A and Christian Elizabeth W. Essentials of Food Science. 2nd Edition. New York: Academy Publishers, 2008.

Web Resources

Central Food Technology Research Institute: www.cftri.com

**DSC – FT- 1B : FUNDAMENTALS OF FOOD SCIENCE AND TECHNOLOGY –
PART II
(CREDITS: THEORY-4, PRACTICAL-2)**

Objective:

1. To familiarize students with the composition and processing of milk, egg, meat, sugars, fat and beverages.
2. To introduce them to the concept of food hygiene and adulteration

THEORY

LECTURES: 60

| | | |
|-----------------|---|----|
| Unit I | Milk and milk products <ul style="list-style-type: none">• 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. | 10 |
| Unit II | Eggs <ul style="list-style-type: none">• 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. | 10 |
| Unit III | Meat, Fish and Poultry <ul style="list-style-type: none">• Composition and nutritive value• Selection/purchasing criteria for meat, fish and poultry• Tenderization of meat. | 8 |
| Unit IV | Sugar <ul style="list-style-type: none">• Composition and nutritive value• Properties of sugars• Manufacturing/refining of sucrose• Sugar cookery – crystalline and non-crystalline candies, sugar based products. | 12 |

| | | |
|---------------|--|----|
| Unit V | Fats and oils | 10 |
| | <ul style="list-style-type: none"> • 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. | |
| VI | Introduction to food hygiene and food adulteration | 10 |
| | <ul style="list-style-type: none"> • Food hygiene, factors affecting food safety, personal hygiene. • Adulteration, adulterants and their effects on health. | |

PRACTICAL

Objective:

1. To introduce the concept of effects of processing on milk, egg, sugar, and fat.
 2. To familiarize the students with simple tests of food adulteration.
-
- | | |
|---|---|
| 1 | <ul style="list-style-type: none"> - Effect of heat, acid and alkali on coagulation and precipitation of milk. - Preparation of milk products using prolonged heating/heat and acid technique. |
| 2 | Determination of pH of different foods. |
| 3 | <ul style="list-style-type: none"> - Egg white foam formation and factors affecting its stability - Egg foam products – omelets/meringues/soufflé - Green ring formation in boiled eggs and its prevention |
| 4 | <ul style="list-style-type: none"> - Behaviour of sugar at various temperatures - Preparation of crystalline and non-crystalline candies |
| 5 | <ul style="list-style-type: none"> - Determination of smoke point of various oils and factors affecting the smoke point. - Preparation of emulsions – mayonnaise |
| 6 | Detection of adulterants in food |

RECOMMENDED READINGS :

- Potter N, Hotchkiss JH. Food Science. 5th edn. Delhi: CBS Publishers, 2007.
- Srilakshmi B. Food Science. Delhi: New Age International Private Limited, 2012
- Suri S and Malhotra A. Food Science, Nutrition and Safety, Pearson India Ltd, 2014

- Vaclavik Vickie A and Christian Elizabeth W. Essentials of Food Science. 2nd Edition. New York: Academy Publishers, 2008.

Web Resources:

- Central Food Technology Research Institute: www.cftri.com

DSC – FT- 1C: BASIC BAKING TECHNOLOGY
(CREDITS: THEORY- 4, PRACTICAL- 2)

Objectives:

1. To impart students basic knowledge relating to the principles of baking
2. To introduce them to the techniques of cake and pastry making.

THEORY

LECTURES: 60

| | | |
|-----------------|--|----|
| Unit 1 | Baking Industry <ul style="list-style-type: none"> • Baking industry and its scope in the Indian economy. • History of Bakery - present trends, prospects • Nutrition facts of bakery products. | 12 |
| Unit II | Wheat Grain Technology <ul style="list-style-type: none"> • 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 | 15 |
| Unit III | Cake Technology <ul style="list-style-type: none"> • 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. Labeling and Packaging. Costing • Cake decoration- different methods of cake decoration | 18 |
| Unit IV | Pastry Technology <ul style="list-style-type: none"> • Preparation of pastry - types of pastries (short crust, puff/flaky and choux pastry); ingredients; processing and evaluation. faults and remedies | 15 |

PRACTICAL

Objectives:

1. To introduce the proximate principal analysis of wheat flour.

2. To equip them with the necessary skills for cake and pastry processing.

- 1 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.
- 2 Sensory evaluation (by Hedonic scale) for various processed food products
- 3 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
- 4 Preparation and sensory evaluation of pastry
 - short crust (jam tarts)
 - puff/flaky (Bombay khari, vegetable patties)
 - choux pastry (chocolate éclairs)

RECOMMENDED READINGS:

- Cornell, Hugh J and Hoveling, Alber W, Wheat Chemistry and Utilization, CRC Press, 1998
- Dubey SC. Basic Baking-Science and Craft. Society of Indian Bakers, Delhi 2007.
- Edward, W P, The Science of Bakery Products, RSC Publishing, 2007.
- Encyclopedia of Food Science and Technology, Academic Press, 1993.
- Kent NL. Technology of Cereals. Pergamon Press, London 2004.
- Ketrappaul N, Grewal RB, Jood S. Bakery Science and Cereal Technology. Daya Publishing House, Delhi 2005.
- Khanna K, Gupta S, Seth R, Mahana R, Rekhi T. The Art and Science of Cooking. Phoenix Publishing House Private Limited, Delhi 2004.
- Matz A. Bakery Technology and Engineering. CBS Publishers, Delhi 1998.
- Matz A. The Chemistry and Technology of Cereals as Food and Feed. CBS Publishers, Delhi 2004.

- Potter, Norman N and Hotchkiss, Joseph H, Food Science, CBS Publishers, Delhi, 2007.
- Raina U, Kashyap S, Narula V, Thomas S, Suvira, Vir S, Chopra S. Basic Food Preparation – A Complete Manual. Orient Longman, 2005
- Sultan S. Practical Baking. The AVI Publishing Company, Connecticut 1996.

DSC- FT- 1D: INTRODUCTION TO FOOD SAFETY AND PRESERVATION

(CREDITS: THEORY- 4, PRACTICAL- 2)

Objectives:

1. To impart students with basic knowledge relating to food safety and principles of preservation.
2. To introduce them to the concept of processing and preservation of fruits and vegetables.

THEORY

LECTURES: 60

Unit I: Purpose and Scope of Preservation

- Objectives of preservation and processing 5
- Scope of preservation industry in India.

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

Unit III: Food Safety

- Key terms, factors affecting food safety, recent concerns 20
- Food laws, standards and regulations
- Food additives and contaminants
- Hygiene and sanitation
- HACCP

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

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.

PRACTICALS

Objectives:

1. To familiarize the students with preserved fruit and vegetable products available in the market.
 2. To equip them with skills required for preservation, packaging and evaluation of fruit beverages, ketchup, sauce and chutney.
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1. Sterilization of bottles.
 2. Market survey of preserved fruit and vegetable products.
 3. 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)
 4. Preparation of labels for preserved foods

RECOMMENDED READING S:

- Frazier WC and Westhoff DC. Food Microbiology. Tata McGraw-Hill Publishing Company Limited, 1995.
- Khurdia DS. Preservation of fruits and vegetables. Indian Council of Agriculture Research, New Delhi 1995.
- Knechtges LI. Food Safety-Theory and Practice, USA: Jones and Barlette Learning 2012.
- Ramaswamy H and Marcott M. Food Processing Principles and Applications. CRC Press, 2005.
- Siddhapa GS, Lal G and Tandon. Preservation of fruits and vegetables. Indian Council of Agriculture Research, New Delhi, 1998
- Srivastava SS. *Phal Parirakshan*. Kitab Mahal, Lucknow 2006
- Subbalakshmi G, Udipi SA. Food Processing and Preservation. New Age International Publishers, Delhi 2007
- Suri S and Malhotra A. Food Science, Nutrition and Safety, Pearson India Ltd, 2014
- The Food Safety and Standards Act along with Rules and Regulations. Delhi: Commercial Law Publishers (India) Pvt Ltd, 2011.

Web resources

- Food safety and Standards Authority of India. www.fssai.gov.in
- National Center for Home Food Preservation. <http://nchfp.uga.edu/>

DISCIPLINE SPECIFIC ELECTIVE (DSE)

DSE- FT 1: ADVANCED BAKING TECHNOLOGY

(CREDITS: THEORY- 4, PRACTICAL- 2)

Objectives:

1. To equip students with knowledge related to baking technology.
2. To impart knowledge related to processing techniques of bread, biscuits and cookies.
3. To familiarize them with various food packaging materials

THEORY

LECTURES: 60

Unit I: Bread Technology

- Preparation of bread - ingredients used; methods of dough preparation; steps in bread processing; evaluation of the baked bread; staling of bread; diseases of bread. 14

Unit II: Biscuit and Cookies Technology

- Preparation of biscuits and cookies – types; ingredients; processing and evaluation. 12
- Crackers

Unit III: Food Packaging

- Packaging – it's importance, essential features of an ideal package; various food packaging materials and their characteristics 14
- recent trends in the field of packaging (active packaging, intelligent packaging, RFID)
- label regulations and designing for packaged foods , nutritional labelling

Unit IV: Marketing and Cost Control

- 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.

12

PRACTICALS

Objectives:

1. To familiarize the students with quality tests of wheat flour and yeast with reference to bread processing.
2. To equip them with the necessary skills for bread, biscuits and cookies processing.
 1. Determination of gluten content in refined wheat flour.
 2. Qualitative assessment of bran content in various wheat flours.
 3. Determination of dough raising capacity (DRC) of yeast and factors affecting the yeast activity.
 4. Preparation and sensory evaluation of:
 - breads (white and brown bread)
 - buns and dinner rolls
 - pizza base
 5. Preparation and sensory evaluation of various biscuits and cookies
 - Dropped biscuits
 - Rolled biscuits
 - Moulded biscuits
 6. Preparing any of the baked product in bulk and organizing an exhibition-cum-sale

RECOMMENDED READING S:

- Athalye AS. Plastics in Food Packaging. Tata McGraw Hill Publishing Company, Delhi 1992.
- Booth GR. Snack Foods. CBS Publishers, Delhi 2003
- Faridi H. The Science of Cookie and Crackers Production. CBS Publishers, Delhi 2004.
- Griffin S. Principles of Food Packaging. The AVI Publishing Company, Connecticut 1997
- Ketrappaul N, Grewal RB, Jood S. Bakery Science and Cereal Technology. Daya Publishing House, Delhi 2005
- Khanna K, Gupta S, Seth R, Mahana R, Rekhi T. The Art and Science of Cooking. Phoenix Publishing House Private Limited, Delhi 2004.
- Matz A. Bakery Technology and Engineering. CBS Publishers, Delhi 1998.
- Potter N, Hotchkiss JH. Food Science. CBS Publishers, Delhi 2006
- Raina U, Kashyap S, Narula V, Thomas S, Suvira, Vir S, Chopra S. Basic Food Preparation – A Complete Manual. Orient Longman, 2005

DSE-FT 2: ADVANCED FRUIT AND VEGETABLE PRESERVATION TECHNOLOGY

(CREDITS: THEORY- 4, PRACTICAL- 2)

Objective:

To equip students with advanced knowledge of processing and preservation of fruits and vegetables.

THEORY

LECTURES: 60

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 vegetable

- Concentration- definition and objectives, techniques

Unit II: Refrigeration and Freezing

- 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. 8

Unit III: Canning

- 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 9

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

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

PRACTICALS

Objective:

1. To equip them with skills required for preservation, packaging and evaluation of jam, jelly, marmalade, pickles and preserves.
 2. To impart them the expertise for freezing and dehydration of fruits and vegetables
-
1. 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
2. Determination of head space, total soluble solid content and acidity of different preserved foods.
 3. Preparing any of the preserved product/new product in bulk and organizing an exhibition-cum-sale

RECOMMENDED READING S:

- Khurdia DS. Preservation of fruits and vegetables. Indian Council of Agriculture Research, New Delhi 1995
- Potter N, Hotchkiss JH. Food Science. CBS Publishers, Delhi 2006
- Siddhapa GS, Lal G and Tandon. Preservation of fruits and vegetables. Indian Council of Agriculture Research, New Delhi, 1986
- Srivastava RS, Kumar S. Fruit and Vegetable Preservation; Principles and Practices. International Book Distributing Company, Lucknow 2005
- Srivastava SS. *Phal Parirakshan*. Kitab Mahal, Lucknow 2006
- Subbalakshmi G, Udipi SA. Food Processing and Preservation. New Age International Publishers, Delhi 2007

Web resources

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

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

Objectives

1. To introduce the concept of food hygiene, and importance of safe food storage.
2. To acquaint the students with important food laws.

3. To familiarize them with basic methods of quality testing of food.

THEORY

LECTURES: 60

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

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)

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.

Unit IV Hygiene and Sanitation in Food Service Institutions 8

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

Unit VI Sensory Methods of Food Quality Testing 8

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

Unit VII 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.

PRACTICAL

Objectives

1. To familiarize students with basic food quality assessment tests using simple equipment.
 2. To develop basic computer skills for giving presentations.
-
1. Presentation on food hygiene and sanitation practices in any local food outlet.
 2. Sensory evaluation tests for processed foods
 3. Determination of the quality of an egg (whole and open egg).
 4. Determination of the moisture content of various flours
 5. Determination of viscosity of various food gruels (porridge, custards, batters etc) using viscometer.
 6. Assessing the texture of raw and cooked food using penetrometer.
 7. Measurement of the water activity (a_w) of raw and cooked food using AW – meter.
 8. Detection of pathogens in food using microbiological detection kits

RECOMMENDED READINGS:

- Fellows P et al. Making Safe Food: A Guide to Safe Food Handling and Packaging for Small-scale Producers Practical. Action Publishing, 1998.
- Frazier WC and Westhoff DC. Food Microbiology, TMH, New Delhi, 2004
- IFST. Food Hygiene Training: A Guide to its Responsible Management, UK: Institute of Food Science and Technology 1992.
- Lawley R, Curtis L and Davis J. The Food Safety Hazard Guidebook , RSC Publishing, 2004.
- Manay NS and Shadakshaswamy M. Food Facts and Principles, New Age International, 2004.
- Marriott NG and Gravani RB. Principles of Food Sanitation, New York: Springer, 2006.

- FAO Food and Nutrition Paper – 60. Food Fortification - Technology and Quality Control. 1996
- Suri S and Malhotra A. Food Science, Nutrition and Safety, Pearson India Ltd, 2014

Web Resources

- Institute of Food Science and Technology. www.ifst.org
- World Health Organization, WHO 5 keys to safer health poster.
<http://www.who.int/foodsafety/publications/consumer/5keys/en>

DSE-FT 4: PROJECT/ DISSERTATION

Objectives – To mentor the students to design and conduct original and ethical research. They should be able to 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.

RECOMMENDED READINGS:

- APA manual for dissertation

Evaluation: Viva jointly by one internal and one external examiner.

SKILL ENHANCEMENT ELECTIVE COURSES

SEC 1: FOOD PRODUCT DEVELOPMENT* (CREDITS: PRACTICAL-2)

**SEC course from B.Sc (Hons.) Food Technology*

Objectives

- To understand the concept of development of a new product and prepare new products based on special dietary requirements, functionality, convenience and improvisation of existing traditional Indian foods.

PROJECTS

Development of New Product (Chapter-3,4,5,6,14,15,19, Anil Kumar et al. and Chapter 13,14 Moskowitz and Saguy)

Definition, Importance, Objectives & Need of product development, Reasons of failure, Types and Steps of product development, Product development Tools and their use

Projects on:

1. 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.
2. Screening of product concept on the basis of techno-economic feasibility.
3. Development of prototype product and Standardization of formulation process.
4. Proximate Analysis of New Product
5. Packaging, labeling and shelf-life studies
6. 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

RECOMMENDED READINGS:

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

SEC 2: ENTREPRENEURSHIP DEVELOPMENT*

(CREDITS: THEORY-2)

**SEC course from B.Sc (Hons.) Food Technology*

THEORY

LECTURES: 30

UNIT I: ENTREPRENEURIAL DEVELOPMENT

10

- 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

UNIT II: FOOD BUSINESS MANAGEMENT

20

- 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

RECOMMENDED READINGS:

- Acharya S S and Agarwal N L Agricultural Marketing in India, Oxford & ISH Publishing Co., New Delhi. 1987
- Chandra, Prasanna Projects, Planning, Analysis, Selection, Implementation and Review, Tata McGraw-Hill Publishing Company Limited, New Delhi. 1996
- D. David and S Erickson Principles of Agri Business Management, McGraw Hill Book Co., New Delhi. 1987
- David H. Holt Entrepreneurship – Anew Venture Creation, Prentice Hall of India, New Delhi. 2002
- Phillip Kotler Marketing Management, Prentice Hall of India Private Limited, New Delhi. 1994
- Vasant Desai The Dynamics of Entrepreneurial Development and Management, Himalya Publishing House Pvt. Ltd., Mumbai .2011
- Vasant Desai Fundamentals of Entrepreneurship and Small Business Management, Himalya Publishing House Pvt. Ltd., Mumbai. 2012

SEC 3: CONFECTIONARY TECHNOLOGY*
(CREDITS: PRACTICAL-2)

*SEC course from B.Sc (Hons.) Food Technology

Objectives

- Understanding status of confectionary industry in India
- To learn the technologies of confectionary products.
- To know about innovations in this sector.

Sugars- Types and sources, methods of preparation of sugars, jaggery, khandsari, raw and refined sugar. Principles of sugar cookery, crystalline and non-crystalline candies. Chapter 26– Manay.

Confectionary Products: Cake icings, hard-boiled candies, toffees, fruit drops, chocolates and other confections- ingredients, equipments & processes, product quality parameters, faults and corrective measures. (Chapter 5, 7 & 8 – Minifie.)

Practicals

1. Determine the effect of heat on sugar solution and perform the thread and cold water test.
2. To study the process of inversion, melting and caramelization in sucrose.
3. Preparation of fondant, fudge and brittles.
4. Preparation of *shakarpara* and *chenna murki*.
5. Preparation of candy and toffee and to perform quality assessment tests.
6. Preparation of icing and other cake decorations.

RECOMMENDED READINGS:

- Beckett S.T. Industrial Chocolate Manufacture, Blackwell Publishing Ltd. 2009.
- Manay, S. & Shadaksharaswami, M. Foods: Facts and Principles, New Age Publishers. 2004
- Minifie B.W. Chocolate, Cocoa and Confectionary, Aspen Publication. 1999.
- Sethi M, Eram Rao, Food Science- Experiments and applications, 2nd Ed. CBS publishers and Distributors Pvt. Ltd. 2011.
- Raina et.al. Basic Food Preparation-A complete Manual. 3rd Ed. Orient Longman Pvt. Ltd. 2003.

SEC 4: NUTRITION AND WELLBEING (CREDITS: PRACTICAL-2)

PRACTICAL

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

RECOMMENDED READINGS:

- Bamji MS, Krishnaswamy K, Brahmam GNV. Textbook of Human Nutrition, 3rd edition. Oxford and IBH Publishing Co. Pvt. Ltd. 2009.
- Srilakshmi .Food Science, 4th Edition. New Age International Ltd. 2007.
- Wardlaw MG, Paul M Insel . Perspectives in Nutrition, Fourth Edition. Mosby 2001.
- Introduction to Human Nutrition ed. Gibney et al, Blackwell Publishers, 2005
- Khanna K, Gupta S, Seth R, Mahna R, Rekhi T .The Art and Science of Cooking: A Practical Manual, Revised Edition. Elite Publishing House Pvt Ltd. 2004.
- ICMR .Nutritive Value of Indian Foods. National Institute of Nutrition.1990.
- Seth V, Singh K. Diet planning through the Life Cycle: Part 1. Normal Nutrition. A Practical Manual, Fourth edition, Elite Publishing House Pvt Ltd. 2005.
- ICMR. Nutrient Requirements and Recommended Dietary Allowances for Indians. 2010.
- Suri S and Malhotra A. Food Science, Nutrition and Safety, Pearson India Ltd. 2014.

SEC-5: MILK and MILK PRODUCT TECHNOLOGY

(CREDITS: PRACTICAL-2)

Objectives:

3. To equip students with skills required for purchase, storage, processing and Distribution of Milk and Milk Products
4. To help students in understanding the unit operations necessary for working or setting up a milk/milk product(s) related sale/distribution/processing/production unit

PRACTICAL

1. To study the sensory and other quality parameters (SNF and adulterants) of milk
2. To study the effect of different temperatures on the keeping quality of pasteurized milk
3. To study the factors influencing shelf life of milk products such as paneer, curd, lassi, ice-cream and fermented milk
4. 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
5. To conduct a market survey on milk and milk products with special reference to their packaging, sale and information mentioned on their packs.

RECOMMENDED READINGS:

- Eram S. Rao. Food Science Experiments and Applications. CBS Publishers. 2nd Edition, 2011
- Frazier WC and Westhoff DC. Food Microbiology. Tata McGraw-Hill Publishing Company Limited, 1995.
- Knechtges LI. Food Safety-Theory and Practice, USA: Jones and Barlette Learning 2012.
- The Food Safety and Standards Act along with Rules and Regulations. Delhi: Commercial Law Publishers (India) Pvt Ltd, 2011.

SEC-6: HOME BASED CATERING
(CREDITS: THEORY:-2)

**SEC course from B.Sc (Pass) Home Science*

THEORY

LECTURES: 30

Unit 1 Introduction to Food Service

- Factors contributing to the growth of food service industry 4
- Kinds of food service establishments

Unit 2 Food Production

12

- Menu planning: Importance of menu, Factors affecting menu planning, Menu planning for different kinds of food service units
- Food Purchase and Storage
- Quantity Food production: Standardization of recipes, quantity food preparation techniques, recipe adjustments and portion control
- Hygiene and Sanitation

Unit 3 Resources

3

- Money
- Manpower
- Time
- Facilities and equipment
- Utilities

Unit 4 Planning of A Food Service Unit

- **Preliminary Planning**
Survey of types of units, identifying clientele, menu, operations and delivery
- **Planning the set up:**
 - a) Identifying resources
 - b) Developing Project plan
 - c) Determining investments
 - d) Project Proposal

RECOMMENDED READINGS:

- West B Bessie & Wood Levelle. Food Service in Institutions 6th Edition Revised By Hargar FV, Shuggart SG, & Palgne Palacio June, Macmillian Publishing Company New York. 1988.
- Sethi Mohini . Institution Food Management New Age International Publishers. 2005.
- Knight J B & Kotschevar LH. Quantity Food Production Planning & Management 3rd edition John Wiley & Sons. 2000.
- Philip E Thangam. Modern Cookery for teaching and Trade Part I & II Orient Longmam. 2008.
- Taneja S and Gupta SL. Entrepreneurship development, Galgotia Publishing. 2001.

GENERIC ELECTIVE

GE-FT-1: BAKING TECHNOLOGY

(CREDITS: THEORY-4, PRACTICAL-2)

Objectives:

3. To impart students with knowledge related to baking technology
4. To introduce them to the techniques of cakes, biscuits and pastry processing.

THEORY

LECTURES: 60

Unit I: Baking Industry

Baking industry and its scope in the Indian economy. Present Trends and Prospects. 8

Unit II: Cake Technology

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. 12

Unit III: Pastry Technology

Preparation of pastry - types of pastries (short crust, puff/flaky and choux pastry); ingredients; processing and evaluation. Faults and remedies. 10

Unit IV: Biscuit and Cookies Technology

- Preparation of biscuits and cookies – types; ingredients; processing and evaluation. 10

Unit V: Food Safety

- Key terms, factors affecting food safety
- Food additives used in baking 8

Unit VI: Marketing and Cost Control

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

12

PRACTICAL

Objectives:

To equip students with the necessary skills for cake, biscuit and pastry processing.

1. Weights and measures, selection of raw material.
2. Preparation, sensory evaluation and packaging of cakes
 - Fatless sponge cakes
 - Shortened cakes
 - Eggless cakes
 - Muffins and brownies
3. Preparation, sensory evaluation and packaging of pastries
 - short crust
 - puff/flaky
 - choux pastry
4. Preparation, sensory evaluation and packaging of biscuits

RECOMMENDED READING S:

- Dubey SC. Basic Baking-Science and Craft. Society of Indian Bakers, Delhi 2007.
- Encyclopedia of Food Science and Technology, Academic Press. 1993.
- Khanna K, Gupta S, Seth R, Mahana R, Rekhi T. The Art and Science of Cooking. Phoenix Publishing House Private Limited, Delhi .2004.
- Matz A. Bakery Technology and Engineering. CBS Publishers, Delhi. 1998.

- Matz A. The Chemistry and Technology of Cereals as Food and Feed. CBS Publishers, Delhi 2004.
- Raina U, Kashyap S, Narula V, Thomas S, Suvira, Vir S, Chopra S. Basic Food Preparation – A Complete Manual. Orient Longman, 2005.
- Sultan S. Practical Baking. The AVI Publishing Company, Connecticut 1996.

GE-FT-2: FRUIT AND VEGETABLE PRESERVATION TECHNOLOGY

(CREDITS: THEORY-4, PRACTICAL-2)

Objectives:

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

THEORY

LECTURES:60

Unit I: Purpose and Scope of Preservation

- Objectives of preservation and processing 4
- Scope of preservation industry in India.

Unit II: Post-harvest Changes and Spoilage

- Physical, chemical and microbiological changes in fruits and vegetables 10
- Factors affecting growth of microorganisms and the control measures

8

Unit III: Food Safety Regulations

- Key terms, factors affecting food safety, recent concerns
- National food law (FSSA), standards and regulations
- Food additives and contaminants
- Hygiene and sanitation
- HACCP

Unit IV: Principles and Methods of Preservation

- Asepsis 10
- Low temperature
- High temperature
- Removal of moisture
- Removal of air
- Use of chemical preservatives
- Fermentation
- Irradiation
- Newer methods

Unit V: Fruit and Vegetable Processing

- Chutney and sauces- Definition, method of preservation, steps in preparation of chutney and sauces. 28
- 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.

PRACTICALS

Objectives:

To equip students with skills required for preservation, packaging and evaluation of fruit and vegetable products.

1. Preparation, packaging, labeling, sensory and objective (TSS, pH) evaluation of:
2. Sauces and chutnies
3. Ketchup (tomato)

4. Squashes (lemon squash, orange squash, pineapple squash)
5. Syrups (rose syrup and almond syrup)
6. Jams (apple jam and mixed fruit jam)
7. Pickles (green chilli, lemon, mixed vegetable)
8. Preserve (carrot)

RECOMMENDED READINGS:

- Khurdia DS. Preservation of fruits and vegetables. Indian Council of Agriculture Research, New Delhi 1995.
- Siddhapa GS, Lal G and Tandon. Preservation of fruits and vegetables. Indian Council of Agriculture Research, New Delhi, 1998.
- Srivastava SS. Phal Parirakshan. Kitab Mahal, Lucknow 2006.
- Subbalakshmi G, Udipi SA. Food Processing and Preservation. New Age International Publishers, Delhi 2007.
- Ramaswamy H and Marcott M. Food Processing Principles and Applications. CRC Press, 2005.
- The Food Safety and Standards Act along with Rules and Regulations. Delhi: Commercial Law Publishers (India) Pvt Ltd, 2011.
- Frazier WC and Westhoff DC. Food Microbiology. Tata McGraw-Hill Publishing Company Limited, 1995.
- Knechtges LI. Food Safety-Theory and Practice, USA: Jones and Barlette Learning 2012.

Web resources

- Food safety and Standards Authority of India. www.fssai.gov.in
- National Center for Home Food Preservation. <http://nchfp.uga.edu/>