



Anekant Education Society's
TULJARAM CHATURCHAND COLLEGE,
BARAMATI, DIST-PUNE – 413102

Revised Proposed Syllabus
For

B. Voc.
(Food Processing & Post Harvest Technology)
(Autonomous)

Sponsored by
University Grant Commission

Under
National Skill Qualification Framework (NSQF)

To be implemented from
2023-24

**Anekant Education Society's
TULJARAM CHATURCHAND COLLEGE, BARAMATI
DIST-Pune-413102
Autonomous**

First Year: Semester-I

Subj. Code	Subject Name	No. of Credits	Marks
Theory (General Component)			
UBFP111	Principles of Food Preservation	4	100
UBFP112	Food Microbiology - I	4	100
UBFP113	Food Science - I	4	100
Practical (Skill Component)			
UBFP1111	Principles of Food Preservation	6	150
UBFP1112	Computer Application	6	150
UBFP1113	Food Science-I	6	150

First Year: Semester-II

Subj. Code	Subject Name	No. of Credits	Marks
Theory (General Component)			
FP-4	Nutrition Science	4	100
FP-5	Food Microbiology-II	4	100
FP-6	Food Science - II	4	100
Practical (Skill Component)			
FP-2.1	Nutrition Science	6	150
FP-2.2	Food Microbiology-II	6	150
FP-2.3	Soft Skill Development	6	150

Second Year: Semester-III

Subj. Code	Subject Name	No. of Credits	Marks
Theory (General Component)			
FP-7	Processing of Fruits, Vegetables & Plantation Crops	4	100
FP-8	Food Chemistry	4	100
FP-9	Food Analytical Techniques	4	100
Practical (Skill Component)			
FP-3.1	Processing of Fruits, Vegetables & Plantation crops	6	150
FP-3.2	Food Chemistry	6	150
FP-3.3	Food Analytical Techniques	6	150

Second Year: Semester-IV

Subj. Code	Subject Name	No. of Credits	Marks
Theory (General Component)			
FP-10	Processing of Cereal, Pulses and Oilseeds	4	100
FP-11	Bakery and Confectionery Technology	4	100
FP-12	Principles of Food Engineering	4	100
Practical (Skill Component)			
FP-4.1	Processing of Cereal, Pulses and Oilseeds	6	150
FP-4.2	Bakery and Confectionery Technology	6	150
FP-4.3	Fundamentals in Bio-Statistics	6	150

Third Year: Semester-V

Subj. Code	Subject Name	No. of Credits	Marks
Theory (General Component)			
FP-13	Dairy Technology	4	100
FP-14	Food Quality and Safety Management	4	100
FP-15	Principle of Post-Harvest Technology	4	100
Practical (Skill Component)			
FP-5.1	Dairy Technology	6	150
FP-5.2	Entrepreneurship Development	6	150
FP-5.3	Project	6	150

Third Year: Semester-VI

Subj. Code	Subject Name	No. of Credits	Marks
Theory (General Component)			
FP-16	Animal Product Technology	4	100
FP-17	Food Safety, Hygiene & Sanitation	4	100
FP-18	Packaging Technology	4	100
Practical (Skill Component)			
FP-6.1	Animal Product Technology	6	150
FP-6.2	Packaging Technology	6	150
FP-6.3	Internship	6	150

Title of the Course: B. Voc. (Food Processing & Post Harvest Technology)
(To be implemented from Academic Year - 2022-2023)

Course structure:

- B. Voc. is three year degree programme with three theory and three practical courses in each semester.
- Each theory course will be of four credits and each credit is of 15 periods
- Each practical course will be of six credits and each credit is of 15 periods
- Each period is of one clock hour.
- In each practical course, there will be one visit to the relevant industry/ institute.
- In addition to the regular practicals based on the theory course, special emphasis will be on communications and soft skills development of the students.

Eligibility:

- 1) **First Year B.Voc. (Diploma):** A student who has passed the Higher Secondary School Certificate (10+2) in any stream or its equivalent examination
- 2) **Second Year B.Voc. (Advanced diploma):** Keeping terms of First Year of B. Voc. and if they fulfill the eligibility conditions.
- 3) **Third Year B.Voc. (Degree):** Student shall pass all First Year B. Voc. courses and satisfactorily keeping terms of Second Year of B. Voc.

Note: Admissions will be given as per the selection procedure / policies adopted by the college, in accordance with conditions laid down by the Savitribai Phule Pune University, Pune.

Examination Pattern:

Examination:

➤ **Pattern of Examination.**

- i) Internal exam, Term end exam, Oral, Project, Presentation, GD, Viva voce
- ii) Pattern of the question paper:

- i) 25% Objective Question
- ii) 50% Short and Long Answer type question
- iii) 25% Problem based Case Study/long answer type

➤ **Theory Examination: -**

- i) Continuous Internal Assessment: 50 Marks (Unit Test I & II, Assignment-2No., Attendance) for each course of programme.
- ii) Semester End Examination: 50 Marks on the basis of Answer Sheet Evaluation for each course

➤ **Practical Examination: -**

- i) Continuous Internal Assessment: 75 Marks (Written exams, Visit Report, Journal, Viva Voce, Seminar/Presentation, Group Discussion and Attendance) for each course.
- ii) Semester End Examination: 75 Marks on the basis of Answer Sheet Evaluation with performance in practical examination which will be evaluated by external examiner for each course.

Second Year

Semester III

Processing of Fruits, Vegetables and Plantation Crops

Theory

Paper No. FP-7

Maximum Marks: 100

Credits: 4

Teaching Period: 4 Theory

Teaching Load: 60 Theory Period/Semester

Learning Objectives:

- To impart knowledge of different methods of fruits and vegetable processing.
- To learn about processing of various spices, tea, coffee and cocoa.
- To develop the skills for processing of food after postharvest and use of various preservation techniques

Learning Outcome:

- Students will have a thorough understanding of various food processing techniques.
- The students will know the importance of various preservation techniques.

Unit 1: Introduction to Fruit and Vegetable Processing

12 P

Fruit and vegetable processing industry in India, Importance, Status of fruit and vegetable processing industry and fruit product orders. Climacteric and Non-climacteric fruits, Poly-nutrients in fruits and vegetables, ripening process, handling, transportation, controlled atmosphere ripening process, modified atmosphere packaging.

Unit 2: Canning, Freezing and Dehydration of Fruits and Vegetables

12 P

Process of Canning, Equipments used in canning, Process of Freezing, Equipments used and problems associated with specific fruits and Vegetable, Dehydration- Pre-processing methods, Osmotic dehydration, Indian Food Regulations and Quality assurance

Unit 3: Fruit and Vegetable Products

12 P

Fruit Beverages, Jam, Jelly, Marmalade, preserve, candied and crystallized fruits and vegetables, pickles, chutney, sauces/Ketchups, Nectar, Cordials, Fruit Cheese, Potato products and Pectin.

Unit-4 Quality Control and Waste Utilization

12P

Quality Characteristics of Fruits and Vegetable for Processing, Quality Control in Food Processing Industry, utilization of Fruit and Vegetable waste, water for Fruit and Vegetable Processing Industries.

Unit-5: Spices, Tea, Coffee and Cocoa

12 Period

Processing and properties of major and minor spices, essential oils & oleoresins. Tea, coffee and cocoa processing.

Second Year**Semester III****Processing of Fruits, Vegetables & Plantation Crops****PRACTICAL****Paper No. FP-3.1****Maximum Marks: 150****Credits: 6****Teaching Period: 2practicals/week Teaching Load: 30 Practical/Semester (4 Period each)**

- | | |
|---|----|
| 1. Maturity analysis of Fruits | 1P |
| 2. Preparation of Fruit Beverages | 7P |
| a. Juice | |
| b. RTS | |
| c. Squash | |
| d. Syrup | |
| e. Cordial | |
| f. Nectar | |
| g. Wine | |
| 3. Preparation of Mixed Fruit Jam | 1P |
| 4. Preparation of Jelly | 1P |
| 5. Preparation of Fruit Cheese | 1P |
| 6. Preparation of Fruit Butter | 1P |
| 7. Preparation of Fruit Juice Powder | 1P |
| 8. Vegetable Pickle Preparation | 2P |
| 9. Preparation of Tomato Products | 2P |
| a. Ketchup/Sauce | |
| b. Tomato Soup | |
| 10. Preparation of Fruit Juice Powder | 2P |
| 11. Preparation of Potato Products | 2P |
| a. Potato Wafers/chips | |
| b. French Fries | |
| 12. Canning of fruits and vegetables | 2P |
| 13. Adulteration of spices | 2P |
| 14. Visit to Industry | 3P |
| 15. Preparation of Report on Industrial Visit | 2P |

References

1. Subbulakshi G ,Udapi shobha A, (2001) ,food processing and preservation , New age international (P) limited , publisher
2. Srivastava R.P, Kumar Sanjeev (1994) ,Fruits and vegetable preservation , first edition, International book distributing co.
3. S. Rangna (1977) ,Handbook of Analysis and quality control for fruit and vegetable products (second edition) ,Tata Mcgraw –hill publishing co. limited
4. Loesecke H.W.V. (2005), Drying and dehydration of foods, Updesh purohit for agrobios (India) jodhpur.
5. S. Saraswathy , T.L.preethi , S.Balsubramanyan , J.suresh ,N. Revanthy and S. naarajan (2008) : Post harvest Management of Horticulture Crops , Dr, Updesh
6. Purohit for Agrobios (India) Jodhpur Salunkhe D.K, Kadam S.S(2005) ,Handbook of fruit science and technology ,Marcel dekker, Inc.
7. Bose T.k ,Mitra S.K ,Sanyal D (2001) , Fruits : Tropical and subtropical (vol .1), Third

edition ,Partha sankar basu naya udyog.

8. Bhatiya Vijaya (2004),Preservation of fruit and vegetables, 2nd edition, Kalyani publishers

Second Year

Semester III

Food Chemistry

Theory

Paper No. FP-8

Maximum Marks: 100

Credits: 4

Teaching Period: 4 Theory

Teaching Load: 60 Theory Period/Semester

Learning Objectives:

- To understand the chemistry of foods - composition of food, role of each component and their interactions.
- To understand the functional aspects of food components and highlight their role in food processing.

Learning Outcome:

- Students will have a thorough understanding of water as a molecule and its importance in food.
- The students will know about the major and minor minerals and its importance

Unit-1 Nutrients & properties of food:

12 Periods

Introduction, classification, structure and importance of Carbohydrates, proteins and lipids.
Physical Properties, Acids, Bases, and Buffers, the Chemical Bond and Colloids

Unit-2 Vitamins & Water:

12 Periods

Introduction, classification, structure and importance of vitamins.
Chemistry of water, physical properties of water, properties of hydration, salivation. Sorption isotherm, Bound water, free water, water activity. Distribution of water in various foods and moisture determination, Filtration Technology for Water: RO, UF, NF etc.

Unit-3 Minerals & Enzymes:

12 Periods

Major and Minor Minerals, Metal uptake in canned foods, Toxic metals, Introduction, nature, classification, nomenclature, role, specificity, hypothesis- lock and key, induced to fit, Enzymatic and Non-Enzymatic Browning, Maillard Reaction, Caramelization reaction, Enzymes in food industry, Industrial Uses of Enzymes.

Unit-4 Food Additives:

12 Periods

Definition, Functions, legal approval, major additives used in food processing, nutrient supplements, functional foods, Phyto-chemicals and nutraceuticals

Unit -5 Food Flavour and Food Colors

14 Periods

Food Flavour: Introduction, definition and basic tastes, Description of food flavours and Flavour enhancers. Effect of different factors on flavor perceptions.

Food Colour (Pigments):

Introduction and classification, Food pigments (chlorophyll, carotenoids, anthocyanins and flavonoids, beet pigments, caramel)

Second Year

Semester III

Food Chemistry

PRACTICAL

Paper No. FP-3.2

Maximum Marks: 150

Credits: 6

Teaching Period: 2/week

Teaching Load: 30 Practical/Semester (4 Period each)

- | | |
|--|----|
| 1) Preparation and Standardization of NaOH Solution | 1P |
| 2) Water analysis- pH, Hardness, TDS, N, S, total phosphorous | 4P |
| 3) Determination of percent free fatty acids and Acid value of fat /oil | 1P |
| 4) Determination of specific gravity of food sample | 1P |
| 5) Iodine value of fat / oil | 1P |
| 6) Smoking points at fats & oils | 1P |
| 7) Estimation of saponification value | 1P |
| 8) Browning in fruits And Vegetables | 1P |
| 9) Measurement of Food Color by Tintometer/ spectrophotometer | 2P |
| 10) Effects of heat on fruits & vegetables | 1P |
| 11) Testing pectin strength in fruit & vegetable extracts. | 1P |
| 12) Natural acidity of milk | 1P |
| 13) Isolation of starch | 1P |
| 14) Isolation of casein | 1P |
| 15) Changes on heating at starches / gelatinization properties of starches | 1P |
| 16) Effect of Acid & alkali on colour of fruits & vegetables | 1P |
| 17) Estimation of vitamins | 1P |
| 18) Estimation of minerals | 1P |
| 19) Effect of sugar on boiling point of water | 1P |
| 20) Visit to food analysis laboratory | 1P |
| 21) Preparation of visit report & presentation | 2P |

Reference:

1. Fennema, Owen R, Food Chemistry, 3rd Ed., Marcell Dekker, New York, 1996
2. Whitehurst and Law, Enzymes in Food Technology, CRC Press, Canada, 2002
3. Wong, Dominic WS, Food Enzymes, Chapman and Hall, New York, 1995
4. Potter, N.N. and Hotchkiss, J. H, Food Science, 5th Ed., Chapman & Hall, 1995
5. DeMan, J.M., Principles of Food Chemistry, AVI, New York, 1980
6. deMan, John M., Principles of Food Chemistry ,3rd Ed., Springer 1999
7. Desrosier, Norman W. and Desrosier., James N., The technology of food preservation , 4th Ed., Westport, Conn. : AVI Pub. Co., 1977.
8. Fuller, Gordon W, New Product Development from Concept to Marketplace, CRC Press, 2004.

Second Year

Semester III

Food Analytical Techniques

Theory

Paper No. FP-9

Maximum Marks: 100

Credits: 4

Teaching Period: 4 Theory

Teaching Load: 60 Theory Period/Semester

Learning Objectives:

- To study different techniques used in analysis of food
- To study the principle working of instruments used for analysis
- To develop the skills on the quantification technique of various components, allergens present in food products.

Learning Outcome:

- Students will have a thorough understanding on the working principle and instrumentation of various instruments used in food analysis
- The students will know the importance of various methods to identify any malfunction aspect of food.

Unit-1: Proximate analysis of food and types of solutions:

15 Periods

Preparation of sample, Methods for estimation of moisture, protein, fat, fibre, ash and carbohydrate

Types of Solutions: Molar Solution, Normal solution, Colloidal solutions, Buffer solutions, Measurement of pH

Unit-2: Colorimetry and spectro-photometry:

10 periods

Principle, Beer's - Lambert's law, Construction, Working, Care of colorimeter, Standard solutions, Blank solutions

Unit-3: Spectroscopy:

10 Periods

Electromagnetic radiation, IR spectroscopy, UV spectroscopy, AAS, NMR Spectroscopy, Mass Spectroscopy

Unit-4: Electrophoresis:

10 Periods

Principle, Types of electrophoresis, Moving boundary electrophoresis, Zone electrophoresis, Isoelectric focusing, Factors affecting electrophoresis, applications

Unit-5: Flame photometer and Fluorimetry:

15 Periods

Principle, Construction, Working, Applications Fluorimetric determination of thiamin & Riboflavin

Chromatographic Techniques: Principle, Classification, Partition chromatography, Adsorption chromatography, Gel chromatography, Ion exchange chromatography, Affinity chromatography, Paper chromatography, Column chromatography, HPLC

Second Year

Semester III

Food Analytical Techniques

PRACTICAL

Paper No. FP-3.3

Maximum Marks: 150

Credits: 6

Teaching Period: 2/week

Teaching Load: 30 Practical/Semester (4 Period each)

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| 1. Principle and working of analytical instrument such as colorimeter, balances, oven, muffle furnace, incubator, centrifuge | 3P |
| 2. Estimation of Moisture from food sample | 3P |
| 3. Estimation of total minerals from food sample | 3P |
| 4. Estimation of Protein from food sample | 3P |
| 5. Estimation of Fat from food sample | 3P |
| 6. Qualitative test for carbohydrates | 2P |
| 7. Phenol sulphuric acid test for carbohydrates | 2P |
| 8. Estimation of starch by anthrone reagent | 2P |
| 9. Verification of Beer's and Lambert's law | 2P |
| 10. Estimation of Fiber from food sample | 2P |
| 11. Determination of acidity of honey sample | 1P |
| 12. Determination of protein by Biuret method | 2P |
| 13. Visit to Food Analysis Laboratory | 1P |
| 14. Preparation of visit report & presentation | 2P |

References:

1. Morris B. Jacobs The chemical analysis of foods and food products, III Edition, CBS Publishers and distributors New Delhi.
2. S. Ranganna, Hand book of analysis and quality control for fruit and vegetable products, II Ed., Tata McGraw Hill Publishing Co. New Delhi.
3. D.T.Plummer An introduction to practical biochemistry, III Ed. Tata McGraw Hill Publishing Co. New Delhi
4. Pomeranz Y., Meloan, Clifton E. 1994. Food Analysis : Theory and practice, 3rd Edn. IS: 6273 (Part-1& Part-2). Chapman and Hall. 8
5. Hand Book of analysis and quality control for fruit and Vegetable Products". IInd edition. Tata McGraw-Hill Publishing Company Ltd. New Delhi.

Second Year

Semester IV

Processing of Cereals, Pulses and Oilseeds

Theory

Paper No. FP-10

Maximum Marks: 100

Credits: 4

Teaching Period: 4 Theory

Teaching Load: 60 Theory Period/Semester

Learning Objectives:

- To teach technology of milling of various cereals
- To impart technical knowhow of pulses and oilseeds refining
- To develop the skills on the postharvest changes in plant based foods, their losses and to preserve food by suitable packaging.

Learning Outcome:

- Students will have a thorough understanding the unit operations followed for raw form to an edible form of cereals and legumes
- The students will know the importance of various methods to identify any disorder in fresh commodities.

Unit-1: Technology of cereals-I

14 Periods

- Wheat --Types, milling, flour grade, flour treatments (bleaching, maturing), flour for various purposes, technology of dough development.
- Rice – Physico-chemical properties, milling (mechanical & solvent extraction of rice bran), parboiling, ageing of rice, utilization of by products.
- Corn – Milling (wet & dry) , cornflakes

Unit-2: Technology of Cereals-II

12Periods

i. Barley- Milling (pearl barley, barley flakes & flour), beer preparation, Oats – Milling (oatmeal, oat flour & oat flakes), Sorghum and millets – Traditional & commercial milling (dry & wet) Rye and triticale—milling (flour), uses, Anti-nutritional Factors in Cereals and their removal

Unit-3: Technology of Pulses:

12 Periods

Milling of pulses- Dry milling, wet milling, improved milling method, soaking, roasting, steaming and cooking, germination, parching, Factors affecting cooking of legumes, Anti-nutritional Factors in Pulses and their removal

Unit-4: Technology of Oilseeds:

12 Periods

Introduction, Extraction of oil and refining, Sources of protein (defatted flour, protein concentrates and isolates), properties and uses, protein texturization, fibre spinning, Oil extraction and refining, Processing of oils, Anti-nutritional Factors in Oilseeds and their removal

Unit-5: Breakfast cereals and Snack foods

10 Periods

Introduction, history, present status, Processing of hot serve cereals and ready –to –eat breakfast cereals, Flakes, shreds, granules, puffed cereals, sugar coated products, popped and

puffed snacks, factors affecting their quality, convenience cereal foods, Durum wheat products and extrusion cooking

Second Year

Semester IV

Processing of Cereals, Pulses and Oil Seeds

PRACTICAL

Paper No. FP-4.1

Maximum Marks: 150

Credits: 6

Teaching Period: 2/week

Teaching Load: 30 Practical/Semester (4 Period each)

1) Morphological Characteristics of cereals.	2P
2) Physical properties of cereals.	1P
3) To study the cooking quality of rice.	2P
4) To study the dehulling of pulses	
5) To study the process of flaking.	2P
6) To study the process of puffing.	2P
7) To study the parboiling of rice.	2P
8) To study the malting of cereals	2P
9) To study the cooking of dal	1P
10) To study the spouting of pulses.	2P
11) To study the preparation of soymilk and tofu	2P
12) Production of protein rich product.	2P
13) To study the preparation of extruded product i.e. noodles.	2P
14) To study the mechanical extraction of oil	2P
15) To study the procedure of food grade cake.	1P
16) To study the preparation of instant dhokla.	1P
17) Visit to industry	1P
18) Preparation of visit report & presentation	2P

References:

- Kent, Technology of Cereal, 5th Ed. Pergamon Press, 2003
- Chakraborty., Post Harvest Technology of Cereals, Pulses and Oilseeds, revised ed., Oxford & IBH Publishing Co. Pvt Ltd, 1988
- Marshall, Rice Science and Technology, Wadsworth Ed., Marcel Dekker, New York, 1994
- Mathews, R.H. Ed. 1989. Legumes: Chemistry and Technology and Human Nutrition, Marcel Dekker, New York
- Pomeranz, Y. Ed. 1978. Wheat: Chemistry and Technology. American Association Cereal chemist. St. Paul, Minnesota.
- Pomeranz, Y. 1987. Modern Cereal Science and Technology, VCH, New York
- Salunkhe, D.K., Kadam S.S. Ed. 1989. Handbook of World Food Legume: Chemistry, Processing and Utilization, CRC Press, Florida.
- Salunkhe, D.K., Kadam S.S. and Austin, A. Ed. 1986. Quality of Wheat and Wheat Production Metropolitan Book Co. New Delhi

Second Year

Semester IV

Bakery and Confectionery Technology

Theory

Paper No. FP-11

Maximum Marks: 100

Credits: 4

Teaching Period: 4 Theory

Teaching Load: 60 Theory Period/Semester

Learning Objective:

- To know about role, chemistry, manufacturing of various ingredients and products in bakery and confectionery industry.
- To develop knowledge and skills in the preparation and storage of Bakery and Confectionery items
- To develop the skills on development of popular snack foods present in Indian Market.

Learning Outcome:

- Students will have a thorough understanding the processing and preservation of appetizers.
- Students will have a thorough understanding on effect of blending and baking on final product of bakery.
- The students will know the various extruded product development.

Unit-1: Wheat and bakery ingredients, Baking technology:

12 Periods

Varieties, Qualities, Types of wheat, Grading system, Chemical constituents, physiological and rheological properties, Enzymes in wheat flour, Major and minor ingredients and their functions in bakery products.

Unit-2: Bakery Products and Equipments

12 Periods

The reactions of baking (mixing, leavening, baking), preparation methods of bread, cake, biscuits, cookies, pastry, buns, crackers, types of quick bread, Non dairy creamer/toppings in bakery industries: Source, method of preparations. Bakery Organization and Equipment

Unit-3: Introduction to confectionery

12 Periods

History, traditional confectionery goods, types of confectionary, classification, invert sugar, glucose syrup, Manufacturing of food starches, heating of starch granules, gelatinization, retro gradation, factors affecting gelatinization.

Unit-4: Sugar based and chocolate based Confectionery

12 Periods

Manufacturing of raw, refined and White sugar, forms of sugar, liquid sweeteners, reactions of sugar, crystalline and amorphous confectionery

Chocolate based confectionery: History and development, cocoa processes, cocoa butter, emulsifiers used in chocolate confectionery coatings and cocoa, chocolate manufacture, chocolate bars and covered confectionery

Unit-5: Caramel, High boiled sweets, Toffee

12 Periods

Definition, composition, caramel manufacture process, properties of high boiled sweets, preparation of high boiled sweets, types of toffee ingredient and their role, Fondant, Fudge preparation.

Second Year

Semester IV

Bakery and Confectionary Technology

PRACTICAL

Paper No. FP-4.2

Maximum Marks: 150

Credits: 6

Teaching Period: 2/week

Teaching Load: 30 Practical/Semester (4 Period each)

1. Quality testing of flour and yeast	1P
2. Preparation of cake	1P
3. Preparation of black forest pastries	1P
4. Preparation of cheese cake	2P
5. Preparation of chocolate muffins	1P
6. Preparation of Biscuits	1P
7. Preparation of Ragi Biscuits	1P
8. Preparation of cookies	1P
9. Preparation of bread	2P
10. Preparation of multigrain bread	2P
11. Preparation of candy	1P
12. Preparation of chocolate	2P
13. Preparation of toffee	1P
14. Preparation of fondant	1P
15. Preparation of fudge	1P
16. Preparation of chocolate mousse	1P
17. Preparation of Lava cake	1P
18. Preparation of Petha	2P
19. Preparation of Icing (Royal and Butter incing)	1P
20. Visit to Bakery Industry	1P
21. Visit to Confectionary Industry	1P
22. Preparation of report and Presentation (Bakery)	2P
23. Preparation of report and Presentation (Confectionery)	2P

References:

1. Matz S. A. (1996): Bakery technology and engineering, 1st edition, Arya book depot New delhi.
2. Practical Baking Cooking, 1st edition, Queen street house, U.K.
3. Kamel B. S. and Stauffer C. E. (1993): Advances in baking technology, 1st edition, Blackie academic and professional.
4. Aylwaed F. (2001): Food Technology Processing and Quality control \, 1st edition, Agrobios (India)
5. Harry W, Loesecke (2001): Outlines of food technology, 2nd edition, Agribios (India)
6. Khetarpaul N, Grewal R. B. and Jood S. (2005): Bakery Science and Cereal Technology, 1st edition, Daya publishing house, Delhi.
7. Manay S.N. and Shadaksharaswamy M. (2001); Food facts and principles, 2nd edn, New Age International (P) limited publishers.

8. Minife B.W. (1997): Chocolate, cocoa and confectionery science and technology, 3rd edition, CBS Publishers and Distributors, New Delhi.

Second Year

Semester IV

Principles of Food Engineering

Theory

Paper No. FP-12

Maximum Marks: 100

Credits: 4

Teaching Period: 4 Theory

Teaching Load: 60 Theory Period/Semester

Learning Objective:

- To know basics of Food process engineering
- To develop knowledge and ability related identification, calculation, formulation and problem solving.
- To develop the skills related to scientific principles of Food process engineering.
- To study working of Food process equipments

Learning Outcome:

- Students will have a thorough understanding of the basic principles of various unit operations and its applications in food processing.
- Develop ability to identify, calculate, formulate and solve problems of engineering and mass & energy balance.
- The students will know the scientific principles in processing technology specific to the materials.
- Ability to operate food process equipments

Unit I Introduction to Food Engineering

12 Periods

Introduction to Food Engineering , Definition of Velocity, Speed, Acceleration, Force and momentum, Weight, Pressure, Work and Energy, Concept of Unit Operation, Units and dimensions

Unit II Principles of Heat processing

12 Periods

Mass and Energy Balance, Heat and Mass Transfer, Modes of heat transfer, Systems for heating and cooling food products, Steam Generation and Boiler Design

Unit III Fluid mechanism

12 Periods

Properties of Liquids, Properties of Solids, Properties of Gases, Fluid dynamics, Fluid flow and its applications, Newton's Law of Rheology

Unit IV Mechanical separation and particle size

12 Periods

Separation Techniques and their Principles – filtration, membrane concentration, sieving, centrifugation, Sedimentation, Size reduction and Classification- Mixing, Kneading, Blending. Mechanical handling conveying and elevation

Unit V Equipments & Plant layout

12 Periods

Design of food plant, Types of Food Plant Layout, Principle and equipments used in food industry and their Working Principles, Installation and Housing of Equipments, Maintenance of Equipments.

References:

Introduction to Food Engineering, R. Paul Singh and Dennis R. Heldman

Romeo T. Toledo. 1999. Fundamentals of Food Process Engineering. Third Edition. Aspen publisher.

S. S. H. Rizvi and Gauri S. Mittal. 1992. Experimental methods in food engineering. Kluwer Academic Publishers Group.

Heldman, D.R. and Lund, D.B. Ed. 1992. Handbook of Food Engineering Marcel Dekker, New York.

Batty, J.C. and Folkman, S.L. 1983. Food Engineering Fundamentals. John wiley and Sons, N.York.

Harper, J.C. 1975. Elements of Food Engineering. AVI, Westport.

Second Year

Semester IV

Fundamentals in Bio-Statistics

PRACTICAL

Paper No. FP-4.3

Maximum Marks: 150

Credits: 6

Teaching Period: 2/week

Teaching Load: 30 Practical/Semester (4 Period each)

- | | |
|---|----|
| 1. Graphical Representation of statistical data | 2P |
| 2. Diagrammatic Representation of statistical data | 2P |
| 3. To study the methods of sampling | 2P |
| 4. Measures of central tendency | 2P |
| 5. To calculate the probability of given sample | 1P |
| 6. Determination of chi-square test | 2P |
| 7. Determination of t-test | 1P |
| 8. Computation of raw and central moment | 2P |
| 9. Measures of skewness and kurtosis | 2P |
| 10. Correlation and regression | 2P |
| 11. Curve fitting | 2P |
| 12. Computation of Measures of Dispersion. | 2P |
| 13. Analyzing and interpreting a given data set by using hypothesis tests. | 2P |
| 14. Graphical and diagrammatic Representation of statistical data using MS-Excel | 2P |
| 15. Computation of summary statistics using MS-Excel | 2P |
| 16. Correlation and regression using MS-Excel | 2P |

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