

**B.Sc. (FOOD TECHNOLOGY)/B.F.S.T (Hons.) SYLLABUS 2019 BATCH
ONWARDS (UPDATED ON 24.05.2019)**

Total Contact Hours = 23

Total Marks = 600

Total Credits = 21

Semester 1 st		Contact Hrs.			Marks			Credits
Subject code	Subject Name	L	T	P	Internal	External	Total	
BFOTS1-101	General Microbiology	3	1	-	40	60	100	4
BFOTS1-102	Introduction to Food Technology-I	3	1	-	40	60	100	4
BFOTS1-103	*Mathematics	3	1	-	40	60	100	4
BFOTS1-104	Computer Science and Applications	3	1	-	40	60	100	4
BFOTS1-105	General Microbiology Lab	-	-	4	60	40	100	2
BPHAR0-002	**Life Sciences	3	1	-	40	60	100	4
BHUMA0-001	Communicative English	3	-	-	40	60	100	3
Total	Theory= 5 Lab=1	15	04	04	260	340	600	21

*Mathematics for Medical Students

** Life Sciences for Non-Medical students

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Total Contact Hours = 23

Total Marks = 600

Total Credits = 19

Semester 2 nd		Contact Hrs.			Marks			Credits
Subject code	Subject Name	L	T	P	Internal	External	Total	
BFOTS1-201	Introduction to Food Technology-II	3	1	-	40	60	100	4
BFOTS1-202	Principles of Food Preservation	3	1	-	40	60	100	4
BFOTS1-203	Environmental studies	3		-	40	60	100	3
BFOTS1-204	Food Chemistry	3	1	-	40	60	100	4
BFOTS1-205	Lab-II Introduction to Food Technology-II	-	-	4	60	40	100	2
BFOTS1-206	Lab-III Principles of Food Preservation	-	-	4	60	40	100	2
Total	Theory = 4 Lab = 2	12	03	08	280	320	600	19

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GENERAL MICROBIOLOGY

Subject Code: BFOTS1-101

**LTPC
3 1 0 4**

Duration: 60 Hrs.

UNIT-I (15Hrs.)

Introduction :Discovery of microbial world, theory of spontaneous generation, Germ theory of disease, Koch's postulates, Pure culture concept, Nature and properties of prokaryotic and eukaryotic micro-organisms.

UNIT-II (15Hrs.)

General characteristics and Nutritional requirements: General characteristics of bacteria, yeast, mold, viruses, algae. Types of bacteria, nutritional classification of bacteria.

Reproduction of micro-organisms: Brief account of bacteria, yeast and mold reproduction.

UNIT-III(15Hrs.)

Microbial Growth : Definition of growth, growth cycle, growth rate, generation time, measurement of growth, effect of environmental factors such as temperature, oxygen, moisture, salt, pH, oxidation-reduction potential and radiations on growth.

UNIT-IV (15Hrs.)

Cultivation of micro-organisms:Pour plate method, spread plate method and streak plate method.

Control of Micro-organisms:Control of micro-organisms by physical, chemical and other chemotherapeutic agents.

Recommended Books:

1. Pelczar M.J., Chan E.C.S. & Krieg N.R., Microbiology, 5th Ed., McGraw Hill Co, Singapore, **1987**.
2. Stanier R.Y., Graham J.L., Wheelies M.L. & Painter P.R., General Microbiology, 5thEd.,The Macmillan Press Ltd., London,**1993**.
3. Cappuccino J.G. & Sherman N., Microbiology: A Laboratory Manual,Benjamin-Cummings Publishing Co., USA,**2004**.
4. Gunase Karan P., Laboratory Manual in Microbiology, New Age International (P) Ltd. New Delhi, **1996**.

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INTRODUCTION TO FOOD TECHNOLOGY-I

Subject code: BFOTS1-102

**LTPC
3 1 0 4**

Duration: 60 Hrs.

UNIT-I (11Hrs.)

Introduction

Introduction to various branches of Food Science and Technology

UNIT-II (18Hrs.)

Compositional, Nutritional and Technological aspects of Plant foods

Wheat: structure and composition, types (hard, soft/ strong, weak) Diagrammatic representation of structure of wheat grain.

Rice: Structure and composition, parboiling of rice- advantages and disadvantages.

Malting, gelatinization of starch, types of browning- Maillard & caramelization.

Corn: Structure and composition, Dry and wet milling,.

Millets: Types of millets.

UNIT-III (15Hrs.)

Pulses

Structure and composition of pulses, toxic constituents in pulses, processing of pulses: soaking, germination, decortication, cooking and fermentation.

UNIT-IV (16Hrs.)

Fats and Oils

Classification of lipids, types of fatty acids - saturated fatty acids, unsaturated fatty acids, essential fatty acids, trans fatty acids. Rancidity –Types- hydrolytic and oxidative rancidity and its prevention.

Recommended Books

1. Manay, S. & Shadaksharaswami, M., Foods: Facts and Principles, New Age Publishers, 2004.
2. B. Srilakshmi, Food science, New Age Publishers, 2002.
3. Meyer, Food Chemistry, New Age, 2004
4. Kenneth F. et al, edited- Vol-1, 2, The Cambridge World History of Food, Cambridge Univ. Press, 2000.
5. Martin Eastwood, Second edition, Principles of Human Nutrition, Blackwell Publishing, 2003.

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MATHEMATICS

Subject Code:BFOTS1-103

**L T P C
3 1 0 4**

Duration: 60Hrs.

UNIT-I(17Hrs.)

Mensuration: Mensuration of rectangles, easy examples of garden paths, cost of planting trees and fencing gardens. Area of right angled triangles area and height of isosceles and equilateral triangles, area of triangles in terms of sides, rent of field. Area of parallelograms, rhombus, quadrilateral and trapezoid. Regular polygons with emphasis on hexagon and octagon. Simple cases of similar figures. Circumference and area of circles. Circular rings. Cost of fencing circular fields and paths.

UNIT-II (14Hrs.)

Mensuration: Volumes of cubes and rectangular solids. Cubic contents of tanks and cisterns, Volumes of triangular & rectangular prisms, right circular cylinders and segments of cylinders (Easy numerical examples based on Science only to be set Proofs of formulae).

UNIT-III (15Hrs.)

Algebra: Solution of quadratic equations and of those reducible to quadratic equation (One variable). Relation between roots and co-efficients. nth term and sum to n terms of an A. P. and G. P. nth term of an H. P. (excluding means and problems on numbers). Permutation and combinations: simple problems only. (Proofs of formulae not required).

UNIT-IV(14Hrs.)

Matrix and Determinant: Introduction matrices, Types of matrices, Operation of matrices, Transpose of matrix, Matrix multiplication, Determinants, Properties of determinants, Products of determinants, Minors and co-factors, Adjoint of a square matrix, Singular and non singular matrices, Inverse of Matrices.

Recommended Books

1. Algebra by D. C. Kapoor & Gurbax Singh.
2. Algebra by T. N. Nagpal & K.K. Gupta.
3. Comprehensive Calculus by R. S. Dehiya.
4. New Style Calculus for T. D. C. – I.

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COMPUTER SCIENCE & APPLICATIONS

Subject Code: BFOTS1-104

**L T P C
3 1 0 4**

Duration: 60 Hrs.

UNIT-I (16Hrs.)

Computer Fundamentals Introduction to Computers:

Characteristics of computers, Historical perspectives of computers, Computer generations, types of computers and uses, Software, Hardware, Basic architecture and functions of CPU and its parts, Important I/O devices like Keyboard, Mouse, Printers, Video Monitors.

Memory Storage: Memory Cells, Semiconductor and Magnetic core memory, ROM (its types), RAM, Cache and Virtual memory, Secondary storage devices and their organization (Hard disk, Floppy disk, CD, DVD).

UNIT-II (16Hrs.)

Operating Systems

Definitions, Need, Organization, Functions, Types of Operating Systems, DOS, Windows, Handling Drives, Directories and files, Commands (Internal & External), Icons, Clipboard, Folders, Major differences between DOS & Windows.

Communication Networks Hardware and software components, seven layers of OSI architecture, Network Topologies (Ring, Star, Fully Connected and Bus), LAN and WAN, Bounded and unbounded communication media, Internet, World Wide Web and I.T., Browsers, Important terminology regarding Internet applications.

UNIT-III(14Hrs.)

Computer Applications Word Processing

Techniques, File manipulation, Formatting, Printing setups Table handling, Mail merge, etc.using MS-Word.

Spreadsheet Package: Worksheets, formatting sheets, Calculations and graphing using formulae and functions, Import and export of data using MS-Excel.

UNIT- IV(14Hrs.)

Computer Applications Graphics

Objectives and types of graphics, Presentation packages, Slides designing, Diagrams and graphs, Import &Export data using MS-Power Point.

Data Security against Viruses: Definition of computer viruses, Detection, prevention and cure against viruses using anti-virus software packages.

Recommended Books

1. Rajaraman, 'Fundamentals of Computers', Prentice Hall of India.
2. N.K. Tiwari, 'Computer Fundamental with Pharmacy Applications', 1stEdn., Pharm. MedPress, 2008.
3. Stultz, 'Learn MS-Office 2000', BPB Publications.
4. Ivens, 'Using Microsoft Windows', Prentice Hall of India, 1998.
5. Stultz, 'Learn DOS in a day', BPB Publications.

LAB-II GENERAL MICROBIOLOGY

Subject Code: BFOTS1-105

**L T P C
0 0 4 2**

Duration: 30 Hrs.

Practicals

1. To study different parts of a microscope.
2. Study of instruments (Autoclave, Hot air oven, Incubator, Laminar flow, pH meter, and spectrophotometer) of microbiology laboratory.
3. Preparation of nutrient agar and MacConkey's Agar plates, slants and broth.
4. To study the serial dilution method.
5. To perform pour plate, spread plate and streak plate methods for isolation and enumeration of micro-organisms.
6. To demonstrate acid fast staining.
7. To stain the given bacteria by Gram's staining method.
8. To measure the size of given micro-organisms by ocular and stage micrometer.
9. To determine the number of micro-organisms with a Haemocytometer.
10. To determine the motility of bacteria by hanging drop method.

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LIFE SCIENCES

Subject code: BPHAR0-002

**LTPC
3104**

Duration: 60 Hrs.

UNIT-I (15Hrs.)

Cell & Molecular Biology

Cell theory, Prokaryotic cell, eukaryotic cell, cell wall, cell membrane, cytoskeleton, nucleus, chloroplast, mitochondria, endoplasmic reticulum, golgi bodies, ribosomes, lysosomes, vacuoles and centrosomes. Cell cycle & division, amitosis, mitosis and meiosis. Study of genetic material, structure of DNA and RNA, replication, transcription, genetic code, translation & DNA repair.

UNIT- II (15Hrs.)

Human physiology

Digestion and absorption, breathing and respiration, circulation, excretory system, nervous system, skeletal and muscular systems. Locomotion and movement, growth, aging and death. Hormones - types of hormones, functions and disorders.

UNIT-III (12Hrs.)

Human health and diseases

Pathogens, Parasites causing human disease (malaria, dengue, chickenguinea, typhoid, pneumonia, common cold, ringworm) and their control. Basic concepts of immunology, vaccines, antibiotics, cancer, HIV and AIDS. Adolescence, drug and alcohol abuse.

UNIT-IV(18Hrs.)

Biochemistry

Structure and function of carbohydrates, lipids and proteins. Enzymes- types, properties and enzyme action, Metabolism- glycolysis, kreb cycle and pentose phosphate pathway.

Biotechnology and its applications

Recombinant DNA technology, applications in health, agriculture and industries, genetically modified organisms; Human insulin, vaccine and antibiotic production. Plant breeding, tissue culture, single cell protein, Transgenic plants and transgenic animals.

Recommended books:

1. Albert L. Lehninger, David L. Nelson and Michael M. Cox: Principles of Biochemistry, Worth Publishers, 1993.
2. B.D. Singh: Biotechnology, Kalyani Publishers.
3. Harvey Lodish, Arnold Berk, Chris A. Kaiser, Paul Matsudaria, Monty Krieger, Jems Darnell, Mathew P. Scott: Molecular Cell Biology, W.H. Freeman, 2004.

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COMMUNICATIVE ENGLISH

Subject Code: BHUMA0- 101

**LTPC
3 0 0 3**

Duration:45 Hrs.

UNIT-I (12 Hrs.)

Communication Skills: Introduction, Definition, the Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context

Barriers to communication: Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers.

UNIT-II (11Hrs.)

Perspectives in Communication: Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment.

Elements of Communication: Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication.

UNIT-III (12Hrs.)

Communication Styles: Introduction, The Communication Styles Matrix with example for each - Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style.

Basic Listening Skills: Introduction, Self-Awareness, Active Listening, becoming an Active Listener, Listening in Difficult Situations.

UNIT-IV (10Hrs.)

Interview Skills: Purpose of an interview, Do's and Don'ts of an interview

Giving Presentations: Dealing with Fears, planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery

Group Discussion: Introduction, Communication skills in group discussion, Do's and Don'ts of group discussion.

Recommended Books

1. Andreja. J. Ruther Ford, 'Basic Communication Skills for Technology', 2ndEdn., Pearson Education, 2011.
2. Sanjay Kumar, Pushpalata, 'Communication Skills', 1stEdn., Oxford Press, 2011.
3. Stephen P. Robbins, 'Organizational Behaviour', 1stEdn., Pearson, 2013.
4. Gill Hasson, 'Brilliant-Communication Skills', 1stEdn., Pearson Life, 2011.
5. Gopala Swamy Ramesh, 'The Ace of Soft Skills: Attitude, Communication and Etiquette forSuccess', 5thEdn., Pearson, 2013.
6. Deborah Dalley, Lois Burton, Margaret, 'Developing your Influencing Skills', Green Hall, 1stEdn., Universe of Learning LTD, 2010.

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7. Konarnira, 'Communication Skills for Professionals', 2nd Edn., PHI, **2011**.
8. Barun K. Mitra, 'Personality Development and Soft Skills', 1stEdn., Oxford Press, **2011**.
9. 'Soft Skill for Everyone', Butter Field, 1stEdn., Cengage Learning India Pvt. Ltd., **2011**.
10. S.J. Francis Peters, 'Soft Skills and Professional Communication', 1stEdn., McGraw Hill Education, **2011**.
11. John Adair, 'Effective Communication', 4thEdn., Pan Mac Millan, **2009**.
12. Aubrey Daniels, 'Bringing out the Best in People', 2ndEdn., McGraw Hill, **1999**.

MAHARAJA RANJIT SINGH PUNJAB TECHNICAL UNIVERSITY

SEMESTER II

INTRODUCTION TO FOOD TECHNOLOGY-II

Subject Code: BFOTS1-201

**LTPC
3 1 0 4**

Duration:60 Hrs.

UNIT-I (16Hrs.)

Fruits and Vegetables

Classification of fruits and vegetables, general composition, enzymatic browning, names and sources of pigments, Dietary fibre.

Postharvest changes in fruits and vegetables-Climacteric rise, horticultural maturity, physiological maturity, physiological changes, physical changes, chemical changes, pathological changes during the storage of fruits and vegetables.

UNIT-II (17Hrs.)

Compositional, Nutritional and Technological aspects of Animal foods

Flesh Foods - Meat, Fish, Poultry

Meat- Definition of carcass, concept of red meat and white meat, composition of meat, marbling, post-mortem changes in meat- rigor mortis, tenderization of meat, ageing of meat.

Fish- Classification of fish (fresh water and marine), aquaculture, composition of fish, characteristics of fresh fish, spoilage of fish- microbiological, physiological, biochemical.

Poultry- Structure of hen's egg, composition and nutritive value, egg proteins, characteristics of fresh egg, deterioration of egg quality, difference between broiler and layers.

UNIT-III (12Hrs.)

Milk and Milk Products

Definition of milk, chemical composition of milk, its constituents, processing of milk, pasteurization, homogenization. An overview of types of market milk & milk products.

UNIT-IV (15Hrs.)

Food Spices and Condiments

Types and uses of spices and condiments, Chemical composition, Extraction, General processing, uses and special attributes of important Indian spices like pepper, cinnamon, clove, ginger, turmeric, cardamom, fenugreek and fennel etc., seasonings and condiments blends.

Recommended Books

1. Manay, S. & Shadaksharaswami, M., Foods: Facts and Principles, New Age Publishers, 2004.
2. B. Srilakshmi, Food science, New Age Publishers, 2002.
3. Meyer, Food Chemistry, New Age, 2004
4. Kenneth F. et.al, edited-Vol-1, 2, The Cambridge World History of Food, Cambridge Univ. Press, 2000.
5. Martin Eastwood, Second edition, Principles of Human Nutrition, Blackwell publishing, 2003.

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PRINCIPLES OF FOOD PRESERVATION

Subject Code: BFOTS1-202

**LTPC
3104**

Duration: 60Hrs

Unit-I (11Hrs.)

Introduction: Historical developments of food preservation. Principles of Food preservation, Scope & its benefits. Chemical preservation: Class I and Class II preservatives.

Unit-II (16Hrs.)

Preservation by low temperature

Freezing and Refrigeration :Introduction, cold storage and freezing, freezing curve, changes during freezing, types of freezing; slow freezing, quick freezing, thawing, changes during thawing and its effects on food.

Unit-III (16Hrs.)

Preservation by high temperature

Thermal processing: Sterilization, commercial sterilization, pasteurization, and blanching. boiling, steam under pressure, canning, aseptic processing, thermal death time.

Unit-IV(17Hrs.)

Preservation by Drying: Definition, drying as a means of preservation, differences between sun drying and dehydration (i.e. mechanical drying), factors affecting rate of drying, normal drying curve, Various types of driers used in food industry.

Irradiation: Units of radiation, Ultraviolet and ionizing irradiations, their effect on microorganisms & uses in food processing.

Recommended Books

- 1.Desrosier NW and Desrosier JN, The Technology of Food Preservation, CBSPublication, New Delhi, **1998**.
2. Paine FA and Paine HY, Handbook of Food Packaging, Thomson Press India Pvt Ltd, New Delhi,**1992**.
3. Potter NH, Food Science, CBS Publication, New Delhi, **1998**.
4. Ramaswamy H and Marcott M, Food Processing Principles and Applications CRC Press,**2006**.
5. Rao PG, Fundamentals of Food Engineering, PHI Learning Pvt Ltd, New Delhi, **2010**.
6. Toledo Romeo T, Fundamentals of Food Process Engineering, Aspen Publishers, **1999**.

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ENVIRONMENTAL STUDIES

Subject Code:BFOTS1-203

**LTPC
3003**

Duration:45Hrs.

UNIT-I (11Hrs.)

The multidisciplinary nature of environmental studies, Natural Resources, Renewable and non-renewable resources: Natural resources and associated problems.

UNIT-II (12Hrs.)

Forest Resources, Water Resources, Mineral Resources, Food resources, Energy resources, Land resources, Role of an individual in conservation of natural resources.

UNIT-III (12Hrs.)

Ecosystems, Concept of an ecosystem, Structure and function of an ecosystem, Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT- IV(10Hrs.)

Environmental Pollution: Air pollution; Water pollution; Soil pollution.

Recommended Books

1. Y.K. Sing, 'Environmental Science', New Age International Pvt, Publishers, Bangalore.
2. K.C. Agarwal, 'Environmental Biology', Nidi Publ. Ltd. Bikaner, **2001**.
3. Bharucha Erach, 'The Biodiversity of India,' Mapin Publishing Pvt. Ltd.
4. R.C. Brunner, 'Hazardous Waste Incineration', McGraw Hill Inc.
5. R.S. Clark, 'Marine Pollution', Clarendon Press Oxford.
6. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 'Environmental Encyclopedia', Jaico Publ. House, Mumbai, 1196p, **2001**.
7. A.K. De, 'Environmental Chemistry', Wiley Eastern Ltd.
8. 'Down of Earth', Centre for Science and Environment.

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FOOD CHEMISTRY

Subject Code: BFOTS1-204

**LTPC
3104**

Duration:60Hrs.

UNIT-I (12Hrs.)

Introduction to Food: Definition and Composition.

Water: Structure of water and ice, Types of water, Sorption phenomenon, Water activity and packaging.

UNIT-II (16Hrs.)

Lipids: Classification, Physical properties-melting point, softening point, specific gravity, refractive index, smoke, flash and fire point, turbidity point. Chemical properties- reichertmeissel value, polenske value, iodine value, peroxide value, saponification value.

Changes in fats and oils- rancidity, lipolysis, flavor reversion, Fat Mimetics.

UNIT-III (17Hrs.)

Proteins: Protein classification and structure, Nature of food proteins (plant and animal proteins). Properties of proteins (electrophoresis, sedimentation, amphotericism and denaturation), Functional properties of proteins, organoleptic, solubility, viscosity, binding gelation/ texturization, emulsification, foaming.

Carbohydrates: Classification and Functions (monosaccharides, oligosaccharides and polysaccharides), Modified celluloses and starches.

UNIT-IV (15Hrs.)

Vitamin : Importance and Stability, Water soluble & Fat soluble vitamins.

Flavour: Definition and basic tastes, Description of food flavours, Flavour enhancers.

Recommended Books

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. & Hotchkiss, J.H, Food Science, 5th Ed., Chapman & Hall, 1995.
5. DeMan, J.M., Principles of Food Chemistry, AVI, New York, 1980.

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LAB II INTRODUCTION TO FOOD TECHNOLOGY-II

Subject Code:BFOTS1-205

LTPC

Duration: 30Hrs.

0042

Practicals

1. Demonstration of the instruments used in food technology.
2. Determination of moisture content in different food samples.
3. Determination of ash content of different food samples.
4. Determination of TSS of ketchup by refractometer.
5. Determination of acidity of milk and juices.
6. To study the effect of blanching on vegetables.
7. Determination of specific gravity of oil and milk.
8. Determination of pH of food samples by pH meter.
9. Determination of saponification value and acid value.
10. Qualitative test for starch and protein.

LAB III PRINCIPLES OF FOOD PRESERVATION

Subject Code: BFOTS1-206

LTPC

Duration: 30Hrs

0042

Practicals

1. Cut out analysis of canned foods.
2. Preservation of fruits and vegetables by syruling and salting.
3. Preservation by paraffining.
4. Preparation of sauerkraut.
5. To determine the adequacy of blanching on vegetables.
6. To enhance the shelf life of eggs by oiling and pickling.
7. To study the curing of meat.
8. Preservative effect of honey and different concentrations.
9. Preservation of fruits and vegetables by salt, Oil and Vinegar.
10. Visit to food industry.