PANJAB UNIVERSITY, CHANDIGARH-160014 (INDIA)

OUTLINES OF TESTS SYLLABI AND COURSES OF READING

FOR

Bachelor of Vocation (Food Science and Technology)

Session 2017-18

(1st to 4th Semester)
**SCHEME of B.Voc. (MLT)**

(SEMESTER SYSTEM)

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Title</th>
<th>Generic/ Skill Component</th>
<th>Theory/ Practical</th>
<th>Internal (Theory)</th>
<th>External (Theory)</th>
<th>Internal (Practical)</th>
<th>External (Practical)</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GEN - 101</strong></td>
<td>Communication Skills</td>
<td>Generic</td>
<td>Theory</td>
<td>20</td>
<td>80</td>
<td>--</td>
<td>--</td>
<td>6</td>
</tr>
<tr>
<td><strong>GEN - 102</strong></td>
<td>Fundamentals of Information Technology</td>
<td>Generic</td>
<td>Theory</td>
<td>20</td>
<td>80</td>
<td>--</td>
<td>--</td>
<td>6</td>
</tr>
<tr>
<td>FST 103</td>
<td>Introduction To Food Microbiology</td>
<td>Skill</td>
<td>Theory &amp; Practical</td>
<td>10</td>
<td>40</td>
<td>10</td>
<td>40</td>
<td>6</td>
</tr>
<tr>
<td>FST 104</td>
<td>Bakery And Confectionery Technology-I</td>
<td>Skill</td>
<td>Theory &amp; Practical</td>
<td>10</td>
<td>40</td>
<td>10</td>
<td>40</td>
<td>6</td>
</tr>
<tr>
<td>FST 105</td>
<td>Bakery And Confectionery Technology-II</td>
<td>Skill</td>
<td>Theory &amp; Practical</td>
<td>10</td>
<td>40</td>
<td>10</td>
<td>40</td>
<td>6</td>
</tr>
</tbody>
</table>

**SEMESTER II**

| **GEN 201**  | Soft Skills and Personality Development  | Generic                  | Theory           | 20                | 80                | --                  | --                  | 6      |
| FST 202    | Management of Food Industry              | Generic                  | Theory           | 20                | 80                | --                  | --                  | 6      |
| FST 203    | Dairy Technology                          | Skill                    | Theory & Practical | 10                | 40                | 10                  | 40                  | 6      |
| FST 204    | Milk And Dairy Food Products              | Skill                    | Theory & Practical | 10                | 40                | 10                  | 40                  | 6      |
| FST 205    | Food Packaging                            | Skill                    | Theory & Practical | 10                | 40                | 10                  | 40                  | 6      |
| **SIT-201** | Summer Industrial Training                | Skill                    | Practical        | --                | --                | 20                  | 80                  | 6      |

*Refer to Generic Components Common to all B.Voc. Courses

** Summer Industrial Training of 4-6 weeks in a relevant Industry after 2nd Semester Examinations during summer break. Training report by the student to be submitted within in one week of start of 3rd Semester. Viva-Voce examination to be held within 3-weeks of the start of 3rd semester.

Job Role: Baking Technician, Food Product Packaging Technician, Dairy Products Processor
<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Title</th>
<th>Generic/ Skill Component</th>
<th>Theory/ Practical</th>
<th>Internal (Theory)</th>
<th>External (Theory)</th>
<th>Internal (Practical)</th>
<th>External (Practical)</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>*GEN 301</td>
<td>Value Education And Human Rights</td>
<td>Generic Theory</td>
<td>20</td>
<td>80</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>6</td>
</tr>
<tr>
<td>FST 302</td>
<td>Food Biochemistry</td>
<td>Generic Theory</td>
<td>20</td>
<td>80</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>6</td>
</tr>
<tr>
<td>FST 303</td>
<td>Food Microbiology</td>
<td>Skill Theory &amp; Practical</td>
<td>10</td>
<td>40</td>
<td>10</td>
<td>40</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>FST 304</td>
<td>Food Analysis and Instrumentation</td>
<td>Skill Theory &amp; Practical</td>
<td>10</td>
<td>40</td>
<td>10</td>
<td>40</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>FST 305</td>
<td>Microbiological Analysis</td>
<td>Skill Theory &amp; Practical</td>
<td>10</td>
<td>40</td>
<td>10</td>
<td>40</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SEMESTER IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>*GEN 401</td>
</tr>
<tr>
<td>FST 402</td>
</tr>
<tr>
<td>FST 403</td>
</tr>
<tr>
<td>FST 404</td>
</tr>
<tr>
<td>FST 405</td>
</tr>
<tr>
<td><strong>SIT-401</strong></td>
</tr>
</tbody>
</table>

*Refer to Generic Components Common to all B.Voc. Courses

** Summer Industrial Training of 4-6 weeks in a relevant Industry after 4th Semester Examinations during summer break. Training report by the student to be submitted within in one week of start of 5th Semester. Viva-Voce examination to be held within 3-weeks of the start of 5th semester.

Job Role: Food Microbiologist
**Job Role:** Baking Technician, Food Product Packaging Technician, Dairy Products Processor

**Course Objectives:** To understand the types of food microbes, causes for food spoilage process for food spoilage, need for food preservation.

**Instructions:**
1. The syllabus of this paper has been divided into four units.
2. Examiner will set a total of nine questions comprising two questions from each unit, Question number one is compulsory of short answer type questions covering the whole syllabus.
3. The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
4. All questions carry equal marks

**Unit I**

Introduction to Food Microbiology
- Definition and Scope of food microbiology
- Characteristics of Microorganisms in Food
- Types of microorganisms, Classification and Nomenclature, Morphology and Structure and their importance in food (bacteria, fungi, viruses and prions, protozoans and others)
  - Significance of spores
  - Heat resistance of microorganisms and their spores – bacteria and their spores – fungi and their spores – yeast and their spores - spoilage of canned foods and types of spoiled cans

**Unit II**

- Microbial Growth in Food
- Microbial Growth Characteristics- Bacterial growth curve, microbial reproduction and microbial growth in food
- Factors affecting the growth of microorganisms in food

**Unit III**

Microbial Food Spoilage
- Sources of Microorganisms in foods
- Some important food spoilage bacteria
- Food spoilage: Microbial, physical, chemical & miscellaneous.
- Changes caused by micro-organisms during spoilage (breakdown of proteins, carbohydrates, fats and other constituents)
- Spoilage of specific food groups- a) Cereal and cereal products b) Vegetables and fruits c) Meat and meat and seafood products d) Milk and dairy products e) Eggs and egg products f) Canned foods.
- Detection of food pathogens: Overview of Conventional and Rapid methods to detect food pathogens.

**Unit IV**

Control of Microorganisms in Foods
- Principles and methods of preservation
- Physical Methods of Food Preservation- Dehydration, Freezing, Cool Storage, Heat Treatment (esp. thermo bacteriology), Irradiation
- Chemical Preservatives
- Bio preservatives
- New Non Thermal methods
- Introduction to Hurdle concept and Predictive Microbiology
Practical:

1. Introduction to the Basic Microbiology Laboratory Practices and Equipments
2. Functioning and use of compound microscope
3. Cleaning and sterilization of glassware
4. Preparation and sterilization of nutrient broth
5. Cultivation and sub-culturing of microbes
6. Preparation of slant, stab and plates using nutrient agar
7. Morphological study of bacteria and fungi using permanent slides
8. Methods of sterilization and preparation of media
9. Simple staining
10. Endospore staining
11. Standard Plate Count Method

Recommended Readings

1) Frazier William C and Westhoff, Dennis C. Food Microbiology, TMH, New Delhi, 2004
2) Jay, James M. Modern Food Microbiology, CBS Publication, New Delhi, 2000
   edition,
Job Role: Baking Technician, Food Product Packaging Technician, Dairy Products Processor

Course Objectives:
1. To provide know about the machinery and process involved in the baking process
2. To understand the various types of sugar and its grades
3. To know the confectionery product manufacture

Instructions:
1. The syllabus of this paper has been divided into four units.
2. Examiner will set a total of nine questions comprising two questions from each unit, Question number one is compulsory of short answer type questions covering the whole Syllabus.
3. The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
4. All questions carry equal marks

Unit I
- Introduction to food processing and preservation.
- Various products of the bread and bakery sub-sector
- List the various types of industries within the bakery sub-sector
- Explain the baking process
- Equipments used in Bakery (Dough mixers, Dividers, rounders, Proofing, moulding, Ovens, Slicers etc), Cleaning and maintenance of the work area and machineries, Baking ingredients required for production and plan production sequence
- Testing of Flour For Bakery Goods: Laboratory testing of Wheat grain Quality, Moisture tests, Grain hardness testing.
- Raw material required for bakery products. Role of flour, water, yeast, salt, Sugar milk and fats.
- Yeast- An elementary knowledge of Baker’s yeast, the part it plays in the fermentation of dough and conditions influencing its working.
- Effect of over and under fermentation and under proofing of dough and other fermented goods
- Mixing methods used for baking, Calculate batch size and plan for various types of dough as per the production schedule

Unit II
- Process of mixing and knead ingredients to make dough
- Oven & Baking – Knowledge and working of various types of oven.
- Biscuit-Types of biscuit dough – Developed dough, short dough, semi-sweet, enzyme modified dough and batters-importance of the consistency of the dough, Factors affecting the quality of biscuits/ cookies
- Cake – Flour specification – ingredients: Cake making ingredients- flour, sugar, shortening and egg types of chemically aerated goods Moistening agents Fats and Oil Leavening agents
- Manufacturing process – Cake making methods sugar batter process, flour batter process, genoise method and blending and rubbing method, Correct temperature for baking different varieties of cakes, Balancing of cake formula Characteristics of cakes: external: Internal , Types of icing

Unit III
- Types of Confectionery, raw materials and processing of chocolates, hard boiled candies.
- Additives for Confectioneries.
- Equipments used in Confectionery manufacture
- Toffees – Milk toffee: chocolate ; stick jaws; liquor chocolate.
- Pastry making, principles and various derivatives
- Baking temperatures for confectionery goods.
- Process of proofing process of baking products in the oven
- Process of cooling of baked products

Unit IV
Bread manufacturing process – Straight dough fermentation Bread improvers- improving physical quality
- Methods of bread making
  - Straight dough methods
  - Delayed salt method
  - No time dough method
  - Sponge and dough method Characteristics of good bread
  - External Characteristics – volume, symmetry of shape
- Internal characteristics- colour, texture, aroma, lclarity and elasticity Bread faults and their remedies.
Bread diseases- Rope and Mould – causes and prevention.

Practicals

1. Preparation of cookies and biscuits
2. Preparation of different types of cakes
3. Preparation of different types of pastries
4. Preparation of different types of ice creams (Vanilla, Strawberry, chocolate, Pineapple, Mango)
5. Preparation different types of Pudding
6. Preparation of Bread rolls; Bread sticks & softs rolls;
7. Preparation of Buns; Hot Cross Buns;
8. Preparation of Fermented doughnuts;
9. Preparation of Chelsea buns; Russian stolen Basic bun dough,
10. Preparation of Pizza base

Reference Books

Job Role: Baking Technician, Food Product Packaging Technician, Dairy Products Processor

Instructions:
1. The syllabus of this paper has been divided into four units.
2. Examiner will set a total of nine questions comprising two questions from each unit. Question number one is compulsory of short answer type questions covering the whole syllabus.
3. The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
4. All questions carry equal marks

Unit I
- Bakery layout- The required approvals for setting up of a Bakery- Government procedure and Bye laws.
- Selection of site & Selection of equipment
- Layout design
- Electricity
- Process of cleaning the work area and machineries after production
- Roles and responsibilities of a bakery production specialist.
- Plan, organize and management of work in bakery.
- Method of documenting and recording the details of baking ingredients to final finished product

Unit II
- Quality control of raw material and of finished products
- Role of Hygiene in Bakery
- Personal hygiene, care of skin, hand and feet, Food handlers hygiene, protective clothing.
- Dishwashing methods- manual and machine dish washing- merits and demerits
- Garbage disposal- different methods- advantages and disadvantages
- Food poisoning- Causative factors and the precautions to be taken by food handlers.

Unit III
- Food Storage- Techniques of correct storage, storage temperature of different commodities prevent bacterial manifestation or contamination. Storage of confectionery products.
- Pest Control- Rodents and insect control techniques, special stress on control of flies, rats and cockroaches, care of the premises and equipment
- Municipal health laws.
- Golden rules of first aid and treatment for cuts, wounds, burns
- Process of packaging of baked products

Unit IV
- Accounts and costing:
  - Book Keeping, double entry, journal, simple cash book and types of accounts.
  - Preparation of invoices and debit/ credit memos
  - Percentage and discounts
  - Introduction to ingredient costs, labour costs, overheads, gross profit calculation of cost price, sales price and catalogue price.
  - Commodities: Sugar, Cocoa, Chocolate, Milk, Butter, Cream, Cheese, Food colours, Flavors & essences
  - Dry fruits & nuts used in confectionery, Fresh and preserved fruit products
  - Food laws- Agmark

Practical:
1. Prepare the Bread rolls/cakes/ and assessment of its quality
2. Perform the quality test on fat/butter for bakery applications on different parameters
3. Carry out the assessment of market Candy and Chewing gum.
4. Perform the quality assessment test on yeast and skimmed milk powder for bakery application.
5. Prepare Chocolate cookies and assessment of its quality.
Reference Books

Job Role: Baking Technician, Food Product Packaging Technician, Dairy Products Processor

Objectives:
1. To develop a knowledge base in key areas of institutional food management.
2. To impart necessary expertise to run a food service unit.
3. To provide practical level experience in managing food service management.
4. To critically evaluate the functioning of food service units.

Instructions:
1. The syllabus of this paper has been divided into four units.
2. Examiner will set a total of nine questions comprising two questions from each unit. Question number one is compulsory of short answer type questions covering the whole syllabus.
3. The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
4. All questions carry equal marks

Unit-I

- Institutional management, Levels of Management.
- Review of different types of food service operations. Commercial, non-commercial food service institutions.
- Importance of food standards. Need for knowledge as to what constitutes good products, criteria for good quality products, hazards of poor quality, quality control, Specification for quality in food products.
- Organisation - definition and types

Unit-II

- Basic Procedure of Method Study (Work Study) and Time Study; Concepts, Objectives and functions of Production Planning and Control (PPC).
- Physical plant- its location, floor plans, space allowance, Institutional food units-storage, preparation and serving Cost control
  a) Food cost, Labour cost, Maintenance cost
  b) Budgets
  c) Documentation and Records: Documentation and maintenance of record of raw materials and packaging materials
  d) Portion control
- Role of supervisor in fruits and vegetable processing industry.
- Planning and organization of work: organization standards, process standards and procedures followed in the organization, types of products produced by the organization, Code of business conduct, Dress code.

Unit-III

- Personnel Management
- Personnel and leadership qualities for food service administration.
- Labour, Types of labour, criteria for selection and employees training.
- Labour laws and legal aspects - health & safety of employees, welfare policies.
- Manage and lead a team Team Management Skills-The Importance of Delegation, Developing Your Team, Motivating Your Team: Motivation Theories – Maslow’s, Herzberg’s; Worker’s Participation in Management; Collective Bargaining.
- Communicating and Working With Your Team – and With Others, Communicating With People Outside Your Team
- Managing Discipline
Hygiene and Sanitation

i) Personal hygiene- Importance of personal cleanliness in handling and serving food. Health examination of personnel. ii) Sanitation in handling food and equipment.
   a. Preventing contamination of cooked food and handling of fresh foods.
   b. Cleaning and hygienic handling of equipments.
   c. Insect and Rodent control.
   d. Safety, general safety rules in food preparation and service area. Accident prevention
   Equipment- Types of equipment- criteria for selection, operation and care.
   Food laws and regulations on raw materials, product(s), packaging and labelling
   Food safety, hygiene, sanitation GMP, HACCP and quality assurance procedures
   Procedures for disposal of waste.

Books Recommended:

1. West Wood A; Harper Food Service in Institution.
2. West, Bessin, Brooks; Food Service in Institutions
3. A.M. Home Economics Association; Hand Book of Food Preparations:
4. Sweetman, M.M. 4, Mac, Keller; Food Selection and Preparation:
5. Oliver B., Watson; School Lunch Room Service
6. Lender H. Katshever and Margret E. Terrel; Food Service Planning: Layout Equipment
7. Davidson and Passmore- Human Nutrition and Dietetics.
Job Role: Baking Technician, Food Product Packaging Technician, Dairy Products Processor

Objectives
1. To know the compositional and technological aspects of milk
2. To study processed milk products.

Instructions:
1. The syllabus of this paper has been divided into four units.
2. Examiner will set a total of nine questions comprising two questions from each unit. Question number one is compulsory of short answer type questions covering the whole syllabus.
3. The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
4. All questions carry equal marks

Unit I

TECHNOLOGY OF MILK AND MILK PRODUCTS
Composition and Physical properties of milk, milk color, taste, pH and buffering capacity, refractive index, viscosity, surface tension, freezing, boiling point, specific heat, OR, electrical conductivity.

Unit II

Milk fat
• Composition and structure, factors affecting melting point, boiling point, solubility and Refractive Index, fat constants (saponification value, iodine value, RM value, Polenske value, peroxide value).
• Chemical reactions of fat (hydrolysis, auto-oxidation), condition favoring autooxidation, prevention, measurement of auto-oxidation.

Unit III

Fats and Oils
• Classification of lipids, types of fatty acids - saturated fatty acids, unsaturated fatty acids, essential fatty acids, Trans fatty acids. (Ch-3, Manay)
• Refining of oils, types- steam refining, alkali refining, bleaching, steam deodorization, hydrogenation (Ch-2 Meyer)
• Rancidity - hydrolytic and oxidative rancidity and its prevention.
• Define - margarine, butter, hydrogenated vegetable oil, lard.
Protein and Enzymes
• General structure, amphoteric nature, difference between casein and serum protein, different types of casein (acid and rennet), uses of casein, fractionation of protein.
• Enzymes - catalase, alkaline phosphatase, lipases and proteases.

UNIT IV

• Liquid milk handling operations : Systems of collection of milk, Reception, Platform testing, Process of testing milk for accepted quality standards, organoleptic test of milk, Procedure for COB test of milk
• Various stages of processing: Filtration and Clarification, Skimming, Standardization
Homogenization, Pasteurization (LTHT, HTST, UHT) Sterilization, Packaging, Storage and distribution of fluid milk
• Description and working of clarifier, cream separator, homogenizer and plate heat exchanger. Need for processing milk.
• List the various units within a dairy processing plant
• List the machineries used in a dairy processing plant
• Roles and responsibilities of a dairy products processor in a dairy processing plant
• Flow diagram of following milk products – Butter, ghee, flavored milk, yoghurt, dahi, shrikhand, ice-cream, condensed milk, milk powder, channa, paneer, cheese (cheddar)
• State the composition and nutritive value of the milk products
PRACTICAL

1. To perform platform tests in milk (Acidity, COB, MBRT, specific gravity, SNF)
2. To estimate milk protein by Folin method.
3. To estimate milk fat by Gerber method.
4. Preparation of flavoured milk. Pasteurization of milk
5. To prepare casein and calculate its yield.

Recommended Readings

5. Webb and Johnson, Fundamentals of Dairy Chemistry
Job Role: Baking Technician, Food Product Packaging Technician, Dairy Products Processor

Course Objectives

• To enable the students to understand the various dairy products and their preparation.

Instructions:

1. The syllabus of this paper has been divided into four units.
2. Examiner will set a total of nine questions comprising two questions from each unit. Question number one is compulsory of short answer type questions covering the whole syllabus.
3. The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
4. All questions carry equal marks

Unit I

• Dairy industry in India & its future prospects.
• Process of production planning
• State the factors affecting operation efficiency during production
• New Concept in milk processing- UHT, Membrane processing, Microwave and irradiation treatments; aseptic packaging. Microbiology of milk, sources of milk contamination.

Unit II

• Process for producing dairy products and process of pasteurization:
• ingredients required for production
• State the production process of pasteurization
• Process of separation and bactofugation
• Method of standardization of milk
• Method of homogenization of milk
• Method of heat exchange during pasteurization
• Process of HTST pasteurization
• Process of producing lassi, flavoured drinks, cheese dahi, kalakand, ice-cream, cream, butter, cooking butter, ghee

Unit III

• Technology of condensed and evaporated milk: Composition, nutritive value, process of manufacture, defects (their causes and prevention).
• Technology of yoghurt, Acidophilus milk, Bufgaricus milk, Kumiss, Kefir; Manufacturing of Cheddar, Mozzarella, cottage and processed cheese.
• Milk adulteration and quality control in dairy industry. By products of dairy industry and their utilization.
• Milk based infant foods; Manufacturing of casein, Caseinate, Co-precipitates, WPC, Lactose; National and International Organizations in dairy Industry.
• Milk and milk product standards and legislations in India: Grading of milk and criterion of grading, reconstituted milk, synthetic milk.
• List the different packaging materials used to pack dairy products
• Method of packaging dairy products

Unit IV

• Methods of cleaning and sanitization: Cleaning of production area, equipment, and tools used Equipment, detergents and sanitizers used in the cleaning and maintenance of the work area, Properties of the cleaning agents used, CIP method of cleaning.
• Lubrication system and its process followed in the dairy industry
• State the different types of maintenance procedures, Periodic maintenance of all production machineries
• Method of managing and disposing waste material
• Personal hygiene and sanitation guidelines
• Demonstrate how to use tools safely
• Food safety hygiene and quality standards to follow in a work environment, HACCP principles to eliminate food safety hazards in the process and products
• Method of documenting and recording the details of raw material to final finished product

PRACTICAL:

1. Platform tests,
2. Determination of fat, SNF, TS Protein,
3. Lactose and ash contents of milk,
4. Layout plan for setting up of milk plant,
5. Preparation and Evaluation of different types of milk and milk products
6. Preparation and evaluation of butter, ice cream, cheese, yoghurt

Text Books/References:

Job Role: Baking Technician, Food Product Packaging Technician, Dairy Products Processor

Course Objectives

• To enable the students to understand about packaging and packaging materials, interaction of food items with packaging materials

Instructions:
1. The syllabus of this paper has been divided into four units.
2. Examiner will set a total of nine questions comprising two questions from each unit, Question number one is compulsory of short answer type questions covering the whole syllabus.
3. The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
4. All questions carry equal marks

UNIT I

Introduction:
• Classify packaging, Explain the packaging process and importance of packaging.
• Roles and responsibilities of a food products packaging technician
• Equipment used for food packaging, Tools and machineries used for food packaging, Identify and set the machines and tools required for production in working condition
• Effect of environmental factors on quality of food.
• General Approach, analysis of storage requirements, accelerated storage studies: Vacuum and Inert Gas Packaging: Tests on packaging materials, Mechanical strength (Tension, notch and tearing strengths), Gas and water vapour transmission rates.
• Packaging Methods – Form fill seal packaging, Hermetic closures, retortable pouches, Aseptic packaging Inert gas packaging, Active & intelligent packaging.

UNIT II

• Packaging Materials – Properties of packaging materials in relation to their function (paper, glass, jute, wood, metal containers, flexible packaging materials, laminates, tetra packs). Quality control tests on packaging materials
• Packaging Criteria – Appearance, Protection, Function and cost.
• Estimation of shelf life.
• Packaging of food products – Factors determining the packaging requirements of various foods and Description of packaging of – a. Frozen products b. Dried products c. Chemically preserved foods d. Fats and oils e. Confectionery f. Fruit juices g. Heat processed foods h. Fresh produce (Eggs, Fruits and Vegetables)

UNIT III

• Flexible Films Packaging: Formation of Films and pouches, Plastics used and their specific applications.
• Copolymers their applications.
• Co-extruded films and Laminates.
• Rigid and Semi rigid plastic packaging methods.
• Extrusion – Retort pouch packaging, Laminated Paper board Cartons, Fibre Board and Corrugated Card Board packaging and their applications.

UNIT IV

• Filling And Sealing Operations For Various Types Of Packages: Closing and sealing of Rigid plastic containers.
• Filling and sealing of Flexible plastic containers, Seal types, Hot wire sealing, hot bar sealing and impulse sealing. Form fill
• Seal equipment: Printing on packages, Bar codes, Nutrition labeling and legislative requirements. Filling and Sealing of pouches, pouch from fill seal machines.
• Active packaging, Moisture control, CO2 and Oxygen scavenging, Modified atmosphere packaging – principles, applications.
• Permeability of gases in packs.
• Speciality packages.
• Personal hygiene and sanitation guidelines; • Food safety hygiene standards in a work environment, HACCP principles to eliminate food safety hazards in the process and products
• Materials and equipment used in cleaning and maintenance of work area and machinery,
• Methods of cleaning processes for tools and machineries used in packaging, Cleanliness of the process machineries required for production using recommended sanitizers
• Method of documenting and recording the details of raw material to final finished product
• Plan ,Schedule and organize the work order to prevent potential problems

PRACTICALS

1. Testing of Packaging material
2. To study the different packaging materials .
3. Determination of water vapour transmission rate for various packaging materials.
4. To determine grease resistance of packaging material.
5. To determine the wax content in given wax paper .
6. To estimate the basis weight of given packaging material.
7. To determine the chemical resistance of given packaging material.

Recommended Readings

1. Desrosier NW and Desrosier JN, The Technology of Food Preservation, CBS Publication, New Delhi, 1998
3. Potter NH, Food Science, CBS Publication, New Delhi, 1998
9. ND. Sethi, Mohini , 2001 Food Science, CBS Publishers,
Job Role: Food Microbiologist

Objectives: The paper provides basic information on chemical, physical and functional properties of various biomolecules present in food and how they contribute to the overall quality of foods.

Instructions:
1. The syllabus of this paper has been divided into four units.
2. Examiner will set a total of nine questions comprising two questions from each unit. Question number one is compulsory of short answer type questions covering the whole syllabus.
3. The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
4. All questions carry equal marks

UNIT I

Introduction to Biomolecules –
- Major and minor constituents of food, Bioavailability of nutrients, their functions, sources, Basics of bioenergetics.
- Carbohydrates - Classification, structure & properties, artificial sweeteners.
- Proteins - Structure and classification of amino acids, essential and non-essential amino acids, structural organization of proteins, physico-chemical properties of proteins, catabolism of proteins in prokaryotes.
- Lipids – Classification and its

UNIT II

- Biosynthetic Pathways: Brief account of Biosynthesis of sugars and polysaccharides, amino acids, nucleotides, fatty acids and lipids in prokaryotes, biosynthesis of bacterial cell wall.

UNIT III

- Enzymes- Enzymes classification and nomenclature; coenzymes, cofactor, kinetics, factors affecting catalytic efficiency of enzymes, allosteric enzymes, feed back inhibition; Competitive and noncompetitive inhibition.
- Vitamins and minerals - Classification, sources and functions.

UNIT IV

- Pigments – Introduction, major types and sources, Food pigments - Chlorophyll, carotenoids, anthocyanins, flavonoids, beet pigments, caramel.
- Flavours - Definition and basic taste factors, chemistry of food flavors from cocoa, coffee, vanilla beans and spices, flavor changes in fats and oil, flavor and aroma’s of food.
- Changes in food constituents during processing: Changes in carbohydrates on cooking, Browning and Maillard reactions, Effects of physic-chemical conditions on proteins, Denaturation of proteins, Oxidative and Hydrolytic Rancidity.

Practicals-
1. Qualitative analysis of carbohydrates.
2. Qualitative analysis of amino acids.
5. To perform isoelectric precipitation of proteins.
7. Determination of acidity and pH of food product.
8. Determination of Protein by kjeldhal method.
9. Determination of moisture by Oven drying method.
10. Determination of acid value in given oil.
REFERENCE BOOKS –

5. De, Amit Krishna., 2012, Biochemistry, S.Chand& Co. Ltd., New Delhi, India.
Job Role: Food Microbiologist

Objectives: To introduce to students fundamental concepts of microbiology that includes microbial diversity, their morphological and functional properties, techniques to study microorganisms, growth and control of microorganisms as well as food spoilage and its control.

Instructions:
1. The syllabus of this paper has been divided into four units.
2. Examiner will set a total of nine questions comprising two questions from each unit. Question number one is compulsory of short answer type questions covering the whole syllabus.
3. The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
4. All questions carry equal marks

UNIT I

- Introduction – Discovery of microbial world, Importance of microbiology, Microbial classification and nomenclature, Characteristics of major groups of microorganisms: Archaeabacteria, Eubacteria, Fungi, Protozoa and Viruses and Bacteriophages.
- Principles of food microbiology and microbiology terminologies
- Significance of micro-organisms in preservation, production and spoilage of food
- Microbial Nutrition: Nutritional requirements of microbes; Types of culture media; Classification of microbes on the basis of nutritional requirements, Identification of bacteria.

UNIT II

- Human-Microbial Interactions: Normal flora –Gastrointestinal tract; Pathogenic mechanisms of food borne bacteria, Brief account of mechanisms of action of chemotherapeutic agents, Introduction to specific and nonspecific defense mechanisms to infections.
- Enumeration of Microorganisms- qualitative and quantitative
- Food Fermentations
- Fermentation –definition and types
- Microorganisms used in food fermentations
- Dairy Fermentations-starter cultures, types and methods of preservation and propagation, Lactic acid and aroma compounds production, Health benefits of LAB, probiotics, prebiotics and symbiotics
- Fermented Foods-types,methods of manufacture for vinegar, sauerkraut, tempeh, miso , soya sauce ,beer,wine and traditional indian foods

Unit III

Food borne Diseases
- Types – food borne infections, food borne intoxications and toxicinfections
- Origin, General characteristics, symptoms and prevention of some commonly occurring food borne diseases caused by Bacillus spp., by Clostridium botulinum,Staphylococcus aureus; Clostridium botulinum; C. perfringens; Listeria monocytogene; Salmonella; Escherichia.coli; Yersinia enterocolitica; Shigella spp., Vibrio parahaemolyticus, Mycotoxins, Hepatatis, Gastroenteritis viruses, Entamoebahistolytica and Entamoeba coli..
- Emerging pathogens of concern

Unit IV

- Microbiology Of Water And Food Commodities: Microbiology of water and their importance of processing of foods in industries. MPN of coliforms Microbiology of milk – Hetero and homo fermentative Lactic acid bacteria – Yogurt and Cheese fermenting

Trends in Food Microbiology
- Rapid Methods of Detection
- SCP and SCO
Recent Advances

- Microbial quality control: Determination of microorganisms in foods by cultural, microscopic, physical, chemical methods.

Practicals

1. Introduction and study of microbiological instruments.
2. Media preparation, aseptic techniques and transfer of microorganisms.
3. To study various culture techniques - pour plating, spread plating and streaking.
4. To study morphology of bacteria by simple staining and negative staining.
5. Principle, procedure and use of gram staining method.
7. To distinguish the growth characteristics of microorganisms in various differential and selective media.
8. Identification of fungi by Lactophenol cotton blue staining method.
9. Sampling and observation of microorganisms from natural sources.
10. To study serial dilutions of the sample and plate counts.
12. Presumptive coliform test for milk, butter and ice-cream.

REFERENCE BOOKS

5. Pelczar, Reid and Chan, 2008, Microbiology, McGraw hill Ed, ND
Job Role: Food Microbiologist

Objectives: • To generate the skill of handling the different instruments of food process technology.
• To study the various techniques of food analysis.

Instructions:
1. The syllabus of this paper has been divided into four units.
2. Examiner will set a total of nine questions comprising two questions from each unit, Question number one is compulsory of short answer type questions covering the whole syllabus.
3. The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
4. All questions carry equal marks.

Unit I

• Introduction to food analysis, type of samples and sampling techniques, storage and preservation of samples, expression of results. Different preservation principles involved in food processing Sampling: Sampling techniques and preparation of food samples. Sampling of Milk, Eggs, Dried & Frozen food products.
• Physico chemical methods for food analysis: Moisture & Total solids Carbohydrates Proteins Fats Fiber Ash & its types Minerals Vitamins Enzymatic methods
• Sensory Tests : Difference, Rating & Sensitivity tests. Types of panels Testing area & schedule

Unit II

• Instrumentation in food analysis : Principles, types and applications of colorimetry and electrophoresis and chromatography: paper, thin layer, ion exchange

Unit III

• Instrumentation in food analysis: Color measurement in foods. X-ray analysis of foods and its applications, scanning electron microscopy (SEM) in food analysis and identification

Unit IV

• Ultrasonic and other instruments for determination of physical and rheological properties of food Texture analysis in foods.
• Sensory versus instrumental analysis of texture, rapid methods of microbial analysis, immunoassays; Techniques for estimation and analysis of toxins and pesticides in food.

Practicals:
1. Use of spectrophotometer in food content estimations.
2. Determination of physical and rheological properties of foods by different techniques.
3. Separation of food components by chromatography.

Reference Books:
Job Role: Food Microbiologist

Objectives:
1. To generate the skill of handling the different instruments of microbiological analysis
2. To study the various techniques of microbiological analysis

Instructions:
1. The syllabus of this paper has been divided into four units.
2. Examiner will set a total of nine questions comprising two questions from each unit, Question number one is compulsory of short answer type questions covering the whole syllabus.
3. The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
4. All questions carry equal marks

Unit I
- Equipments and tools used for of food products such as weighing scale,
- homogenizer, autoclave, laminar air flow chamber, vacuum pump, Bunsen burner, inoculation loop, incubator, refrigerator, microscope, etc.
- Microbiological techniques for analysis of food products
- Analyze results and provide recommendations SOPs for preparing culture media,
- Prepare liquid and solid culture media (nutrient broth and nutrient agar) following SOP and prepare for sterilization

Unit II
- Sterilization of culture media, solvents and glassware
- Disposal of used microbiological media and culture
- Quality standards for food products produced in the organization and methods to assess and maintain quality of food products
- GMP

Unit III
- Cleaning process to disinfect equipments/ tools and glass wares used ,Recommended sanitizers
- Organization standards to clean laminar air flow cabinet or lab bench using approved disinfectants and sanitizers, health and safety, recommended dosage for use of sanitizers, control of substances hazardous to health, handling/storage/disposal/ cautions of use of sanitizers and disinfectants, fire precautions, occurrences, hygiene practice, disposal of waste, environmental protection, etc.
- Standards and procedures followed in the organization for cleaning and disinfecting equipment/ tools in microbiology laboratory

Unit IV
- Job responsibilities/duties to maintain lab hygiene standards.
- Dress code .
- Hygiene, safety and quality standards.
- Hygiene requirements and standards relevant to microbiology laboratory.
- Food Safety Standards and Regulations (as per FSSAI), food safety systems like HACCP, food hygiene and sanitation.
- Knowledge of legal regulations pertaining to work place- food regulatory system such as FSSAI and food standards for products produced in the organization.
- Microbiological hazards in production process, and its critical control point to minimize or prevent those hazards.
- Physical, chemical and biological hazards and methods of prevention of various hazards
- Personal hygiene.
- Document and maintain records on microbiological analysis of raw materials for production of food products.
- Management and leading of team.
Practicals

1. Quality audit methods and procedures
2. Lactophenol staining
3. Hanging drop preparation to observe motility of bacteria

Reference Books:

4. Jay, James M. Modern Food Microbiology, CBS Publication, New Delhi, 2000
Job Role: Food Microbiologist

Objectives:

1. To understand basic quality attributes of foods in raw as well as processed form.
2. To learn various systems of objective and subjective evaluation and their application in industry.

Instructions:

1. The syllabus of this paper has been divided into four units.
2. Examiner will set a total of nine questions comprising two questions from each unit. Question number one is compulsory of short answer type questions covering the whole syllabus.
3. The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
4. All questions carry equal marks

UNIT I

Introduction to quality attributes: Appearance, flavor, textural factors and additional quality factors.

Taste

- Introduction
- organs involved in taste perception- tongue, papillae, taste buds, salivary glands
- mechanism of taste perception
- chemicals responsible for sweet, salt, sour, and bitter taste their structure and chemical dimensions
- Factors affecting taste quality, reaction time and factors affecting it absolute and recognition threshold, taste abnormalities

UNIT II

Olfaction

- Introduction and definition, anatomy of nose, mechanism of odour perception, Prerequisites for odour perception, odour classification, chemical specificity of odour, measurement of odour using different techniques – primitive, double tube olfactometer, Elseberg techniques, Wenzel’s olfactometer, sniffing, merits and demerits of each methods, olfactory abnormalities

UNIT III

Colour

- Introduction to natural and synthetic colours
- functions of colour in foods
- Optical aspect of colour,
- perception of colour,
- objective evaluation, colour measurement using different systems
- Qualitative and quantitative analysis of colour,
- Reflectance spectrophotometry and Colorimetry.
UNIT IV

Texture

- Introduction
- Definition and classification of texture profile
- Subjective evaluation, phases of oral processing
- Objective analysis, rheological methods of texture measurement including rheological models
- Measurement of texture in various food groups viz. cereals, dairy, fruits and vegetables, meat and meat products

PRACTICAL

1. Training of sensory panel for flavor perception.
2. To perform sensitivity tests for four basic tastes.
3. To perform difference tests.
4. To identify a few chemicals and related odors.
5. Sensory evaluation of milk and detection of flavor defects in milk.
6. Extraction of pigments from various fruits and vegetables and influence of heating time and pH.
7. Sensory evaluation of biscuit samples for textural properties.
8. Simple tests for detection of common adulterants- formaldehyde, starch, cane sugar, hydrogen peroxide, sodium bicarbonate in milk.

Reference Books:

4. Yeshajahu Pomeranz & Clifton E. Meloan, Food Analysis & Theory & Practice, 1st Indian ed. CBS Publisher & Distributors, New Delhi, 2002
Job Role: Food Microbiologist

Objectives:
1. To teach technology of milling of various cereals
2. To impart technical knowhow of pulses and oilseeds refining
3. To create awareness about the processing of major cereals like paddy, maize etc.
4. To study the storage and handling techniques of cereals.
5. To gain knowledge on processing and milling of pulses.
6. To study about the byproducts obtained during processing along with their uses.

Instructions:
1. The syllabus of this paper has been divided into four units.
2. Examiner will set a total of nine questions comprising two questions from each unit. Question number one is compulsory of short answer type questions covering the whole syllabus.
3. The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
4. All questions carry equal marks

UNIT I

Technology of cereals

Wheat --Types, milling, flour grade, flour treatments (bleaching, maturing), flour for various purposes, technology of dough development. Chapter4-7, Kent

UNIT II

- Barley- Milling (pearl barley, barley flakes & flour), beer preparation
- Oats – Milling ( oatmeal, oat flour & oat flakes )
- Sorghum and millets – Traditional & commercial milling ( dry &wet )

UNIT III


UNIT IV

- Introduction
- Sources of protein (defatted flour, protein concentrates and isolates), properties and uses, protein texturization, fiber spinning
- Breakfast cereals – porridge , flakes and puffed products.
Practicals

1. Determination of physical properties of different cereal grains.
2. Determination of water absorption capacity, sedimentation value and alcoholic acidity of the Maida.
3. Determination of adulterant (NaHCO3) in wheat flour/ Maida.
4. Estimation of Protein content of different Cereals and Legumes.
5. Determination of Gluten content in wheat flour samples.
6. Physical characteristics of wheat.
7. Moisture content of wheat and products.
8. Yeast fermenting power.
9. Estimation of KBrO.
10. Physical characteristics of rice.

Reference Books

Job Role: Food Microbiologist

Objectives

To understand the following:
1. Food safety and hygiene
2. Types of hazards associated with food
3. Food regulations (national as well as international)
4. Design and implementation of food safety management systems such as ISO series, HACCP and its prerequisites such as GMP, GHP etc.
5. Emerging concerns

Instructions:

1. The syllabus of this paper has been divided into four units.
2. Examiner will set a total of nine questions comprising two questions from each unit. Question number one is compulsory of short answer type questions covering the whole syllabus.
3. The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
4. All questions carry equal marks

UNIT I:

Introduction to Food Safety
- Definition
- Factors affecting Food Safety
- Importance of Safe Foods

Food Hazards of Physical and Chemical Origin
- Introduction
- Physical Hazards with common examples
- Chemical Hazards (naturally occurring, environmental and intentionally added)
- Impact on health
- Control measures

UNIT II

Management of hazards
- Need
- Control of parameters
- Temperature control
- Food storage
- Product design

Hygiene and Sanitation in Food Service Establishments
- Introduction
- Sources of contamination
- Control methods using physical and chemical agents
- Pest and Rodent Control
Unit III

Food Safety Management Tools
- Basic concept only

Microbiological criteria
- MRA
- Microbiological standards and limits (for processed food, water)
- Microbiological Assessment and categories of food based on microbial quality
- Sampling
- Basic steps in detection of food borne pathogens
- Water Analysis

UNIT IV

Food laws and Standards
- Indian Food Regulatory Regime
- Global Scenario
- Other laws and standards related to food

Recent concerns
- New and Emerging Pathogens
- Packaging, Product labeling and Nutritional labeling
- Genetically modified foods \ Transgenic
- Organic foods
- Newer approaches to food safety
- Recent Outbreaks

PRACTICALS

1. Preparation of different types of media (complex, differential and selective) shift to microbiology
2. Microbiological Examination of different food samples
3. Bacteriological Analysis of Water
4. Assessment of surface sanitation by swab/rinse method
5. Assessment of personal hygiene
6. Scheme for the detection of food borne pathogens

REFERENCE BOOKS –

1. Lawley, R., Curtis L. and Davis, J. The Food Safety Hazard Guidebook, RSC publishing, 2004
Job Role: Food Microbiologist

Objectives:
1. To learn about quality management in food production chain.
2. To learn about physical, chemical contaminants in foods.
3. To learn about latest trends and techniques in food science.
4. To understand the significance of safe processing of foods.
5. To understand the role of food standards and regulations in maintaining food quality.
6. To understand the different principles of food quality control.
7. To assess the food quality assurance of different food.

Instructions:
1. The syllabus of this paper has been divided into four units.
2. Examiner will set a total of nine questions comprising two questions from each unit. Question number one is compulsory of short answer type questions covering the whole syllabus.
3. The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
4. All questions carry equal marks.

UNIT I

Food Quality
- Organisation policies and goals, quality management, budget management, food regulatory policies and procedures related to products produced in the organisation, quality mark accreditations of the organisations, audit procedures, code of business conduct, leadership techniques, manpower modelling and handling.
- Quality in the Agri-food production chain- Techno-managerial approach, food quality relationship and food quality management functions. Dynamics on the agri-food production chain, core developments in food quality management.

UNIT II

Food contamination
- Contamination in Food- Physical, chemical (heavy metals, pesticide residues, antibiotics, veterinary drug residues, dioxins, environmental pollutants, radionucleides, solvent residues, chemicals) Natural toxins.
- Total quality management (TQM) - good manufacturing practices, good hygienic practices, good lab practices. Microbial quality control: determination of microorganisms in foods by cultural, microscopic, physical, chemical, immunological and bioassay methods.

UNIT III

- Food adulteration, nature of adulteration, methods of evaluation of food adulterants and toxic constituents of milk, tea, coffee, meat, spices, cereals, oils & fats and other products. Their analysis and analysis of common preservatives used in processed foods. Permissible limits of Preservatives.
- Sensory quality evaluation: Introduction, methods, panel screening, selection methods, Sensory and instrumental analysis in quality control.
- Introduction, need of food additives in food processing and preservation. Characteristics and classification of food additives.
- Antioxidants - Introduction, mechanism of action, natural and synthetic anti-oxidants, technological aspect of antioxidants.
- Colors- Introduction, importance, classification- natural, artificial, and natural identical, FD&C Dyes and Lakes. Use of plant tissue culture, polymeric colors etc for color.
Unit IV

- Food Laws, standards and regulations: History, National and International laws & Regulations: USFDA, EU, USFDA, ISO 9000 series etc. Food laws and standards, IPR and patents, Food standards and safety Act: salient provisions and prospects, role of various national and international agencies
- World Trade Organization (Sanitary and Phyto Sanitary agreement, Technical Barriers in Trade), Standards of Identity, Standards of fill of the container. Statistical quality control in food industry. Food safety and Standards Act 2006: Salient provision and prospects, Role of national and international regulatory agencies, Bureau of Indian Standards (BIS), AGMARK, Food Safety and Standards Authority of India (FSSAI)

PRACTICALS

1. Qualitative tests for fats and oils, spices and condiments.
2. Estimation of residual sulphur dioxide in beverages.
4. Analysis of edible common salt for MC, MIW and total chlorides.
5. Estimation of pesticide residues in food/water.
7. Techniques of quality assessment of different natural and processed foods.
8. Identification and ranking of food product attributes

REFERENCE BOOKS –

2. Brannen and etal, Food Additives, Marcel Dekker, New York, 1990