



**PANJAB UNIVERSITY, CHANDIGARH-160014 (INDIA)**

**OUTLINES OF TESTS SYLLABI AND COURSES OF READING**

**FOR**

**Bachelor of Vocation (Food Processing and Quality Management)**

**Session 2018-19**

**(1<sup>st</sup> to 6<sup>th</sup> Semester)**

# SCHEME OF B.Voc. (Food Processing and Quality Management)

## (SEMESTER SYSTEM)

<b>Semester I</b>								
Paper Code	Title	Generic/ Skill Component	Theory/ Practical	Internal (Theory)	External (Theory)	Internal (Practical)	External (Practical)	Credit
*GEN - 101	Communication Skills	Generic	Theory	20	80	--	--	6
*GEN - 102	Fundamentals of Information Technology	Generic	Theory	20	80	--	--	6
FPQM-103	Introduction to bakery and confectionary	Skill	Theory & Practical	10	40	10	40	6
FPQM-104	Dairy technology	Skill	Theory & Practical	10	40	10	40	6
FPQM-105	Food Quality control	Skill	Theory & Practical	10	40	10	40	6
<b>SEMESTER II</b>								
*GEN 201	Soft Skills and Personality Development	Generic	Theory	20	80	--	--	6
GC 202	Business Ethics	Generic	Theory	20	80	--	--	6
FPQM-203	Food Packaging	Skill	Theory & Practical	10	40	10	40	6
FPQM-204	Industrial Safety Hazards & Prevention	Skill	Theory & Practical	10	40	10	40	6
FPQM-205	Food Plant Layout & waste disposal	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 3<sup>rd</sup> Semester. Viva-Voce examination to be held within 3-weeks of the start of 3<sup>rd</sup> semester.**

Semester III								
Paper Code	Title	Generic/Skill Component	Theory/ Practical	Internal (Theory)	External (Theory)	Internal (Practical)	External (Practical)	Credit
*GEN 301	Value Education And Human Rights	Generic	Theory	20	80	--	--	6
GC-302	E-Commerce	Generic	Theory	20	80	--	--	6
FPQM-303	Technology of fruit & vegetable processing	Skill	Theory & Practical	10	40	10	40	6
FPQM-304	Egg, poultry, meat & fish processing	Skill	Theory & Practical	10	40	10	40	6
FPQM-305	Principles of food processing and preservation	Skill	Theory & Practical	10	40	10	40	6
SEMESTER IV								
*GEN 401	Environmental Studies	Generic	Theory	20	80	--	--	6
GC-402	Project Management	Generic	Theory	20	80	--	--	6
FPQM-403	Technology of oils and fats processing	Skill	Theory & Practical	10	40	10	40	6
FPQM-404	Spices and flavor processing	Skill	Theory & Practical	10	40	10	40	6
FPQM-405	Seminars	Skill	Practical	--	--	100	--	6
**SIT-401	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 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.**

## Semester V

Paper Code	Title	Generic/Skill Component	Theory/ Practical	Internal (Theory)	External (Theory)	Internal (Practical)	External (Practical)	Credit
*GEN-501	Critical Thinking and Elementary Statistics	Generic	Theory	20	80	-	-	6
GC 502	Introduction to Research methodology and Report Writing	Generic	Theory	20	80	-	-	6
FPQM - 503	Food Analysis	Skill	Theory & Practical	10	40	10	40	6
FPQM - 504	Unit operations in Food Engineering	Skill	Theory & Practical	10	40	10	40	6
FPQM - 505	Food Safety and food laws	Skill	Theory & Practical	10	40	10	40	6

## Semester VI

Paper Code	Title	Generic/Skill Component	Theory/ Practical	Internal (Theory)	External (Theory)	Internal (Practical)	External (Practical)	Credit
*GEN-601	Entrepreneurship Development Programme	Generic	Theory	20	80	-	-	6
GC 602	Total Quality Management	Generic	Theory	20	80	-	-	6
FPQM - 603	Food Microbiology	Skill	Theory & Practical	10	40	10	40	6
FPQM - 604	Food Additives	Skill	Theory & Practical	10	40	10	40	6
FPQM - 605	Technology of Fermented foods	Skill	Theory & Practical	10	40	10	40	6

**\*Refers to all Generic Components common to all B.Voc. Courses**

**Industrial Training of 5-6 weeks of 6 credits in each year followed by Report Writing and Viva-voce  
These credits will be evaluated at the end of vi semester**

**B.Voc. (Food processing and quality Management)**

**Semester : ----I**

**Paper Title: INTRODUCTION TO BAKERY AND CONFECTIONERY**

**Paper Code: FPQM-103      Credits: 6**

**Job Role: Baking Technologist: Responsible for manufacture of bakery and confectionary products and their quality control.**

- Objectives:**
1. To understand the role of different ingredients used in Baking Industry.
  2. To know the general methods of processing and preservation of foods.
  3. To identify the microorganisms that can otherwise spoil bakery products.

**Instructions for Examiner:**

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, including Question No. 1 (compulsory) of short answer type 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, Types and processing methods: Wheat:** Structure, types, milling **Rice:** Structure and processing. **Flour:** grades, treatment and Storage. **Raising and Thickening Agents:** their uses. Leavening agents: their role in baking industry.

## UNIT II

**Methods of Preservation:** Preservation by heat treatment –Pasteurization, sterilization, blanching and canning – Heat resistance of microorganisms and their spores (bacteria, fungi and yeast). Thermal death curves, types of retorts, aseptic packaging. Spoilage of canned foods and types of spoiled cans. Cold preservation and processing. Non-thermal methods of preservation: High pressure processing

## UNIT III

**Introduction to Baking and confectionary process methods:** Methods of Bread Making: Straight dough method, Sponge dough method, principle and types of pastry making, Types of cake making methods: Sugar batter, Flour batter method, process of biscuit making.

## UNIT IV

**Bread Spoilage:** Rope and Mould, Factors responsible for it and preventive measures. **Defects and Remedies:** Basic reasons and suggested remedies: Bread, Cake and Biscuits.

**Suggested Resources for Reading:**

1. Frasier.1987. Food Microbiology. Tata McGraw-Hill Education.
2. Adams M.R and Moss M.O, 2004 “Food Microbiology”, Panima Publishing corporation, New Delhi, 2<sup>nd</sup>

Edition

3. Bread: A baker's book of techniques and recipes by Jeffrey Hamelman
4. Ornamental Confectionary and the Art of Baking in all its Branches by Herman Hueg
5. Bakery-I, Student handbook and practical manual, published by CBSE.
6. A professional Text to bakery and confectionary by John Kingslee

### **Practical based on FPQM-103**

**Time: 3 hours**

1. Preparation of White Bread.
2. To determine moisture in bread and biscuits.
3. Studying the effect of temperature on process of biscuit making.
4. Determination of ash content in bread and biscuits.
5. Principle and preparation of Fruit cake
6. To do icing on the cake
7. Determination of gluten

**Paper Title: Dairy Technology**

**Paper Code: FPQM-104**

**Credits: 6**

**Job Role: Dairy Technologist:** To supervise manufacture of dairy products like milk, butter, yogurt, cheese and their preservation.

**Objectives:**

1. To develop knowledge among students about various aspects of dairy industry.
2. To study quality standards and production of various types of milk and milk products.
3. To study the role of dairy farming in Indian economy

**Instructions for Examiner:**

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, including Question No. 1 (compulsory) of short answer type 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**

**Milk:** Definition, composition, physicochemical properties of milk and its constituents, nutritional value, overview of processes used in milk and milk products- pasteurization, homogenization and standardization, dye detection test, platform tests, milk borne diseases. Microbiology of milk, types of spoilage and its preventions.

Types of market milk: Toned milk, Double Toned milk, Standardized Milk, Recombined milk, reconstituted milk, fortified milk. Effluent treatment of dairy plant disposal.

**UNIT II**

**Technology underlying manufacture of Milk products:** Butter, cream, butteroil, cheese, yoghurt, paneer, chhana, ice-cream

**UNIT III**

**Composition, standards, manufacturing:** Process, equipments and defects during manufacturing and storage of dairy products and by products (paneer, dahi, milk powder-skimmed milk and whole milk powder, casein, whey concentrate, lactose, ghee residue ).

## UNIT IV

**Dairy development in India:** - Present status, future prospective and its role in Indian economy. Important government initiative. Role of dairy development organizations (NDRI, Amul) in dairy development

### **Suggested Resources for Reading:**

1. Fluid milk industry, J.S Handerson, A.V.I Publishing Company, USA1
2. Indian Dairy products, K.T. AcharyaPublication
3. Milk Hygiene in milk production processing and distribution, F.A.O Publication.
4. Sukumar.1983.Outlines of Dairy Technology.De,Oxford University Press.

### **PRACTICAL BASED ON FPQM 104**

**Time: 3 hours**

1. Sampling of milk and milk products for microbiological analysis
2. Platform test for milk analysis.
3. To determine fat in milk by gerber method.
4. To determine specific gravity of given sample of milk by lactometer.
5. Visit and study a nearby milk union/ dairy and prepare a checklist of problems in procurement and milk distribution.
6. Detection of various adulterants in milk.
7. Preparation of sterilized flavored milk.
8. To prepare pasteurized milk.
9. Methylene blue reduction test in milk.



**Paper Title: FOOD QUALITY CONTROL**

**Paper Code: FPQM 105**

**Credits: 6**

**Job Role:**

**Food quality control manager:** To determine and establish quality standards for food products and

Is responsible for ensuring that food products produced meet standards set by both the organisation and regulatory authorities.

**Objectives:**

1. To understand the different principles and functions of food quality control department.
2. To understand various food laws and regulations

**Instructions for Examiner:**

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, including Question No. 1 (compulsory) of short answer type 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**

Objectives, functions and principles of quality control. Difference between food quality control and quality assurance, assessment of raw materials and finished products (quality control)of baking industry.

**UNIT-II**

Total quality management (TQM) – Principles of quality management, good manufacturing practices, good hygienic practices, good lab practices, general awareness and role of management practices in quality control.

Quality Attributes: Size, shape, colour, aroma and texture. Microbial quality control: an overview

**UNIT-III**

Food laws and regulations, grade and standards, concepts of Codex Alimentarius, HACCP, USFDA, ISO 9000 series etc, Food standards and safety Act: salient provisions and prospects, role of various food standards in India- PFA, FPO, AGMARK and BIS.

## UNIT-IV

Sensory quality evaluation: Introduction, methods, panel screening, selection methods, Sensory and instrumental analysis in quality control.

Food adulteration, nature of adulteration, methods of evaluation of food adulterants and toxic constituents of bakery products.

### **Practical based on FPQM- 105**

- 1 Techniques of quality assessment of different natural and processed foods.
- 2 Documentation of details of baking ingredients, process and finished products used in baking industry.
- 3 Quality evaluation of milk and milk products
- 4 Sensory methods for measuring food quality assessment of raw materials used and processed bakery products
- 5 Instrumental methods for measuring food quality assessment of raw materials used and processed bakery products
- 6 Study of cleaning and sanitizers used in pre and post-operative processes in bakery industry
- 7 Listing of quality control agencies at national and international levels

### **Suggested Resources for Reading:**

1. InteazAlli (2003). Food Quality Assurance Principles and Practices.CRC Press.
  2. J Andres Vasconcellos (2003) Quality Assurance for the Food Industry. A Practical Approach.CRC Press.
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**Paper Title: Food Packaging**

**Paper Code: FPQM 203**

**Credits: 6**

**Job Role:**

**Food Packaging technician:** monitors

packaging of various foods and their subsequent

Compatibility and handles all categories of packaging such as primary, secondary and tertiary packaging for food products.

**Objectives:** To enable the students to understand about packaging and packaging materials, compatibility of various food items with packaging materials

**Instructions for Examiner:**

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, including Question No. 1 (compulsory) of short answer type 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**

Packaging Technology: Definitions, Functions of packaging, Properties of packaging material in relation to their functions, package design, Tests on packaging materials, Gas and water vapor transmission rates, types of containers- primary & secondary, flexible & rigid, hermetic & non-hermetic.

**UNIT-II**

Packaging materials: Flexible films and pouches, Plastics used and their Specific applications. Rigid and Semi rigid plastic packaging methods. Retort pouch packaging. Laminated Paper board Cartons, Fiber Board and Corrugated Card Board packaging and their applications.

Wood: structure, types of wooden containers and their properties.

Glass : composition, properties, types and manufacture of glass containers.

**UNIT-III**

Metal Cans: properties of metals for packaging material, Types of Metallic Cans - Tin cans and Aluminum cans, steel plate and functions of its various constituents, Importance of Open top sanitary cans, Lacquering- types and applications, three piece cans and two piece cans.

Introduction to Canning operations – Can Reformer, Flanger, Seaming, Can closures, Sterilization of jars and bottles.

## 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,

Aseptic packaging, shrink packaging, gas packaging, vacuum and modified atmosphere packaging – principles, applications.

Estimation of shelf life, analysis of storage requirement, accelerated storage

### **Suggested Resources for Reading:**

1. Coles, R., Dowell, D.M., Kirwan, J. “Food Packaging Technology”. Blackwell Publishing Ltd. ISBN-084939788X, 2003.
2. NIIR Board: Food Packaging Technology Handbook National Institute of Industrial Research, New Delhi (2004)
3. Pirenger O.G. and A.L. Baver: Plastic Packaging Materials for Food Wiley VCH, GmbH, Germany (2000).

### **Practical based on FPQM- 203**

1. To determine thickness of paper and paper board.
  2. To identify different types of packaging materials.
  3. Demonstration. of measurement of cartons’ dimensions as per organizational standards.
  4. Demonstration of measurement of dimensions of bottle mouth, cans and their caps.
  5. Demonstration of sealing processes used in food industry.
  6. Demonstration of filling process.
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**Paper Title: Industrial Safety, Hazards & Prevention**

**Paper Code: FPQM 204**

**Credits: 6**

**Job Role:**

To evaluate values of industrial safety and hygiene.

Is responsible for monitoring and assessing hazardous and unsafe situations and developing measures to assure workers safety.

**Objectives:**

1. To create awareness about health hazards of industrial substances.
2. To evaluate the threshold value of industrial hygiene and safety.

**Instructions for Examiner:**

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, including Question No. 1 (compulsory) of short answer type 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**

Microbial Contaminants associated with food–Bacteria, viruses, fungus, molds and yeast. Factors affecting the growth of microbes in food. General Microbiological Methods of enumeration and isolation of food related microbes.

General methods of Preservation: Pasteurization, sterilization and appertization

**UNIT-II**

Studies of process hazards, Law Codes, Standards, Properties and functions of Chemicals, and Health hazards of industrial substances.

**UNIT-III**

Toxicology: Toxic materials and their properties, effect of dose and exposure time, relationship and predictive models for response, Threshold value and its definitions, industrial sanitation and hygiene evaluation.

**UNIT-IV**

Propagation of fire and effect of environmental factors, ventilation, dispersion, purifying and sprinkling, safety and relief valves.

### **Practical based on FPQM- 204**

1. Methods of sterilization and preparation of media
2. Gram staining
3. Study of morphology of bacteria, yeast and fungi
4. Methods of pure culture techniques for bacteria
5. Enumeration and isolation of bacteria and fungi from water/milk and contaminated food.
6. Demonstration of different safety aspects and maintenance of material safety data sheets followed in food industry.

### **Suggested Resources for Reading**

1. Crawl D.A. And Louver J.A., 2001 "Chemical Process Safety Fundamentals With Applications" Prentice Hall
  2. Wentz, C.A, 2001. "Safety Health and Environmental Protection," McGraw Hill
  3. Smith, B.D, 2001 "Design of Equilibrium State Process, "McGraw Hill.
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**Paper Title: FOOD PLANT LAYOUT AND WASTE DISPOSAL**

**Paper Code: FPQM 205**

**Credits: 6**

**Job Role:**

**Food Plant layout officer:** Managing and updating food plant layout time to time as per business policies and safety standards.

**Objectives:**

1. Introduction of the basic setup of a food processing industry.
2. To make them conversant with the machinery and equipments used in different types of food industry.

**Instructions for Examiner:**

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, including Question No. 1 (compulsory) of short answer type 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**

Industrial plant design concepts and general design considerations for location of food plants. Application of HACCP concept, ISO, FPO & MPO requirements in food plant layout and design.

**UNIT-II**

Importance of plant layout selection of site. Selection of building material. Selection and planning of manufacturing process and service facilities Basic understanding of equipment layout and ventilation in food processing plants. Process flow charts for material movement and utility consumption in food plants.

**UNIT-III**

Plant layout and design of milk and milk products. Plant layout and design of beverage industry

**UNIT-IV**

Plant layout and design of bakery and biscuit industries. Miscellaneous aspects of plant layout and design like provision for waste disposal, safety arrangements etc.

1. Industrial visit and report making.

**Text Books/ References.**

1. J M Apple, "Plant layout and Material handling", John Willey & Sons, (1977)
  2. Manufacturing Facilities Design and Material Handling by Fred E. Meyers, and Matthew P. Stephens, 3<sup>rd</sup> Edition, Pearson Prentice Hall, 2000.
  3. James M Moore, "Plant Layout and Design", McMillan & Co., (1959)
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**Paper Title: Technology of fruit and Vegetable processing**

**Paper Code: FPQM 303**

**Credits: 6**

**Job Role:**

Fruit and vegetable processing technician is responsible for processing various fruits & vegetable and developing new products from them.

**Objectives:**

1. To know technical details of processing of different fruits and vegetables in accordance with their composition.
2. To understand various aspects of fruit and vegetable preservation.

**Instructions for Examiner:**

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, including Question No. 1 (compulsory) of short answer type 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**

Post-harvest losses of fruit and vegetable and factors affecting them, Post harvest changes in fruits and vegetables. Maturity indices of fruits and vegetables. Climateric and non climateric fruits. Fruit ripening and changes. Packaging of whole fruits and vegetables. Processing and packaging of cut fruits and vegetables. Post-harvest physical and chemical treatment to enhance the shelf life of fruits and vegetables. Microbiological spoilage of fruits and vegetables.

**UNIT-II**

Classification, chemical composition and nutritive value of fruits and vegetables. Preparing fruit and vegetable for processing-washing, sorting, grading, peeling, blanching, grating, destoning, pitting. Bottling and canning of fruit and vegetable products.

**UNIT-III**

FPO Specifications and preparation of Jam, Jellies, marmalade, preserves, pickles. Tomato processing- FPO standards and preparation of tomato juice, puree, paste, chutney, sauce and ketchup. Preparation and standards of fruit juices, squashes & cordials, fruit syrups, nectar, RTS & pulp.

## UNIT-IV

Machinery for peeling, slicing/dicing, pulping, grating, hydraulic pressing & Clarification.

Fruit juice aroma recovery & its equipment & importance. Different systems of filling practices- tetrapack for small quantities. Minimal processing- basic concepts.

### **Suggested Resources for Reading:**

1. Preservations of fruits and vegetables by Girdhari Lal, Sidappa GS & Tandon GL, 1960, ICAR, New Delhi.
2. Food Facts & Principles by Shakuntla Manay N & Shadoksharaswamy N, 1996, New Age world publisher, CA.
3. Food Science by Potter, N.N., CBS Publisher, New Delhi.
4. Shrivatsava, R. P. & Kumar S, 1998. "Fruit and vegetable preservations. Principles & practices". International Book Distributing Co. Company. Lucknow.

### **Practicals based on FPQM -303**

- 1 Preservation and processing of certain vegetables by freezing.
  - 2 Preparation of fruit juices.
  - 3 Preparation of tomato ketchup & its preservation.
  - 4 Preparation of Amla preserve & candy.
  - 5 Minimal processing of fruits and vegetables.
  - 6 Organoleptic evaluation of fruit & vegetable products.
  - 7 Visit to fruit & vegetable industry.
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**Paper Title: Egg, Poultry, Meat & Fish Processing**

**Paper Code: FPQM 304**

**Credits: 6**

**Job Role:**

To work in an abattoir, wholesale meat Factories and meat processing plants. A meat processor is involved with the production of meat and poultry products

**Objectives:**

1. To enable the students to understand the various aspects of egg, meat and fish products and their preparation.
2. To gain knowledge on processing of meat and fish.

**Instructions for Examiner:**

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, including Question No. 1 (compulsory) of short answer type 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**

Egg-structure, composition, nutritive value, interior quality of egg and its evaluation, functional properties, grading, microbial spoilage of egg and preservation and storage of eggs.

Poultry types, nutritive value of poultry meat, antimortem examination and slaughtering of hen, poultry cut up parts.

**UNIT-II**

Meat- scope of meat processing industry in India, structure, composition & nutritive value of meat, classification of meat- mutton, pork & sheep. Meat quality parameters- meat colour, water holding capacity, marbling, firmness and factors affecting it. slaughtering and dressing of meat animal, post mortem changes in meat- rigor mortis, biochemical changes associated with rigor mortis, conversion of muscle to meat.

**UNIT-III**

Processing and preservation methods of meat-aging of meat, meat tenderization, (natural and artificial methods), factors affecting tenderness, storage and preservation of meat: Chilling, Freezing, Curing, drying & smoking. Cooking, palatability and eating quality of meat, microbial spoilage of meat, Restructured meat products.

## UNIT-IV

Fish –types, compositions & nutritive value, post mortem changes in fish.

On board handling, storage & transportation of fish, curing, smoking, salting & drying of fish, fish oil, fish protein concentrate, fish meal.

### **Text Books/References:**

1. R.A. Lawrie, 1988 Meat Science, Pergamon Press.
2. G.J. Mountney.1995. Poultry Products Technology by Taylor & Francis,
3. Parkhurst& Mountney.2012. Poultry Meat and Egg Production.Springer London, Limited, 05-Jul-2012
4. Food Facts & Principles by Shakuntla Manay N & Shadoksharaswamy N, 1996, New Age world publisher, CA.
5. Egg Science & Technology by Stadelman WJ, & Cotterill OJ, 2002, CBS Publisher, New Delhi.
6. Fish Processing & preservations by Charles L, Cutting.

### **Practicals on FPQM-304: Egg, poultry, meat & fish processing**

1. Determination of egg components.
  2. Grading and quality evaluation of egg.
  3. Preparation of egg products-boiled, scrambled and omelette.
  4. Visit to slaughter houses.
  5. Study of post motem changes.
  6. Preparation of sausages, burger, meat balls & kebab.
  7. To check freshness of fish.
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**Paper Title: Principles of food processing and preservation**

**Paper Code: FPQM 305**

**Credits: 6**

**Job Role:**

Working on different methods of processing of different foods and their preservation techniques.

**Objectives:**

To understand the basic principles & objectives of food processing.

To study different means of food preservation and their subsequent utilization.

**Instructions for Examiner:**

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, including Question No. 1 (compulsory) of short answer type 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- Historical developments of food preservation, Principles of food preservation, benefits of food preservation. Food Spoilage and to study its causes (microbial, physical or chemical)

**UNIT-II**

Preservation by heat: Heat resistance of microorganisms, thermal death curve, heat treatments and their effects on food- Boiling, steam under pressure, blanching, pasteurization, canning, aseptic packaging, cans and container types, spoilage of canned foods, heat penetration in cans.

**UNIT-III**

Preservation by low temperature- refrigeration storage, requirements of refrigerated storage, changes of foods during refrigerated storage, refrigeration load, Freezing and frozen storage- Slow and quick freezing, factors determining freezing rate, freezing methods, changes in foods during freezing, frozen food storage, Freezing curve, Intermediate moisture foods- their advantages and problems.

Drying, dehydration and concentration- Types of drying, types of dryers, food concentration and their methods, changes in foods during dehydration and concentration.

**UNIT-IV**

Microwave Heating- Properties, mechanism and its food applications.

Preservation by radiations- Ultraviolet and ionizing radiations, its applications in foods.

Chemical Preservation: Types, uses and effects of class I & class II preservatives in foods.

**Suggested Resources for Reading:**

1. Food Science by Potter NN, 2006, CBS Publishers, New Delhi.
  2. Food Microbiology by Frazier WC & West Hoff DC, 1998, Tata Macgraw Hill Publishers, New Delhi.
  3. The Technology of food preservation by Desrosier and Desrosier.
  4. Fellows, P. (2000) Food Processing Technology, Principles & Practices 2<sup>nd</sup> Edition Woodhead, Cambridge.
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**Practicals:**

1. Study of blanching process in vegetables.
  2. Dehydration of foods.
  3. Preservation of food products by low temperature.
  4. Use of chemicals in preservation of food.
  5. Microwave cooking of food.
  6. Cut out examination of canned foods.
  7. Visit to food industry.
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**Paper Title: Technology of oils and fats processing**

**Paper Code: FPQM 403**

**Credits: 6**

**Job Role:**

Oil and fat processing technician is responsible for maintaining the quality of oils and fats used in preparation of various food products.

**Objectives:**

1. To understand the basic properties of oils and fats.
2. To know their nutritional importance and extraction of oils

**Instructions for Examiner:**

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, including Question No. 1 (compulsory) of short answer type 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 oils and fats, physical and chemical properties of oils and fats, Nutritional importance of oils and fats.

**UNIT-II**

Extraction of oils/fats, refining, degumming, bleaching and deodourization, problems during storage-rancidity and reversion.

**UNIT-III**

Hydrogenation of oils, fractionation & winterization of oils, functions of oils and fats in food processing: Frying, Cooking and baking, Quality assessment tests of fats and oils, packaging of oils and fats

**UNIT-IV**

Sources and physico-chemical properties of following oils: animal (butter oil, lard and Tallow) and plant(groundnut, sunflower, soyabean and coconut oil)

**Suggested Resources for Reading:**

1. Food Chemistry by Meyer LH, 2006, CBS Publisher, New Delhi
2. Food Science by Potter NN, 5<sup>th</sup> Ed, 2006, CBS publisher, New Delhi.
3. Food Oils & Fats: Technology, Utilization and Nutrition by Lawson H, 1995, CBS Publisher, New Delhi.

**Practicals:**

1. To determine moisture content of oilseeds.
  2. To determine FFA (free Fatty acid) of oil.
  3. Determination of Iodine value, R.M. value and Polenske value.
  4. Detection of adulteration of fats or oil.
  5. Visit to vegetable oil factory.
  6. To determine fat and moisture of butter.
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**Paper Title: Technology of Spices & Flavours**

**Paper Code: FPQM 404**

**Credits: 6**

**Job Role:**

Spices and flavor technologist is responsible for checking the quality and purity of various spices and flavor to be used in food products.

**Objectives:**

1. To know various types of spices and flavours.
2. To understand the techniques of processing spices.

**Instructions for Examiner:**

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, including Question No. 1 (compulsory) of short answer type 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**

Classification and uses of spices, Chemical constituents of spices, microbial contamination and insect infestation in spices and its control.

**UNIT-II**

Chemistry & Technology of major spices-pepper, cardamom, ginger & turmeric.

**UNIT-III**

Chemistry & Technology of minor spices- cumin, coriander, cinnamom, fenugreek, garlic, cloves and vanilla.

**UNIT-IV**

Cryomilling of spices, spice oleoresins and spice emulsion, essential oils, packaging of spices and spice products. Classification of flavouring compounds, processing of cocoa and coffee, stability of flavourings, present trends in synthesis of volatiles.

**Suggested Resources for Reading:**

- 1 Handbook on spices, National Institute of Industrial Research (NIIR) Board, Asia Pacific Business Press Inc., New Delhi 2004.
- 2 Chocolate, cocoa and confectionary Technology, Minifie Bernard W., III Edition , Aspen Publication, 1999
- 3 Spices and condiments by Pruthi, J. S., 1976, NBT India.
- 4 Handbook of Spices by Peter K. V. 2001, Woodhead Publishers, UK.



**Practicals:**

1. Identification of different spices.
  2. Determination of moisture in ground spices.
  3. Determination of total ash in spices.
  4. Determination of extraneous matter in spices.
  5. Determination of pungency rating (scoville method) in red pepper.
  6. Adulteration tests of different spices.
  7. Organoleptic evaluation of flavours.
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**Paper Title: Seminars**

**Paper Code: FPQM -405**

**Credits: 6**

**Job Role:**

To improve the communicating and presentation skills of the individuals.

**Objectives:**

To make the student conversant with latest happening in the field of food processing and preservation and to improve their communication skills.

**Paper Title:Food analysis****Paper code: FPQM-503****Credits :6****Job role - Food analyst:** To analyse various parameters of different food products in food testing laboratory.**Objectives:**

- To impart the skills of handling the different instruments used in food analysis.
- To study the various techniques in the analysis of food samples.

**Instructions for Examiner:**

The syllabus of this paper has been divided into four units.

Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus.

The students are required to attempt one question from each All questions carry equal marks

**Unit-1**

Introduction to food analysis, types of samples and sampling techniques, collection, storage and preservation of samples, preparation of food sample, sampling of cereals, fruits and vegetables, milk, eggs, meat, fish, dried and frozen food products, canned food products.

**Unit-2**

Physico-chemical methods for food analysis: moisture, fat, protein, carbohydrate, crude fibre, ash and its types, minerals and vitamins in food.

**Unit-3**

Technology used in food analysis- principle, types and applications of colorimetry and spectroscopy, photometry, chromatography and electrophoresis, refractometry and polarimetry, atomic absorption spectrophotometry, calibration and standardization of different instruments.

**Unit-4**

Brief introduction and principles to special techniques: surface tension, scanning electron microscopy, texture analyzer, rheometer, hunter lab ,amylograph and farinography.

**Practicals based on FPQM -503:**

1. Determination of protein content of food samples.
2. Determination of fat content by soxhlet apparatus.
3. Determination of moisture content of food samples.
4. Demonstration of instruments- farinograph, UV-VIS spectrophotometer, microscope, HPLC.
5. Estimation of tannin/phytic acid pigments by spectrometric method.
6. Analysis of dietary fibre/ glucose by enzymatic method.
7. Estimation of ash content in food samples.

**Suggested resources for reading:**

1. Ranganna. S., Handbook of Analysis & Quality Control for fruits & vegetable Products, Tata Mcgraw Hill, New Delhi.
2. Jacobs.M.B, Chemical Analysis of Food & Food products, CBS Publishers, New Delhi.
3. Nielsen, S.S, Introduction to chemical analysis of food CBS Publishers, New Delhi.
4. SemihOties. Handbook of Food Analysis Instruments. CRC Press.

## **Paper Title: Unit operations in Food Engineering**

**Paper code:FPQM-504**

**Credits- 6**

**Job role-** Food Engineer: To analyse the working and output of various equipments used in food processing industry.

### **Objectives:**

- To create awareness about the unit operations involved in food processing industry.
- To explain the principles of methods used for preservation of food.
- To study different types of equipment used in the food processing industry

### **Instructions for Examiner:**

The syllabus of this paper has been divided into four units.

Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus.

The students are required to attempt one question from each All questions carry equal marks.

### **Unit-1**

Units and measurements- brief introduction to dimensions, fundamental units and derived units, system of measurements- cgs, mksand SI units

Heat exchanger- brief introduction to principles of heat transfer (conductive, convective and radiative) steam injection and steam infusion, tubular, scraped surface, plate heat, shelland tube heat exchangers.

### **Unit-2**

Driers- principles and application of tray drier, rotary drier, drum drier, fluidized bed drier, spray drier, vacuum drier and freeze drier

Evaporators- different types of evaporators, principles of single effect and multiple effect evaporator, steam economy, thermal and mechanical vapour recompression system.

### **Unit-3**

Size reduction- definition and requirements of size reduction, equipments for size reduction- crushing rolls, hammer mills, disc attrition mill, tumbling mill, ball and rods, buhr mill. Modes of operation and energy requirementsfor comminution of solids.

Screening- types of screens- grizzly, trammels, viberating screens

Introduction to pumps- displacements and centrifugal pumps

### **Unit-4**

Extrusion technology- introduction, principles, types and applications

Hurdle technology- principles, types and applications

Introduction to membrane technology, high intensity electric field pipes, hydrostatic pressure processing, food irradiation and microwave processing.

**Practicals based on FPQM - 504:**

- 1) Study of psychometric charts –use and applications.
- 2) Determination of moisture content on wet and dry basis.
- 3) Study of dehydration characteristics of different food materials.
- 4) To study the working principle of an evaporator.
- 5) Determination of thermal conductivity of food.
- 6) To study the different modes of heat transfer in food.
- 7) Shelf life evaluation of food product.

**Suggested resources for reading:**

- Fundamentals of food engineering by RadhaCharanVerma, Sanjay Kumar Jain-Himanshu Publications.
- Fundamentals of food processing engineering by Romeo T Taledo, CBS Publications.
- Introduction to food engineering by R Paul Singh and Dennis R Heldman-Academic press London.
- Experimental methods in food engineering by Rizvi and Mittal, CBS publishers.
- Unit operations of agriculture processing by K M Sahay and K K Singh, Vikas Publishers.
- Unit operations of chemical engineering by Mccab and Smith, Mcgraw Hill, New Delhi.

## **Paper Title :Food safety and food laws**

**Paper code: FPQM-505**

**Credits: 6**

**Job role-** Quality Analyst and Food Safety Officer: To ascertain the safety of food by assessing the quality of food and their conformation to food laws.

### **Objectives:**

- To understand the importance of food safety.
- To study implementation of food safety systems.
- To study national and international food standard and laws.

### **Instructions for Examiner:**

The syllabus of this paper has been divided into four units.

Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus.

The students are required to attempt one question from each All questions carry equal marks.

### **Unit-1**

Introduction to food safety- definition, factors affecting food safety, importance of safe foods. Food borne pathogenic microorganisms, parasites, food poisoning/food intoxication.

### **Unit-2**

Food safety managementsystem- pre-requisite of food hygiene-GHP,GLP, GAP, GMP, HACCP,ISO-22000, TQM. Steps involved in implementation of food safety programmes, Quality management system in india, applications in different food industries.

### **Unit-3**

Hygiene and sanitation – importance of personal hygiene of food handlers- habits, clothes, illness, Education in food handling and service. Cleaning agents and disinfectants, food sanitation- principles and methods, control and inspection.

### **Unit-4**

Food safety laws and regulation- detailed study of FPO, PFA, AGMARK, Codex alimentarius, MFPO, Weights and Measures act, FSSAI, ISO, USFDA.

### **Practicals based on FPQM-505:**

- 1) Preparation of HACCP chart for Food industry.
- 2) Quality evaluation of oils and fats.
- 3) Quality evaluation of fruit and vegetables.
- 4) Quality evaluation of meat and poultry.
- 5) Quality evaluation of cereal industry.
- 6) Quality evaluation of dairy industry.
- 7) Visit to different food industries and study the implementation of HACCP ,ISO 22000 systems

**Suggested resources for reading:**

1. Adam MR and Moss MO Food microbiology New Age International ( P ) Ltd. ND
2. Potter NN Food Science CBS Publishers ND.
3. Food Safety by Ian C Shaw Wiley Blackwell.
4. Principles of food sanitation by Marriott, CBS Publishers, New Delhi.

**Paper Title: FOOD MICROBIOLOGY****Paper code: FPQM 603****Credits:6**

**Job role-** Food Microbiologist: To identify various microorganisms associated with food and to analyse the microbiological quality of different food products.

**Objectives:**

- To understand the isolation methodology of microorganisms
- To identify the microorganisms of food products of plant and animal origin.
- To learn about Food borne diseases and microorganisms.

**Instructions for Examiner:**

The syllabus of this paper has been divided into four units.

Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus.

The students are required to attempt one question from each All questions carry equal marks.

**UNIT-1**

INTRODUCTION- discovery of microbial world, application of microbiology and its relevance to food technology, theory of spontaneous generation, germ theory of disease, kosh's postulates, pure culture concept, nature and properties of prokaryotic and eukaryotic.

**Unit-2**

Microscopy- light microscope- resolving power, magnification, bright field, dark field, electron microscopy, scanning electron microscope

**Unit-3**

Food as nutrients for various micro-organism, factors affecting the growth and survival of micro-organisms in food., general features and importance of different group of bacteria, yeast and molds important in food, methods of microbial examination of food and food products. Definition of growth, growth cycle, growth rate, generation time, measurement of growth.



## Unit-4

Food spoilage- microbial and biochemical aspects of food spoilage, role of bacteria, yeast and molds in food spoilage, spoilage of cereals and cereal products, fruits and vegetables, meat and meat products, milk and milk products, food borne illness, food intoxication and food infection, bacterial food poisoning by *streptococcus aureus*, *clostridium botulinum*, *salmonella*, *E. Coli*, *Clostridium perfringes*, *Listeria monocytogenes*, *Campylobacter jejuni*.

### Practicals based on FPQM-603:

- 1) To study different parts of microscope.
- 2) Study the instruments (autoclave, hot air oven, incubation, laminar flow, pH meter, and spectrophotometer) of microbiological laboratory.
- 3) Sterilization and disinfection of equipments used in food microbiology laboratory.
- 4) To determine the no. of microorganism with haemocytometer.
- 5) Isolation of fungi from food material.
- 6) Preparation of media, slant and broths required in microbial analysis of food.
- 7) Study of incubation tests of heated canned food.
- 8) Micro biological analysis of egg, cereals products and food products.
- 9) Determination of TPC in food products.
- 10) Determination of Coliform counts.
- 11) Microbiological analysis of water-samples.

### Suggested resources for reading:

1. Microbiology by Pelczar M.J., Chan E.C.S & Krieg N.R., McGraw Hill Co.
2. General Microbiology by Stanier R.Y., In graham J.L., Wheelies M.L. & Painter P.R. Macmillan press Ltd., London
3. Laboratory Manual in Microbiology by GunaSeKaran P, New age international Ltd., New Delhi.
4. Frazier WC and Westoff DC "Food Microbiology" Tata macro Hill Publishing
5. Adams MR and Moss MO "Food Microbiology"New age international Ltd,.

## **Paper Title: Food Additives**

**Paper code: FPQM-604**

**Credits: 6**

**Job role:** Food analyst: To analyse and assess the presence of various additives in different forms of foods.

### **Objectives:**

- To give the knowledge of various additives in food products, and their functions.
- To study the properties of various food additives, their hazards and limits prescribed under food safety regulations.

### **Instructions for Examiner:**

The syllabus of this paper has been divided into four units.

Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus.

The students are required to attempt one question from each All questions carry equal marks.

### **Unit-1**

Definition, classification and functions, nutritional and non-nutritional food additives, uses and functions of acid, base, buffer, salts and chelating /sequestering agents, low calories and non-nutritive sweeteners, preservatives.

### **Unit-2**

Antioxidants, emulsifying and stabilizing agents, anti-caking agent, humectants, thickeners, firming agents, flour bleaching agents and bread improvers.

### **Unit-3**

Antimicrobial agents/class-1 and class-2 preservatives, food colors( synthetic and natural), pigments, their importance and utilization,flavouring agent( synthetic and natural) and related substances, flavor emulsion, essential oils and oleoresins, application of fibres,clarifying agents.

### **Unit-4**

Concept of nutraceuticals- nutraceuticals and functional foods, nutraceuticals as new dietary ingredients, biological significance of nutraceuticals, nutraceuticals and dietary supplements. Adverse effect and toxicity of nutraceuticals. Concept of probiotics, prebiotics and symbiotic and then significance, resistant starch.

### **Practicals based on FPQM-604:**

- 1) Description of quality/quantity recommended as safe (GRAS) food additives.
- 2) Applications of additives and ingredients in cereals foods.
- 3) Determination of adulterants in oils & fats and spices..
- 4) Identification and estimation of selected nutraceuticals.
- 5) Food labelling with respect to nutrition and health.
- 6) To study inter-national codes for food additives.

**Suggested resources for reading:**

1. Food facts and principles by ShakuntalaManay N&Shadoksharaswamy N, New age world publishers.
2. Potter NN Food Science CBS Publishers ND.
3. Food Chemistry O.R. Fennema
4. Food Chemistry, Belitz, Grosch.

**Paper Title:Technology of fermented foods****Paper code: FPQM-605****Credits:6****Job role:** Food Technologist: Production of different types of fermented food products.**Course objectives:**

- To understand the different types of fermentation techniques used in the production of fermented food products.

**Instructions for Examiner:**

The syllabus of this paper has been divided into four units.

Examiner will set a total of nine questions comprising two questions from each unit, and one compulsory question of short answer type covering the whole syllabus.

The students are required to attempt one question from each All questions carry equal marks.

**Unit-1**

Introduction to fermentation, concept of fermented foods, scope and development of fermented foods, rate of microbial growth and death, benefits of fermented foods, classification of food fermentation- alcoholic, acetic& lactic fermentation, types of fermentation system ( submerged surface and solid state)

**Unit-2**

Food fermentation-lactic acid fermentation of milk, vegetables, cereals and meat, alcoholic fermentation of fruit juices , sugar and starch substrate, leavening and baking process.

**Unit-3**

General methods of fermentation- aerobic fermentation, anaerobic fermentation,fermented milk products-curd, yoghurt, acidophilus ilk, Bulgarian milk, kumiss, kefir, legume products-soya sauce, miso, tempeh, idli

**Unit-4**

Fruit and vegetable products-sauerkraut, kimchi, cucumber pickle, meat products- fermented meat sausages, alcoholic beverages,beer,wine and vinegar.

### **Practicals based on FPQM:605**

- 1) Visit to food industries.
- 2) To study different parts and working of fermentor.
- 3) Barley steeping, germination, malting mashing and brewing of malt.
- 4) Preparation of sauerkraut and pickles.
- 5) Preparation of idli and dosa.
- 6) Preparation of fermented milk products.

### **Suggested resources for reading:**

1. Principles of fermentation technology by Stanbury and Whittaker.
2. Biotechnology: Food Fermentation by VK Joshi & Ashok Pandey.
3. Potter NN Food Science CBS Publishers ND.
4. Food facts and principles by Shakuntala Manay N & Shadoksharaswamy N, New age world publishers.
5. Frazier WC and Westoff DC "Food Microbiology" Tata MacGraw Hill Publishing
6. Industrial- Microbiology by Prescott & Dunn.
7. Outlines of Dairy Technology by Sukumar De , Oxford University Press, UK.