Food Processing Technology (FPT)

Syllabus for B.Voc in Food Processing Technology

Programme template: B.Voc course (CBCS) in FPT, Gauhati University

SEMESTER	CORE COURSE (12 PAPERS, 72 CREDITS)	ABILITY ENHANCEMENT COMPULSORY COURSE(AECC) (2 PAPERS, 8 CREDITS)	SKILL ENHANCEMENT COURSE (SEC) (4 PAPERS,16 CREDITS)	DISCIPLINE SPECIFIC ELECTIVE(DSE) (6 PAPERS,36 CREDITS)
I	FPT-VC-1016	ENG-AE-1014		
	FPT -VC-1026			
	FPT -VC-1036			
II	FPT-VC-2016	ENV-AE-2014		
	FPT -VC-2026			
	FPT -VC-2036			
III	FPT-VC-3016		XXX-SE-3XX4	
	FPT -VC-3026			
	FPT -VC-3036			
IV	FPT-VC-4016		XXX-SE-4XX4	
	FPT -VC-4026			
	FPT -VC-4036			
V			XXX-SE-6XX4	FPT-VE-5016
				FPT-VE-5026
				FPT-VE-5036
VI			XXX-SE-6XX4	FPT-VE-6016
				FPT-VE-6026
				FPT-VE-6036

SEMESTER I

Qualification Pack: Jam, Jelly and ketchup Processing Technician (NSQF level 4)

Paper: FPT-VC-1016: Basic of Food Processing

Total Credit: 6 **Total Marks: 100**

Theory: 60 marks

Unit 1	**Introduction to food processing** Unit operations, techniques used in unit operations, general structure of wheat and rice kernels, starch microscopy, milling, size reduction, milk pasteurization, physical and chemical preservation techniques, food packaging
Unit 2	**Basic industrial mathematics** Ingredient formulation, chemical concentration, normality, molarity, ppm, ppb calculation, statistical tools and various bars/curve plotting using MS-excel
Unit 3	**Basics of food safety and quality control** Definition of food quality, quality attributes of food, subjective and objective indices for quality, factors affecting quality in food chain, sanitation measures, classification of foods based on perishability, effect of intrinsic and extrinsic properties on quality, mycotoxins, bacterial exotoxins, heat and cold methods of preservation, use of gamma rays, adulteration, spoilage, HACCP .

Practical: 20 marks

1. Basic laboratory rules.
2. Identification of laboratory glasswares and accessories.
3. Preparation of standard solutions- normality, molarity, ppm, ppb and percent calculation
4. Determination of moisture content of food sample in both dry basis and wet basis.
5. Determination of gluten content of wheat flour.
6. Curve plotting using MS-excel

Internal assessment: 20marks

- Sessional Examination: Maximum 10 marks
- Internal Practical: Maximum 06 marks
- Attendance: Maximum 04 marks

Books and references

1. Manay , N.S, Shadaksharaswamy, M., Foods-Facts and Principles , New Age International Publisher, New Delhi, 2004
2. Potter,N. N , Hotchkiss,J.H. Food Science , CBS Publisher, New Delhi, 2000
3. Srilakshmi,B, Food Science (3rd edition), New age International (p) limited Publisher , New Delhi, 2003
4. Fellows, Food process technology: Principles and Technology, CRC publications.
5. Khetarpaul, N. (2005). Food Processing and Preservation, Dya Publishing House, New Delhi.
6. Essentials of food science

Paper: FPT-VC-1026: Industrial Food Processing

Total Credit: 6 **Total Marks: 100**

Theory: 60 marks

Unit 1	**Introduction to food processing machineries** Millers, ovens, boilers, freezers, mixers and kneaders, size reduction machineries, pasteurizer, packaging equipments, working principles and designs of the machineries`
Unit 2	**Designing of a food industry** Basic production lines of different food industries: bakery, mills, milk and other dairy products, drinking water, beverages, cold storage, abattoir, fruits and vegetable products etc., Quality management system in a food industry, marketing and distribution of products, governing agencies in India and Assam, Entrepreneurship, meaning of entrepreneur and entrepreneurship, characteristics of entrepreneur, entrepreneurial competencies, motivations, entrepreneurship development programme, entrepreneurial, entrepreneurial competencies, motivations, entrepreneurship development programme, entrepreneurial process .

Practical: 20 marks

1. Identification of different instruments and machineries with their working principles.
2. Instrument handling procedures.
3. Construction, operation and utility of food processing laboratory equipments.

Internal assessment: 20 marks

- Sessional Examination: Maximum 10 marks
- Internal Practical: Maximum 06 marks
- Attendance: Maximum 04 marks

Books and references

1. Srilakshmi,B, Food Science (3rd edition), New age International (p) limited Publisher , New Delhi, 2003
2. Fellows, Food process technology: Principles and Technology, CRC publications.

Paper: FPT-VC-1036: Industrial Processing of Fruits and Vegetables

Total Credit: 6 **Total Marks: 100**

Theory: 60 marks

Unit 1	Definition of food processing, various subsectors of food processing industry, status and scope of fruits and vegetables processing industry in India.
Unit 2	Post harvest losses of fruits and vegetables and factors affecting them, post harvest changes in fruits and vegetables , maturity indices of fruits and vegetables , climacteric and non climacteric fruits ,fruit ripening and changes ,packaging of whole 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 3	Classification, chemical composition and nutritive value of fruits and vegetables, preparing fruits and vegetables for processing- washing, sorting, grading, peeling, Bottling and canning of fruits and vegetables.
Unit 4	Job role and responsibilities of jam, jelly and ketchup processing technician, hierarchy role and organizational structure.
Unit 5	Machineries for peeling, slicing/dicing, pulping, hydraulic pressing and clarification; preparation and maintenance of work area and process machineries; different materials and equipments used in the cleaning process.
Unit 6	FPO specifications and preparations of Jam, Jellies, marmalade, pickles Tomato processing - FPO standard and preparation of tomato juice, puree, paste, chutney, sauce and ketchup. Preparation and standard of fruit juices, squashes, cordials, fruit syrup, nectar, RTS and pulp.
Unit 7	Packaging of jam, jelly and ketchup; microbial spoilage; microbial; analysis of products; documentation procedure and maintenance of record of raw materials, packing materials, finished products.
Internship	In food industry/processing unit. **Conduct in workplace**: The students will undergo industrial internship (NSQF level 4) during the first semester. Evaluation will be done by departments based on the feedback from the industrial management on their performance during the tenure.

	Report making and verbal presentation: After completion of the internship, the student will prepare a report on his work and experience. Evaluation will be based on the quality of the report and presentation.

Practical: 20 marks

1.	Studies on maturity indices of fruits and vegetables.
2.	Estimation of total soluble solids (TSS).
3.	Studies on the physiological disorders-chilling injury of banana.
4.	Preparation of fruit jam
5.	Preparation of fruit jelly/marmalade
6.	Preparation of fruit preserve and candy.
7.	Preparation of fruit juice/squash/cordial/nectar
8.	Preparation of pickle/mixed pickle.
9.	Preparation of tomato products- sauce, puree, ketchup.
10.	Visit to fruit and vegetable processing industry.

Internal assessment: 20 marks

- Sessional Examination: Maximum 10 marks
- Internal Practical: Maximum 06 marks
- Attendance: Maximum 04 marks

Books and references

1. Post harvest physiology , handling and utilization of tropical and subtropical fruits and vegetables-E.B.Pantastico, AVI Publishing company, INC
2. Post harvest technology of fruits and vegetables: handling, processing, fermentation and waste management. Vol I and Vol II Verma L R and Joshi V.K.
3. Preservation of fruits and vegetables- Girdharilal, G.S. Siddapa and G.L. Tandon.
4. Fruits and vegetables preservation principles and practices- Srivastava R.P and Sanjeev Kumar.

SEMESTER II

Qualification Pack: Plant Baker (NSQF level 5)

Paper: FPT-VC-2016: Food Quality Regulation and Maintenance

Total Credit: 6 **Total Marks: 100**

Theory: 60 marks

Unit 1	Objectives, functions and principles of quality control; Difference between food quality control and quality assurance, assessment of raw materials and finished products.
Unit 2	Food safety and food labeling, Food laws and regulations, concepts of codex alimentarius, HACCP, ISO series, GMP, GHP, 5S, SOP, audit system, documentation etc. Food standard and safety act: salient provisions and prospects, role of various food standards in India- PFA, FPO, AGMARK and BIS .Recent development in food quality regulation, MOFPI and schemes for establishing food industries in India.
Unit 3	Sensory quality evaluation - introduction, method, sensory panel; Sensory and instrumental analysis in quality control.

Practical: 20 marks

1. Identification of food logos.
2. Study of food labeling.
3. Identification of critical control points in a product line.
4. Small scale demonstration of food processing.
5. Sensory evaluation of different food samples

Internal assessment: 20 marks

- Sessional Examination: Maximum 10 marks
- Internal Practical: Maximum 06 marks
- Attendance: Maximum 04 marks

Books and references

1. Early, R. (1995): Guide to Quality Management Systems for the Food Industry, Blackie, Academic and professional, London.

2. Gould, W.A and Gould, R.W. (1998). Total Quality Assurance for the Food Industries, CTI Publications Inc. Baltimore.

Paper: FPT-VC-2026- Food Chemistry

Total Credit: 6 **Total Marks: 100**

Theory: 60 marks

Unit 1	**Water** Types of water-bound water, free water. Water activity – concepts, methods for measuring; Distribution of water in various foods and moisture determination
Unit 2	**Carbohydrate** Classification and structure of carbohydrate .sources of carbohydrate. Basic concepts of starch, cellulose, glycogen, pectin, agar-agar; Reducing and non-reducing sugar-concept and their estimation, basic idea about gelatinization, retrogradation, caramelization, Maillard browning.
Unit 3	**Proteins** Classification of amino acids, sources and properties of proteins, structure, protein denaturation, common food proteins.
Unit 4	**Fats** Fatty acids – concept, classification, essential fatty acids, cis and trans fats, properties of fats and oils, defects (rancidity) and their prevention. Acid value, peroxide value, saponification number, iodine value, Richert-meissel number; Fats estimation by solvent extraction method.
Unit 5	**Vitamins and minerals** Sources and physiological functions of minerals and vitamins, deficiency disorder, effects of processing and storage of vitamins.
Unit 6	**Enzyme** Definition, classification, function and sources

Practical: 20 marks

1. Determination of moisture in food sample
2. Determination of protein in food sample.
3. Determination of ash/mineral in food sample.
4. Determination of crude fat in food sample.
5. Determination of acidity and pH in food sample/beverages.
6. Determination of vitamin c content in food sample
7. Determination of total sugar, reducing sugar and non-reducing sugar

Internal assessment: 20 marks

- Sessional Examination: Maximum 10 marks
- Internal Practical: Maximum 06 marks
- Attendance: Maximum 04 marks

Books and references

1. Fenema's food chemistry- 4th edition, CRC press, Taylor and Francis group, New York, 2008
2. Meyer, L.H- Food chemistry, CBS publisher and distributor, New Delhi, 2002
3. Manay, N.S, Shadaksharaswamy, M., Foods-Facts and Principles, New Age International Publisher, New Delhi, 2004
4. Potter, N. N, Hotchkiss, J.H. Food Science, CBS Publisher, New Delhi, 2000
5. Srilakshmi, B, Food Science (3rd edition), New age International (p) limited Publisher, New Delhi, 2003
6. Nielsen, S.S. Introduction to the chemical analysis of foods. Jones and Bartlett publishers, Boston, London, 2003
7. Sadasivam,S, Manickam,A. Biochemical methods, 2nd edition, New age international (p) limited, New Delhi, 2001

Paper: FPT-VC-2036- Bakery Science and Technology

Total Credit: 6 **Total Marks: 100**

Theory: 60 marks

Unit 1	• Food processing and its sectors; overview on bakery and bakery products • List the various types of industries within the bakery sub sector. Scope, present status and future perspective
Unit 2	• Baking process; Equipments used in bakery industry (Dough mixer, divider, rounder, proofing, molding, baking machine, Slicing machine) • Cleaning and maintenance of work area and machineries.
Unit 3	• 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, viscograph, amylograph, farino-graph • Units and measurements used in bakery industry. Raw materials required for bakery products. Role of flour, water, salt, yeast, sugar, milk, fats etc • Yeast----an elementary knowledge of baker's yeast, role plays in fermentation of dough and conditions influencing its working. • Effect of over and under fermentation and under proofing of dough • Mixing methods used for baking. Calculate batch size and plan for various types of dough as per the production schedule.
Unit 4	• Process of mixing and knead ingredients to make dough. • Oven and baking-knowledge and working of various types of oven • Biscuits-types of biscuit dough, developed dough, short dough, semi sweet dough , batters; importance of the consistency of dough; factors affecting the quality of biscuits/ cookies . • Cakes –ingredients-cake making ingredients—flour, sugar, shortening and egg, fats and oils, leavening agents. • Manufacturing process—cake making method, sugar batter process, flour

	batter process, correct temperature for baking different types of cakes. • Bread- bread manufacturing process; straight dough fermentation, bread improvers, improving physical quality • Methods of bread making---straight dough method No time dough method Sponge and dough method • External characteristic------volume, symmetry of shape • Internal characteristics-----color, texture, aroma • Bread faults and remedies; Bread diseases—rope and mould. • Spoilage of bakery products and microbial analysis, packaging of bakery products.
Internship	**Conduct in workplace**: The students will undergo industrial internship (NSQF level 5) during the second semester. Evaluation will be done by departments based on the feedback from the industrial management on their performance during the tenure. **Report making and verbal presentation:** After completion of the internship, the student will prepare a report on his work and experience. Evaluation will be based on the quality of the report and presentation.

Practical: 20 marks

1. Determination of moisture content of different raw ingredients, finished goods and packaging material.
2. Determination of sedimentation value, ash, acid insoluble ash, grittiness, alcoholic acidity, germ oil index of wheat flour.
3. Determination of water insoluble matter in sugar.
4. Determination of salt content of butter.
5. Determination of yeast activity
6. Study of different equipments used in bakery industry
7. Preparation of different bakery products-bread, cake, biscuit/cookies, bun, pastries etc.
8. Microbial analysis of bakery products.
9. Visit to a bakery industry.

Internal assessment: 20 marks

- Sessional Examination: Maximum 10 marks
- Internal Practical: Maximum 06 marks
- Attendance: Maximum 04 marks

Books and references

1. Bakery 1 student handbook and practical manual published by cbse.
2. Bread: A baker's book of techniques and recipes by Jeffrey Hamelman.
3. A professional Text to bakery and confectionary by John Kingslee
4. Samuel A. Matz, "Bakery Technology and Engineering", Chapman & Hall, 3rd Edition, 1992.
5. "Association of Operative Millers Cereal Millers Hand Book", Burgess Publishing company, USA, 1963.
6. Pomeranz Y, "Modern Cereal science and Technology" MVCH Publications, NY, 1987. 4
7. Kent N.L.,.Evers A.D, "Technology of Cereals" Peregaman Press, Elsevier Publishers, 1994.
8. Samuel A. Matz, "Equipment for Bakers" Pan Tech International Publication, 1988.
9. Stanley P Cauvain, Linda S Young, "Technology of Bread making", Aspen publication, 2nd Edition, 2007.

SEMESTER III

Qualification Pack: Food Microbiologist (NSQF level 6)

Paper: FPT-VC-3016: Food Analysis

Total Credit: 6 **Total Marks: 100**

Theory: 60 marks

Unit 1	**Introduction to food analysis** Proximate principles and analysis of foods, official method of analysis
Unit 2	**Sampling techniques** Population and sampling, importance of sampling, types of sampling, sampling plan, preparation of samples, problems in sampling.
Unit 3	**Analysis of moisture, carbohydrate and protein** Moisture assay-oven drying method, Karl Fischer titration Carbohydrate- reducing and non-reducing sugar, starch and crude fibre analysis Protein-kjeldahl method, Biuret method, Lowry's method
Unit 4	**Analysis of fats, vitamin and minerals** Fat – Soxhlet method, Garber method Analysis of vitamin C Estimation of minerals by ashing- dry ashing, wet ashing.
Unit 5	**Food adulteration** Definition, classification-intentional and incidental, health hazard caused by various adulterants, common adulterants in food and their testing

Practical: 20 marks

1. To test different food samples for adulteration.
2. Proximate analysis of food samples-determination of moisture, ash, protein, fats, crude fibre etc.
3. To find out the amount of total carbohydrate in the given food sample.
4. To estimate the amount of vitamin c in the given sample.
5. Determination of ph and acidity of the given sample.
6. Determination of acid value/peroxide value of the given sample.
7. Determination of saponification value of the given sample.
8. Determination of iodine no of the given sample

Internal assessment: 20 marks

- Sessional Examination: Maximum 10 marks
- Internal Practical: Maximum 06 marks
- Attendance: Maximum 04 marks

Books and references

1. Kalia, M. Food analysis and quality control, Kalyani publisher, New Delhi, 2002
2. Nielsen, S.S. Introduction to the chemical analysis of foods. Jones and Bartlett publishers, Boston, London, 2003
3. Sadasivam,S, Manickam,A. Biochemical methods, 2nd edition, New age international (p) limited, New Delhi, 2001
4. Pomeranz, Y. & Mrloan (1978). Food Analysis: Theory and Practice, Westport,
5. connectiant: AVI . Pomeranz, Y. & Mrloan (1978). Food Analysis: Theory and Practice,
6. Westport, connectiant: AVI .

Paper: FPT-VC-3026- Food Quality Assurance **Total Credit: 6** **Total Marks: 100** **Theory: 60 marks**	
Unit 1	**Definition and introduction to general terms** Quality, quality control, quality assurance, total quality management in food industry.
Unit 2	**Introduction to bakery and job role** Overall view of bakery industry, its process line, job description as QA-manager
Unit 3	**Introduction to basic mathematics, statistical tool, computer application** Mean, median, mode, ANOVA (one way), working procedure and use of MS-office- word, excel, power point, email writing to communicate with peers and seniors.
Unit 4	**Introduction to organization standard** Maintenance and leading of team, profession and personal attribute as QA-manager, organization's policies, statutory and regulatory norms, HACCP, ISO, FSSAI, 4M, 5S, AIB, six sigma, GMP, PCI.
Unit 5	**Introduction to different raw material, packaging material, machinery and tools used in bakery industry and their maintenance** Function of materials, testing and maintenance of quality parameter, their storage norms, FIFO, FEFO, sampling-procedure, importance, precaution to be taken, stock maintenance, bin card, inventory management, different tools and techniques and machinery like mixing, oven, cooling system, packaging machines, instrument handling and their working procedure of laboratory.
Unit 6	**Standard Operating Procedures** Preparing scope, quality policy and quality objectives of food processing company, Defining Standard operating procedure – purpose- Format - developing and implementing, effective writing. SOP for purchasing raw materials, receiving

	raw materials, storage, cleaning, holding, cooling, freezing, personal hygiene, facility and equipments. Systems in laboratory accreditation, GRN making, Invoice making and maintenance
Unit 7	**Quality Management Tools** Seven old and new Quality management tools, Statistical process control – Mean & range chart, P chart and C chart, Seven deadly wastages, PDCA cycle, Quality circle, Q-score, CQI- score, VQIP (Vendor Quality Index Performance Report)
Unit 8	**Pre-requisite program** Good Manufacturing Practices - Personal hygiene – occupational health and safety specification, Food Plant Sanitation Management - Plant facilities construction and maintenance - exterior of the building- interior of the building- equipments. Storage, transportation, traceability, recalling procedures, training, emergency preparedness. PCI activities.
Unit 9	**Maintenance of work area in a bakery industry** Cleaning, sanitation, different cleaning procedure and precautions, CIP, COP, maintenance and importance of Non routine activity format, waste disposal
Unit 10	**HACCP principle** Conduct a hazard analysis, CCP identification, establish critical limits for each CCP, establish CCP monitoring procedures, establish corrective actions procedures, and establish procedures for HACCP verification and validation, documenting the HACCP Program, Implementation of HACCP
Unit 11	**Audit Check List** Preparation of HACCP based SOP checklist - personal hygiene, food preparation, mixing, food storage and dry storage, production, training for effectiveness, cleaning and sanitizing, utensils and equipments, large equipments, garbage storage and disposal and pest control
Unit 12	**Conducting audit** HACCP for bakery industries, Quality audit, Internal audit, conducting open meeting and close meeting in auditing, preparation of audit reports for different department- audit exercise

Unit 13	**Handling customer and complains** Definition- customer, consumer, food chain, types of complains, handling customer, evaluation and solution of problem, report making, CAPA
Unit 14	**General principles for food safety and hygiene** Principles of food safety and quality, food safety system, quality attributes, Good Hygienic Practices, Good Manufacturing Practices, risk analysis, risk management, risk assessment, risk communication, Traceability and authentication, product recall

Practical: 20 marks

1. 5S practice
2. Lab Safety and Quality evaluation of foods
3. Use of Excel- format making
4. Sampling
5. Traceability and product recalling hands on practice.
6. Product development and maintenance of report.

Internal assessment: 20 marks

- Sessional Examination: Maximum 10 marks
- Internal Practical: Maximum 06 marks
- Attendance: Maximum 04 marks

Books and references

1. Early, R. (1995): Guide to Quality Management Systems for the Food Industry, Blackie, Academic and professional, London
2. Gould, W.A and Gould, R.W. (1998). Total Quality Assurance for the Food Industries, CTI Publications Inc. Baltimore.
3. Bryan, F.L. (1992): Hazard Analysis Critical Control Point Evaluations A Guide to Identifying Hazards and Assessing Risks Associated with Food Preparation and Storage. World Health Organization, Geneva.
4. Krammer, A. and Twigg, B.A. (1970). Quality Control for the Food Industry. 3rd Edn. AVI, Westport.
5. Rekha, S. Singhal, Pushpa R. Kulkarni, Dananesh V. Rege, (1997). Hand Book of Indices of food Quality and Authenticity, wood head Publishing Ltd

Paper: FPT-VC-3036- Food Microbiology **Total Credit: 6** **Total Marks: 100** **Theory: 60 marks**	
Unit 1	**Introduction and scope of microbiology** Definition and history of microbiology, contribution of Antony van Leeuwenhoek, Louis Pasteur, Robert Koch, importance and scope of microbiology.
Unit 2	**Study of Microscope** Construction and working principles of different types of microscope
Unit 3	**Staining techniques** Basic principle of simple and grams staining, simple and gram staining process, mordant and its action, acidic and basic dyes.
Unit 4	**Characteristics of microorganisms in food** Types of microorganisms- classification, morphology, structure and their importance in food (bacteria, fungi, virus, yeast etc.) Significance of spores
Unit 5	**Microbial growth in food** Microbial growth characteristics- bacterial growth curve, Factors affecting the growth of microorganisms in foods
Unit 6	**Culture media** Classification and preparation of bacteria, yeast and mold growth medium, serial dilution technique, pure culture, mixed culture, slant culture, broth culture, pour plate, spread plate and streak plate method of isolation. Thermal inactivation of microbes, Concept, determination and importance of TDT, lethal rate, F,Z and D values
Unit 7	**Microbial food spoilage** Sources of microorganisms in foods, some important food spoilage bacteria, spoilage of specific food groups-milk and dairy products, meat, fish and poultry, fruits and vegetables and canned products, cereal and cereal products

Practical: 20 marks

1. Construction, operation and uses of laboratory equipments • Autoclave • Hot air oven • Incubator • p^H meter • Centrifuge • Spectrophotometer • Laminar air flow
2. Study of compound microscope.
3. Cleaning and sterilization of glasswares.
4. Preparation of nutrient broth, potato dextrose, nutrient agar media.
5. Pure culture technique. (Pour plate, spread plate and streak plate)
6. Gram staining technique
7. Microbial examination of different food products.

Internal assessment: 20 marks

- ❖ Sessional Examination: Maximum 10 marks
- ❖ Internal Practical: Maximum 06 marks
- ❖ Attendance: Maximum 04 marks

Books and references

1. Frazier, W.C. Food microbiology, 4th edition, McGraw Hill, 2008

2. Khetarpaul, N. Food microbiology, Daya Publishing House, New Delhi, 2009

3. Pelzar, H.J and Rober, D. Microbiology, 5TH edition, McGraw Hill, 2009

4. Prescott,L.M; Harley,J.P and Klein, D.A. Microbiology, 4th edition, 1999

5. James M. Jay (2000). Modern Food Microbiology, 5th Edition, CBS Publishers.

6. Banwart, G.J. (1997). Basic Food Microbiology, CBS Publishers.

7. Adam, M.R. & Moss, M.O. (1995). Food Microbiology, New Age International Pvt. Ltd Publishers.

SEMESTER IV

Qualification Pack: Food Microbiologist (NSQF level 6)

Paper: FPT-VC-4016: Modern Methods in Food Processing

Total Credit: 6 **Total Marks: 100**

Theory: 60 marks

Unit 1	**Modern processing techniques and products** Fluidized bed drying, freeze drying, ohmic heating, cold sterilization, aseptic packaging, tetra pack, HTST pasteurization, microencapsulation, vacuum processing, edible coatings and films, nanotechnology in food, modern packaging traits, and modern waste management systems in food industries
Unit 2	**Modern analytical tools** Food color, Food texture analysis, viscosity of flour and starch paste, food crystallinity, antioxidants in foods, HPLC and other modern chromatographic techniques, calorimetry, electron microscopy, microbiological plating, colony counting, ELISA.

Practical: 20 marks

1. Study of fluidized bed dryer.
2. Study of freeze dryer.
3. Study of hunter color l, a, b.
4. Study of texture analyzer.
5. Study of HPLC.
6. Study of Gas chromatography

Internal assessment: 20 marks

- Sessional Examination: Maximum 10 marks
- Internal Practical: Maximum 06 marks
- Attendance: Maximum 04 marks

Books and references

1. Pomeranz, Y. & Mrloan (1978). Food Analysis: Theory and Practice, Westport, connectiant: AVI . Pomeranz, Y. & Mrloan (1978). Food Analysis: Theory and Practice, Westport, connectiant: AVI .

Paper: FPT-VC-4026: Basics of Food Engineering **Total Credit: 6** **Total Marks: 100** **Theory: 60 marks**	
Unit 1	**Material & Energy Balance: -** Properties of wet, dry saturated & superheated steam,use of steam tables &Mollier diagram, Numerical problems on material and energy Balance related of food processing. **Thermal Processing: -** Microbial inactivation, concept of F, Z & D value, evaluation Of thermal process time for batch sterilization by graphical & formula method, Calculation of process time, continuous flow system, factor affecting rate of heat Penetration, effect of can size on sterility requirement, different types of sterilizers (Batch and continuous type). **Evaporation: -** Boiling point elevation. Basic principles of evaporators. Construction And operation. Different types of evaporators used in food industry. Basic concept of multiple effect evaporator.
Unit 2	**Drying and Dehydration:-** Introduction to principles of drying, Equilibrium moisture content, bound and unbound moisture, rate of drying, constant, & falling rate periods, Engineering aspects of different types of dries used in food processing including tray drier, drum drier,fluidized bed drier, spray and freeze drier etc. **Freezing: -** Depression of Freezing point, Planks equation and other modified equations for prediction of freezing time, freezing time calculation for a product having uniform temperature (negligible internal resistance), Different types of Freezers like air blast freezer, plate freezer and cryogenic freezer. **Liquid transport system:-** pipelines and pumps for food processing plants-positive displacement pumps, air-lift pumps, propeller pumps, centrifugal pumps and jet pumps. **Heat exchangers:-**different types.

Practical: 20 marks

1. Determine the evaporation capacity of an evaporator by material balance.
2. Calculate the specific heat of the given sample.
3. Find the thermal conductivity of the given sample.
4. Determine the viscosity of the given sample.

Internal assessment: 20 marks

- Sessional Examination: Maximum 10 marks
- Internal Practical: Maximum 06 marks
- Attendance: Maximum 04 marks

Books and references

1. Singh, R.P and and Heldman, D.R. Introduction to food engineering, academic press.
2. Earle, R.L. Unit operations in food processing. 2nd edition.

Paper: FPT-VC-4036: Fermentation Technology

Total Credit: 6 **Total Marks: 100**

Theory: 60 marks

Unit 1	History of fermentation, introduction to fermentation process, media formulation and process optimization
Unit 2	Microorganisms used in food fermentation, types of culture, starter culture – maintenance, propagation and cultivation of culture.
Unit 3	Types of fermentation-submerged/solid state fermentation, batch/ continuous fermentation, fermenter design and operation.
Unit 4	Fermented foods – types, methods of manufacture for sauerkraut, tempeh, miso, soya sauce and traditional Indian foods

Practical: 20 marks

1. Study of fermenter- design, construction and working principle.
2. Study of different types of fermenter
3. Preparation of various fermented foods
4. Preparation of wine.
5. Preparation of sauerkraut
6. Lactic acid fermentation of milk and vegetables

Internal assessment: 20 marks

- Sessional Examination: Maximum 10 marks
- Internal Practical: Maximum 06 marks
- Attendance: Maximum 04 marks

Books and references

1. Robert W Hutkins. 2006. Microbiology and technology of fermented foods. Wiley-Blackwell

2. Y. H. Hui and E. Ozgul Evranuz. 2012 .Handbook of plant based fermented foods and beverage technology. CRC press

Semester V **Qualification Pack: Production Manager (NSQF level 7)** **Paper: FPT-VE-5016: Industrial Processing of Grains, Pulses and Oilseeds** **Total Credit: 6** **Total Marks: 100** **Theory: 60 marks**	
Unit 1	**Food grain processing** Food grains of worldwide importance, general structures of food grains, principles of milling, products and by products of grain milling, grain based food products, chemistry of different grains affecting product quality, by-product utilization, nutritional factors and anti-nutritional factors in grains, traditional Assamese grain based products, storages and preservation.
Unit 2	**Pulse and oilseeds processing** Composition, nutritive value and anti-nutritional factors in pulses and oilseeds, pulse germination and changes, processing of mustard oil seed, protein isolates, soyabean chunks, by-product utilization in oil industry, controlling rancidity in oil, storage and preservation.

Practical: 20 marks

1. Physical characteristics of rice- bulk density, true density, porosity, 1000kernel weight
2. Physical characteristics of wheat.
3. Cooking quality of rice- minimum cooking time, elongation ratio, water uptake ratio

Internal assessment: 20 marks

- Sessional Examination: Maximum 10 marks
- Internal Practical: Maximum 06 marks
- Attendance: Maximum 04 marks

Books and references

1. Essentials of food science
2. David Dendy A.V. Cereals and cereal products: technology and chemistry- 2000
3. "Association of Operative Millers Cereal Millers Hand Book", Burgess Publishing company, USA, 1963.

4. Pomeranz Y, "Modern Cereal science and Technology" MVCH Publications, NY, 1987. 4

Paper: FPT-VE-5026: Industrial Processing of Animal Products **Total Credit: 6** **Total Marks: 100** **Theory: 60 marks**	
Unit 1	Structure, composition and nutritive value of meat, meat types, meat products, abattoir, slaughter methods, rigor mortis and other biochemical changes in carcass meat processing, traditional and modern preservation techniques, meat curing, meat storage.
Unit 2	Marine and fresh water fish, popular fishes, primary processing, minced fish, fish protein isolate, fish liver oil, natural causes of rapid spoilage, fish glazing, other preservation techniques, fermented and non-fermented fish products, fish drying and dried fish products of Assam, storage.
Unit 3	Structure and composition of egg, egg quality evaluation, primary processing, egg white and egg yolk, egg-based products, egg as natural emulsifier, storage.
Unit 4	Co-operative dairy schemes, milk composition and properties, milk micro-flora, detection techniques, collection of milk, homogenization, pasteurization techniques, aseptic packaging, toned and double-toned milk, recombined and reconstituted milk, lactose intolerance.
Unit 5	Reconstituted / recombined milks, flavored milks, dahi and yoghurt, paneer, chana, butter, ghee, lassi, toffee, milk powder, ice cream- processing and quality, microbiology and storage, recent developments in dairy industry.
Unit 6	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. 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. 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 products
Unit 7	Organizational policies and goals, production team, various expertise to achieve production goals, effective communication with the employee , leadership , monthly/weekly/daily production plan, plan details, development of production schedule as per market demands, co-ordination with maintenance and quality. The Production Function: Objectives of Production Management, Operation Concept, Concepts, Objectives and functions of Production Planning and Control (PPC) 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. Personnel Management: Personnel and leadership qualities

	Labour: Types of labour, criteria for selection and employees training. Labour laws and legal aspects- health & safety of employees, welfare policies

Practical: 20 marks

1. Estimation of moisture content of meat.
2. Estimation of protein content of meat.
3. Preservation of meat
4. Analysis of microbial spoilage in meat and meat products.
5. Milk reception operation.
6. To perform different platform tests in milk
7. Straining, filtration and clarification of milk.
8. Chilling and storage of milk
9. Standardization of milk.
10. To estimate milk fat by Gerber method.
11. Study of cream separator.
12. Study of can washer.
13. Study of batch pasteurizer and HTST pasteurizer.
14. Preparation of khoa, chana and paneer.

Internal assessment: 20 marks

- Sessional Examination: Maximum 10 marks
- Internal Practical: Maximum 06 marks
- Attendance: Maximum 04 marks

Books and 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-July 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
7. Sukumar de; Outlines of dairy technology -oxford university press.
8. Indian dairy products, K.T.Acharya publication
9. Milk hygiene in milk production processing and distribution, FAO Publication.

10. Fliud milk industry, J.S Handerson, A.V.I Publishing Company, USA

11. Milk Hygiene in milk production processing and distribution, F.A.O Publication.

Paper: FPT-VE-5036: Project/ Internship **Total Credit: 6** **Total Marks: 100**	
Project/ Internship	**Conduct in workplace**: A student will undergo either a project supervised by any teacher or industrial internship in the field of their specialization during this semester of the academic year. Evaluation will be done by the department based on the outcome of the project or on feedback received from the industrial management on the student's performance during the tenure. **Report making and verbal presentation:** After completion of the project, the student will prepare a report on his work and experience. Evaluation will be based on the quality of the report and presentation. **Project report + presentation+ viva**

Semester VI

Qualification Pack: Production Manager (NSQF level 7)

Paper: FPT-VE-6016: Industrial Processing of Tea, Coffee and Spices

Total Credit: 6 **Total Marks: 100**

Theory: 60 marks

Unit 1	General introduction to the plant, types of tea, green tea, black tea, white tea, oolong tea, yellow tea, instant tea, flavored tea, industrial processing techniques, tea fermentation and compounds, quality of tea, health effects, Assam tea, flavor stability, tea bags, storage of tea, innovative tea-based products, tea-wine, *kombucha* etc.
Unit 2	Introduction to coffee, different types, processing, quality analysis.
Unit 3	Introduction, classification, composition and functions. Major international quality specifications of spices. Spice processing, Value added spice products: Spice volatile oils, spice oleoresins

Practical: 20 marks

1. Processing of tea leaves.
2. Quality analysis of different spices.
3. Field visit.

Internal assessment: 20 marks

- Sessional Examination: Maximum 10 marks
- Internal Practical: Maximum 06 marks
- Attendance: Maximum 04 marks

Books and references

1. Food facts and principles, N.Shakuntala Manay, M. Shadaksharaswamy

Paper: FPT-VE-6026: Food Packaging **Total Credit: 6** **Total Marks: 100** **Theory: 60 marks**	
Unit 1	**Introduction to food packaging** Definition, functions and requirements for effective packaging, packaging criteria, classification of packaging-primary, secondary and tertiary packaging, Flexible and rigid packaging, Importance of packaging.
Unit 2	**Materials for food packaging** Paper, glass, tin, aluminium-polymer coated, tin free steel cans, cellophane, plastics-different types of plastics.
Unit 3	**Different forms of food containers** Boxes, jar, cans, bottle; Interaction of package with foods; Packaging requirements for various products-fruits and vegetables, meat, fish, milk and dairy products, canned foods, dehydrated foods.
Unit 4	**Modern concepts of packaging technology** Aseptic packaging, form-fill seal packaging, edible films, retort pouch packaging, Gas flushing, tetra pack, vacuum packaging, MAP & CAP, active packaging, intelligent packaging.
Unit 5	**Food packaging laws and specifications** Quality testing of packaging materials- • Paper and paper board-thickness, bursting strength, tensile strength, puncture resistance

	• Flexible packaging materials (plastics)-density, tensile strength, WVTR, GTR, seal strength

Practical: 20 marks

1.	Study of different packaging materials
2.	Determination of water vapor transmission rate of various packaging materials.
3.	Demonstration of measurement of carton's dimension as per organizational standard.
4.	To determine the thickness of paper and paper board.

Internal assessment: 20 marks

- ❖ Sessional Examination: Maximum 10 marks
- ❖ Internal Practical: Maximum 06 marks
- ❖ Attendance: Maximum 04 marks

Books and references

1. Coles,r; dowel, d.m; kirwan,j. food packaging technology. Black well publishing ltd
2. Niir board; food packaging technol;ogy handbook national institute of industrial research , New Delhi
3. PirengerO.G.andA.L.Baver: Plastic Packaging Materials for Food Wiley VCH, GmbH, Germany

Paper: FPT-VE-6036: Project/ Internship **Total Credit: 6** **Total Marks: 100**	
Project/ Internship	**Conduct in workplace**: A student will undergo either a project supervised by any teacher or industrial internship in the field of their specialization during this semester of the academic year. Evaluation will be done by the department based on the outcome of the project or on feedback received from the industrial management on the student's performance during the tenure. **Report making and verbal presentation:** After completion of the project, the student will prepare a report on his work and experience. Evaluation will be based on the quality of the report and presentation. **Project report + presentation+ viva**

The End