National Occupational Standards

Fundamentals of Food Quality and Testing

Unit Code: FIC/N7633

Version: 1.0

NSQF Level: 4

Food Industry Capacity & Skill Initiative || Shriram Bharatiya Kala kendra, 3rd floor, 1, Copernicus Marg, Mandi House, New Delhi
Delhi 110001 || email:santosh@ficsi.in

Description

This course focuses on the fundamentals of food analysis and testing, covering essential methods for ensuring food quality. Participants will learn to develop quality control systems and conduct physical, chemical, and microbiological tests on both food and packaging. The curriculum includes key topics such as quality monitoring, statistical analysis, regulatory compliance, laboratory management, and sustainable practices. By the end of the course, participants will be equipped to ensure food safety and quality in industrial as well as in professional testing laboratories.

Scope

The scope covers the following :

- Quality Control System Development
- Physical testing of food
- Chemical testing of food
- Physical testing of packaging material
- Microbiological testing of food
- Food quality monitoring and evaluation
- Statistical analysis and quality management
- Compliance with regulations and standards
- Food laboratory maintenance
- Sustainability in production processes

Elements and Performance Criteria

Quality control system development

To be competent, the user/individual on the job must be able to:

PC1. develop and implement comprehensive quality control systems across various stages of food production

PC2. design, evaluate, and refine quality control protocols to ensure consistency in food quality throughout the production process

PC3. utilize industry standards, best practices, and innovative methods to create robust quality control frameworks that align with organizational and regulatory requirements

PC4. apply appropriate sampling techniques and statistical methods, including concepts of normality and morality, to ensure accurate results and data integrity

PC5. perform stock solution calculations with precision to maintain the integrity of analytical procedures and ensure accurate test results

PC6. perform accurate weight metrology measurements and calibrate instruments to ensure precision in testing and compliance with calibration standards

Physical testing of food

To be competent, the user/individual on the job must be able to:

PC7. prepare food samples for physical tests, ensuring they are representative

PC8. observe and accurately record physical attributes such as colour, size, shape, and texture

PC9. operate basic physical testing instruments like texture analyzers, colorimeters, viscometers, and moisture analyzers

Chemical testing of food

To be competent, the user/individual on the job must be able to:

PC10. perform standard chemical tests such as pH measurement, moisture content, fat content analysis, and protein quantification

PC11. use appropriate equipment pH meters, titrators, refractometers, and spectrophotometers for chemical testing of food, following the appropriate safety precautions

PC12. record chemical test results accurately, including any observations or deviations from expected outcomes

PC13. handle, store, and dispose of the chemicals used in testing properly to ensure safety and compliance with regulations

Microbiological testing of food

To be competent, the user/individual on the job must be able to:

PC14. prepare samples for microbiological food testing, including dilution and plating

PC15. follow aseptic techniques to prevent contamination during sample preparation and testing

PC16. use microbiological testing tools and equipment such as incubators, autoclaves, laminar flow hoods, and microscopes

PC17. apply basic microbial culture techniques, including streak plating and pour plating

PC18. count colony-forming units (CFUs) and identify basic microbial types and indicator microorganisms (e.g., E. coli, Salmonella, coliform)

PC19. interpret microbiological test results and determine their implications for food safety

PC20. document the microbiological findings accurately, including any anomalies or areas of concern

Physical testing of packaging material

To be competent, the user/individual on the job must be able to:

PC21. inspect the packaging material for physical integrity, ensuring no defects such as tears and punctures

PC22. perform appropriate tests to assess the material's ability to prevent the entry of air, moisture and light

PC23. check the tensile strength of the packaging material to ensure it can withstand mechanical stress during handling and storage

PC24. perform seal strength tests to ensure the packaging seals are robust to prevent contamination

PC25. check the packaging material for transparency and clarity, ensuring it allows for clear identification of the product inside

PC26. perform drop tests to assess the durability of the packaging material by subjecting it to falls from specified heights

PC27. assess the flexibility and pliability of the packaging material to ensure it can adapt to various shapes and sizes without compromising integrity

Food quality monitoring and evaluation

To be competent, the user/individual on the job must be able to:

PC28. evaluate food quality regularly to ensure compliance with applicable standards and customer expectations

PC29. identify areas of improvement in food quality through regular inspections, audits, and assessments

PC30. implement corrective actions based on evaluation findings, ensuring continuous compliance with applicable food quality standards

Statistical analysis and quality management

To be competent, the user/individual on the job must be able to:

PC31. apply statistical methods and quality management principles to maintain and improve food quality

PC32. utilize statistical tools such as Six Sigma and Statistical Process Control (SPC) to analyze data and improve quality

PC33. interpret data trends and make data-driven decisions to optimize food quality and reduce variability in production processes

Compliance with regulations and standards

To be competent, the user/individual on the job must be able to:

PC34. interpret and follow the applicable regulations to meet legal and safety requirements

PC35. follow changes in food safety regulations and standards, ensuring all processes and products meet legal requirements

PC36. coordinate with regulatory bodies and ensure that the organization adheres to the latest food safety laws and guidelines

PC37. ensure compliance with Indian regulations and international standards for food quality testing

PC38. ensure all testing processes align with applicable standards, such as FSSAI, ISO 22000, HACCP, etc.

PC39. implement and maintain quality testing protocols that meet or exceed regulatory expectations, ensuring market access both domestically and internationally

PC40. follow trends concerning food safety and testing to remain informed about the latest industry advancements

PC41. identify and apply emerging trends, new research, and technological advancements in food safety and testing

PC42. integrate new insights and innovations into the organization’s quality testing processes, staying ahead of industry developments

PC43. establish quality standards for the procurement of raw materials and ingredients

PC44. evaluate vendors and suppliers based on their adherence to food quality and safety standards

PC45. coordinate the delivery of materials with vendors to ensure they meet the applicable quality control and food safety requirements

Food laboratory maintenance

To be competent, the user/individual on the job must be able to:

PC46. ensure a clean and sanitized laboratory workstations and equipment to prevent cross-contamination and ensure accurate testing results

PC47. calibrate and maintain laboratory equipment according to manufacturer guidelines and Good Food Laboratory Practices (GFLPs) standards

PC48. maintain accurate and detailed records of laboratory maintenance, calibration activities, and equipment validation

PC49. follow GFLP protocols for the proper handling, storage, and disposal of reagents, samples, and hazardous waste

Sustainability in production processes

To be competent, the user/individual on the job must be able to:

PC50. ensure sustainability in production processes

PC51. implement sustainable practices that minimize waste, reduce energy consumption, and lower the environmental impact of food production

PC52. lead initiatives to incorporate sustainability into quality management systems, balancing quality with environmental stewardship

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the economic effects of maintaining high food quality standards, including the marketability of products and brand trust building

KU2. the effect of consistent food quality on consumer satisfaction, repeat purchases, and long-term brand loyalty, and profitability

KU3. the principles of sensory evaluation of food products, including taste, texture, aroma, and appearance

KU4. the appropriate sampling techniques, statistical methods

KU5. the concepts of normality and morality to ensure accuracy and data integrity

KU6. the stock solution preparation and calculation methods

KU7. weight metrology and instrument calibration techniques

KU8. the quality standards for raw material and ingredient procurement to ensure food safety and quality consistency

KU9. the vendor and supplier evaluation methods based on food safety and quality standards

KU10. the process of conducting sensory tests and interpret results

KU11. the basic physical properties of food, such as texture, colour, and viscosity

KU12. the sampling of food for the physical, chemical and microbiological testing

KU13. the significance of physical test results in relation to food quality and consistency

KU14. the use of texture analyzers, colourimeters, viscometers, and moisture analyzers for the physical testing of food

KU15. the chemical properties of food, such as pH, acidity, sugar content, and fat content

KU16. the use of pH meters, titrators, refractometers, and spectrophotometers for chemical testing of food

KU17. the standard chemical tests, such as pH measurement, moisture content, fat content analysis, etc.

KU18. the identification and characteristics of microorganisms relevant to food safety, such as bacteria, yeasts, and molds.

KU19. the process of dilution and plating of food samples for microbial analysis

KU20. the significance of microbial load in food safety and quality

KU21. the Standard Operating Procedures (SOPs) specific to physical, chemical, and microbiological testing

KU22. the safety protocols related to the handling of samples, chemicals, and microorganisms

KU23. the documentation and record maintenance requirements concerning food testing

KU24. the importance of monitoring environmental conditions in the manufacturing area

KU25. the process of conducting different tests on the packaging material to check its suitability for different food items

KU26. the process of designing and implementing quality control systems across various stages of food production

KU27. how to develop, implement, and monitor quality control protocols that ensure consistency and compliance with food safety standards

KU28. the principles of continuous evaluation and the application of statistical methods and quality management principles

KU29. the use of statistical tools, such as Statistical Process Control (SPC) to monitor food quality, identify trends, and implement improvements

KU30. the application of Indian and international food quality and safety regulations, including FSSAI guidelines and ISO 22000

KU31. the emerging trends and advances in food quality and safety technologies

KU32. the importance of incorporating new technologies and practices into quality management systems to enhance food safety and quality

KU33. the appropriate practices to ensure sustainability in food processing

KU34. the laboratory sanitation practices to prevent cross-contamination and maintain testing accuracy

KU35. the equipment calibration and maintenance procedures

KU36. the Good Food Laboratory Practice (GFLP) protocols for proper handling, storage, and disposal of reagents, samples, and hazardous waste

KU37. the National Accreditation Board for Testing and Calibration Laboratories (NABL) standards and accreditation processes

KU38. the detection methods for adulterants, pesticide residues, and heavy metals in food products

KU39. the FSSAI-recommended detection methods for heavy metals in food, such as Atomic Absorption Spectroscopy (AAS), Inductively Coupled Plasma Mass Spectrometry (ICP-MS), and their role in ensuring food safety compliance

KU40. the FSSAI-approved techniques for detecting pesticide residues in food products, including Gas Chromatography-Mass Spectrometry (GC-MS) and Liquid Chromatography-Mass Spectrometry (LC-MS), to monitor and control contamination levels within permissible limits

KU41. the emerging technologies concerning food quality testing, such as Matrix-Assisted Laser Desorption/Ionization (MALDI), Electrospray Ionization (ESI), Imaging Mass Spectrometry, Biosensors, Lab-on-a-chip, etc.

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. maintain work-related notes and records

GS2. read the relevant guides and literature to get the latest information about the field of work

GS3. communicate clearly and politely

GS4. perform basic calculations

GS5. listen attentively to understand the instructions being given
GS6. identify solutions to work-related issues
GS7. plan and prioritize tasks to ensure timely completion
GS8. make quick decisions in case of emergencies

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Quality control system development	**3**	**6**	**-**	**2**
PC1. develop and implement comprehensive quality control systems across various stages of food production	0.5	1	-	0.5
PC2. design, evaluate, and refine quality control protocols to ensure consistency in food quality throughout the production process	0.5	1	-	-
PC3. utilize industry standards, best practices, and innovative methods to create robust quality control frameworks that align with organizational and regulatory requirements	0.5	1	-	0.5
PC4. apply appropriate sampling techniques and statistical methods, including concepts of normality and morality, to ensure accurate results and data integrity	0.5	1	-	-
PC5. perform stock solution calculations with precision to maintain the integrity of analytical procedures and ensure accurate test results	0.5	1	-	0.5
PC6. perform accurate weight metrology measurements and calibrate instruments to ensure precision in testing and compliance with calibration standards	0.5	1	-	0.5
Physical testing of food	**2**	**3**	**-**	**2**
PC7. prepare food samples for physical tests, ensuring they are representative	0.5	1	-	1
PC8. observe and accurately record physical attributes such as colour, size, shape, and texture	0.5	1	-	0.5
PC9. operate basic physical testing instruments like texture analyzers, colorimeters, viscometers, and moisture analyzers	1	1	-	0.5
Chemical testing of food	**3**	**4**	**-**	**2**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. perform standard chemical tests such as pH measurement, moisture content, fat content analysis, and protein quantification	0.5	1	-	0.5
PC11. use appropriate equipment pH meters, titrators, refractometers, and spectrophotometers for chemical testing of food, following the appropriate safety precautions	0.5	1	-	0.5
PC12. record chemical test results accurately, including any observations or deviations from expected outcomes	1	1	-	0.5
PC13. handle, store, and dispose of the chemicals used in testing properly to ensure safety and compliance with regulations	1	1	-	0.5
Microbiological testing of food	**4**	**7**	**-**	**3**
PC14. prepare samples for microbiological food testing, including dilution and plating	0.5	1	-	1
PC15. follow aseptic techniques to prevent contamination during sample preparation and testing	0.5	1	-	0.5
PC16. use microbiological testing tools and equipment such as incubators, autoclaves, laminar flow hoods, and microscopes	0.5	1	-	-
PC17. apply basic microbial culture techniques, including streak plating and pour plating	0.5	1	-	0.5
PC18. count colony-forming units (CFUs) and identify basic microbial types and indicator microorganisms (e.g., E. coli, Salmonella, coliform)	0.5	1	-	-
PC19. interpret microbiological test results and determine their implications for food safety	0.5	1	-	0.5
PC20. document the microbiological findings accurately, including any anomalies or areas of concern	1	1	-	0.5
Physical testing of packaging material	**4**	**7**	**-**	**3**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC21. inspect the packaging material for physical integrity, ensuring no defects such as tears and punctures	0.5	1	-	0.5
PC22. perform appropriate tests to assess the material's ability to prevent the entry of air, moisture and light	0.5	1	-	0.5
PC23. check the tensile strength of the packaging material to ensure it can withstand mechanical stress during handling and storage	0.5	1	-	0.5
PC24. perform seal strength tests to ensure the packaging seals are robust to prevent contamination	0.5	1	-	-
PC25. check the packaging material for transparency and clarity, ensuring it allows for clear identification of the product inside	0.5	1	-	0.5
PC26. perform drop tests to assess the durability of the packaging material by subjecting it to falls from specified heights	0.5	1	-	0.5
PC27. assess the flexibility and pliability of the packaging material to ensure it can adapt to various shapes and sizes without compromising integrity	1	1	-	0.5
Food quality monitoring and evaluation	**2**	**3**	**-**	**2**
PC28. evaluate food quality regularly to ensure compliance with applicable standards and customer expectations	0.5	1	-	1
PC29. identify areas of improvement in food quality through regular inspections, audits, and assessments	0.5	1	-	0.5
PC30. implement corrective actions based on evaluation findings, ensuring continuous compliance with applicable food quality standards	1	1	-	0.5
Statistical analysis and quality management	**2**	**3**	**-**	**1**
PC31. apply statistical methods and quality management principles to maintain and improve food quality	0.5	1	-	0.5

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC32. utilize statistical tools such as Six Sigma and Statistical Process Control (SPC) to analyze data and improve quality	0.5	1	-	-
PC33. interpret data trends and make data-driven decisions to optimize food quality and reduce variability in production processes	1	1	-	0.5
Compliance with regulations and standards	**6**	**10**	**-**	**3**
PC34. interpret and follow the applicable regulations to meet legal and safety requirements	0.5	1	-	-
PC35. follow changes in food safety regulations and standards, ensuring all processes and products meet legal requirements	0.5	1	-	-
PC36. coordinate with regulatory bodies and ensure that the organization adheres to the latest food safety laws and guidelines	0.5	1	-	0.5
PC37. ensure compliance with Indian regulations and international standards for food quality testing	0.5	0.5	-	-
PC38. ensure all testing processes align with applicable standards, such as FSSAI, ISO 22000, HACCP, etc.	0.5	0.5	-	-
PC39. implement and maintain quality testing protocols that meet or exceed regulatory expectations, ensuring market access both domestically and internationally	0.5	1	-	0.5
PC40. follow trends concerning food safety and testing to remain informed about the latest industry advancements	0.5	1	-	0.5
PC41. identify and apply emerging trends, new research, and technological advancements in food safety and testing	0.5	1	-	-
PC42. integrate new insights and innovations into the organization’s quality testing processes, staying ahead of industry developments	0.5	0.5	-	-
PC43. establish quality standards for the procurement of raw materials and ingredients	0.5	0.5	-	0.5

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC44. evaluate vendors and suppliers based on their adherence to food quality and safety standards	0.5	1	-	0.5
PC45. coordinate the delivery of materials with vendors to ensure they meet the applicable quality control and food safety requirements	0.5	1	-	0.5
Food laboratory maintenance	**2**	**4**	**-**	**1**
PC46. ensure a clean and sanitized laboratory workstations and equipment to prevent cross-contamination and ensure accurate testing results	0.5	1	-	-
PC47. calibrate and maintain laboratory equipment according to manufacturer guidelines and Good Food Laboratory Practices (GFLPs) standards	0.5	1	-	0.5
PC48. maintain accurate and detailed records of laboratory maintenance, calibration activities, and equipment validation	0.5	1	-	-
PC49. follow GFLP protocols for the proper handling, storage, and disposal of reagents, samples, and hazardous waste	0.5	1	-	0.5
Sustainability in production processes	**2**	**3**	**-**	**1**
PC50. ensure sustainability in production processes	0.5	1	-	0.5
PC51. implement sustainable practices that minimize waste, reduce energy consumption, and lower the environmental impact of food production	0.5	1	-	-
PC52. lead initiatives to incorporate sustainability into quality management systems, balancing quality with environmental stewardship	1	1	-	0.5
NOS Total	**30**	**50**	**-**	**20**

National Occupational Standards (NOS) Parameters

NOS Code	FIC/N7633
NOS Name	Fundamentals of Food Quality and Testing
Sector	Food Processing
Sub-Sector	
Occupation	Quality Analysis/ Assurance
NSQF Level	4
Credits	2
Minimum Job Entry Age	18
Minimum Educational Qualification & Experience	12th grade Pass (or Equivalent) OR 10th grade pass with 3 Years of experience in Food Processing Industry OR Previous relevant Qualification of NSQF Level (3.5) with 1.5 years of experience in Food Processing Industry OR Previous relevant Qualification of NSQF Level (3) with 3 Years of experience in Food Processing Industry
Version	1.0
Last Reviewed Date	08/05/2025
Next Review Date	08/05/2028
NSQC Clearance Date	08/05/2025
Reference code on NQR	NG-04-FI-04213-2025-V1-FICSI
NQR Version	1.0
CCN Category	1