



Quality Testing Laboratory
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Entrepreneurship and Career-Based Certificate Programme

CERTIFICATE COURSE

Food Processing and Quality Analysis with Accreditation

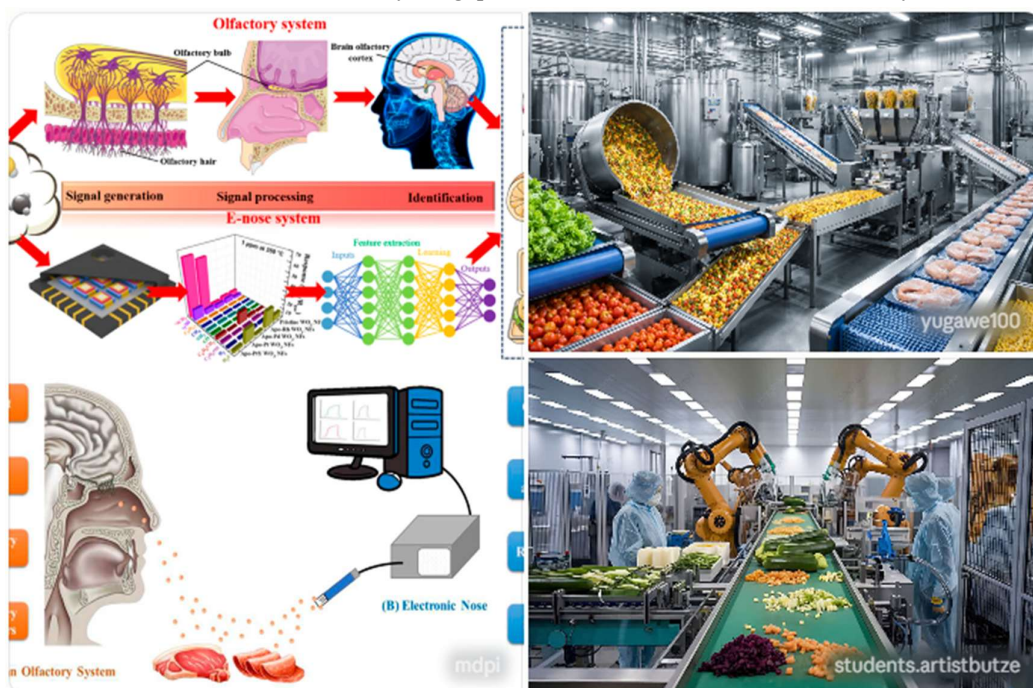
A Three-Month Hybrid Training Programme (with a Dedicated Module on AI Integration in Food Testing)

Programme Leadership

Coordinator: Prof. (Dr.) Achintya Saha, Head of the Laboratory

Co-Coordinator: Prof. (Dr.) Debarati Mitra, Assistant Head & Quality Manager

Co-Coordinator: Dr. Avery Sengupta, Technical Consultant, QTL Laboratory



1. Background

Food processing and food quality analysis is the discipline concerned with the development of food products and the application of analytical procedures to characterize their properties. These procedures generate information on the composition, structure, physicochemical properties and sensory attributes of foods — information that is essential both to a rational understanding of what determines food quality and to the industry's ability to economically produce food that is safe, nutritious and desirable, enabling consumers to make informed dietary choices.

This course explains, in depth, the techniques used to analyse food components and provides insight into the quality-assurance dimension of the food industry. No food product can reach the market without clearance from a quality assurance unit, and no food-testing laboratory can issue a valid certificate of analysis without proper FSSAI and NABL accreditation. The course therefore also covers the accreditation framework governing the food-testing sector — knowledge that is of growing importance as government scrutiny of food safety increases and new testing laboratories continue to open across the country.

In recognition of how rapidly artificial intelligence is reshaping laboratory practice, this edition of the course introduces a dedicated, in-depth module (Module 13) on the integration of AI into food testing — covering AI-enabled sensors, machine-learning-based adulteration detection, computer vision for grading, and predictive analytics for safety and shelf-life, alongside the regulatory considerations of using such tools in accredited laboratories.

The programme aims to:

- Qualify participants with knowledge and modern research skills in the field of food and clinical nutrition.
- Develop candidates' knowledge and skills in food and nutrition analysis to advance their future careers.
- Train professionals to apply sound scientific and ethical principles — covering disease biomarkers, diagnosis and bio-safety — in research and laboratory practice.
- Contribute to addressing national nutrition and food-safety challenges through structured evaluation of diagnostic and quality biomarkers.
- Expose participants to modern technologies, including AI-based tools, used in nutritional diagnosis, food analysis and quality assessment.

2. Scope and Objectives

- Develop candidates' knowledge and skills in food analysis to advance their future careers.
- Teach participants modern techniques of proximate and ultimate analysis of food — proximate analysis addressing the nutritional and biochemical profile of food, and ultimate analysis addressing determination of specific elements or compounds present in it.
- Train participants in laboratory safety rules and good laboratory practice.
- Enable participants to learn methods for detecting food adulteration, including emerging AI/ML-assisted methods.
- Guide participants through the quality assurance system and the NABL and FSSAI accreditation frameworks.
- Introduce participants to modern technologies — including artificial intelligence and data analytics — that support good food-laboratory practice.

3. Course Details

Duration of Course	3 months
Mode	Hybrid (in-person laboratory sessions + online theory sessions)
Venue	Department of Chemical Technology, University of Calcutta
Eligibility	Pursuing graduation or post-graduation in any discipline of Science
Number of Participants	Twenty (20)
Commencement Date	November 2026 (tentative)
Number of Modules	13 modules, including a dedicated module on AI Integration in Food Testing
Course fees	Rs. 6,000.00 for 3 months

4. Detailed Syllabus

The syllabus is organised into thirteen modules, progressing from the foundations of food processing through quality assurance, safety, packaging, microbiology, sensory analysis and entrepreneurship, and culminating in a dedicated, in-depth module on the integration of Artificial Intelligence into food testing.

Module	Syllabus Content
Module 1	Introduction to Food Processing Industries - Food industry: a global and national glance - Mechanism of food processing across various sectors - Unit operations in food manufacturing
Module 2	Methods and Techniques of Food Processing - Food processing methods and types - Primary, secondary and tertiary processing of food
Module 3	Food Quality Assurance and Quality Control - Relevance of quality assurance in manufacturing - Overview of quality control and testing procedures - Proximate analysis of food products
Module 4	Nutritional and Biochemical Components of Products - Food chemistry fundamentals - Product ingredient specification - Nutrient stipulations and labelling norms
Module 5	Food Preservation and Analytical Techniques - Approaches to the use of food additives - Advanced food preservation techniques
Module 6	Food Good Manufacturing Practices (GMP) - Role of cGMP in plant operations - GMP as a broad framework for quality and processing
Module 7	Food Safety Measures and Protocols

Module	Syllabus Content
	– FSMS as a preventive approach – Food safety laws and guidelines – National and international standards of food safety
Module 8	Food Packaging Technology and Labelling – Regulations governing packaging and labelling – Role of advanced packaging in the food industry – Packaging and consumer satisfaction
Module 9	Food Microbiology, Food-borne Illness and Hazards – Microbiological analysis of food products – Role of pathogenic bacteria in food safety
Module 10	Application of Food Sensory Analysis in Manufacturing – Methods of food sensory analysis – Objectives of sensory testing in food products
Module 11	Entrepreneurship Development in Food Processing – Introduction to food business start-ups – Career pathways in food processing and preservation – Laws and regulations for start-ups in the FMCG sector
Module 12	Laboratory Demonstration, Practical and Instrument Handling – Good Laboratory Practices (GLP) – Methods of QA/QC analysis and testing – Demonstration of equipment and apparatus for analysis
Module 13	Artificial Intelligence (AI) Integration in Food Testing – Introduction to Artificial Intelligence and Machine Learning in food science – Role of AI in modern food quality assurance and testing laboratories – AI-enabled sensor technologies: Electronic Nose (e-Nose) and Electronic Tongue (e-Tongue) for rapid, non-destructive quality assessment – Machine learning algorithms for food adulteration detection and product authentication – Computer vision and image-processing systems for automated food grading, sorting and defect detection – AI-assisted analysis of spectroscopic data (NIR, FTIR, Raman) for rapid, high-throughput testing – Predictive modelling for shelf-life estimation, spoilage detection and quality-decay forecasting – AI-driven food safety hazard prediction and risk analysis integrated with HACCP – Application of AI/ML in microbial contamination detection and pathogen identification – Data analytics, Laboratory Information Management System (LIMS) integration and automated, AI-assisted report generation – Overview of AI tools and software used in food laboratories, with illustrative case studies – Regulatory, ethical and validation considerations for deploying AI in NABL/FSSAI-accredited testing environments

5. Resource Persons

The course draws on senior industry, regulatory and technical experts, including a dedicated AI expert engaged for the Module 13 sessions on AI integration in food testing:

- R&D Head, Mitra SK Pvt. Ltd., Kolkata
- QC & R&D Head, Vinayak Oils and Fats Pvt. Ltd.
- R&D Head, Geo Nutri Foods Pvt. Ltd.
- R&D Head, Budge Budge Refineries Pvt. Ltd.
- FSSAI, Newtown
- Regional AGMARK Laboratory
- Management Executive – Advanced Multilab Analysis, SGS, Kolkata
- AI Expert (Food Informatics / Data Science)
- Expert from the Packaging Industry