

BSc (Hons) Food Safety and Quality – A302

1. Objectives

The programme is designed to develop the necessary attitude and competence for the application of scientific principles in the control of food safety and quality towards enhancing global food security and sustainable food production to fulfil consumer, business, economic, social and environmental needs. It aims at preparing professionals for the food sector including food industries, small and medium food enterprises, food authorities, food laboratories and food research institutions. Teaching and Learning will impart knowledge, skills and values to develop employability and produce lifelong learners who can think and act creatively. Teaching methods will facilitate practical, interactive, critical, reflective and integrative learning.

On completion of this programme, learners will be able to:

- explain the chemical, physical, microbiological, nutritional and sensory properties of food, and the factors which affect these properties during manufacture and storage;
- apply scientific principles to control the chemical, physical, microbiological, nutritional and sensory properties of food during manufacture and storage;
- apply methods of preservation and processing to control deterioration and spoilage mechanisms in foods and to produce safe foods;
- apply methods of food analysis to assess quality, nutritive value, safety and compliance with standards;
- apply statistical principles to assess the performance of a food production process as well as the quality of raw materials and finished products;
- participate in the development, implementation and maintenance of food safety management systems to protect consumer health;
- integrate food safety management within quality and environmental management systems in food businesses;
- identify sustainable solutions to food quality and safety problems;
- make a positive contribution to the successful development of small and medium food enterprises, food industries and catering organisations;
- engage in enhancing the effectiveness and efficiency of the national food control system;
- develop and implement interactive communication strategies to enhance people involvement in ensuring food safety and quality;
- create commitment to drive actions towards enhancing global food security;
- apply the steps involved in a research process;
- demonstrate use of written and oral communication skills;
- embark on training programmes at postgraduate level.

2. General Entry Requirements

In accordance with General Entry Requirements for Admission to the University for Undergraduate Degrees.

3. Programme Requirements

SC : Credit in Mathematics and Chemistry

2 GCE 'A' Level passes in related approved Science subjects (Mathematics, Chemistry, Physics, Biology, Food Studies, Botany, Zoology, Computer Science or Computing).

Preference will be given to candidates holding 'A' Levels in Chemistry and either Food Studies or Biology or Physics.

4. Programme Duration

	Normal (Years)	Maximum (Years)
Degree	3	5

5. **Credits per Year:** Minimum 18 credits, Maximum 48 credits subject to Regulation 4.

6. **Minimum Credits Required for Award of Undergraduate Degree: 106**

Breakdown as follows:

	Credits		
	Core Taught Modules	Project	GEM
Degree	91	9	6

The Practical Training Component and the "Scientific Communication Skills" module must be completed satisfactorily for the award of the degree.

Students may exit with a

- (a) Certificate after having earned 30 credits in core modules.
- (b) Diploma after having earned 60 credits in core modules.

7. Assessment

Each module will be assessed over 100 marks (i.e. expressed as %) with details as follows (unless otherwise specified).

Assessment will be based on a Written Examination of 2-3 hour duration, carrying a weighting of 70%, and Continuous Assessment carrying 30% of total marks for AGRI modules. Modules from other Faculties/Departments/Centres will carry weighting in the Written Examination and the Continuous Assessment as specified by the concerned Faculties/Departments/Centres. Continuous Assessment will be based on laboratory/field works, and/or assignments, and should include at least 1 class test. Written examinations for all AGRI modules will normally be carried out at the end of the academic year.

An overall total of 40% for combined continuous assessment and written examination components would be required to pass a module, without minimum thresholds within the individual continuous assessment and written examination.

Modules will carry the weightings of 1, 3 or 5 depending on their status (Introductory, Intermediate or Advanced). Weighting for a particular module is indicated within parentheses in the module code.

Each module carries credits in the range of 3 to 6. Project carries 9 credits. The “food product development” module carries 1 credit.

Students who do not have SC level pass in Biology will be required to follow the “structure and function of multicellular organisms and ecosystems” module in the first semester of the first year of the programme of study. Assessment will be based on a Written Examination carrying a weighting of 70%, and Continuous Assessment carrying 30% of total marks. The module carries no credits. For satisfactory completion of the module, a minimum of 40% should be attained.

Assessment of the “scientific communication skills” module will be based on continuous assessment of students throughout the module and/or submission of a portfolio. The module carries no credits. For satisfactory completion of the module, a minimum of 40% should be attained.

Assessment of the “food product development” module will be based on group presentation and submission of group portfolio in the first week of the second semester of the final year.

Assessment of practical training will be based on the on-site supervisor’s evaluation and the student’s portfolio. For satisfactory completion of the practical training, a minimum of 40% should be attained.

8. Important Note

The rules as stipulated in this Programme Structure and Outline Syllabus will replace all other rules and regulations.

9. Academic Teaching in Case of an Emergency

To ensure minimal disruption of normal academic teaching in case of an emergency (eg. closure of the University for more than 2 weeks), the Moodle e-Learning Platform of VCILT will be used to deliver Teaching and Learning content. Relevant learning resources will be posted on the Platform. Assignments (if any) will be submitted using the online submission box. Arrangements will be made to register students on the Moodle platform at the beginning of the academic year.

10. List of Modules

Core Modules

Code	Module Name	Hr/Yr L+P	Credits
AGRI 1011Y(1)	Food Microbiology	60+60	6
AGRI 1012Y(1)	Biochemistry and Nutrition	75+30	6
AGRI 1014Y(1)	Food Chemistry and Food Analysis I	60+60	6
AGRI 1041Y(1)	Introduction to Agricultural Production	45+0	3
AGRI 1052Y(1)	Chemistry Fundamentals and Laboratory Techniques	30+60	4
AGRI 1055Y(1)	Basic Food Hygiene	45+30	4
AGRI 1065Y(1)	Introduction to Food Engineering	45+45	4
MGT 1111(1)	Organisation and Management	D.E.	3
AGRI 2015Y(3)	Food Chemistry and Food Analysis II	75+30	6
AGRI 2019Y(3)	Molecular Biology	30+30	3
AGRI 2020Y(3)	Sensory Analysis	30+30	3
AGRI 2039Y(3)	Statistics and Research Methodology	45+60	5
AGRI 2105Y(3)	Food Processing	75+30	6
AGRI 2106Y(3)	Food Testing and Statistical Control	30+45	3
AGRI 2107Y(3)	Food Quality Management Systems	45+30	4
AGRI 2108Y(3)	Food Safety Management Systems	45+30	4
AGRI 2080Y(3)	Advanced Food Microbiology	30+30	3
AGRI 2100	Scientific Communication Skills	20+0	-
AGRI 3000Y(5)	Project		9
AGRI 3014Y(5)	Food Legislation	45+0	3
AGRI 3069Y(5)	Food Product Development	15+0	1
AGRI 3088Y(5)	Postharvest Management	45+0	3
AGRI 3089Y(5)	Developments in Food Safety and Quality	60+0	4
AGRI 3090Y(5)	Advanced Nutrition and Food Toxicology	60+0	4
AGRI 3076Y(5)	Novel Foods and Food Ingredients	45+0	3
GEM (1)		-	6

Basic module in biology for students who do not have SC level Biology:

AGRI1000	Structure and Function of Multicellular Organisms and Ecosystems	45+0	-
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AGRI2000 - Practical Training can be undertaken either in year 1 or in year 2

Total no. of credits: 106

11. Programme Plan – BSc (Hons) Food Safety & Quality

YEAR 1			
Code	Module Name	Hr/Yr L+P	Credits
AGRI 1011Y(1)	Food Microbiology	60+60	6
AGRI 1012Y(1)	Biochemistry and Nutrition	75+30	6
AGRI 1014Y(1)	Food Chemistry and Food Analysis I	60+60	6
AGRI 1041Y(1)	Introduction to Agricultural Production	45+0	3
AGRI 1052Y(1)	Chemistry Fundamentals and Laboratory Techniques	30+60	4
AGRI 1055Y(1)	Basic Food Hygiene	45+30	4
AGRI 1065Y(1)	Introduction to Food Engineering	45+45	4
MGT 1111(1)	Organisation and Management	D.E.	3
AGRI 1000	Structure and Function of Multicellular Organisms and Ecosystems	45+0	-
GEM (1)		-	6
YEAR 2			
Code	Module Name	Hr/Yr L+P	Credits
AGRI 2015Y(3)	Food Chemistry and Food Analysis II	75+30	6
AGRI 2019Y(3)	Molecular Biology	30+30	3
AGRI 2020Y(3)	Sensory Analysis	30+30	3
AGRI 2039Y(3)	Statistics and Research Methodology	45+60	5
AGRI 2105Y(3)	Food Processing	75+30	6
AGRI 2106Y(3)	Food Testing and Statistical Control	30+45	3
AGRI 2107Y(3)	Food Quality Management Systems	45+30	4
AGRI 2108Y(3)	Food Safety Management Systems	45+30	4
AGRI 2080Y(3)	Advanced Food Microbiology	30+30	3
AGRI 2100	Scientific Communication Skills	20+0	-
YEAR 3			
Code	Module Name	Hr/Yr L+P	Credits
AGRI 3000Y(5)	Project		9
AGRI 3014Y(5)	Food Legislation	45+0	3
AGRI 3069Y(5)	Food Product Development	15+0	1
AGRI 3088Y(5)	Postharvest Management	45+0	3
AGRI 3089Y(5)	Developments in Food Safety and Quality	60+0	4
AGRI 3090Y(5)	Advanced Nutrition and Food Toxicology	60+0	4
AGRI 3076Y(5)	Novel Foods and Food Ingredients	45+0	3

AGRI 1000: Only for students who do not have SC level Biology

AGRI 2000 - Practical Training can be undertaken either in year 1 or in year 2

Total no. of credits: 106

12. Outline Syllabus

AGRI 1011Y(1) – FOOD MICROBIOLOGY

Microbial diversity, structures and functions. Microbial physiology. Growth and survival. Control of microorganisms. Food spoilage. Food-borne illness. Useful micro-organisms. Microbiological examination of foods. Specifications and standards.

AGRI 1012Y(1) – BIOCHEMISTRY AND NUTRITION

Basic concepts of biochemistry and cell biology. Structure and function of biological molecules. Enzymes and reaction kinetics. Metabolic pathways. Essential principles and processes of cell and molecular biology.

Sources and functions of nutrients. Major Diet-related diseases. Nutritional requirements. Concept of Healthy eating. Energy balance and weight control. Digestion and absorption of food. The effect of processing on nutrients.

AGRI 1014Y(1) – FOOD CHEMISTRY AND FOOD ANALYSIS I

pH and acid-base equilibria. Buffers: functions and uses. Acid-base titrations, indicators and titration curves. Potentiometric titration. Chemical kinetics. Partition coefficients. The chemistry of food constituents: water, carbohydrates, lipids, proteins, vitamins and minerals. Browning in foods. Colloid chemistry of food systems.

Sampling and errors in food analysis. Sample preparation. Instrumental methods of food analysis.

AGRI 1041Y(1) – INTRODUCTION TO AGRICULTURAL PRODUCTION

Fundamentals of animal management and production: nutrition; feeds and feeding; reproduction and breeding; animal welfare and health; housing and equipment; Introduction to farm animal industries, their products and by-products: matching production of quality and safe food with protection and care of the environment. Sustainable food production. Food security concepts.

Classification of food crops and their economic importance. Fundamentals of food crop production: agro-climatic requirements; planting materials; crop establishment; plant nutrition; irrigation; crop protection; harvesting and postharvest practices. Good Agricultural Practices and sustainable crop production. Introduction to food crop production enterprises. Processed products from commercial food crops.

AGRI 1052Y(1) CHEMISTRY FUNDAMENTALS AND LABORATORY TECHNIQUES

Basics of organic, inorganic and physical chemistry. Structures of atoms, molecules, bonding, orbitals. Reactions and stoichiometry. Reaction rates and equilibrium. Acid/base redox reactions. Isomerism. Stereochemistry. Free radicals. Electrophilic, nucleophilic reactions. Spectroscopic techniques.

Physical and chemical methods of analysis. Preparation of standard solutions. Standardisation of reagents. Volumetric methods (acid-base titrations; redox titrations). Spectrophotometric methods.

AGRI 1055Y(1) BASIC FOOD HYGIENE

Food safety, quality, hygiene and security definitions and concepts. Sustainable development concepts. Factors which affect food safety and quality. Basic food hygiene principles and practices: plant, equipment, environmental and personnel hygiene. Implementation of food hygiene throughout the food chain. Codex general principles of food hygiene. Relevant codes of practice: Good Agricultural Practice (EUREPGAP, APEXHOM GAP); Good Catering Practice (GCP); Good Manufacturing Practice (GMP); Good Hygienic Practice (GHP); Good Food Safety Practices (SGS Mauritius). Monitoring of effectiveness of food hygiene practices.

AGRI 1065Y(1) – INTRODUCTION TO FOOD ENGINEERING

Basic engineering principles of food processing operations: units, dimensions and system conversions. Material and energy balance. Thermodynamics. Heat and mass transfer. Heat exchangers. Solid and fluid rheology. Fluid flow. Pumps.

MGT 1111(1) - ORGANISATION & MANAGEMENT

Management Concepts and Functions. Development of Management Theories. The Internal and External Environments of the Organisation. Social Responsibility and Ethics in Management. Managerial Decision Making. The planning process. The nature of Organisation Structure. Organisational Control. Contemporary issues in Management. Management in Future.

AGRI 1000 – STRUCTURE AND FUNCTION OF MULTICELLULAR ORGANISMS AND ECOSYSTEMS

Introduction to unity in biological sciences. The structures and processes common to all living things at the cellular and molecular levels are introduced in the first part of the course followed by genetic principles and processes, and an overview of evolutionary concepts. Finally basic concepts on evolution and the diversity of living things (including bacteria, plants, fungi and animals) will be explored. Ecosystems and the relationship of organisms to their environment will also be considered.

AGRI 2015Y(3) – FOOD CHEMISTRY AND FOOD ANALYSIS II

The chemistry of natural pigments, flavours and major food products including dairy products, seafood products, fat products, meat, egg, cereals, fruits and vegetables. Chemistry and applications of food additives: sugar replacers; antimicrobial agents; antioxidants; colouring agents. Chemistry and mechanisms of fat modification processes to control formation of trans fatty acids.

Qualitative and quantitative methods of food analysis. Control of factors which affect the reliability of analyses. Good Laboratory Practices. Sampling plans and methods. Sample preparation. Validated and standard methods of food analysis. Application of physical, chemical, biochemical, immunological, instrumental and sensory methods to determine nutritive value, quality, safety and compliance with food standards. Analysis of selected food products. Structure and content of scientific reports.

AGRI 2019Y (3) – MOLECULAR BIOLOGY

Gene structure and organisation. DNA replication, repair and recombination. Gene expression and modification processes. Modification of genetic content. Principles of gene cloning. Recombinant DNA technology and genetically modified organisms.

AGRI 2020Y (3) – SENSORY ANALYSIS

Physiology and psychology of perception. The senses. Sensory characteristics of foods. Types of sensory evaluation methods. Establishment of sensory panels. The sensory laboratory. Setting up sensory facilities. Experimental design and statistical analysis of sensory data. Analytical and affective sensory tests. Training of panelists for quantitative descriptive analysis. Writing up a sensory report. Ethical and professional issues. Relevant ISO standards for sensory analysis.

AGRI 2039Y(3) - STATISTICS AND RESEARCH METHODOLOGY

Introducing statistics in food science. Descriptive statistics – summarising and displaying data. Probability distributions. Point and Interval Estimation. Hypothesis Testing. Analysis of Categorical data. Regression Analysis. Design and Analysis of Experiments. Data entry and analysis using EXCEL & MINITAB. Elements of Research Methodology. Qualitative and Quantitative Research. Sampling Methods. Questionnaire development, design and administration. Data coding and processing using SPSS. Elements of scientific and technical writing.

AGRI 2105Y(3) – FOOD PROCESSING

Principles of food preservation using low and high temperatures, reduced water activity, chemicals, radiation. Modified atmospheres in food preservation. Source and variability of agricultural produce and their impact on food processing operations. Processing of food commodities including milk, egg, seafood, meat, poultry, fish, fruits and vegetables, cereals and vegetable oils. Effects of processing on product quality. Alternatives to heat processing including ionising radiation, microwave and high pressure. Process control and validation of critical process parameters including time, temperature, pressure and flow rate.

AGRI 2106Y(3) – FOOD TESTING AND STATISTICAL CONTROL

Codex and standard sampling plans. Application of sampling plans and methods to determine compliance of raw materials and finished products with standards. Assessment of food quality and safety characteristics. Good practices in food inspection and testing. Food authentication, detection of Genetically Modified foods, irradiated foods and allergens. Monitoring of chemical food safety hazards in the food chain.

Inherent and assignable causes of process variation. Measurement of variation associated with food production processes. Estimation of proportion defectives based on process mean and spread. Calculation of process capability indices. Development and application of variable and attribute Shewart Control Charts in food businesses for process control and improvement. Case studies on development and application of Shewart Control Charts in food production.

AGRI 2107Y(3) – FOOD QUALITY MANAGEMENT SYSTEMS

Definitions and relationships between quality and quality management concepts. Food laws, standards and specifications. Evolution of quality management approaches. Quality management principles. Quality management system standards (ISO 9001). Quality management system documentation and auditing. Food product identification and traceability. Codes of practice and quality standards for food laboratories (ISO 17025). Validation of methods of food analysis (accuracy, precision, sensitivity, uncertainties). Management of food processing wastes. Environmental Management Systems (ISO 14001). Occupational Health & Safety. Social Accountability. Certification and standardisation. Reported benefits and constraints associated with effective implementation of quality management systems in food businesses in Mauritius and world-wide. Case studies on development and implementation of quality management systems in food businesses.

AGRI 2108Y(3) – FOOD SAFETY MANAGEMENT SYSTEMS

Importance of food safety management throughout the food chain. Food safety hazards: primary sources, characteristics, adverse health effects, implicated foods and control measures. Food safety risks. Actual and perceived risks. Risk analysis (Risk Assessment, Risk Management, Risk communication). Food Safety Risk Assessment.

Comprehensive food safety management systems. Relationships between quality, environment and food safety management. Pre-Requisite Programmes (PRPs). Codex guidelines for mass catering. Codex guidelines for the Hazard Analysis Critical Control Point (HACCP) system. Application of the seven HACCP principles to selected food processing and catering operations. HACCP experience of food businesses in Mauritius and world-wide. Psychological barriers to HACCP development, implementation and maintenance. HACCP training. Validation and verification of food safety management systems. ISO 22000 food safety management system standard. British Retail Consortium food safety standards.

AGRI 2080Y(3) – ADVANCED FOOD MICROBIOLOGY

Microbiological Criteria for foods. Standard sampling plans for microbiological examination of foods. Microbiological food safety hazards. Emerging pathogens. Monitoring of microbiological food safety hazards in the food chain. Epidemiological data on foodborne disease outbreaks. Foodborne disease surveillance. Microbiological food safety risk assessment (hazard identification, hazard characterization, exposure assessment and risk characterisation). Validation of heat processing and cooking conditions for destruction of microbiological food safety hazards. New methods and technologies in the detection of micro-organisms. Molecular tools for microbiological detection and characterisation. Predictive microbiology and shelf life determination.

AGRI 2100 – SCIENTIFIC COMMUNICATION SKILLS

Avenues of communication in science. Scientific and technical writing. Oral and poster presentations. Ethics of scientific publishing.

The dissertation guidelines. Planning and managing the dissertation writing up process – effective literature search and review, introduction, methodology, results, discussion, conclusions, referencing rules and plagiarism.

AGRI 2000 – PRACTICAL TRAINING

Students are required to undergo a full-time practical training of 6-8 week duration during the winter vacation, either in year 1 or in year 2. The practical training placement may take place in food industries/research institutions/private or public food laboratories. The aim is to contextualise learning within real-life work environments related to the field of study. Students are required to submit a training placement portfolio.

This module does not carry any credit, but training must be completed satisfactorily for the award of the degree.

AGRI 3000Y(5) – PROJECT

This is a very important component of the programme, allowing students to develop high level skills and cognitive abilities. Every student will be allocated a research topic and the research work will be carried out under supervision. The student is required to investigate a topic/problem, plan and execute the research work, as well as present and discuss the results. The project may be industry based and may address a research problem in the food industry. The student will have to submit a dissertation at the end of the final year. Students should demonstrate good practice in using skills and knowledge acquired and follow guidelines as laid down.

AGRI 3014Y(5) – FOOD LEGISLATION

FAO guidelines for national food control systems. Mauritius food control system. Mauritius current Food Act. Food inspection by authorised officers. British food control system. European food legislation. Food Labelling controls. Nutritional labelling. Control of nutritional and health claims. Codex Alimentarius Commission. World Trade Organisation. Elimination of tariff and technical barriers to food trade. Regional Free Trade Areas. Agreements on Sanitary and Phytosanitary measures (SPS) and Technical Barriers to Trade (TBT).

AGRI 3069Y(5) - FOOD PRODUCT DEVELOPMENT

Integration and application of acquired competencies through group learning activities to select and develop a food product based on a valid scientific, business, environmental and social rationale. Group learning activities for selected food product: relevant food standards; literature search and scientific thinking to propose a food product formulation and process; processing inputs and methods; pre-requisite programmes and HACCP plan; appropriate food packaging; food label; nutritional labelling and health claims; target markets and consumers. Communication of guidelines for implementation and assessment of group learning activities by module co-ordinator in the first week of the final year. Interactive sessions with lecturer(s) to guide students and monitor progress of learning activities.

AGRI 3088Y(5) - POSTHARVEST MANAGEMENT

Introductory postharvest biology. Postharvest losses, loss assessment and loss reduction technologies. Pre-harvest factors and postharvest quality. Maturity indices. Quality standards. Field harvesting. Handling and packinghouse operations. Cool chain management. Storage. Case-studies: fresh produce transportation; commercial fruit ripening; and marketing standards. Field trips: postharvest enterprises.

Role and functions of packaging. Packaging materials. Selection and evaluation of packaging. Package design. Modified atmosphere packaging. Sustainable packaging. Case-studies: packaging of selected food products.

AGRI 3089Y (5) - DEVELOPMENTS IN FOOD SAFETY AND QUALITY

Emerging food safety hazards. Consumer research methods and outcome: expectations of food quality; food safety risk perception; food safety knowledge, attitude and behaviour. Research on the implementation of food safety and quality management in food businesses world-wide and in Mauritius. Food traceability systems. Phytochemicals and natural antioxidants. Research and development of new food products to meet consumer needs: low/no fat; low/zero calorie; diabetic; halal; vegetarian; food additive free; GMO (Genetically Modified Organisms) free, allergen free, organic, trans fatty acid free.

AGRI 3090Y(5) ADVANCED NUTRITION AND FOOD TOXICOLOGY

Nutrition and well-being. Dietary intolerance. Diet related diseases and eating disorders. Nutritional research methods. Nutrition education. Functional foods and emergence of the “food-drug interface” concept. Nutraceuticals. Health significance of trans fatty acids and conjugated linoleic acids. Probiotics and prebiotics.

Toxicity testing protocols. Safety evaluation of food additives. Scientific Advisory Committees. Determination of NOAEL (No Observable Adverse Effect Level) and ADI (Acceptable Daily Intake). Agrochemicals and environmental contaminants including dioxins. Toxicological evaluation of pesticide residues. Determination of MRL (Maximum Residue Limits), TDI (Tolerable Daily Intake).

AGRI 3076Y(5) NOVEL FOODS AND FOOD INGREDIENTS

Definition of novel foods. Food safety risk assessment for Genetically Modified foods. Use of Genetic Modification in the production of food additives and other food ingredients. Regulatory control of novel foods. Consumer demand and acceptance of novel foods. Application of nanotechnology in food manufacture: potential benefits and food safety risks. Nano-crystals as novel food ingredients including potential fat replacers. Other novel foods and food ingredients.

15 August 2011