



UNIVERSITY
TECHNOLOGY,
MAURITIUS

School of Health Sciences

Certificate in Food Science and Biosecurity

PROGRAMME DOCUMENT

VERSION 1.0

CFSB v1.0
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Certificate in Food Science and Biosecurity

A. PROGRAMME INFORMATION

Food science and biosecurity are fundamental tools required for the development of sustainable agriculture and for the innovative advancement of food production, product development and services. When integrated appropriately into the food sector, knowledge in this field will be of significant assistance in meeting the needs of an expanding and increasingly urbanized population in the next millennium.

Food science is a discipline that encompasses chemistry, biology and nutrition to study the nature, properties and composition of foods and the changes which they undergo during storage and processing. Students will gain an understanding of operations and innovative procedures that are applied for the preservation of foods, enhancement of texture, flavor and nutritional composition in the food processing industry. Product development, quality management and food safety and hygiene will also be covered. Biosecurity is a strategic and integrated approach that explores the policy and regulatory frameworks that analyze and mitigate risks in sectors related to food safety, animal plant life and health and associated environmental risks. Through this programme, students will learn how to characterize plant pests and animal diseases, the impact of genetically modified organisms on the food industry and management techniques of invasive alien species. Overall, the concept of biosecurity has a direct relevance to the sustainability of agriculture, food safety and protection of the environment, including biodiversity.

This certificate programme may be of interest to food industry personnel seeking to upgrade their present qualifications, technical sales and marketing personnel, dieticians, nutritionists or food and public health inspectors wishing to expand their knowledge base. This programme will also provide recognition to those individuals who wish to pursue further studies in the field of agriculture, food science or food security.

B. PROGRAMME AIMS

This programme aims to provide:

- a framework for the acquisition of a comprehensive understanding of food processing, product development, quality management, safety and hygiene; using biotechnological tools to address food-related industrial problems, regulatory frameworks and legislative measures to enhance product quality; applicable to professional practice and research in this area.
- an insight on environmental science, the latter intimately linked with food production and processing; while looking into aspects of sustainable measures in agricultural practices.
- not only specialist knowledge, but also an extensive perspective of intellectual, ethnical and social issues related to food sciences and food biosecurity.
- the opportunity for development of transferable skills, including effective communication, use of information technology, report-writing, scientific literature reviewing and working as part of a team.
- independent learning and improve on students' cognitive skills such as scientific and creative thinking, critical analysis and logical problem solving skills.

C. PROGRAMME OBJECTIVES

Upon completion of this programme, the student shall have:

- acquired a good understanding of food composition, classification of macronutrients and their contribution in daily nutritional aspects to improve health status; while demonstrating a good grasp of the detrimental effects of malnutrition on health via nutrition-related diseases.
- Knowledge of the bioactive components of food and the importance of functional foods and its nutraceutical traits. This will also create a platform to understand the basis of clinical trials for biosafety and applications of nutraceuticals.
- gained the technical know-how with respect to lab-based techniques for analysis of food components while looking into chemical and biological contaminants of food. Investigative steps such as microbiological screening methods and factors catalyzing the growth of pathogenic micro-organisms will also be taught.
- developed insights about quality control and quality management principles which are essential pre-requisites to ensure food safety and hygiene practices; the latter which include ISO, HACCP, and FSMS as a whole.
- understood the different techniques used in food processing from a critical point of view with a fair assessment of their respective pros and cons; new innovative technologies to assist in food processing while ensuring protection of food quality and safety.
- Knowledge of the various biotechnological applications used in the agro-industry for food production and processing. This will also highlight the notions of biotechnology with a snapshot on molecular and cellular biology as well as an understanding of basic genetics and proteomics features.

Part I - REGULATIONS

D. GENERAL ENTRY REQUIREMENTS

As per UTM 'Admissions Regulations', and 'Admission to Certificate and Diploma Programmes'

E. PROGRAMME ENTRY REQUIREMENTS

N/A

F. PROGRAMME MODE AND DURATION

Full Time – Minimum duration 1 year (2 semesters)

Maximum duration 3 years (6 semesters)

Part Time – Minimum duration 1.5 years (3 semesters)

Maximum duration 3.5 years (7 semesters)

G. TEACHING AND LEARNING STRATEGIES

This programme will consist of a wide variety of teaching methods, including lectures, individual or group projects, presentations, workshops, seminars, case studies and site visits may also be conducted. Self-learning is a key feature of the programme, enabling students to explore, investigate and research various issues related to Food Science and Biosecurity.

H. STUDENT SUPPORT AND GUIDANCE

In addition to traditional lectures, individual or group tutorial sessions are arranged for students.

I. ATTENDANCE REQUIREMENTS

As per UTM Regulations.

J. CREDIT SYSTEM

Each module is equivalent to 3 or 4 credits as per the Programme Structure and Plan. All modules will carry 100 marks

1 credit = 15 hours of lecture

1 credit = 30 hours of practical/tutorial/seminar/Directed-Study

Total number of credits for the programme = 33 credits.

K. STUDENT PROGRESS AND ASSESSMENT

Students are expected to clear all the listed modules for the award of the certificate. All modules will have equal weightage, except where specified.

Written examinations will be of a maximum of 3 hours' duration and will carry up to 70% of the total marks. Continuous assessment will carry up to 30% of the total marks and will be based on group work, presentations, class tests and/or assignments, etc.

L. EVALUATION OF PERFORMANCE

Grade	Marks x (%)
A	$70 \leq x \leq 100$
B	$60 \leq x < 70$
C	$50 \leq x < 60$
D	$40 \leq x < 50$
F	$x < 40$
A-D	Pass
F	Fail

M. PROGRAMME DEVELOPMENT COMMITTEE:

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Part II - PROGRAMME STRUCTURE & SYLLABUS OUTLINE

N. Certificate in Food Science and Biosecurity

PROGRAMME STRUCTURE AND PLAN- (FULL-TIME)

Semester 1		YEAR 1				Semester 2	
Code	Modules	Hrs/Wk L+T/P+ DS	Credits	Code	Modules	Hrs/Wk L+T/P+ DS	Credits
CFSB1101	Fundamentals of Food Science and Nutrition	2+2+2	4	CFSB 1201	Food Chemistry and Analysis	2+1+1	3
CFSB1102	Principles of Environmental Management and Agriculture	2+2+2	4	CFSB 1202	Food Safety Management Systems	2+1+1	3
CFSB1103	Functional Foods and Nutraceuticals	2+1+1	3	CFSB 1203	Innovative Food Processing Techniques	2+1+1	3
CFSB1104	Nutrition Education and Health Promotion	2+1+1	3	CFSB 1204	Food Biotechnology and GMOs	2+1+1	3
CFSB1105	Food Microbiology and Toxicology	2+1+1	3	CFSB 1205	Food Product Development and Entrepreneurship	2+2+2	4

PROGRAMME STRUCTURE AND PLAN- (PART-TIME)

Semester 1		YEAR 1				Semester 2	
Code	Modules	Hrs/Wk L+T/P+ DS	Credits	Code	Modules	Hrs/Wk L+T/P+ DS	Credits
CFSB1101	Fundamentals of Food Science and Nutrition	2+2+2	4	CFSB1104	Nutrition Education and Health Promotion	2+1+1	3
CFSB1102	Principles of Environmental Management and Agriculture	2+2+2	4	CFSB1105	Food Microbiology and Toxicology	2+1+1	3
CFSB1103	Functional Foods and Nutraceuticals	2+1+1	3	CFSB 1201	Food Chemistry and Quality Analysis	2+1+1	3
				CFSB 1202	Food Safety Management Systems	2+1+1	3
Semester 1		YEAR 2					
Code	Modules	Hrs/Wk L+T/P+ DS	Credits				
CFSB 1203	Innovative Food Processing Techniques	2+1+1	3				
CFSB 1204	Food Biotechnology and GMOs	2+1+1	3				
CFSB 1205	Food Product Development and Entrepreneurship	2+2+2	4				

O. MODULE OUTLINE

Year 1, Semester 1

- **CFSB1101 Fundamentals of Food Science and Nutrition**

Chemical structure and nature of macronutrients: carbohydrates, proteins and lipids, Gastrointestinal anatomy, Principles of digestion, absorption and assimilation, Micronutrients: fat- and water-soluble vitamins, minerals, Water and dehydration, Somatotyping, Energy metabolism, Classification and nutritional content of foods, Dietary reference values (DRV), Reference daily Intake (RDI), Basic nutritional guidelines across gender, age-groups and health status, Nutrition-related diseases and disorders, Sports nutrition, Food additives, Effect of hormones, antibiotics and pesticide use in farming, Analysing food labels, Food choices across cultures

- **CFSB1102 Principles of Environmental Management and Agriculture**

Principles of environmental science, Ecological systems (landscape, community, population ecology, natural resource management), Environmental biodiversity, Conservation practices, Environmental legislation and policies, environmental management systems (approaches to policy and management; role of different stakeholders/decision-makers, environmental governance, EU Eco-Management & Audit Scheme (EMAS), ISO), Urban land management, Environmental Indicators (Life Cycle Assessment (LCA), Environmental Performance Indicators (EPIs)), Life Cycle Screening & Costing, Environmental technology, Environmental sampling and monitoring systems (tools & techniques), Environmental Impact Assessment (EIA), Emerging green technologies, Environmental security & sustainable development, Sustainable agricultural practices & environmental preservation techniques (organic farming, aeroponics & aquaponics systems)

- **CFSB1103 Functional Foods and Nutraceuticals**

Defining functional foods and nutraceuticals, Phytochemicals and polyphenols, Free radicals and Oxidative stress, Health benefits of functional foods: metabolic syndrome, heart disease, weight loss, cognitive function, diabetes, cancer etc., Evidence-based cellular and molecular mechanisms, Clinical trial testing for safety and efficacy, Extraction, isolation and analysis techniques, Application and benefits of Probiotics, soy-based products, fermented food and beverages, marine-derived products, plant-based nutraceuticals, dietary fibers, Regulations, guidelines and policies governing product development, testing and marketing, Evaluation of functional foods as complementary and alternative medicine (CAM)

- **CFSB1104 Nutrition Education and Health Promotion**

Role of nutritionists, Understanding social, cultural and economical influences on nutrient intake, Consumer and behaviour models, Core indicators for monitoring health, Health literacy, Designing, implementing and evaluating health education and nutrition education programmes, Communication skills: voice control, body language and gestures etc., Health promotion strategies across age groups and literacy levels, Cultural sensitivity skills, Role of media in health promotion, Application of m-health and e-health, Design concepts for health education material, public speaking skills

- **CFSB1105 Food Microbiology and Toxicology**

Role of food microbiologist, Characteristics and classification of bacteria and fungi, Role of microorganisms in deterioration and food spoilage, Intrinsic and extrinsic growth control factors, Sources of food contamination, Methods of food sampling, Practical techniques for detection, isolation and identification of microorganisms and toxins, Fermentation science in productions of beverages, meats, vegetal foods and other food stuffs, Fermentation and innovative food product development, Food-borne microorganisms and toxins, Natural and synthetic food toxin formation during production, storage, handling and preparation, Dose-response relationships, Absorption, distribution, storage, biotransformation and elimination of food toxicants, Target organ toxicity, Adverse effects, treatment and prevention of food illnesses and food allergies, Risk assessment, Risk control

- **CFSB1201 Food Chemistry and Analysis**

Concepts of water activity and as a solvent in food systems, Applications and biochemical reactions of carbohydrates: isomerization, caramelization, Maillard browning etc., Types and uses of starch and modified starch, Process of starch gelatinization and staling, Applications and biochemical reactions of lipids: hydrogenation, oxidation, Emulsification, Amino acid nomenclature and protein interactions, Enzyme kinetics, Role of enzymes in food systems: baking, brewing, fermentation etc., Enzymes as food colorants, additives and flavor enhancers, Biochemical considerations for ripening and storage of foods, Chemistry of fat soluble and water soluble vitamins, Atomic Absorption, Spectrophotometry, Chromatography: TLC, HPLC, GC- MS, Sampling and sample preparation techniques, Direct and indirect moisture determination: evaporation, distillation, Ash and total mineral analysis, Lipid content determination, Protein content determination, Carbohydrate analysis: simple sugar and reducing sugar content, enzymatic determination of starch, Dietary fibre analysis

- **CFSB1202 Food Safety Management Systems**

Food safety & Quality, Factors compromising food quality, Food Contaminants (physical, chemical and biological), Food fraud & terrorism, Analytical parameters for food safety (Aesthetic, Organic/Inorganic determinants), Microbiological & chemical performance in food safety & public health, Food safety audits & inspection, Enhancing food quality via hygiene design and practices, Food safety policies, Food tracking & traceability, Quality Control practices, Principles of Food Safety Management Systems (FSMS), Hazard Analysis and Critical Control Point (HACCP), ISO 22000, Global Food Safety Initiative (GFSI), Safe Quality Food (SQF), Risk management, Evaluation and Communication (food businesses), Hazard and Operability Study (HAZOP), Food legislation in Mauritius: Food Act 1998 and Food Regulations 1999

- **CFSB1203 Innovative Food Processing Techniques**

Principles of food processing (meat, dairy & seafood), Food characteristics and shelf-life, Raw material preparation, Techniques for size reduction of solid foods, Separation and concentration techniques for food components, Heat processing methods (blanching, pasteurisation, heat sterilization), Modified Atmospheres and food processing, Enzymes in food processing, Ultrasonics in food processing, Food bioprocessing (upstream and downstream equipment), Bioreactors for food bioprocess operations, High-Pressure Processing, Equipment design for food processing, Pulsed Electric Fields Processing for food, Osmotic Dehydration during food processes, Food irradiation, & microwave applications, Supercritical fluids and food processing, Issues arising from food processing (biofilms, resistant mycotoxins, biohydrogen gas, antioxidants persistence, biogenic amines), Traditional food processing techniques and micronutrients bioavailability, Principles of food preservation (temperature-mediated methods, pH modifications (Salting/lye), curing practices, fermentation, microbiological interventions, and chemical preservatives)

- **CFSB1204 Food Biotechnology and GMOs**

Molecular biology, Understanding genetics (genes & heredity, genetic code, transcriptional and translational processes, regulatory sequences, mutations and gene functionality, chromosomal variation), Proteomics & Bioinformatics, Role of vectors and promoters in recombinant DNA technology, Modifying the genetic code: GMOs (biotechnological applications for splicing/insertion/deletion of genetic sequences: TALEN, CRISPR-Cas9, RNAi technologies), Transformation processes, Recombinant protein production, Genetically engineered micro-organisms in food processing & agriculture (biopesticides & biofertilizers), Risk assessment for GMO-derived products, Detection techniques for GMOs, Quantification of GMOs, Framework for labeling and traceability regulations for GMOs, Biosafety aspect of nutritionally enhanced foods, Issues arising from GMOs (antibiotic resistance, pests resistance), Ethical implications of GMO-derived food products, Biosafety and Lab Standard Operating Procedures, Patenting and intellectual property rights, GMOs and public health (Biotechnological applications and gene therapy), Mauritian legislation on GMOs

- **CFSB1205 Food Product Development and Entrepreneurship**

Trends & innovations in current food markets, Food product development stages (design, development and evaluation), Creativity template in food product development, Compliance during food design, Characterizing new food products (line extensions, product repositioning, reformulation of existing products, new packaging of existing products), Methods for sensorial evaluation of novel foods, Features of packaging development and practices, Factors influencing novel food products, Product life cycles, Enhancing product integrity: Quality Control practices, Role of consumer in food product development, Organizational involvement in the food development process, Competitor & market assessment for novel foods (market niches, SWOT, direct/indirect competitors, research methodology in market analysis), Venturing practices for small-food business, Conceptualization of innovative ideas into marketable products