

# M.Sc. in Food Safety and Quality Management (MSCFSQM)

## Syllabus

### First Year

#### Course-MVP-001: Food Fundamentals and Chemistry (4+0)

Block	Block Title	Unit	Unit Title
1	Introduction to food science	1	Food Basics
		2	Food from Plant Sources
		3	Foods from Animal Sources
		4	Other Foods
2	Food Chemistry	5	Water
		6	Carbohydrates
		7	Proteins and Enzymes
		8	Lipids
		9	Vitamins and Minerals
		10	Food Additives
3	Food Analysis	11	Sampling Techniques of Food Products
		12	Physical and Chemical Analysis of Foods
		13	Instrumentation in Food Analysis
		14	Sensory Evaluation of Food Products
4	Food Processing and Preservation	15	Introduction to Food Preservation and Processing
		16	Food Packaging
		17	Waste Management in Food Processing Industry

#### Course-MVPI-001 : Food Microbiology (2+2)

Block	Block Title	Unit	Unit Title
1	Fundamentals of Food Microbiology	1	Introduction to Food Microbiology
		2	Food Contamination and Spoilage
		3	Food Borne Diseases
		4	Beneficial Roles of Micro-Organisms
2	Analytical Techniques in Microbiology	5	General Techniques of Detection and Enumeration of Micro-organisms in Food
		6	Screening and Enumeration of Spoilage Micro-organisms in Food
		7	Detection of Pathogens in Food
		8	Rapid Detection Technique for Food Micro-organisms
	Practical Manual	1	Introduction to the Basic Microbiology Laboratory Practices
		2	Cleaning and Methods of Sterilization
		3	Cultivation and Sub-culturing of Microbes
		4	Staining Techniques
		5	Standard Plate Count Method
		6	Direct Microscopic Examination of Foods
		7	Enumeration of Fungi (Yeasts and Molds)
		8	Assessment of Air using Surface Impingement Method
		9	Assessment of Surface Sterilization using Swab and Rinse Method
		10	Detection of Coliforms and Indicator Organisms (1) Most Probable Number
		11	Detection of Coliforms and Indicator Organisms (2) Confirmed and Completed Tests, Membrane Filter

			Techniques
		12	EXPERIMENT 12 Interpretation of Microbiological Data and its Inferences

### Course-MVP-002 : Food Laws and Standards (4+0)

Block	Block Title	Unit	Unit Title
1	Food Safety and Standard Act, Rules and Regulations	1	Food Safety and Standard Act, 2006
		2	Food Safety and Standards Rules and regulations - Standards
		3	Food Safety and Standards Rules and regulations, - Procedures
		4	Inspection and Audit
2	Global Scenario	5	Codex Alimentarius Commission (CAC)
		6	WTO Implications
		7	Other International Standard Setting Bodies
3	Export and Import Laws and Regulations	8	Export (Act,
		9	Export Regulations and Promotion Bodies
		10	Food import and Quarantine aspects
4	Other Laws and Standards Related to Foods	11	International regulatory bodies
		12	Other Laws Related to Food Products
		13	Voluntary National Standards: BIS and AGMARK
		14	National Agencies for Implementation of International Food Laws and Standards
		15	Food Labelling

### Course-MVP-003 : Principles of Food Safety and Quality Management (4+0)

Block	Block Title	Unit	Unit Title
1	Food Safety and Quality Management Systems	1	Introduction to Food Safety
		2	Food Safety System
		3	Total Quality Management
		4	Schedule 4 of FSSR
2	Risk Analysis	5	An Introduction to Risk Analysis
		6	Risk Management
		7	Risk Assessment
		8	Risk Communication
3	HACCP	9	History, Background and Structure of HACCP
		10	HACCP Prerequisites and Good Hygienic Practices
		11	Principles and Implementation of HACCP
		12	Case Studies on HACCP
4	Other Food Safety Practices	13	Good Agriculture Practices, Good Animal Husbandry Practices and Good Manufacturing Practices
		14	Good Retail Practices, Good Transport Practices and Nutrition Labelling
		15	Traceability Studies

### Course-MVP-004 : Food Safety and Quality Management Systems (4+0)

Block	Block Title	Unit	Unit Title
1	Management Systems, Auditing and Accreditation	1	Introduction to Management Systems
		2	Auditing
		3	Standardization and Accreditation
2	Quality Management	4	ISO-9001:2015 - An Overview
		5	ISO-9001:2015 – Structure

	System	6	Clause wise Interpretation of ISO 9001:2015
		7	ISO 9001:2015- Case Studies
3	Food Safety Management Systems	8	ISO 22000:2018 - An overview
		9	Clause Wise Interpretation of ISO 22000
		10	ISO 22000:2018 - Food Safety Plan
		11	ISO 22000:2018 - Case Studies
4	Laboratory Quality Management System	12	An Overview and Requirements of ISO 17025
		13	Requirements Specific to Food Testing Laboratories - Physical and Chemical Parameters
		14	Requirements Specific to Food Testing Laboratories - Biological Parameters
		15	General Topics: Related to Food Testing Laboratories
5	Retailer Standards	16	BRC Food and BRC/IOP Standards - An Overview
		17	International Food Standard (IFS)
		18	SQF 1000 and SQF 2000
		19	Global GAP and India GAP

### Course-MVPL-001 : Food Safety and Quality Auditing (0+4)

Practical Manual	1	Visit to a nearby Food Establishment
	2	GHP and GMP in a Food Factory a) Identifying the Key Focus Areas for GHP and GMP b) Identifying Gaps in its Implementation c) Closure Plans for Identified Gaps in a Food Factory/ Food Outlet
	3	Developing the Process Flow for the Food Establishment Including all the Inputs, Outputs and Interim Loops
	4	Development of Methodology (Decisions Trees) as per Clause 7.4.4 of ISO 22000 for a Food Establishment
	5	Developing FSMS (Module 1) a) Data Collection and Hazard Identification (Physical, Chemical and Biological) b) Hazard Analysis (Using FMEA Technique for Risk Assessment)
	6	Developing FSMS (Module 2) a) Development of OPRP (Operational Pre-requisite Programme) and Development of HACCP Plan (Critical Limits including Rationale for Limits), Monitoring Procedure, Correction and Corrective Measures) b) Managing Unsafe Product
	7	Developing FSMS (Module 3) a) Verification and Validation of Control Measures (OPRP and HACCP Plan) as per Codex Guidelines on Validation b) Emergency Situation, Preparedness and Response Plan c) Communication (External and Internal)
	8	Developing FSMS (Module 4): Traceability System as a Tool for, Recall/ Withdrawal (ISO 22005: 2007)
	9	Application of ISO 9001 Model a) Understanding Process Approach b) Defining Quality Policy and Objectives c) Correction, Corrective Action and Preventive Action d) Continual Improvement
	10	Food Laws (Module 1) Identification of Legal Requirements for following Food Groups/Products/Standards: a) Fruits and Vegetable Products b) Dairy products c) Meat and Meat Products d) Cereal/Pulses/Oil Seeds Products e) Fish and Sea Foods f) Ready to Eat Foods
	11	Food Laws (Module 2) Hygienic Requirements for Manufacturing Premises as Prescribed by Law
	12	Food Laws (Module 3) Design a Label for any Food Product

	13	Matrix Preparation to Find Correspondence between ISO 22000, HACCP Series and BRC and any other Related Standard (Food Retail Management-Basic Requirements)
	14	Understanding ISO 17025 Requirements for 9001 and Clause 8.3 in ISO 22000:2005
	15	Audit Planning a) Role and Responsibilities of Auditors and Lead Auditors and Pre-audit Information Required to Plan the Audit (Module 1) b) Preparation of an On-site Audit Plan that is Appropriate to the Audit Scope (Stage 1 and Stage 2) (ISO:22003 and 17021) (Module 2)
	16	Produce an Audit Checklist Including Salient Features of ISO 9001 and FSMS 22000 (Module 3)
	17	Document Review as per the Case Study (Module 4)
	18	Auditing (Module 5) a) Conducting the Opening Meeting and Closing Meeting (as per ISO: 19011) b) Establishing Qualification Criteria for Auditors and Lead Auditors (ISO 17021 and ISO 22003 for a Food Industry)
	19	Mock Audit Exercise to Develop Interpersonal Skills Information Gathering Techniques and Exercising Objectivity in the Review of Evidences Collected (Module 6)
	20	Post Audit Activities (Module 7) a) Report Writing, including Writing Valid, Factual and Value adding Non-conformity Report b) Proposals for Corrective Action and Follow Up

### Course-MVPL-002 : Chemical Analysis and Quality Assurance (0+4)

Practical Manual	1	Calibration of Glassware
	2	Preparation of Standard Volumetric Solutions
	3	Determination of Moisture in Food Products by Hot Air Oven-drying Method
	4	Determination of Moisture in Food Products Using Karl Fischer Titration Method
	5	Determination of Moisture in Food Products by Dean and Stark Method
	6	Determination of Protein Content in Food Products by Kjeldahl Method
	7	Determination of Crude Fat in Foods by Soxhlet Extraction Method
	8	Determination of Total Fat in Foods by Rose Gottlieb Method
	9	Determination of Volatile Oil in Spices
	10	Determination of Starch in Cereal Grains by Acid Hydrolysis Method
	11	Determination of Starch in Cereal Grains by Glucoamylase Method
	12	Determination of Crude Fibre in Food Sample
	13	Determination of Total Ash Content in Food Products
	14	Determination of Acid Insoluble Ash in Food Products
	15	Determination of pH of Food Products by Using pH Meter
	16	Determination of Free Fatty Acids and Acid Value in Oils and Fats
	17	Determination of Unsaponifiable Matter in Oils and Fats
	18	Determination of Melting Point or Solidification Point of Oils and Fats
	19	Determination of Refractive Index of Oils and Fats
	20	Determination of Specific Gravity of Oils and Fats
	21	Determination of Titre Value of Oils and Fats
	22	Determination of Colour of Oils and Fats by Lovibond Tintometer
	23	Determination of Iodine Value in Oils and Fats
	24	Determination of Saponification Value in Oils and Fats
	25	Determination of Acetyl Value and Hydroxyl Value in Oils and Fats
	26	Determination of Allyl Isothiocyanate in Mustard Oil
	27	Determination of Reichert Meissl (RM) Value and Polenske Value (PV) in Oils and Fats
	28	Determination of Peroxide Value of Oils and Fats

	29	Determination of Sodium Chloride Content in Butter
	30	Determination of Gluten Content in Wheat Flour
	31	Determination of Sorbic Acid in Food Products
	32	Determination of Copper, Zinc, Lead and Cadmium in Food Products by Atomic Absorption Spectroscopy
	33	Determination of Cholesterol Content in Ghee by GC
	34	Determination of Vitamin A Content in Ghee by HPLC
	35	Sensory Evaluation Laboratory
	36	Selection of Sensory Panelists
	37	Sensory Evaluation of Food Products–Hedonic Rating Test
	38	Judging of Milk

### Course-MVPP-003 : Project Work 1 (0+8: Project work)

#### List of Suggestive Topics

1. Study on effective implementation of correction, corrective action and preventive actions as per QMS in an organization.
2. Study on implementation of process approach as required by QMS in a organization.
3. Study of GHP of street food hawkers (Minimum 4 hawkers in one location) and report the recommendations for implementation.
4. Study of GMP in different food industries (organized and unorganized) in different food groups.
5. Development of Training Modules for workers on GMP & GHP.
6. Development of Training Modules for middle management : Internal Audit and concept and Implementation of HACCP.
7. Study on compliance to legal and customer requirements related to food safety and hygiene in a Food establishment.
8. Study on appropriate CCP identification for a food establishment as required by ISO 22000 clause 7.4.4.
9. Study on CCP Monitoring, corrective actions and verifications in a food organization and propose improvement.
10. Food Safety and Standards Act: Study of existing food laws versus Food Safety and Standards Act 2006.
11. Study on different emergency situations affecting food safety in a food establishment and propose mitigation plan.
12. Study on Internal communication in an organization for ensuring compliance to 22000 clause 5.6.
13. Study on External communication in an organization for ensuring compliance to 22000 clause 5.6.
14. Study on effective cleaning of equipment/machinery (food contact surfaces including food gloves) in a food establishment.
15. Study on hygienic practices at raw material suppliers' premises and recommendations for improvement.
16. Study on suitability of packaging material at various stages of processing (raw, intermediate and finished product) as per prescribed standards.
17. Study on compliance to labeling requirements for domestic and imported food items (minimum four different category of products).
18. Study on repeatability and reproducibility of testing methods and results in an organization.
19. Designing an ideal plant layout for a food establishment related to food safety.

20. Study on calibration techniques of instruments in food industry, food laboratories and CCP monitoring.
21. Study on Waste (liquid and solid) Management in a food establishment.
22. Study on Pest Management in a food establishment.
23. Study on existing versus idealistic process for identification, Traceability and withdrawal (recall) as per ISO 22000 and ISO 22005.
24. Study on method adopted for finalizing/establishing shelf life of a product (against declared/claim).
25. Study on allergens, intolerants (e.g Lactose) and their control in a food products.

## First Year

### **Course MVP-005: Food Toxicology and Public Health (4+0 credits)**

Block	Block Title	Unit	Unit Title
1	Introduction to Food Toxicology	1.	Basics of Food Toxicology
		2.	Biological Factors Influencing Toxicity
		3.	Determination of Toxicants in Food & Types of Toxicological Studies
		4.	Adverse Reactions to Food & Food Adulteration
2	Toxicants from Natural & Man-made Sources & Contaminants	5.	Natural Toxins from Plant, Animals, Marine Sources
		6.	Pesticide Residues in Food, their Toxicology & Safety
		7.	Heavy Metals and Contaminants in Foods
		8.	Veterinary Drugs & Antibiotic Residues in Foods and their Safety
3	Derived Food Toxicants	9.	Toxicants Generated from Processing and Packaging
		10.	Food Additives and Nutraceuticals Toxicology
		11.	Microbial & Fungal Toxins in Food and Food Poisoning
4	Food Safety and Public Health	12.	Public Health Risks related to Food
		13.	Case Studies related to Food Hazards
		14.	Epidemiology
		15.	Surveillance of Food Borne Diseases

### **Course MVP-006: Food Biotechnology (4+0 credits)**

Block	Block Title	Unit	Unit Title
	Basics of food Biotechnology	1.	Introduction to Food Biotechnology
		2.	Recombinant DNA Technology
2	Food Fermentation	3.	Food Fermentation Technology
		4.	Applications of Food Fermentation Technology-1
		5.	Applications of Food Fermentation Technology-2
3	Application of Biotechnology in Food Production	6.	Biotechnology and Food Ingredients - I
		7.	Biotechnology and Food Ingredients - II
		8.	Food applications of Enzymes
4	Advances in Food Biotechnology	9.	Application of Genetics to Food Production
		10.	Protein Engineering in Food Technology
		11.	Bioremediation
5	Challenges in Food Biotechnology	12.	Biotechnology for Food Security and Safety
		13.	GMOs and GM Food

### **Course MVP-007: Emerging Trends in Food Technology and Safety (4+0 credits)**

Block	Block Title	Unit	Unit Title
	Advanced Technologies and Food Safety	1.	Novel Processing Technologies and Food Safety
		2.	Functional Food, Nutraceuticals, Supplements and Nutrigenomics
	Emerging Trends in Food Microbiology	3.	Issues in Food Microbiology
		4.	Predictive Microbiology for Food Safety

	Technological Advances in Food Safety	5.	Novel packaging Technologies and Food Safety
		6.	Nanotechnology and Food Safety
		7.	Biosensors in Food Safety
		8.	Applications of Biosensors in Food Safety
4	Advances in Food Analysis	9	Non Invasive Food Analysis
		10	Molecular Tools for Detection of Food Pathogens
		11	Other Advanced Techniques
5	Trends and Challenges in Food Safety	12	Food Fraud and its Mitigation
		13	Entrepreneurship
		14	Digital Transformation

### Course MVP-008: Novel Technologies for Food Processing and Shelf-Life Extension (0+3 Credits)

(MOOC offered by Prof. Hari Niwas Mishra | IIT Kharagpur)

- Week 1** : Introduction to food processing, preservation and quality; Basic principles & methods, water activity vs. food stability, structure-function relationship.
- Week 2** : Chemical changes in food during processing; Browning reactions (enzymatic and non-enzymatic), protein interactions, carbohydrate interactions.
- Week 3** : High pressure processing and Membrane technologies in food processing.
- Week 4** : Food irradiation, RF & microwave heating; Super critical fluid extraction.
- Week 5** : Food extrusion technology, RTE snack foods, Textured vegetable protein, Rice and dal analogues.
- Week 6** : Hurdle technology concept, Natural antimicrobials & bacteriocin; Freeze drying.
- Week 7** : Controlled atmosphere storage of food grains; ozone, microwave treatment for disinfestation of grains; Detection of spoilage in grains.
- Week 8** : Modified atmosphere packaging, Active packaging, and Edible coating of fruits & vegetables.
- Week 9** : Extraction and processing of oil; Mechanical expellers, solvent extraction, refining, hydrogenation, winterization.
- Week 10** : Shelf life extension of oils using natural antioxidants; Concept and measurement of rancidity.
- Week 11** : Microencapsulation of bioactive, and Technology of oil powder.
- Week 12** : Functional foods and Nutraceuticals, Ready-to-eat therapeutic food, micronutrient fortified high energy bar, gluten free bread, carbonated cereal beverage.

### Course MVP-009: Research Methodology (0+4 credits)

Block	Block Title	Unit	Unit Title
1	Science and Scientific Approach	1.	Selection of Research Problem
		2.	Review of Literature
		3.	Concept and Variables, Formulation and Testing of Hypothesis
2	Research Designs	4.	Research Design
		5.	Descriptive and Survey Research
		6.	Experimental Research



3	Data collection, Sampling, Tests and Measurements	7.	Levels of Measurement
		8.	Knowledge Test Construction
		9.	Data Collection
		10.	Sampling Technique
4	Data Analysis and Reporting	11.	Quantitative Techniques
		12.	Qualitative Techniques
		13.	Statistical Analysis and Packages
		14.	Report Writing

**Course-MVPS-001 : Seminar (0+1 credit)**

The student can choose any topic related to any of the courses studied in two years of MSCFSQM and has to present the seminar in the study centre as the oral presentation.

**Course-MVPP-002 : Dissertation (0+16 credits)**

The dissertation shall be carried out under the supervision of the supervisor/guide appointed to each learner by the programme incharge/coordinator at the respective programme study centre or approved by the Programme Coordinator, School of Agriculture. The dissertation can be done at study centre/programme study centre, food testing laboratory or in the food industry/establishment. The student can select any topic related to emerging issues in the area of food safety and quality management. After completing the dissertation (thesis), the report is to be submitted to the Regional Centre for Evaluation. For Dissertation work, details are given in the Dissertation Manual for MVPP-002.

**Course-MVPP-004 : Project Work 2 -- (0+4 credits)**

This is for the lateral entry students who have taken admission with 32 credits PGDFSQM. The guideline is same as for the course MVPP 003.