DEPARTMENT OF FOOD SCIECNE AND TECHNOLOGY

P.G Diploma Food Safety and Quality Assurance in Food Industry

REGULATIONS

Background: Food Safety Regulations in India has reached global standards with the introduction of Food Safety and Standards Act 2006 in the year 2011. With this, requirement of adequately trained manpower to be a part of Food Safety Quality Assurance and Regulatory Systems has increased immensely. With the enormous expansion of food sector (Manufacturing, retail distribution and hospitality sector) and customer awareness, safety and quality assurance has become a very vital hitch to be addressed in the current decade. This has opened an enormous job opportunities for adequately trained human resource in the area.

In view of this, for the first time in India, Post Graduate Diploma course (One year – Full time) on Food Safety and Quality Assurance in Food Industry will be offered by Pondicherry University, Puducherry, sponsored by University Grants Commission under the innovative programmes scheme. The post M.Sc. P.G Diploma programme is intended to prepare food scientists, food engineers, microbiologists and others with appropriate scientific backgrounds for active job opportunities in food safety and quality assurance, monitoring and certification process in the food industry and in the Government.

The course provides an outline of State-Of-Art theoretical information and practical experience, directly and indirectly related to a better understanding of food safety problems, their origin and solutions. The program is framed for transmission of both knowledge and know-how of local importance and global significance to the students.

Admission requirements

M.Sc. in Food Science and Nutrition/ Food Science and Technology/ Biotechnology/ Biochemistry/ Microbiology or M. Tech. in Food Technology/ Biotechnology with minimum of 55% marks or B.Sc. with 55% marks in any area of life sciences with at least 3 years of experience in the food industry / B. Tech. in Food Technology/ Biotechnology with at least 2 years of experience in the food industry/B. Tech in Food technology with two year P.G. Diploma in Food Technology.

CURRICULUM - OVERVIEW

Semester	Course Code	Title of the Course	Category	Credits
I	DFSQ601	Food Safety Basics	HC	3
	DFSQ602	Microbiological Safety of Foods	HC	3
	DFSQ603	Analytical Quality Assurance in Food Laboratories	HC	3
	DFSQ604	Chemical Safety of Foods	HC	3
	DFSQ605	Food Standards And Quality Control	HC	3
	DFSQ615	*Food Toxicology*	*SC*	*3*
	LAB			
	DFSQ651	Food Standards And Quality Control Lab	HC	1
	DFSQ652	Analytical Quality Assurance in Food Laboratories Lab	HC	1
	DFSQ653	*Microbiological Safety of Foods Lab*	*SC*	*1*
	DFSQ654	*Chemical Safety of Foods Lab*	*SC*	*1*
II	DFSQ621	Food Safety And Standards Act 2006	HC	4
	DFSQ622	Industry Project Programme (Any One Area): 1. Food Safety Regulation 2. Food Safety in Manufacturing Sector 3. Food Safety in Retail Sector 4. Food Safety in Catering Sector 5. Food Safety Auditing	HC	6
	DFSQ632	*Food Safety Auditing*	*SC*	*4*
	LAB			
	DFSQ655	*Food Safety Auditing Lab*	*SC*	*1*

PONDICHERRY UNIVERSITY

Department of Food Science and Technology

P.G Diploma Food Safety and Quality Assurance in Food Industry

Semester I

Course Code	Title of the Course	Credits
	Hard core	
DFSQ601	Food Safety Basics	3
DFSQ602	Microbiological Safety of Foods	3
DFSQ603	Analytical Quality Assurance in Food Laboratories	3
DFSQ604	Chemical Safety of Foods	3
DFSQ605	Food Standards And Quality Control	3
DFSQ651	*Food Standards And Quality Control Lab*	*1*
DFSQ652	*Analytical Quality Assurance in Food Laboratories Lab*	*1*
	Soft Core	
DFSQ615	Food Toxicology	3
DFSQ653	*Microbiological Safety of Foods Lab*	*1*
DFSQ654	*Chemical Safety of Foods Lab*	*1*

DFSQ601 **FOOD SAFETY BASICS** **CREDIT 3**

Unit I **10hours**

History of food regulations in India. Legislations- Prevention of Food Adulteration act 1954, Food product order (1955), Solvent Extracted Oil, De-oiled Meal and Edible Flour (Control) Order, 1967, Meat Food Products Order (1973),Edible Oils Packaging, 1998, Edible Oils Packaging, 1998, Vegetable Oil Products Order, 1998, Milk & Milk Product Amendment Regulations – 2009.

UNIT II **10 hours**

Food Sanitation and safety: Factors contributing to physical, chemical and biological contamination in food chain, prevention and control of food borne hazards, definition and regulation of food sanitation, sources of contamination, personal hygiene-food handlers, cleaning compounds, sanitation methods, waste disposal strategy (solid and liquid waste) and pest control

UNIT III **9 hours**

Food adulteration: common adulterants, simple tests for detection of adulteration. Food additives-classification, functional role and safety issues, types of adulteration and recent trends in food adulteration.

UNIT IV **10 hours**

Food Safety and Quality Assurance: quality control of raw materials, in –process food control, quality control of finished products, quality assurance of therapeutic, functional, nutraceutical and novel foods.

UNIT V **9 hours**

Food Quality Indices: Meat and meat products, fish and fish products, milk and dairy products, vegetables , fruits and their products, grain , pulses and oil seeds, coffee, tea and spices.

Text books

1. Early, R. (2006) Guide to Quality Management Systems for the Food Industry, Blackie, Academic and professional, London.
2. Gould, W.A and Gould, R.W. (2005) Total Quality Assurance for the Food Industries, CTI Publications Inc. Baltimore.
3. Pomeraz, Y. and MeLoari, C.E. (2008) Food Analysis: Theory and Practice, CBS publishers and Distributor, New Delhi.
4. Bryan, F.L. (2007) Hazard Analysis Critical Control Point Evaluations A Guide to Identifying Hazards and Assessing Risks Associated with Food Preparation and Storage. World Health Organization, Geneva.
5. Kirk, R.S and Sawyer, R. (2005) Pearson's Composition and Analysis of Foods, Longman Scientific and Technical. 9th Edition, England.
6. FAO (2006) Manuals of Food Quality Control. 2-Additives Contaminants Techniques, Rome.

DFSQ602 MICROBIOLOGICAL SAFETY OF FOODS CREDIT 3

UNIT I **9 hours**

Importance and significance of microorganisms in food safety, intrinsic and extrinsic factors affecting the growth of micro organisms in food.

UNIT II **9 hours**

Protection and preservation of foods: Hurdle technology, chemical, modified atmosphere, irradiation, thermal and non thermal techniques.

UNIT III **10 hours**

Food borne diseases: characteristics and incidence- global and Indian scenario, food poisoning and food intoxications of microbial origin, bacterial food borne diseases; viral food borne diseases; protozoa animal parasite food borne diseases; mycotoxicoses; mushroom poisoning; investigation and management of food borne diseases.

UNIT IV **10 hours**

Food spoilage: characteristic features, dynamics and significance of spoilage of different groups of foods - cereal and cereal products, vegetables and fruits, meat poultry and sea foods, milk and milk products, packed and canned foods.

UNIT V **10 hours**

Determination of micro organisms and their products in food: sampling, sample collection, transport and storage, sample preparation for analysis. microscopic and culture dependent methods- direct microscopic observation, culture enumeration and isolation methods ; culture independent techniques – PCR Based, DGGE, metagenomics, etc.; chemical, physical, immunological methods for microbial metabolites- microbial metabolites.

Text books

1. Pelczar, M.I., and Reid, R.D. (2009) Microbiology, 5th Ed., McGraw Hill Inc., New York.
2. James, M.J. (2007) Modern Food Microbiology, 2nd Ed., CBS Publisher, New Delhi
3. Adams, M.R., and Moss, M.G., (2005) Food Microbiology, 1st Ed., New Age International (P) Ltd., New Delhi.
4. Frazier, W.C. (2008) Food Microbiology, 4th Ed., McGraw Hill Inc., New York.
5. Doyle, P., Bonehat, L.R. and Mantville, T.J. (2007) Food Microbiology, Fundamentals and Frontiers, ASM Press, Washington DC.

DFSQ603 ANALYTICAL QUALITY ASSURANCE IN FOOD LABORATORIES CREDIT 3

UNIT I **9 hours**

Food laboratories : need for food analysis, accreditation of food laboratory, referral laboratories, functions of food analysts, hierarchy of food safety authorities, analysis of food samples and reports, other regulatory provisions pertaining to analysis of food

UNIT II **10 hours**

Validation of analytical methods: Good Laboratory Practices (GLP)- history of GLP, areas of application, facilities, test systems, test and reference items, Standard Operating Procedure (SOP), study performance and reporting.

UNIT III **9 hours**

Analytical method used for quality determination: chemical and physical, microbiological, biochemical and sensory analysis.

UNIT IV **10 hours**

Analytical methods of determination of basic food components: protein, saccharides, lipids, vitamins, water, minerals and trace elements, sensory active compounds, anti-nutritive and natural toxic compounds, food additives and food contaminants.

UNIT V **10 hours**

Advanced laboratory techniques: principle, working and application of GC, HPLC, HPTLC, LC/MS, inductively coupled Plasma Mass Spectroscopy and PCR, real time PCR, ELISA, Triple Quadrapole system.

Text Books

1. The training manual for Food Safety Regulators. Vol.II- Food Safety regulations and food safety management. (2011) Food safety and Standards Authority of India. New Delhi.

AOAC International. (2005) Official methods of analysis of AOAC International. 17th Ed., current through 1st revision. Gaithersburg, MD, USA, Association of Analytical Communities.

DFSQ604 CHEMICAL SAFETY OF FOODS CREDIT 3

UNIT I **9 hours**

Pesticides and veterinary drugs: Detection and quantification of carbamates, organochlorine and organosuplhur, organohalogens, nitrites, herbicides, hormones, antibiotics, steroids, environmental chemicals - heavy metals, toxic residues, radioactive isotopes.

UNIT II **10 hours**

Processing contaminants: Detection, quantification and health hazards of direct contaminants – acrylamide, PAHs, oxyhalides, and haloacetic acids, preservatives, flavor enhancers, color additives. Indirect contaminants- boiler water additives, peeling aids, defoaming agents, building and equipment contaminates: lubricants, paint and coatings, contaminants during packaging, storage and transport: cleaners, sanitizers and cross contaminants .

UNIT III **10 hours**

Food additives: Detection, quantification and health hazards of hydrogenated or partially hydrogenated oils, high-fructose corn syrup, artificial colorants, artificial sweeteners such as aspartame, sucralose and saccharin, BHA or BHT, monosodium glutamate, hydrolyzed vegetable protein or autolyzed yeast extract, potassium bromate, propyl gallate, sulfites, sodium nitrate, sodium benzoate.

UNIT IV **10 hours**

Food colorants and sweeteners: Detection, quantification and health hazards of brilliant blue, Indigo, carmine, citrus red , fast green, erythrosine, allura red ,tartrazine, sunset yellow, lake pigments and non certified colorants, food sweeteners- neotame, sorbitol and non certified sweeteners.

UNIT V **9 hours**

Emulsifiers, stabilizers, thickening and gelling agents: tara gum, soyabean hemicelucose, sucroglycerides, stearyltartarate, talc, gluconic acid, candelilla wax, carbamide, argon, salt of aspartame and other non certified agents- detection, quantification and health hazards.

Text Books

1. Branen, A.L., Davidson, P.M. & Salminen, S. (2007) Food Additives, 2nd Ed., Marcel Dekker.
2. George, A.B. (2006) Encyclopedia of Food and Color Additives, Vol. III, CRC Press, LLC. Boca Raton, FL
3. George, A.B. (2008) Fenaroli's Handbook of Flavor Ingredients, 5th Ed, CRC Press, LLC. Boca Raton, FL
4. Madhavi, D.L., Deshpande, S.S., & Salunkhe, D.K. (2006) Food Antioxidants: Technological, Toxicological and Health Perspective, Marcel Dekker
5. Morton, I.D., & MacLeod, A.J. (2008) Food Flavors, Part A, B & C. Elsevier.
6. Nakai, S., & Modler, H.W. (2007) Food Proteins. Processing Applications. Wiley VCH.

DFSQ605 FOOD STANDARDS AND QUALITY CONTROL CREDIT 3

UNIT I **11 hours**

Principal aspects of sampling of food: Importance of sample collection, sampling tools and containers, sample collection techniques, sampling for microbiological analysis of food, routine versus investigational sampling, quantity of sample to be collected, packaging and sealing of sample, dispatch of sample, documentation and commodity specific sampling procedure.

UNIT II **9 hours**

Codex Alimentarius Commission (CODEX): Introduction, standards, codex of practice, guidelines and recommendations, applying codex standards, Codex India, core functions of National Codex Contact Point, National Codex Committee of India

UNIT III **10 hours**

International Organization of Standardization (ISO): Overview, structure, interpretation and case studies of food safety and Quality management including ISO-22000, ISO-9001:2000, ISO22000:2005, ISO 17025/CODES/GLP, Retailers standards: BRC food and BRC IOP standards, IFS, SQF: 1000, SQF: 2000.

UNIT IV **8 hours**

Hazard Analysis Critical Control Point (HACCP): History, structure, pre- requites and principles, HACCP applications, HACCP based SOPs.

UNIT V **10 hours**

Good Manufacturing Practices (GMP), Good Hygienic Practices (GHP), Good Agricultural Practice(GAP), Good Veterinary Practice (GVP),Storage and distribution of food, sanitation and safety in food services.

Text Books

2. The training manual for Food Safety Regulators. Vol.II- Food Safety regulations and food safety management. (2011) Food safety and Standards Authority of India. New Delhi

3. Mortimre, S., and Wallace, C., (2005) HACCP: A practical approach, 2nd Ed, Aspen Publication

4. Surak, J.G., and Wilson, S. (2007) American Society for Quality, 2nd Ed., Quality Press

DFSQ615 **FOOD TOXICOLOGY** **CREDIT 3**

UNIT- I **11 hours**

Principles of Toxicology: classification of toxic agents; characteristics of exposure; spectrum of undesirable effects; interaction and tolerance; biotransformation and mechanisms of toxicity. Evaluation of toxicity: risk vs. benefit: experimental design and evaluation: prospective and retrospective studies: Controls :Statistics (descriptive, inferential): animal models as predictors of human toxicity: Legal requirements and specific screening methods: LD_{50} and TD_{50}: in vitro and in vitvo studies; clinical trials.

UNIT – II **9 hours**

Natural toxins in food: natural toxins of importance in food- toxins of plant and animal origin; microbial toxins (e.g., bacterial toxins, fungal toxins and Algal toxins), natural occurrence, toxicity and significance, determination of toxicants in foods and their management.

UNIT – III **10 hours**

Food allergies and sensitivities: natural sources and chemistry of food allergens; true/untrue food allergies; handling of food allergies; food sensitivities (anaphylactoid reactions, metabolic food disorders and idiosyncratic reactions); Safety of genetically modified food: potential toxicity and allergenisity of GM foods. Safety of children consumables.

UNIT – IV **9 hours**

Environmental contaminants and drug residues in food: fungicide and pesticide residues in foods; heavy metal and their health impacts; use of veterinary drugs (e.g. Malachite green in fish and β- agonists in pork); other contaminants in food, radioactive contamination of food, Food adulteration and potential toxicity of food adulterants.

UNIT – V **9 hours**

Food additives and toxicants added or formed during food processing: safety of food additives; toxicological evaluation of food additives; food processing generated toxicants: nitroso-compounds, heterocyclic amines, dietary Supplements and toxicity related to dose: common dietary supplements; relevance of the dose; possible toxic effects.

Text Books

1. Helferich, W., and Winter, C.K. (2007) Food Toxicology, CRC Press, LLC. Boca Raton, FL
2. Shibamoto, T., and Bjeldanes, L. (2009) Introduction to Food Toxicology, 2nd Ed. Elsevier Inc., Burlington, MA.
3. Watson, D.H. (1998) Natural Toxicants in Food, CRC Press, LLC. Boca Raton, FL
4. Duffus, J.H., and Worth, H.G. J. (2006) Fundamental Toxicology, The Royal Society of Chemistry
5. Stine, K.E., and Brown, T.M. (2006) Principles of Toxicology, 2nd Ed. CRC Press.
6. Tönu, P. (2007) Principles of Food Toxicology. CRC Press, LLC. Boca Raton, FL.

1. Sampling Quantity, packaging and sealing of sample, dispatch of sample, documentation and commodity specific sampling procedure for microbiological analysis of food
2. Sampling Quantity, packaging and sealing of sample, dispatch of sample, documentation and commodity specific sampling procedure for chemical analysis of foods
3. Hazard Analysis and Critical Control Point (HACCP) of Milk and milk products
4. Hazard Analysis and Critical Control Point (HACCP) of Cereals and cereal products
5. Hazard Analysis and Critical Control Point (HACCP) of Meat and meat products
6. Hazard Analysis and Critical Control Point (HACCP) of Fish
7. Hazard Analysis and Critical Control Point (HACCP) of Bakery products
8. Hazard Analysis and Critical Control Point (HACCP) of Fruits and vegetables

1. Calibration of pipettes, scales and dispensers
2. Calibration of selected equipments
3. Equipment Maintenance, record keeping and reporting of results
4. Estimation of proximates from food samples
5. Estimation of vitamins from food samples
6. Estimation of minerals from food samples
7. Estimation of trace elements from food samples
8. Estimation of mycotoxins from food samples

1. Collection of food samples – sampling, collection, transport and storage
2. Enumeration of microorganisms:
    a. Direct count
    b. Total aerobic count
    c. Selective media
3. Identification of pathogenic microorganisms
    a. Selective media
    b. PCR based identification
    c. ELISA
4. Detection of microbial metabolites: HPTLC, HPLC, ELISA
    a. Bacterial toxins: Ceralides, *E Coli* Toxins
    b. Mycotoxins: Aflatoxins, Trichotheenes
    c. Histamine
5. Isolation and identification of virulent *E. Coli* from foods
6. Investigation of suspected food borne disease outbreak

1. Detection and quantification of pesticides
2. Detection and quantification of hormones
3. Detection and quantification of antibiotics and steroids
4. Detection and quantification of environmental chemicals - heavy metals, toxic residues, radioactive isotopes.
5. Detection and quantification of processing contaminates.
6. Detection and quantification of food additives.
7. Detection and quantification of food colorants and sweeteners.
8. Detection and quantification of emulsifiers and stabilizers
9. Detection and quantification of thickening and gelling agents

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Semester II

Course Code	Title of the Course	Credits
	Hard Core	
DFSQ621	Food Safety And Standards Act 2006	4
DFSQ622	Industry Project Programme (Any One Area): 1.Food Safety Regulation 2.Food Safety in Manufacturing Sector 3.Food Safety in Retail Sector 4.Food Safety in Catering Sector 5.Food Safety Auditing	6
	Soft Core	
DFSQ632	Food Safety Auditing	4
DFSQ655	Food Safety Auditing Lab	1

DFSQ621 FOOD SAFETY AND STANDARDS ACT 2006 CREDIT 4

UNIT I **12 hours**

Food Safety and Standards Act: Salient features of food safety and standards Act ,2006, administration at central and state level, functions, duties and responsibilities of food safety regulators, implementation of food regulation –FSS act,2006 including licensing and registration, inspection and reports, improvement notices and prohibition Orders.

UNIT II **14 hours**

Food safety standards of licensing and registration of food Business regulations, 2011: short title, commencement, definitions, licensing and registration of food business, schedule I, II, III, IV. general requirements of hygienic and sanitary practices to be followed by all food business operators applying license, specific hygienic and sanitary practices to be followed by food business operator engaged in manufacturing, processing, storage and selling of milk and milk products, meat and meat products, specific hygienic and sanitary practices to be followed by food business operators engaged in catering/ food service management.

UNIT III **12 hours**

Food safety standards of packaging and labeling regulations, 2011-Short title and commencement, definition, registration. packaging - general requirements, product specific requirements. labeling - manner of declaration, specific requirements and restriction on manner of labeling, restriction on advertisement, exemption from labeling requirement, notice of addition, admixture or deficiency in food.

UNIT IV **14 hours**

Food safety standards of food product standards and food additives regulations 2011-Short title, commencement, definition and regulation of dairy products and analogues, fats, oils and fat emulsions ,fruits and vegetable products, nuts and raisins, cereal and cereal products, bakery products, meat and meat products, fish and fish products, sweet and confectionery, sweetening agents, salt , spices , condiments and related products, common salt, beverages- alcoholic and non alcoholic, irradiation of foods, food additives and other food products.

UNIT V **12 hours**

Food safety standards of prohibition and restriction sales regulations 2011- title, commencement, definitions, prohibition and restriction of sales – sale of certain admixtures prohibited, restriction on the use of certain ingredients, prohibition and restriction on sale of certain products.

Food safety and standards of contaminants, toxins and residues regulation 2011-short title, commencement and definition of metal contaminants, crop contaminates and naturally occurring toxic substances, residues, antibiotic another pharmacologically active substances.

Food safety standards of laboratory and sample analysis, 2011- short title, commencement and definition of notified laboratories to import, referral laboratories, procedure for sampling.

Text Book

1. Gazette of Food Safety and Standards Act, (2006) Food Safety regulations and food safety management. Food Safety and Standards Authority of India. New Delhi

2. The training manual for Food Safety Regulators. (2011) Vol.III, Food Safety regulations and food safety management. Food Safety and Standards Authority of India. New Delhi.

DFSQ622 INDUSTRY PROJECT PROGRAMME CREDIT 6

Project work in a food industry with following specializations:

1. Food safety regulation, working with the enforcement agency.
2. Food safety in manufacturing sector, in a food processing industry.
3. Food safety in retail sector, in a food retailing company.
4. Food safety in catering sector, in a catering organization.
5. Food safety auditing- working with a food safety auditing company.

Candidates will be trained in the selected topics in any of the four areas in an industry or a company and will submit a project at the end and will be evaluated through viva voce.

DFSQ632 FOOD SAFETY AUDITING CREDIT 4

UNIT I **12 hours**

Food surveillance: International and national practices, procedure and protocols, food alerts, traceability and food product recall.Risk analysis: risk assessment, management and communication. Food standards and Specification: need for auditing, increasing importance of HACCP based Codex Standards (GATT).

UNIT II **12 hours**

Export and import of food in India: Introduction, import and export policies, FDA import policy, export-import policy, export control systems. Import intelligence and alert systems, packaging and labeling, specifications and certifications. case studies and judicial pronouncements, procedure for investigations and filing of cases by food safety regulator as per FSS act.

UNIT III **14 hours**

Inspection of food establishments, manufacturing units: Food regulatory enforcement and compliance through inspection. Inspectional requirements for food business operators: general inspection procedures, biological inspection of establishments.

UNIT IV **12 hours**

Special establishment inspection part I: Processing of fruits and vegetables, bakery products, milk and milk products, meat and meat products, fish and fish products and chocolate and cocoa.

UNIT V **12 hours**

Special establishment inspection part II: Candy and chocolate processing units, fats and oil processing units, frozen food establishments, food canning plants, beverage industry, retail meat shops, food ware houses and food service distribution

Text Books

1. The training manual for Food Safety Regulators. (2011) Vol.III, Food Safety regulations and food safety management. Food Safety and Standards Authority of India. New Delhi.

2. Foreign Trade Policy (27^{th} August 2009 to 31^{st} March 2014), Department of Commerce, Ministry of Commerce and Industry, Government of India

DFSQ655	FOOD SAFETY AUDITING LAB	CREDIT 1

Auditing of a selected food industry / establishment and submission of report

1. Data collection on the quality of raw materials
2. Date collection on the processing parameters and documentation
3. Data processing
4. Preparation of model
5. Validation of model
6. Making recommendation to the Industry
7. Comparative analysis of similar establishments
8. Submission of report