Postgraduate Diploma in Food Safety and Quality Management (PGDFSQM)

Course Code	Subject	Credit	Distribution of marks		Total
			University Exam	Internal Assessment	
PGDFSQM51	Fundamentals of Nutrition	4	70	30	100
PGDFSQM52	Food Chemistry	4	70	30	100
PGDFSQM53	Food Microbiology	4	70	30	100
PGDFSQM54	Techniques in Food Analysis	4	70	30	100
PGDFSQM55	Food Safety and Quality Management Systems	4	70	30	100
PGDFSQM56	Practicals- I	4	70	30	100
PGDFSQM57	Practicals- II	4	70	30	100
PGDFSQM58	Project Work & Viva Voce	2	50	-	50
TOTAL		**30**	**540**	**210**	**750**

SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat
(Reaccredited with 'A' Grade by NAAC (CGPA 3.11)
Syllabus with effect from the Academic Year 2024-2025

Curriculum of
Postgraduate Diploma in Food Safety and Quality Management

PG-F.S.Q.M

New Syllabus: June 2024

Faculty of Science
Board of Studies (Biosciences)
Faculty of Medicine SARDAR PATEL UNIVERSITY Vallabh Vidyanagar
388120 (Gujarat)

SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat
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Syllabus with effect from the Academic Year 2024-2025

Curriculum of

POSTGRAGUATE DIPLOMA IN FOOD SAFETY AND QUALITY MANAGEMENT (PG-FSQM)

JUNE-2024

Need and scope of Postgraduate Diploma in Food Safety and Quality Management

- The postgraduate diploma programme in Food Safety and Quality Management 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 food safety and quality has become an area of priority and necessity for consumers, retailers, manufactures and regulators.
- 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.
- In order to develop strong and need based programme, PG Diploma in Food Safety and Quality Management course prepare a human resources for to create innovative food items that respond to various needs, as well as continuing to improve the quality of food available to consumers with nutritive value .

Objective of the Course

- The objective of the PG Diploma in Food Science and Quality Control programme is to prepare professionals for development, implementation and auditing of Food Safety and Quality Control Systems in the country. This program is expected to meet the increasing human resource for food safety and quality control analysis in food sector.
- To train the students to be competent working professionals in the food industry to ensure the quality food by imparting better nutritional analysis, sanitation & hygiene concepts.
- To organize functions for creating awareness about the importance of safe processed nutritious food.
- The programme develops qualified and competent food safety and quality management professionals for regulators, industry, academic/research institutions, certifying and accreditation bodies, food trade, food testing and training, harmonisation with global benchmarks, quality management systems, food analysis, instrumentation, risk analysis/management, and more.

These regulations shall be called as **"The Regulations for the postgraduate diploma in Food Safety and Quality Management"** programme under the **Faculty of Sciences** and **Board of Biosciences**. They shall come into effect from the Academic Year 2024-25.

RFSQM -1: Eligibility for Admission- A Candidate for admission to the Postgraduate Diploma in Food Safety and Quality Management (PG-FSQM) must have passed the B.Sc. Degree Examination of the any UGC recognized University with Chemistry, Microbiology, Bio-Chemistry and Biotechnology as one of the Principal subjects. Candidates shall be eligible to have Bachelor of Science (B.Sc.) in Agriculture, Food Science, Physics, Food Science & Technology, Food Engineering, Home Science (Food and Nutrition), Life Sciences, Botany, Environment Science, Horticulture, Diary Technology, Veterinary, Fisheries, Hotel Management, Hospitality Management, and Medical Lab. Technology.

RFSQM -2: Duration of Course-The course of study for the Postgraduate Diploma in Food Safety and Quality Management shall be a full time course and its duration shall be of one academic year as prescribed in the curriculum. Examinations will be conducted at the end of each year in subjects prescribed in the respective scheme of examinations.

RFSQM -3: To become eligible to appear in the final examination conducted by Sardar Patel University - a) a candidate has to keep one year at the Institute recognised for teaching the course of studies in Food Safety and Quality Management by the university. b) A candidate has to keep the minimum attendance of 75% in Theory and Practical's separately. c) A candidate has to obtained at least 40% marks in each subject in the internal tests conducted by the Institute.

RFSQM -6: For the purpose of deciding final result at this examination, the ratio between the internal assessment and final University examination shall be 30:70 for both theory & practical. The internal assessment is done based on continuous evaluation including two internal test, seminar, quiz and attendance.

RFSQM -7: The final examination for the Postgraduate Diploma in Food Safety and Quality Management shall be held at the end of the academic year in the month of April. Re-examination for failed students will be carried on Oct/Nov month. One internal and one external examiner should jointly conduct practical/ oral examination for each student.

RFSQM -8: The Postgraduate Diploma in Food Safety and Quality Management shall not be conferred upon a candidate unless he/she has passed in all the subject of the theory examination and the practicals in accordance with the provisions of relevant regulations.

RFSQM-9: Programme Project means a project work on which the student undergoes a project with minimum one month at the end of year under the supervision of a teacher in the parent department/any appropriate research centre/Food processing Industries in order to submit a report on the project work as specified. Project report will be evaluated based on relevance of the topic and analysis, project content and presentation, project viva.

RFSQM -9: STANDARD OF PASSING

(A) To pass the Postgraduate Diploma in Food Safety and Quality Management Examination, a candidate must obtain at least 40% marks in each paper/practical/oral at the University Examination as also in the total of the internal assessment and the University Examination.

(B) AWARD OF CLASS:

1. The successful candidates who obtain at least 50% or more but less than 60% marks in the total of internal assessment & the University examination will be place in Second Class.
2. The successful candidates who obtain at least 60% or more but less than 70% marks in the total of Internal assessment & the University examination will be place in First Class.
3. The successful candidates who obtain at least 70% or more marks in the total of internal assessment & the University examination will be declared to have passed the examination in First Class with Distinction.
4. University rank Certificate or University Gold medal will be declared and awarded based on only External Theory and Practicals Marks.

Letter Grade	Grade Point
O (Outstanding)	10
A+ (Excellent)	9
A (Very Good)	8
D I (Good)	7
B (Above Average)	6
C (Average)	5
P (Pass)	4
F (Fail)	0
0 Ab (Absent) 0	0

RFSQM -10: Faculty under which the degree is awarded

Faculty of Science and Name of degree awarded: Postgraduate Diploma in Food Safety and Quality Management.

PROGRAMME STRCTURE
Postgraduate Diploma in Food Safety and Quality Management

POs, PSOs

Program Outcomes (POs)	
PO1	Students will have ability to apply knowledge of Food Science and its quality.
PO2	Students will have an ability to identify problems and design to resolve the problems in the actual situations during food processing, food quality controlling, food packaging and storage
PO3	Students will have an ability to express practical proficiency in the field of food analysis
PO4	Build technical proficiency in undertaking food safety and quality assurance in food processing chain i.e., from farm to fork.
PO5	Comprehend the issues of safety and quality in food production, handling, and processing and trade.

Program Specific Outcomes (PSOs)	
PSO1	Students acquired hands-on experience testing and discovering innovative food safety technologies also undertake standard microbiological and chemical analysis of Food Products.
PSO2	Student will apply the knowledge of food chemistry, food preservation and food packaging for the effective utilization of agricultural commodities to develop healthy and nutritious foods
PSO3	Student can understand the science of food safety, nutrition, and health, and may influence the regulatory decisions of the FDA and other government agencies.

PROGRAMME STRCTURE

The subject of examination for the Postgraduate Diploma in Food Safety and Quality Management will be as under.

Postgraduate Diploma in Food Safety and Quality Management (PGDFSQM)

Course Code	Subject	Duration of Examination (hours)	Distribution of marks		Total
			University Exam	Internal Assessment	
PGDFSQM51	Fundamentals of Nutrition	3 hours	70	30	100
PGDFSQM52	Food Chemistry	3 hours	70	30	100
PGDFSQM53	Food Microbiology	3 hours	70	30	100
PGDFSQM54	Techniques in Food Analysis	3 hours	70	30	100
PGDFSQM55	Food Safety and Quality Management Systems	3 hours	70	30	100
PGDFSQM56	Practicals- I	3 hours	70	30	100
PGDFSQM57	Practicals- II	3 hours	70	30	100
PGDFSQM58	Project Work & Viva Voce	-	50	-	50
TOTAL			**540**	**210**	**750**

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Course Code	PGDFSQM51	Title of the Course	Fundamentals of Nutrition
Total Credits of the Course	04	Hours per Week	04

Couse Objective	• Know and understand the functions, importance of all nutrients for different age groups and special groups • Understand the relationship between nutrition and human wellbeing. • Impart knowledge regarding the principles of human-nutrition and metabolism of nutrients

Unit	Description	Weightage (%)
1	**Introduction to Nutrition** – definition of nutrition, Food as a source of nutrients, Functions of foods **Classification of Food** : Food classification: Natural, Organic, Functional, Probiotic, Prebiotic, Fabricated, Space, Health, Nutritional, Convenience, fast foods, GM Foods, Traditional Foods, Fabricated Foods, Junk Foods, RTS, and RTE. Interrelationship between nutrition & health : - Visible symptoms of goods health **Use of food in body** Digestion, Absorption, transport & utilization **Nutraceuticals:** Definition, classification and role of nutraceuticals, Effect of nutraceuticals on health and prevention of diseases	25%
2	**Types of Food category:** Cereal Nutritional value, Processing Milling, polishing, parboiling, flaking, Pulses: composition and nutritional value, processing, soaking, germination. Cooking and fermentations: Toxic constituents of pulses, Lathyrism. Nuts and oil seeds: Nutritive value, importance & classification. Milk and milk products: Composition of milk, properties and effect of heat, nutritional importance, milk processing, milk products. Flesh foods- selection, storage, uses and nutritional aspects of meat, fish and poultry, spoilage of fish. Fruits and vegetables: **Classifications, composition and importance in human nutrition storage**: Sugar and Sugar products, Beverages: processing composition and preparation, types and composition. Fats and oils: Types, role of fat in cookery. Egg - composition & classification of egg & egg products, its nutritive value. Baking - Types of bake products & its nutritive value. **Balanced Diet:** Definition, Factors affecting balanced diet, Concept of Balanced diet.	25%
3	**Basics of energy metabolism**, nutrition & dietetics - Unit of measuring energy, calorific value of food, Measurement of energy value of foods by Bomb Calorimeter, BMR & factors affecting it, SDA of food, calculation of energy requirement, balanced diet, nutrition in health & diseases (protein energy malnutrition). thermic effect of food and physical activity; Factors influencing energy expenditure	25%

	Methods for determination of energy expenditure – direct and indirect calorimetry; Estimation of energy requirements of individuals and groups: RDA, principles and the methods used for RDA measurement. Nutritional problems: malnutrition, background problem of malnutrition in India ecology of malnutrition, effect of malnutrition on vulnerable society, impact of malnutrition on national development **Nutritional Needs:** Nutritional Needs: Nutrition during infancy, childhood, adolescence and adult, nutrition during pregnancy& lactation, nutrition in later maturity period, nutrition and infection, nutrition and immunity, nutrition & stress. **Nutrition and weight management:** obesity and its causes, body composition, B.M.I., Weight for height measures, health implications of obesity. **Glycaemia Index of Foods:** Control its importance	
4	**Method of Preservation:** High and low temperatures preservation: Pasteurization, Sterilization, Canning, Freezing, Refrigeration, Moisture removal preservation technique, low temperature, high temperature, use of preservatives, dehydration, irradiation, Heat, Drying, Canning, Chemical, Non-Thermal Methods. Use of Chemical Preservatives – Advantages and Disadvantages Microwave Heating **Food Additives :** Food additives. definition, need and classification of food additives, preservatives-Natural and Artificial, antioxidants, chelating agents, coloring agents, curing agents, Emulsions, flavors and flavor enhancers, leavening agents, nutritional supplements, non-nutritive sweeteners, pH control agents, stabilizer and thickeners, humectants, anti-caking agents, firming agent, clarifying agent, flour bleaching agents. Household level food preservation and storage. Anti-microbial agents/ Class I and Class II preservatives	25%
Reference Book	• Fennema, O.R. Ed. 1976. Principles of Food Science: Part-I Food Chemistry. Marcel Dekker, New York. • Swaminathan M (2010). Handbook of Foods and Nutrition. Published by: Ganesh and Co. Pvt. Ltd. Madras, ISBN-10: 812041795X / ISBN13: 978-8120417953 • Essentials of Food & Nutrition-M.Swaminathan-vol I &vol II. • Food Science- N.Potter & J.H.Hotchkiss- CBS Publishers & Distributors, New Delhi. • Principles of Nutrition E.D Wilson,K.H. Fisher& M.C.Faqua • Branen AL, Davidson PM &Salminen S. 2001. Food Additives. 2nd Ed.Marcel Dekker. Nutrient Requirements and Recommended Dietary Allowances for Indians – Indian Council of Medical Research, National Institute of Nutrition, Hyderabad.	

Course Code	PGDFSQM52	Title of the Course	Food Chemistry
Total Credits of the Course	04	Hours per Week	04

Couse Objective

- ✓ Know role of carbohydrates, lipids, proteins in food structure.
- ✓ Students will have a thorough understanding of various factors responsible for food spoilage.
- ✓ The students will know the specifications of various contamination sources and disease developed in certain processed products.
- ✓ Students will have a thorough understanding of importance of hygiene and sanitation in during food processing

Unit	Description	Weightage (%)
1	**Carbohydrates-** composition, classification, sources, functions, structure, physical & chemical properties. Properties of sugars and sweeteners: Sugars, syrups, sugar alcohols, browning reaction in food: enzymatic and non-enzymatic browning, their occurrence and applications in food; starches: functionality of starch in foods, gelatinization and retro-gradation of starches, modified starches, resistant starches, Physiological role and health benefits of dietary fibre, Resistant starch meaning and its physiological benefits; Requirements and food sources; Glycemic index of foods. **Water:** Physical and Chemical properties, Water Activity Determination and its influence on Food Quality and Stability **Water:** Water molecule structure, liquid water and ice, water activity, Phase transition of water molecule, WLF equation. Dispersed System: surface chemistry, colloidal interaction, creaming foams and emulsion. **Moisture in food:** Hydrogen bonding, Bound water, free water, Water activity and Food stability	25%
2	**Lipids** – classification, composition, nomenclature, saturated & unsaturated fatty acids, food sources, functions of fats. Polyunsaturated Fatty Acids hydrogenation, rancidity and industrial importance, Quality changes in fat/oil during storage and prevention of fat spoilage; Role of fat/oil in food products; Fat substitutes. Definition and functions; Role of n-3, n-6 fatty acids in health and disease, Trans fatty acids and its association to cardiovascular diseases. **Minerals:** Macro minerals: Calcium, phosphorus, Magnesium, sodium, potassium and chloride functions, requirements, food sources, deficiency and toxicity; **Micro-minerals:** Iron, copper, zinc, manganese, iodine, fluoride. Trace Minerals: Selenium, cobalt, chromium, vanadium, silicon, boron, nickel functions, requirements, food sources, deficiency and toxicity. **Vitamins** – Classification, units of measurement, sources, functions and deficiency diseases caused by following vitamins: a. Fats soluble vitamins – Vitamin A, D, E and K b. Water soluble vitamins – Vitamin C and B-complex 3. Vitamins and minerals structure general causes of loss in food. Fortifications, Enrichment and Restoration.	25%

3	**Proteins** – composition, classification, sources, functions, denaturation, and protein deficiency, determination of protein quality. amino acids, essential amino acids, biological value, PER (Protein Efficiency Ratio), and industrial importance, Factors influencing protein quality: Amino acid composition and digestibility **Role of enzymes** in food products; Immobilized enzymes and its application in food industries. Kinetics factors influencing enzyme activity, controlling enzyme action. Enzyme added to food during processing, modification of food by endogenous enzyme. Enzyme inhibitors in food. **Food pigments and synthetic dyes:** Natural pigments, their occurrence and characteristic properties, their changes during processing and storage, Some common pigments used in food industry (chlorophylls, myoglobin, anthocyanin, betalain, carotenoids, synthetic colors & lake /dye colors and other colourants)	25%
4	**Food Toxicology**: Dose-response, Measurement of toxicants and toxicity, Assessment of toxicity of evaluation of limits of contaminants in contexts of food safety, Natural anti-nutritional factors, microbial toxins-Myco toxins (Aflatoxin). Toxicants in Plant foods, Seafood toxins, Antivitamins, Radioactive metals in foods **Toxicants in food Enzyme inhibitors**, antivitamins, glycoalkaloids, saponins, goitrogens, teratogens. Mycotoxins with special emphasis on Aflatoxin B1 and its metabolism, toxicity and preventive measures, different stages involved in hepatocarcinogenesis by Aflatoxin B1. Toxic Constituents of Marine & Fungal Origin and Food allergies Puffer fish, paralytic shellfish poisoning, ciguatera poisoning, toxic algae, Mushrooms (amanita toxins), **Detoxification** – Xenobiotics, enzyme systems involved mechanism of detoxification **Food chemical carcinogens**-sources and mechanism, Food associated carcinogenesis, food allergens, Industrial food processing and Packaging contaminants.	25%
Reference Book	• Belitz, H.D. and Grosch, W. (1999): Food Chemistry, (2nd edition), Springer, New York • Principles of Food Chemistry, DeMan, J M , AVI, New York, 1980 • Aurand, L.W. and Woods, A.E. 1973. Food Chemistry. AVI, Westport • Fennema, O.R. Ed. 1976. Principles of Food Science: Part-I Food Chemistry. Marcel Dekker, New York • Chopra and Panesar (2010), Food Chemistry, Narosa Publishing House • L H Meyer (2004). Food Chemistry, CBS Publishers and Distributorss Pvt. Ltd. ISBN 9788123911496 • Fundamentals of Biochemistry J L Jain 4th Edition 1990 S.Chand &Company, New Delhi • Food Toxicology (Ed. Debasis Bagchi, Anand Swaroop), 1st edition, CRC Press, Boca Raton, Florida, US)	

Course Code	PGDFSQM53	Title of the Course	Food Microbiology
Total Credits of the Course	04	Hours per Week	04

Couse Objective	✓ To develop an understanding of the role of microorganisms in environment, Industry and in maintenance of health. ✓ Students will have a thorough understanding on various food laws with their amendments and regulation guidelines followed in national and international level. ✓ Analyze the habitats, taxonomy, and growth parameters of microorganisms of importance to the food industry. ✓ Student get trained to undertake a job in food and industries dealing with fermentation

Unit	Description	Weightage (%)
1	**Introduction to microbiology** and its relevance to everyday life-General morphology of micro-organisms – General characteristics of bacteria, fungi, virus, protozoa, algae **Control of micro-organisms, growth curve** – Effect of environmental factors on growth of micro-organisms-pH, water activity – oxygen availability, temperature & others **Food Spoilage** - Microbial and biochemical aspect of food spoilage, role of bacteria, yeast and molds in food spoilage, Spoilage of cereal and cereal products, fruits and vegetables, meat and meat products, milk and milk products, fish and fish products, spoilage of egg and poultry and heated canned foods.	25%
2	**Microbial growth in food:** intrinsic, extrinsic and implicit factors, Microbial interactions, Inorganic, organic and antibiotic additives, Effect of injury on growth or survival **Microbiology of different foods** – Spoilage and contamination- Sources, types, effects on the following: ✓ Cereals & Cereals products. ✓ Vegetables & Fruits. ✓ Meat & Meat products. ✓ Eggs & Poultry. ✓ Milk & Milk products. Waste product handling- planning for waste disposal, solid wastes and liquid Wastes	25%
3	**Effects of micro-organisms on food degradation and food bore illness – Bacteria, Virus, Molds, Yeasts and parasites (food poisoning).** Beneficial effect of micro-organisms. Microbial spoilage of foods — food borne pathogens, food poisoning, food infection and intoxication. Examples: *Escherichia coli*, *Brucella, Bacillus, Salmonella*, *Campylobacter jejuni*, *Bacillus cereus, Shigella sp.*, *Clostridium sp.*, *Staphylococcus sp.*, Non-bacterial agent & food borne illness, (Helminths & Nematodes, protozoa, toxic algae, fungi & food borne viruses Norwalk like viruses, Hepatitis A.	25%

	Biotechnology in food: Fermented foods: eg dairy products, oriental fermentations, alcoholic beverages, and food ingredients. Genetically modified foods – concept, types and application Bt brinjal , Bt maize and golden rice	
4	**Introduction to fermenter;** different types of fermenter and fermentation process downstream processing and on-line monitoring of industrial fermentation process/products purification and recovery of food or nutrient; Bio-processing/food supplements from microbes, Food fermentation: Bread, Cheese, Vinegar, fermented Vegetables, fermented dairy products, fermented meat products- Sausage & their production methods. **Mycotoxins Impacting Food Production and Manufacturing-** Patulin, Ochratoxin, Zearalenone, Aflatoxins, Trichothecenes and Fumonisins- Guidance and regulations on mycotoxins in food and feed-Mycotoxin Control Strategies	**25%**
Reference Book	• Banwart, G.T. (1987). Basic Food Microbiology. CBS Publications:New Delhi. • Krammer A & Twigg BA.1973. Quality Control in Food Industry. Vol. I, II. AVI Publ. • Jay J.M. 1986. Modern Food Microbiology. 3rd Edn. VNR, New York • Banawart GJ. 1989. Basic Food Microbiology. 2nd Ed. AVI Publ • Garbutt, J. (1997) Essentials of Food Microbiology, 1st Edition, Arnold International Students Edition. • Modern Food Microbiology 4th Edition James, M.J.2005 CBS Publisher, New Delhi • Food Microbiology 5th Ed Frazier, W.C. 2014 McGraw Hill Inc., New York • Hand Book of Analysis and Quality Control Fir Fruit and Vegetable Product 2nd Edition S Ranganna1997 McGraw Hill Education Pvt.Ltd • Bhatia,R. and Ichhpujan,R.L. Quality assurance in Microbiology. CBS Publishers and Distributors, New Delhi. 2001.	

Course Code	PGDFSQM54	Title of the Course	Techniques in Food Analysis
Total Credits of the Course	04	Hours per Week	04

Couse Objective	✓ Students will have a thorough understanding on the working principle and instrumentation of various instruments used in food analysis. ✓ The students will know the importance of various methods to identify any malfunction aspect of food. ✓ Students will have a thorough understanding on the quality attributes, their measurement principle and instrumentation of various instruments used in food quality analysis. ✓ The students will know the importance of various methods to identify any adulteration aspect of food.

Unit	Description	Weightage (%)
1	**Concept of quality**: quality attributes: physical, chemical, nutritional and microbial evaluation and measurement, physiochemical method, microscopic examination and physical method; Sensory evaluation: Sensory characteristics of food, sensory requirements, Types of sensory evaluation, Accuracy and precision maintenance in laboratory **Sampling techniques:** Introduction, Food Regulations and Standards – Sampling methods – Sample preparation and preservation- Extraction methods and Separation process of food components; Statistical evaluation of analytical data – Official Methods of Food Analysis. Proximate analysis of foods Moisture in foods, Ash content of foods – determination by different methods; Titratable Acidity in foods, Determination of dietary fibre and crude fibre, **Instrumentation** – Types, Principles, Maintenance, Operation, Working G.C., H.P.L.C., G.L.C., A.A.S., Organic C analyzer Spectrophotometry Basic Principles, Spectrophotometric analysis of food additives and food Components -IR Spectroscopy; AAS and ICPAES in mineral elements and toxic metals analysis; use of fluorimeter in vitamin assay-specific use of Tintometer in Vanaspati analysis. Chromatography Basic Principles, Detection of adulterants in foods by paper chromatography and thin layer chromatography, Column chromatography for purification of pigments, Analysis of food additives, phytochemicals and aflatoxins, contaminants and other food components by HPLC, GC analysis of fatty acids, cis, trans Isomers volatile oils, flavours and pesticides	25%
2	**INTRODUCTION TO FOOD ANALYSIS** Introduction to food Analysis; Food composition and Factors affecting food composition, Sampling, Population, Proximate Principles, Importance of sampling, Sampling technique, Types of sampling, Sampling Plan, Preparation of samples, Problems in sampling **PHYSICAL METHODS OF FOOD ANALYSIS** : Physical Methods of Food Analysis; Refractometry; Polarimetry specific General Gravity Viscosity,	25%

	Food Rheology, Freezing point determination, Surface tension, Electro analytical determination; Polarography **Application of nanotechnology** in food Science in brief: Nanosensors for microbial, chemical contaminants; Foods incorporated with nanoscale antimicrobial compounds, antioxidants and flavours which would improve shelf-life or sensory characteristics such as flavour, odour.	
3	**Vitamin Analysis:** Vitamin A by Carr-Price method, HPLC • Vitamin C- Ascorbic acid dichloroindophenol method • Vitamin D- Line test **MINERAL ANALYSIS :** Mineral Analysis- Calcium- Gravimetric, EDTA and redox titration • Iron – Redox titration • Phosphorous- colorimetry **Analysis of Food adulteration and food toxins:** Common adulterant in food (milk and milk products, edible oils, cereals & pulses, prepared foods, spices, beverages; simple screening, control of food adulteration. **Introduction to Advanced laboratory techniques** for Detection of Pesticide Residues, Toxicants, Heavy Metals, Processing Contaminants (Direct and Indirect)	25%
4	**Bacteriological analysis of Foods:** Both processed and unprocessed like vegetables and fruits, cereals, spices and canned foods, using conventional methods, yeast and mold count in foods. Bacteriological analysis of water and milk, Total count, MPN Coliform (Count) and MBRT, IMVIC etc **Screening and Enumeration of spoilage microorganisms.** Detection of pathogens in food (Traditional Biochemical test using kits, specialized media), Rapid detection technique for microorganisms — Total ATP measurement, **Microbial techniques-** ELISA-Types, PCR, RTPCR, Complement Fixation Techniques, gel documentation-Flow cytometry. Immuno affinity techniques. Radio Immuno Assay Electrophoresis, definition, types of electrophoretic methods, free solution electrophoresis, agar gel electrophoresis, PAGE. **Various biochemical tests used in identification of commonly found bacteria in foods:** IMVIC urease, H2S, Catalase, coagulase, gelatin and fermentation (Acid/gas) Demonstration of available rapid methods and diagnostic kits used in identification of microorganisms or their products.	25%
Reference Book	• Gould, W.A. and Gould, R.W. (1988): Total Quality Assurance for the Food Industries, CTI Publications Inc. Baltimore • Pomeranz, Y. and MeLoan, C.E. (1996): Food Analysis: Theory and Practice, CBS Publishers and Distributor, New Delhi. • James, C.S. (1995): Analytical Chemistry of Foods, Blackie Academic and Professional (Chapman and Hall), Madras. • Food Analysis: Theory and Practice 3rd Edition Pomeraz, Y. and McLoari, C.E. 2008 CBS publishers and Distributor, New Delhi • Modern Food Microbiology 4th Edition James, M.J.2005 CBS Publisher, New Delhi • Methods in Food Analysis. Joslyn, M.A. Ed. 1970.Academic Press, New York • Food science chemistry & experimental food By Dr. M. Swaminathan • PomeranzYandMeLoanCE(1996).FoodAnalysis:TheoryandPractice(3 rd ed.). CBS Publishers and Distributors, New Delhi	

Course Code	PGDFSQM55	Title of the Course	Food Safety and Quality Management Systems
Total Credits	04	Hours per Week	04
Couse Objective	✓ Understanding the issues of safety and quality in food production, handling, processing, and trade ✓ Building technical proficiency in undertaking food safety and quality assurance in food processing chain ✓ Ensuring the safety and quality of food products as per mandatory legal requirements and voluntary standards including export regulations ✓ To conduct quality auditing in the food industries		

Unit	Description	Weightage (%)
1	**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. **Defining Standard operating procedure** – purpose- Format - developing and implementing, effective writing. SOP for purchasing raw materials, receiving raw materials, storage, cleaning, holding, cooling, freezing, thawing, reheating, personal hygiene, facility and equipment. Systems in laboratory accreditation	25%
2	**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. **Food Safety and Standards Act: Salient features of food safety and standards Act ,2006; 2011:** **INTERNATIONAL BODIES DEALING IN STANDARIZATION** International Standardization Organization (ISO), Joint FAO/WHO Food Standards Program. Codex Alimentarius Commission (CAC), Other International Organizations Active in Food Standard Harmonization. Advantages of Utilizing International Standards. Rapid Alert system.	25%
3	**Food safety:** Characterization and risk analysis- Food hazards: Physical, Chemical and biological systems for food safety. Conduct a hazard analysis, CCP identification, establish critical limits for each CCP, establish CCP monitoring procedures, establish corrective actions procedures, and establish procedures for HACCP verification and validation, documenting the HACCP Program. **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 labelling, specifications and certifications. Case studies and judicial pronouncements, procedure for investigations and filing of cases by food safety regulator as per FSS act.	25%
4	**Quality Assurance:** Mandatory and voluntary food laws, Theoretical and practical considerations, description of different systems: GAP, GMP, TQM, ISO. Indian food standards- Voluntary and Obligatory standards (PFA, FPO, MMPO, AGMARK etc.) Codex alimentarius, Worldwide food safety issues.	25%

	Regulations on use of Food Additives- FSSAI guidelines Recent updates about Ministry of Food Processing Industries (MOFPI) and Agricultural and Processed Food Products Export Development Authority (APEDA).	
Reference Book	• Frederick, J.F, 2000, Encyclopedia of Food Science and Technology. Second edition vol 1-4, a widely inter science publication. • Roday, S., 2008, Food science and nutrition. Third edition, Oxford University Press, New Delhi. • Besterfield DH, C Besterfield-Michna, Besterfield GH, M Besterfield-Sacre (2007) Total Quality Management, 3rd Edition, Pearson Education Inc. • Rekha S. Singhal, Pushpa R. Kulkarni, Dinanath V. Rege (1997) Handbook of Indices of Food Quality and Authenticity, 2nd Edition, Woodhead Publishing Ltd, England. • Inteaz Ali (2004) Food Quality Assurance: Principles & Practices, CRC Press. • Roday S, (2011) (2002), "Food Hygiene and Sanitation", McGraw Hill Publishing Company Limited. • Andres Vasconcellos J. 2005. Quality Assurance for the Food industry - A practical approach. CRC press.	

Course Code	**PGDFSQC55**	**Title of the Course**	**Practicals-I**
Total Credits of the Course	04	Hours per Week	04
Couse Objective	• To acquire skill of food component analysis and determination • To learn energy value of food and its calculation • To learn the analysis of physical and chemical properties of various food		
	1. Estimation of calorific value of food sample (Fruits, Bakery Product, egg, nuts etc) 2. Water Analysis (pH, Conductivity, Hardnase, BOD, COD) 3. Determination of protein, CHO, Crude fat in given food sample 4. Determination of Vitamin C in given food sample 5. Determination of moisture by air oven method and vacuum. 6. Estimation of gluten in foods. 7. Determination of total ash. 8. Determination of sugar concentration and soluble solids by the use of hand and Abbe's refractometer. 9. Determination of vitamin A. 10. Determination of benzoic acid in foods. 11. Estimation of turbidity of solution. 12. Determination of carotenes, anthocyanin and chlorophyll content in foods 13. Estimation of non-enzymatic browning in foods 14. Saponification value and unsaponifiable matter of fats and oils. 15. Study of role of protein in food structure development in curd, yogurt and cheese making 16. Determination of Iron in foods. 17. Estimation of Starch and Sugar from food 18. Sorbic acid in food products.		

Course Code	**PGDFSQC57**	**Title of the Course**	**Practicals-II**
Total Credits of the Course		Hours per Week	04
Couse Objective	• To acquire skill of food component analysis and determination • To learn Microscopic examination of food and Milk • To learn the analysis of toxin and adulteration present in various food		
	1. Isolation, Enumeration and Characteristics of microorganisms 2. Estimation of Toxin and Pesticide in food sample 3. Estimation of Total Microbial count of Yeast, Mold of Milk, Fruit and vegetable, Meat, fish, canned product. 4. Detection of adulteration in fats and oils 5. Determination of nitrate and Nitrite in foods 6. Microbiology of Milk (Enzymatic test of milk by MBRT(Methylene Blue Reductase Test), Determination of phosphatase activity of milk, Detection of mastitis through milk test, Detection of calcium and phosphorous in milk) 7. SWAB test 8. Capsule staining 9. Spore staining 10. Microscopic examination of living organisms- hanging drop mount method for the demonstration of bacterial motility 11. Negative staining of bacteria 12. Working and handling of common microbiological laboratory equipments and materials 13. Detection of mastitis through milk test 14. To analyse facts gravimetrically. 15. To analyse facts by volumetric methods 16. Development of GHP and GMP Plan for a food factory (Module 1) a. Identifying the key focus areas for GHP & GMP b. Identifying gaps in its implementation and c. Closure plans for identified gaps in a food factory/ food outlet 17. Food laws (Module 1) : Identification of legal requirements for following food groups product standards : (a) Fruit/Vegetables, (b) Dairy, (c) Meat & Meat products (d) Cereal, Pulses and Oilseeds e) fish and sea foods (f) and ready to eat foods (specific legal requirements)		

Course Code	**PGDFSQC55**	**Title of the Course**	**Internship and Viva**
Total Credits of the Course	04	-	-
Couse Objective	• To develop research and project writing skills in students. • Student can acquired industrial skill/food analysis and its interpretation on site.		
	Internship: A candidate will be required to undergo internship training of one month in a factory/business house/Research Lab/Testing Lab etc. and submit a report of the work done. She/He will be evaluated through a presentation and viva-voce on the internship report by a panel of examiners. A research or industrial project for one month will be allotted to each student. They will be required to complete the data collection, analysis and writing of dissertation so as to submit it.		