

**SIES COLLEGE OF ARTS, SCIENCE AND COMMERCE
(AUTONOMOUS)**

DEPARTMENT OF BIOCHEMISTRY

SYLLABUS FOR

POST GRADUATE DIPLOMA

IN

FOOD TECHNOLOGY AND NUTRACEUTICALS

WITH EFFECT FROM JULY 2020

RATIONALE:

Nutraceutical industry, which includes functional foods and dietary supplements, is the industry which amalgamates pharma and food industry. The popularity and growth of this industry is attributed to consumers' increased inclination towards health and nutrition. Today, functional foods are in great demand for their potentials to provide physiological benefits in chronic lifestyle diseases and Nutraceuticals are perceived as alternatives to prescription drugs.

In this scenario, as the market for food and nutraceutical grows, the demand for skilled and trained graduates and postgraduates increases. This Post Graduate Diploma in Food Technology and Nutraceuticals is tailored to be a job-oriented program.

OBJECTIVES OF THE COURSE:

- Train students to become skilled professionals for the growing Food and Nutraceutical industry
- Motivate the students to research and develop novel, innovative and improved food products
- Familiarize the student with the rules and regulations related to safety, quality and label claims of food and nutraceutical products
- To provide a platform to collaborate actively with industry
- Develop entrepreneurial spirit among students for inspiring them to set up their own facilities.

Eligibility

The qualifications required for admission to the course is as follows.

The applicant should possess a B.Sc. /M.Sc. degree of University of Mumbai or any recognized University and should have offered the following subjects at the various examinations as shown below.

He / She must have Master's degree in Biochemistry/ Microbiology/ Botany/ Zoology/ Life sciences/ Chemistry. Applicant with Master's degree in Chemistry must have any one biological science subject at least till the second year of B.Sc.

OR

He /She must have B.Sc. degree with any one of the following subjects at the T.Y.B.Sc level of the three year degree course.

- i) Biochemistry ii) Microbiology iii) Life Sciences iv) Zoology v) Botany
- vi) Chemistry

Those with chemistry subject at the T.Y.B.Sc. Level should have any one biological science subject at least till the second year of B.Sc.

Graduate/Postgraduate in Science (other than the above mentioned subjects) or other stream, with experience of working in Food/nutraceutical/Nutrition or allied industry

will be considered for admission under 'Industry seats', based on the interview by admission panel.

Duration : One Year plus Three months in-plant training

Syllabus Summary

PAPER CODE	UNIT	TOPICS	CREDITS	HOURS
PGDFTN01	FOOD TECHNOLOGY		04	
	I	Basics principles of Food and Nutrition		15
	II	Principles of food processing and preservation.		15
	III	Food process technology - I		15
	IV	Food process technology - II		15
PGDFTN02	NUTRACEUTICAL		04	
	I	Functional foods and Nutraceuticals		15
	II	Extraction and isolation of natural bioactive compounds		15
	III	Analytical techniques		15
	IV	Packaging and labeling of food product and nutraceutical		15
PGDFTN03	FOOD REGULATORY AND QUALITY MANAGEMENT SYSTEM; SOFT SKILLS		04	
	I	Food laws and standards		15
	II	Principles of food safety and quality management system		15
	III	Food Product Licensing, Import and Export regulations, IPR and Documentation		15
	IV	Communication and Soft Skills		15
PGDFTNP				
	I	Food Technology	04	
	II	Nutraceutical	04	
	III	Experiential Learning	08	
	IV	Dissertation	04	
		INTERNSHIP	08	

Total Credits: 40; Total marks: 600

STRUCTURE OF THE COURSE

Sr.no	Paper no.	Title	MARKS		
			Theory	Practical	Total
1	I	Food Technology	60 + 40 (4 Credits)	100 (4 Credits)	200
2	II	Nutraceutical	60 + 40 (4 Credits)	100 (4 Credits)	200
3	III	Food Regulatory and Quality Management System: Corporate and Soft Skills. *(Experiential Learning: Industrial Visit, training, workshop, assignments)	60 + 40 (4 Credits)	*50 (8 credits)	150
4	IV	Project/Dissertation		50 (4 Credits)	50
5		INTERNSHIP	08 credits		
Total Credits: 40					600

PATTERN OF EXAMINATION: Annual Pattern

SCHEME OF EXAMINATION

A) THEORY

- External Examination 60%. The theory examination shall be at the end of second term.
- Internal Examination 40%. There will be continuous evaluation / internal assessment in the form of activity, assignments, presentation and class test.
- Each theory paper shall carry 60 marks
- Each theory paper shall be 2 1/2 hours duration.
- Each theory paper shall contain 04 questions of 15 marks each as follows:- Q1 Based on Unit I, Q2 Based on Unit II, Q3 Based on Unit III and Q4 Based on Unit IV.

B) PRACTICAL

- Evaluation of the performance of the students in practical shall be based on annual examination
- There will be continuous evaluation / internal assessment of

practical records, Reports of lab visits and industrial visits etc..

EVALUATION SYSTEM

1. Standard of passing

To pass in each paper students are required to obtain minimum 40% marks in each internal (40 marks) and Term end exam (60 marks).

2. Assessment of Project / Industrial visit /study tour /Internship Report

- The Industrial visit/study tour/on-job training report must be submitted by the prescribed date usually two weeks before the end of academic session of the semester/term
It is desirable that the topics for Industrial visit/study tour/ on-job training report shall be assigned by the end of previous semester/term
- The Industrial visit/study tour/ on-job training report and its presentation shall be evaluated by the coordinator of the course and concerned faculty.

3 Grade point for Theory/Practical/ Industrial visit /study tour/ on-job training Report

Table –I: for 100 Marks Theory or Practical

Grade Point	Marks out of	Mark obtained	Grade	Description of Performance
0	600	0-30	D	Unsatisfactory
1	600	30-60		
1.5	600	61-90		
2	600	91-120		
2.5	600	121-150		
3	600	151 -180		
3.5	600	181-210	C	Fair
4	600	211-240		
4.5	600	241 - 270	B	Satisfactory
5	600	271 -300		
5.5	600	301 - 330		
6	600	331 - 360	B+	Good
6.5	600	361 - 390		
7	600	391 - 420	A	Very Good
7.5	600	421 - 450		
8	600	451 - 480	A+	Excellent
8.5	600	481 - 510		
9	600	511 - 540	O	Outstanding
9.5	600	541 - 570		

10	600	571 - 600		
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Calculation of SGPA and CGPA

1. Semester Grade Point Average (SGPA) = $\frac{\Sigma (\text{course credits in passed courses} \times \text{earned grade points})}{\Sigma (\text{Course credits in registered courses})}$
2. Cumulative Grade Point Average = $\frac{\Sigma (\text{course credits in passed courses} \times \text{earned grade points}) \text{ of all Sem.}}{\Sigma (\text{Course credits in registered courses}) \text{ of all Semesters}}$
(CGPA)

SGPA and CGPA Table

Grade Point	Grade	Description of Performance
0.00 to 3.49	D	Unsatisfactory
3.5 to 4.49	C	Fair
4.5 to 5.49	B	Satisfactory
5.5 to 5.99	B+	Good
6.0 to 6.99	A	Very Good
7.0 to 8.49	A+	Excellent
8.5 to 10.00	O	Outstanding

- Ist Class with distinction: CGPA > 7.0 and above
Ist Class: CGPA > 6.0 and < 7.0
- IInd Class: CGPA > 5.0 and < 6.0
- Pass Class: CGPA > 4.0 and < 5.0
- Fail: CGPA < 4.0

PAPER I – FOOD TECHNOLOGY

Unit 1: Basic principles of Food and Nutrition

(Lectures: 15)

1.1 Food Chemistry: Biochemical constituents of food - Carbohydrates, proteins, lipids, vitamins, minerals and water.

1.2 Basic concepts in nutrition:

Basics of energy balance - Basal Metabolic Rate (BMR), Body Mass Index (BMI) and Specific Dynamic Action (SDA/ thermic effect), recommended dietary intake, acceptable dietary intake, Nutrient reference values (NRVs), nitrogen balance, protein efficiency ratio, net protein utilization.

1.3 Special dietary needs and therapeutic nutrition: Physical activities and sports, infancy, pregnancy and lactation, menopause, malnutrition, diseases like diabetes, CVDs.

1.4 Food Microbiology: Microorganisms in food (Yeast, Mold, Bacteria); sources, microbial growth analysis, factors affecting growth of microorganisms: Intrinsic, Extrinsic.

1.5 Microbial spoilage and its effect on food; Spoilage of different kinds of food- cereals, pulses, fruits and vegetables, meat, fish egg, poultry and their processed products, milk and milk Products, canned foods and beverages.

Food borne diseases, intoxication, infection and microbial toxins.

Unit 2: Principles of food processing and preservation (Lectures: 15)

2.1 Food processing techniques:

- Baking, Frying, Roasting, Blanching
- Fermentation : Fermentation process in traditional food, commonly available fermented foods: sauerkraut, yoghurt, cheese, miso, tempeh, idli, dosa.

2.2 Techniques of food preservation:

- High Temperature: Evaporation, Drying & dehydration, Pasteurization, Canning and bottling, Retort processing and Smoking.
- low temperature: Refrigeration, Chilling, Freezing.
- Non- thermal methods - radiations, controlled atmosphere storage,

enzymes and bacteriocins.

2.3 Principles of Hurdle technology.

Factors affecting food deterioration and spoilage

2.4 Food additives: Types, General principles and regulation in their use.

Color, flavors, emulsifiers, firming agents, humectants and propellants, anti-browning and anticaking agents, antioxidants, raising and glazing agents, stabilizers, thickening and gelling agents, foaming and antifoaming agents, Chemical preservatives.

- 2.5 Enzymes in Food processing (Fruits, vegetables and beverages): Cellulase, Amylase, Protease, lipase & Pectinases. Production and Immobilization of enzymes.

Unit 3 : Food process technology - I

(Lectures: 15)

3.1 Fermentation technology: Steps, Bioprocess bioreactors, downstream processing.

3.2 Production of alcoholic beverages, Vitamins (vitamin B12), organic acid (citric acid), vinegar, polysaccharides (xanthan gums) and high fructose corn syrup.

3.3 Processing of fruits and vegetables: Post harvest handling, storage, control of ripening, Introduction to fruit and vegetable products, different types of products, dehydration techniques, canning, processed fruits and vegetables - pulps, jams, jellies, marmalades and other products like fruit juice and fruit bars.

3.4 Processing of Cereals and pulses: Different types of processing methods used in case of cereals and pulses-conventional and modern methods, Processing operations such as milling, pearling, par boiling. Extruded, puffed and fermented cereal based products, Indian traditional products.

3.5 Bakery - Different types of bakery products, manufacturing process of bread, biscuits and others

Unit 4: Food process technology - II

(Lectures: 15)

4.1 Dairy technology: Milk processing by filtration, clarification, standardization, homogenization and pasteurization, cream separating techniques and chilling techniques.

Types of milk and milk products- cream, butter, spray dried powder, casein, lactose, whey, ice cream, fermented dairy products, technology and applications with examples of Yoghurt, Acidophilous milk and value added products (baby foods, weaning foods, therapeutic foods. fortification and enrichment).

4.2 Sugar and Confectioneries - Types of sugars and different products of sugar industry, sugar processing - chocolate and confectionary manufacturing.

4.3 Oil Processing

4.4 Beverages and spices technology - Chemistry and production technology of coffee, tea and cocoa cultivation, harvesting, management and manufacture, value added products; Spice industry - cultivation, processing, and manufacture of value added products, specific examples of pepper, cardamom, ginger, turmeric, vanilla, garlic.

4.5 Poultry, meat and fish processing - sources, process and products. (Chicken Sausages, Salami, Smoked Meat, Fish Fingers)

PAPER II- NUTRACEUTICALS

Unit 1: Functional foods and Nutraceuticals (Lectures: 15)

1.1 Introduction to functional foods and nutraceuticals, Classification of nutraceuticals based on source and chemical nature.

Nutraceuticals of plant origin: Plant secondary metabolites- Terpenoids, Phenolics, Alkaloids, phytoestrogens, Pigments, Organosulphur compounds.

Sources and health benefits of nutraceuticals:

Glucans, ascorbic acid, quercetin, kaempferol, rutin, β -carotene, allicin, lycopene, limonene, α -tocopherol, zeaxanthin, caffeine, Olive oil, green tea.

1.2 Nutraceuticals of animal origin: chitin, chitosan, glucosamine, chondroitin sulphate, conjugated linoleic acid, eicosapentenoic acid, docosahexenoic acid, choline, lecithin

1.3 Microbial and algal nutraceuticals:.

Concept of prebiotics, probiotics and synbiotics.

Prebiotics: Non-digestible carbohydrates- Dietary fibers, functional oligosaccharides, Resistant starch and gums.

Probiotic microorganisms- Features and health benefits.

Probiotics in various foods: Dairy-based, fermented and non-fermented foods.

Quality assurance of probiotics and safety

Algae as source of omega-3 fatty acids, antioxidants and minerals; kelp and spirulina.

1.4 Concept of antioxidants - use of antioxidants as dietary supplements in prevention and treatment of cancer, obesity and stress

Functional foods and Nutraceuticals in diabetes, management of cancer,

Cognitive decline, liver and kidney disorders, osteoporosis, pediatrics,

geriatrics, sports, pregnancy and lactation

1.5 Nutraceutical Industry: Scope of the industry, Indian and global scenario.

Unit 2: Extraction and isolation of natural bioactive constituents (Lectures: 15)

2.1 Plant secondary metabolites: Alkaloids, phenols, Terpenoids, Glycosides.

Extraction and purification: Pre-extraction preparation,

Isolation and purification:

Traditional methods- maceration, Soxhlet extraction, decoction, infusion, percolation, sonication

Modern methods: Microwave-assisted, ultra sound assisted, supercritical fluid extraction, accelerated solvent extraction.

2.2 Concepts of standardization- Pharmacopeial standards; screening of phytochemicals.

2.3 Effect of food processing technology on bioactive components of nutraceuticals and functional foods.

2.4 Biotechnology in Phyto nutraceuticals : Role of medicinal and aromatic plants in nutraceutical industry–propagation-conventional and tissue culture, cultivation, post-harvest technology and strategies for crop improvement, development of high yielding lines and yield enhancement, plant genomics and metabolomics. Introduction to nanobiotechnology with special reference to nutraceuticals.

Unit 3: Analytical techniques (Lectures: 15)

3.1 Basic concepts, principle and applications: paper chromatography, thin layer chromatography, ion exchange chromatography, affinity chromatography and gel exclusion chromatography. High pressure liquid chromatography, gas liquid chromatography - principle, instrumentation and applications. Column chromatography as a separation technique.

3.2 Principle and applications of electrophoresis, Capillary and zone electrophoresis, PAGE, SDS-PAGE, two dimensional electrophoresis, pulsed field gel electrophoresis, isoelectric focusing and isotachopheresis.

3.3 Basic principles of spectroscopy-, UV-Visible spectroscopy, colorimetry, NMR, ESR, Mass spectrometry, Flame photometry and atomic absorption spectroscopy, Fluorescence spectrometry, IR spectrometry-Instrumentation and applications.

3.4 Study of Rheological properties and Principles of instruments used:

- Viscosity - Brookfield Viscometer, Texture Analyzer and Universal Testing Machine.
- Study of pH and its Importance in Food Technology.
- Study of Water Activity and its measurement.

- Polarimetry and measurement of colour.

Unit 4: Packaging and labeling of food product and nutraceutical (Lectures: 15)

4.1 Fundamentals of packaging: Role and importance of packaging

Packaging materials: Types, properties, advantages and disadvantages

Types of packaging /Forms of packaging – box, bottle, tetra, pouch, shrink, vacuum, gas, Controlled atmosphere packaging (CAP), Modified Atmosphere Packaging (MAP), aseptic etc.

4.2 Materials and their behavior; Permeability studies; Introduction to Water vapor transmission rate (WVTR), Gas transmission rate (GTR),

Migration studies

Compatibility studies; bursting strength, tensile strength, tearing strength, drop test, puncture test, impact test, Biodegradability

4.3 Package Labelling and label claims:

Function and scope of labelling- components of labelling,

Regulations of labelling: national and international regulations on labelling; claims related to health and nutritional profile

4.4 Shelf life and accelerated shelf life studies- Theory and numerical

4.5 Innovations in food packaging, Bio degradable polymers, edible films and coating, oxygen scavenging, packaging, bio Nano packing and green plastics, non-migratory bioactive polymers.

4.6 Packaging laws

PAPER III – Food Regulatory and Quality Management System; Soft Skills

Unit 1: Food laws and standards:

(Lectures: 15)

1.1 Understanding the food regulatory cycle

1.2 Introduction to Global regulatory authorities for food Industry:

- Codex Alimentarius Commission (CAC): 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.
- Introduction to Other International Standards setting Bodies: FAO, WHO, WTO – SPS (Sanitary and phytosanitary measures), TBT (Technical Barrier to trade), SQF: 1000, SQF: 2000.,SQF 8.1
- FDA – USFDA, SFDA, EU (European Union).

- Canadian Food Inspection Agency (CFIA), Food Standards Australia New Zealand (FSANZ), New Zealand Food Safety Authority (NZFSA), BRC food and BRC IOP standards, Food standards Agency (UK).

1.3 Food Regulations & Guidelines in India:

- History of food regulations in India. Legislations- Prevention of Food Adulteration act 1954, Food product order (1955), Meat Food Products Order (1973), Vegetable Oil Products Order, 1998, Milk & Milk Product Amendment Regulations – 2009.
- FSSAI – Role of FSSAI - Food Safety and Standards Act, 2006 (FSS) and Regulations:
 - Food Safety and Standards (Food Products Standards and Food Additives) Regulation, 2011.
 - Food Safety and Standards (Packaging and Labelling) Regulation, 2011.
 - Food Safety and Standards (Health Supplements, Nutraceuticals, Food for Special Dietary Use, Food for Special Medical Purpose, Functional Food and Novel Food) Regulations, 2016.
 - Food Safety and Standards (Organic Food) Regulation, 2017.
 - Food Safety and Standards (Fortification of Food) Regulation, 2018.
 - Food Safety and Standards (Packaging) Regulation, 2018.
 - Standard weights and measures – legal metrology

1.4 Voluntary National Standards: BIS and AGMARK

Unit 2: Principles of food safety and quality management system (Lectures: 15)

2.1 Introduction to Food Safety, Food Safety System.

2.2 Quality Management in Food Industry:

- Concept of Total Quality Management –
 - Quality Management Systems (QMS): ISO9001
 - Food Safety Management Systems (FSMS): ISO 22000
- General Principles of -GHP and GMP

- Other food safety practices: Good Agriculture Practices, Good Retail Practices, Good Transport Practices, GDP and Nutrition Labelling, Traceability studies.
- Hazard Analysis Critical Control Point (HACCP): History, structure, pre-requisites and principles, HACCP applications, HACCP based SOPs. Risk analysis: Introduction to risk analysis, Risk management, assessment and communication.

2.3 Introduction to Management Systems – Auditing, Certification and Accreditation:

- Food safety and quality audit: Audit planning, check list, Auditor competence, Audit exercise and Post audit activities: report writing, verification of corrective action and follow up.
- International Organization for Standardization (ISO): Overview, structure, interpretation and case studies of food safety and Quality management including ISO-9001:2015, ISO22000:2018, ISO 17025.
- FSSC 22000 – Food Safety Systems Certifications: Overview, Importance and Functions.

2.4 Laboratory Quality Management System:

- NABL Accreditation
- An Overview and Requirements of ISO 17025
- Requirements Specific to Food Testing Laboratories – Physical, Chemical and Biological Parameters

Unit 3: Food Product Licensing, Import and Export regulations, IPR and Documentation (Lectures: 15)

3.1 Food Safety and Standards (Licensing and Registration of Food Businesses) Regulation, 2011:

- Guidelines for registration of Business, procedure to be followed.
- Food Safety and Standards (Prohibition and Restriction of Sales) Regulation, 2011

3.2 Food Safety and Standards (Import) Regulation, 2017:

- Food Product Export Regulations – EIC

3.3 Food Industry Intellectual Property Rights:

- Patents
- Copyrights
- Trademarks

3.4 Documentation, Good Documentation Practices:

- Preparation of SOP's and Protocols
- Dossier Preparation and CTD

Unit 4: Soft Skills: (in the form of workshops)

(Lectures: 15)

4.1 Corporate & Office Etiquette

- Transition from College to Corporate world; Perceptions v/s Real Corporate life; Team work; Basics of corporate communication; Elements of a good handshake; Visiting cards exchange & How to manage business cards; Small Talk & Networking; Basics dining etiquette.

4.2 Personality Development: Self-assessment:

- SWOT analysis; Understanding Personality - Identifying different personalities; Levels of Human Learning; Change v/s Transformation; Sensitivity - Sharpen your senses; Creativity and Lateral thinking; Developing Positive Mental Attitude; Emotional Quotient; Handling Criticism; Positive Health; Food habits and Meditation; Goal setting - Creative Visualization - Law of Attraction; Living a created life - Personal Leadership.

4.3 Project Report Writing

- Project Charter; Project Plan; Gant Chart; Activities List; Resources List; Risks List, Project Status Report; Project Closure Report; Types of graphics & illustrations; Study of Project Report Templates.

4.4 Email Writing

- Problems resulting out of emails; Contents of email, Importance of a good subject line; Dos and Don'ts; Using your email software to its maximum; Setting up signatures; Setting up accounts; Creating HTML stationary; Creating email templates for common emails; Using short mails for internal communication; Importance of acknowledging

emails; Creating folder structure for easily accessing emails; Care to be taken while deleting emails, Archiving emails; Comparison of emails and letters; Writing typical emails, sending point-wise reply to emails.

4.5 Leadership & Effective Team Building

- Leading a Team; Alignment for Maximizing Performance; Work of Leadership; Leadership Decision Styles; Situational Leadership, Leader or a Manager; Setting standards and follow up; Developing our own leadership development strategy; Pre-empting and Managing conflict as a leader; Appraisal/development skills; Decision making, Creating a team identity; Building an emotional bond.

4.6 Time Management

- Priorities & time matrix; Time wasters; Work effectiveness and productivity; Bio-rhythm; Strategic breaks; 80/20 rule; Meetings as time wasters; Overcoming Interruptions; Procrastination; Identifying procrastination; Overcoming procrastination; Prioritization & Scheduling; Delegation; Setting up SMART action plan; Balanced lifestyle.

4.7 Stress Management

- Anatomy of Stress; General Adaptation Syndrome; Stress Management Strategies - Different type stress Management; Personality type & Individual Strategies; Lifestyle Management and stress; Organizational Stress; Stressors; Occupational Stress Management; Personal action Plan; Progressive Muscle Relaxation Technique

PRACTICAL- I

FOOD ANALYSIS

1. Determination of moisture content by Hot air method/Karl Fischer method.
2. Determination of ash content.
3. Determination of Mineral content (calcium, phosphorus and iron).
4. Quantitative estimation of reducing sugars by DNS method.
5. Quantification of proteins by Folin Ciocalteu method.
6. Lipid Analysis (Acid value, saponification and peroxide).

7. Study of Sol-gel properties of different starch samples.
8. Estimation of Vitamin B1.

FOOD MICROBIOLOGY

9. Preparation of culture media for cultivation of bacteria molds and yeasts.
10. Different methods of maintenance and preservation of cultures of microorganisms.
11. Different methods of isolation of microorganisms.
12. Microbial analysis of water and milk-Total count, Viable count, MPN Coliform and MBRT.
13. Bacteriological analysis of foods, yeast and mold count in food samples.
14. Biochemical tests for characterization of bacteria.(IMVIC)

ENZYME ANALYSIS

15. Determination of activity of phosphatase in milk.
16. Determination of thermal inactivation time of enzymes present in fruit and vegetables (catalase, phenolase, peroxidase.)
17. Enzyme studies- Activity and Specific activity measurements of amylase/ protease/ catalase / peroxidase and urease.
18. Immobilization of enzymes by gel entrapment method.

FOOD PROCESSING

19. Processing of fruits and vegetables- wine preparation.
20. Preparation of syrups, squashes, jams, jellies, fruit bars, ketchups and sauces.
21. Lab scale preparation of fermented milk products (yogurt, cheese)
22. Manufacture of margarine & Peanut butter.
23. Preparation of cookies & biscuits.
24. Preparation of Chocolates and candies.

PRACTICAL-2

STUDY OF PHYTOCONSTITUENTS

1. Chemical profiling of plant samples and extracts.
2. Extraction and characterization (UV/VIS, chromatography) of phytoconstituents
Extraction and characterization of alkaloids (Caffeine/Catechins).
Extraction and characterization of polyphenols (Gallic acid).
Extraction and characterization of flavonoids and isoflavones.
Extraction and characterization of terpenes and terpenoids

- Extraction of Pigments (Lycopene, Curcumin, Carotenoids).
3. Determination of caffeine and tannin content in coffee and tea.
 4. Study of functional foods and nutraceuticals already in market
 5. Writing of Standard operating procedures (SOPs).
 6. Sensory evaluation tests for processed foods.
 7. Preparation of certificate of analysis of nutraceutical raw material – turmeric and curcumin.
 8. Preparation of certificate of analysis of lactobacillus.
 9. Preparation of certificate of analysis of processed food.

DEMONSTRATION

1. Preparation of chitin, chitosan and glucosamine from prawn shell.
2. Determination of heavy metal load and pesticide residues in food and nutraceutical samples.

PROJECT

- Dissertation to be submitted
- Preparation of a novel healthy food/ functional food/ nutraceutical
- Aspects to be covered:
- Formulation/recipe, Preparation, Processing, Biochemical analysis, Sensory evaluation, study of shelf life, Packaging

INDUSTRY AND LAB VISITS/ TRAINING

- Dairy industry, poultry, Meat and Fish processing, Bakery, Confectionary,
- Vegetable and fruit processing, Oil and fat industry
- Nutraceutical industry, Herbal analysis lab, Food testing lab, Instrumentation company (Perkin Elmer)

PROPOSED GUEST LECTURES:

1. Special Dietary needs/ Role of nutrition in health and disease
2. Food additives and preservatives : Current market trends and safety
3. Emerging technologies in food processing
4. Functional foods and Nutraceuticals : Current trends, challenges and future perspectives
5. Extraction and characterization of bioactive compounds

6. Advancement in food technology: Dairy and Meat
7. Advancement in food technology: Bakery and Confectionary
8. Innovations in packaging of food and nutraceutical
9. Emerging trends in the manufacture and formulation of nutraceuticals and functional foods.
10. Quality evaluation and safety of food and nutraceutical products.
11. Novel health ingredients and their applications
12. Nutrigenomics: The genome-food interface
13. Probiotics: Facts and myths

Acknowledgement:

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Dr. Deepali Kothekar (Head Dept. of Biochemistry, Co-ordinator Food Technology and Nutraceuticals and Chairperson-BOS, Food Technology and Nutraceuticals)

Dr. Geeta Ibrahim (Principal, Nirmala Niketan College of Home Science, Mumbai; Member-BOS)

Mr. Sandeep Gupta (Founder and Director -Expert Nutraceutical Advocacy Council, Chairman & Member - Standard Review Group, Nutraceuticals, FSSAI (Food Safety and Standards Authority of India, Member- BOS) and ENAC team

Dr. Nilesh Amritkar (Managing Director-Envirocare labs Pvt. Ltd.; Member-BOS)

Ms. Mayuri Bane (Faculty and Member-BOS)

Dr. Sandhya Nambiar (Faculty and Member-BOS)

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Reference Books

1. Handbook of nutraceuticals and functional foods by Robert E C. Wildman, CRC/Taylor&Francis
2. Food processing principles and application by J. Scott Smith and Y.H.Hui Balckwell Pubishing-2004.
3. Food Microbiology by Martin R Adams and Maurice O Moss RSC publishing
4. Food Biochemistry and Food Processing by Benjamin K. Simpson Wiley

Blackwell publisher.

5. Food industry quality control systems By Mark Clute CRC press
6. Nutritional Health : Strategies for and Disease Prevention by Norman J. Temple, Ted Wilson, David R. Jacobs
7. Dietary Supplements of Plant Origin, M. Maffei (Ed.), Taylor & Francis, 2003.
8. Dairy Ingredients for Food Processing by Ramesh C. Chandan Arun Kilara Wiley Blackwell publisher.
9. Drying of Foods Vegetables and Fruits by Sachin V. Jangam, Chung Lim Law and Arun S Mujumdar.
10. Handbook of Meat Processing by Fidel Toldrá Wiley Blackwell publisher.
11. Food Process Engineering and Technology by Zeki Berk.
12. Natural Colorants for Food and Nutraceutical Uses by Francisco Delgado-Vargas Octavio Paredes-López. CRC PRESS
13. Bioprocesses and Biotechnology for Functional Foods and Nutraceuticals, Jean – Richard Neeser & J. Bruce German, Marcel Dekker, Inc., 2004.
14. Herbal Products –Timotht S. Tracy, Richard L. Kingston.
15. Nutritional Biochemistry, II edition by Tom Brody.
16. Phenolics in food and nutraceuticals by Fereidoon shahidi and Marian Naczkc CRC press
17. Functional Foods: Principles and Technology, M. Guo, CRC press, 2009.
18. Unit operations in food processing, R L Earle and M D Earle, NZIFST Publications
19. Food processing handbook, James G Brennan, Wiley VCH
20. Ultra-high pressure treatment of foods, Marc E. G. Hendrickx, Dietrich W. Knorr Novel Food processing technologies, Gustavo V. Barbosa-Cánovas, María S. Tapia, M. Pilar Cano, CRC press, 2005
21. Non Thermal preservation of foods, Gustavo V. Barbosa-Cánovas, Marcel Dekker, 1998
22. Handbook on food preservation by Shafiur Rahman
23. Physical principles of food preservation, Marcus Karel, Daryl B. Lund, Marcel Dekker, 2003

24. Food Biochemistry and Food processing, YH Hui (Ed), Wai-Kit Nip (Ass Ed), Leo ML Nollet (Ass Ed), Gopinadhan Paliyath (Ass Ed), Benjamin K Simpson (Ass Ed), Wiley Blackwell, 2006
25. Food packaging principles and practice, Gordon L. Robertson, Marcel and Dekker Inc. New York. 1993.
26. Aseptic processing and packaging of Particulate foods by Edward M.A . Willhoft.
27. Food packaging and shelf life-A practical guide, Gordon L. Robertson, CRC Press/Taylor & Francis Group, 2009
28. HPLC: A Practical handbook of Preparative HPLC-Donald A Welling
29. Mass Spectrometry (Principle & Application)-E. Hoffmann & V. Strooban
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