



**St Aloysius College (Autonomous)**  
**Mangaluru**

**Re-accredited by NAAC “A” Grade**  
**Course structure and syllabus of**  
**B.Sc.**  
**FOOD SCIENCE**

**Under NEP Regulations, 2021**

ಶಾಲೆಯ ಹೆಸರು (ಕನ್ನಡ)  
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Re-accredited by NAAC with 'A' Grade with CGPA 3.62/4  
Recognised by UGC as "College with Potential for Excellence"  
Conferred "College with "STAR STATUS" by DBT, Government of India.  
Centre for Research Capacity Building under UGC-STRIDE

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Date: 17-08-2022

### NOTIFICATION

Sub: Syllabus of **B.Sc. FOOD SCIENCE** under NEP Regulations, 2021.  
(As per Mangalore University guidelines)

- Ref: 1. Decision of the Academic Council meeting held on 18-12-2021 vide  
Agenda No: 6.15 (2021-22)  
2. Decision of the Academic Council meeting held on 09-07-2022 vide  
Agenda No: 14  
3. Office Notification dated 21-02-2022  
4. Office Notification dated 17-08-2022

Pursuant to the above, the Syllabus of **B.Sc. FOOD SCIENCE** under NEP Regulations, 2021 which was approved by the Academic Council at its meeting held on 18-12-2021 & 09-07-2022 is hereby notified for implementation with effect from the academic year 2021-22.

  
PRINCIPAL



  
REGISTRAR

To:

1. The Chairman/Dean/HOD.
2. The Registrar Office
3. Library

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Board of studies meeting was held on Thursday 2<sup>nd</sup> of December 2021 in the LCRI Director room , Department of Food Science, St Aloysius College, Mangalore.

### Board of Studies in Food Science

Sl. No.	Category	Name & Contact details
1	Chairman/Chairperson	Dr. AdarshaGowda
2	Members of the Department	Dr. S.N. Raghavendra Ms. ShilpaLekha M.S. Mr. Ashok Kumar C Ms. Daniella Anne L. Chyne Ms. Sherin Mathew Ms. JovitaCarrolSoans Ms. Rachitha R Mr. Roysten Dias Ms. Jenisa Ms. Claret
3	Members of the Allied Departments	a) Dr. Richard Gonslaves b) Dr. Asha Abraham, c) Prof Harsha Paul, d) Dr. LyneddafnyLasrado
4	Subject Experts	Dr. ArchanaPrabhat Dr. Krishna Prasad N
5	Vice Chancellor Nominee	Dr. Mamtha
6	Representative from Industry/ Corporate Sector / Allied Area	Mr. Ananthesh V Prabhu Mr. Prakash Mr. G. Girish .
7	Special Invite:	Dr. Anil Kumar

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**BOS meeting was held on 17<sup>th</sup> June 2022**

**Board of Studies in Food Science**

<b>Sl. No.</b>	<b>Category</b>	<b>Name &amp; Contact details</b>
<b>1</b>	<b>Chairman/Chairperson</b>	<b>Dr. AdarshaGowda</b>
<b>2</b>	<b>Members of the Department</b>	<b>Dr. S.N. Raghavendra Ms. ShilpaLekha M.S. Mr. Ashok Kumar C Ms. Daniella Anne L. Chyne Ms. Sherin Mathew Ms. JovitaCarrolSoans Ms. Rachitha R Mr. Roysten Dias Ms. Jenisa Ms. Claret</b>
<b>3</b>	<b>Members of the Allied Departments</b>	<b>a) Dr. Richard Gonslaves b) Dr. Asha Abraham, c) Prof Harsha Paul, d) Dr. LyneddafnyLasrado</b>
<b>4</b>	<b>Subject Experts</b>	<b>Dr. ArchanaPrabhat Dr. Krishna Prasad N</b>
<b>5</b>	<b>Vice Chancellor Nominee</b>	<b>Dr. Mamtha</b>
<b>6</b>	<b>Representative from Industry/ Corporate Sector / Allied Area</b>	<b>Mr. Ananthesh V Prabhu Mr. Prakash Mr. G. Girish</b>
<b>7</b>	<b>Special Invite:</b>	<b>Dr. Anil Kumar</b>

## **B.Sc. (Basic / Hons.) Food Science**

### **Preamble:**

In keeping with the Govt. of India's NEP-2020 vision of a holistic and multidisciplinary Under-Graduate education that equips employable graduates with the required skills in domain as well as personality that are required in the 21<sup>st</sup> century, the Govt. of Karnataka constituted Subject-wise Committees to work towards envisaging, designing and drafting a common syllabus with hallmarks being multiple entry and exit points enabling horizontal and vertical mobility. This has now been adapted in Mangalore University with minor changes and shall be effective from the academic year 2021-22.

Salient features are as follows:

1. Discipline Core (DSC) or Domain-specific Core Courses in Food Science
2. Discipline Electives (DSE) or Elective Courses in the Core Subject or Discipline.
3. Open Electives (OE) are Elective Courses offered to students from non-core Subjects across disciplines.
4. Skill Enhancement Courses (SEC) that are domain-specific or generic.
5. 1 hour of Lecture or 2 hours of practical per week in a semester is assigned one credit.
6. Core discipline theory courses are of 3/4 credits, while practicals are of 2 credits

### **Program Outcomes (POs)**

At the end of the program, Food technology graduates will be able to:

- PO 1. **Disciplinary Knowledge:** Bachelor degree in Food Technology helps to apply the knowledge of science, engineering fundamentals, and mathematical concepts to the solution in the field of food technology, science and other allied subjects
- PO 2. **Communication Skills:** Communicate effectively and write effective reports and design documentation, make effective presentations through seminars, project

dissertations

PO 3. **Critical thinking and analytical reasoning:** Recognize the need for, and have the preparation and ability to engage in independent/ as an entrepreneur and life-long learning in the broadest context of technological change logical reasoning and capability of recognizing and distinguishing the various aspects of real-life problems.

PO

4. **Problem Solving:** Identify, formulate, review research literature, and analyze complex

Food Technology/ applications problems and Design solutions for complex problems and design system components or processes that meet the specified needs with appropriate consideration for the food sustainability

PO

5. **Research related skills:** Acquire the practical knowledge and demonstrate the ability to design, conduct/trouble shoot experiments and analyze data in the field of food technology

PO 6. **Information/digital Literacy:** The completion of this program will enable the learner to use appropriate software's to apply for bulk scale/ industrial production of technology-based food products

PO 7. **Self-directed learning:** The student completing this program will develop an ability of working independently and to make an in-depth study of various disciplines of food technology.

PO

8. **Moral and ethical awareness/reasoning:** Understand the impact of the professional food technology solutions in societal and environmental contexts, and apply ethical principles and commit to professional ethics and responsibilities

PO 9. **Lifelong learning:** This program provides self-directed learning and lifelong learning skills to think independently and develop problem solving skills with respect to food industry

PO 10. Ability to peruse advanced studies and research in Allied fields of Food science.

## Scheme and Syllabus for B.Sc. (Basic / Hons.) Food Science)

SEMESTER- 1								
Group	CourseCode	Titleof theCourse	Instruction Hours/week	Duration of Exam (Hours)	Marks			Credits
					IA	Exam	Total	
Discipline Core Courses	G 514 DC1.1	Fundamentals of Food Science & Nutrition	3	3	40	60	100	3
	G 514 DC 2.1P	Fundamentals of Food Science & Nutrition- Practical- 1	3	3	25	25	50	2
Open Elective Courses								
	G 514 OE1.1	Food and Nutrition	3	3	40	60	100	3
<b>Total</b>			<b>9</b>		<b>250</b>			<b>8</b>

SEMESTER- II								
Group	CourseCode	Titleof theCourse	Instruction Hours/week	Duration of Exam (Hours)	Marks			Credits
					IA	Exam	Total	
Discipline Core Courses	G 514 DC1.2	Food Processing And Preservation	3	3	40	60	100	3
	G 514 DC2.2P	Food Processing And Preservation	3	3	25	25	50	2
Open Elective	G 514 OE1.2	Food safety	3	3	40	60	100	3
<b>Total</b>			<b>9</b>				<b>250</b>	<b>8</b>



SEMESTER- III								
Group	CourseCode	Titleof theCourse	Instruction Hours/week	Duration of Exam (Hours)	Marks			Credits
					IA	Exam	Total	
Discipline Core Courses	G 514 DC1.3	Basics of Food Safety and Quality Control	3	3	40	60	100	3
	G 514 DC 2.3P	Basics of Food Safety and Quality Control - Practical 3	3	3	25	25	50	2
Open Elective Courses	G 514 OE1.3	Healthy Lifestyles and Nutrition	3	3	40	60	100	3
<b>Total</b>			<b>9</b>		<b>250</b>			<b>8</b>

SEMESTER- IV								
Group	CourseCode	Titleof theCourse	Instruction Hours/week	Duration of Exam (Hours)	Marks			Credits
					IA	Exam	Total	
Discipline Core Courses	G 514 DC1.4	Fundamentals of food chemistry and microbiology	3	3	40	60	100	3
	G 514 DC2.4P	Fundamentals of food chemistry and microbiology - Practical 4	3	3	25	25	50	2
Open Elective Courses	G 514 OE1.4	Nutrition in Physical Fitness	3	3	40	60	100	3
<b>Total</b>			<b>9</b>				<b>250</b>	<b>8</b>

**Pedagogy** for student engagement is predominantly lectures. However, other pedagogies that enhance better student engagement may be adopted for each course. The list includes active/experiential learning/course projects/problem or project-based learning (PBL)/case studies/self-study like seminar, term paper or MOOC/field visits/ industrial visits/group activity/simulations /hackathon setc.

**Assessment:** Every course need to include assessment for higher order thinking skills (applying/analyzing/evaluating/creating). These shall necessarily be reflected also in the Question Papers, such that questions of all levels of difficulty are framed. Alternate assessment methods that help formative assessment (i.e. assessment for learning) may also be adopted.

## **SUBJECT TITLE: FOOD SCIENCE**

### **COMBINATION: Food Science, Chemistry and Biochemistry (FS & CB)**

#### **SCOPE OF FOOD SCIENCE:**

Food science can be defined as the application of the basic sciences and engineering to the study of fundamental physical, chemical and biochemical nature of foods and the principles of food processing. As such food science is a broad branch which contains within it many specializations such as food microbiology, food chemistry, nutrition, preservation, processing food safety and quality control, and subjects like marketing are also mated with food science it makes more comprehensive.

As the knowledge in food science is a very fundamental to all concerned in food-based business and supply, it becomes imperative that the knowledge in the food science is imparted as branch of science at college and university levels. The food industry, government and academic institutions need to employ the trained personnel, the need to include the subject at bachelor level assumes relevance and significance. Therefore, food science is recognized as an essential and much required subject to be included in college curricula.

## **PROGRAM SPECIFIC OUTCOMES**

Food Science Graduates will be able to:

- 1.** Know the chemistry underlying the properties and reactions of various food components, have sufficient knowledge of food chemistry to control reactions in foods, know the major chemical reactions that limit shelf life of foods, use the laboratory techniques common to basic and applied food chemistry and know the principles behind analytical techniques associated with food.
- 2.** Identify the important pathogens and spoilage microorganisms in foods and the conditions under which they will grow, inactivated, killed or made harmless in foods and know the principles involving food preservation via fermentation processes.
- 3.** Incorporate the principles of food science and nutrition in practical, real- world situations and problems.
- 4.** Apply the principles of food science to control and assure the quality of food products and also identify government regulations required for the manufacture and sale of food products.
- 5.** List major properties, functions, and important food sources of the nutrients, describe human nutrient and energy needs throughout the life span and in physical training and translate human nutrient and energy needs into daily food selection utilizing appropriate standards and guidelines.
- 6.** Explain the significance of food practices to nutrition and disease prevention and effectively evaluate meal plans for nutritional adequacy, nutrient density, balance, variety, and calorie control.

## CURRICULUM STRUCTURE FOR UNDERGRADUATE DEGREE

### B.Sc. FOOD SCIENCE

#### SEMESTER 1

Total Credits for the Program: 180 credits

#### Program Articulation Matrix:

This matrix lists only the core courses. Core courses are essential to earn the degree in that discipline/subject. They include courses such as theory, laboratory, project internship etc. Elective courses may be listed separately

### B.Sc. FOOD SCIENCE

#### FUNDAMENTALS OF FOOD SCIENCE & NUTRITION      52 hours (THEORY)

#### Course Outcomes:

After successful completion of this Course, students will be able to:

To enable students

- CO 1. Obtain knowledge of different food groups, their composition and role in diet.
- CO 2. To gain knowledge of different plant and animal derived foods and their nutritive values and properties.
- CO 3. Different methods of processing and cooking.
- CO 4. Critically assess and analyze food science information available in the public domain in an innovative and ethical way.

#### UNIT -I (13 hours)

**Food groups:** Basic of food groups. Functional food groups-energy yielding, body building and protective foods (only sources and not properties and functions). Food Pyramid, My Plate. Study of various cooking methods - Boiling, steaming, stewing, frying, baking, roasting, broiling, cooking under pressure. Cereals - composition of rice, wheat, effects of cooking on parboiled, principles of starch cookery, gelatinization.

#### UNIT -II (13 hours)

**Introduction to Food:** Definition, classification and constituents of food: carbohydrates, lipids, proteins, fat soluble vitamins- (A,D,E and K) water soluble

vitamins (thiamin, riboflavin, niacin, pyridoxine, vitamin B12 and vitamin C, minerals, calcium, iron, zinc, iodine and fluorine). Nutritional concept in food design: nutritive values of cereals, pulses, oil seeds, fruits, vegetables, fish, meat and eggs. Food Pigments: Anthocyanins, chlorophyll, flavonoids, carotenoids.

### **UNIT -III (13 hours)**

Basic terms used in study of food and nutrition Understanding relationship between food, nutrition and health. Food Groups, Functions of water in body, water balance & energy balance. Assessment of nutritional status (biochemical, anthropometric, dietary), BMI & BMR of an individual. Balanced diet, malnutrition.

### **UNIT -IV (13 hours)**

Functions of food-physiological, psychological and social. Concept of balanced diet. Principles of meal planning. Nutrients, vitamins and minerals. Recommended Dietary Allowance (RDA): Requirement of infants, children, adults, old people, expectant and nursing mothers. Geriatric nutrition, nutrition for athletes. FUNCTIONAL FOOD: Introduction to Functional foods, Prebiotics, Probiotics, Nutraceutical. Organic Foods and GM foods

## **PRACTICALS**

**CBCS/Semester System ((2020-21) - I Semester Syllabus**

**B.Sc. FOOD SCIENCE AND NUTRITION**

**DSC-1 Paper-1 Lab: FOOD SCIENCE (PRACTICAL)**

**Hours of instruction 2 per week**

**Credits**

**Internals:**

**Sem end exam: 50**

1. Food group- Grouping of foods, discussion on nutritive value.
2. Measuring ingredients Methods of measuring different types of foods – grains, flours &quids.
3. Edible portion: Determination of edible portion percentage of different foods.
4. Cooking methods Moist heat methods – (i) boiling, simmering, steaming, & Pressure cooking (ii).Dry heat methods – baking. (iii), Fat as a medium for Coking-shallow and deep fat frying.
5. To study nutritional information in different packed foods available in the market.
6. Qualitative and quantitative determination of carbohydrates in food.\
7. To prepare scrap file showing excess and deficiency of different food components.

### **Reference Books:**

1. N. ShakuntalaManay& M. Shadaksharaswamy Food Facts and Principles by, New Age International (P) Ltd. Publishers.
2. Food Science by Srilakshmi , second edition,2002.
3. Food science, Chemistry and Experimental foods by M. Swaminathan.
4. N. Potter & J. Hotchkiss, Food Science CBS Publisher and Distributors.
5. ManoranjanKalia and SagitaSood, Food Preservation and Processing by KalyaniPublishers.
6. Shubhangini Joshi, Nutrition and Dietetics TataMcgraw Hill Co. Ltd.
7. M. Swaminathan, Vol-I Food and Nutrition , Bangalore Printing and

PublishingCo.

8. Gopalan C, Rama Sastri BV, Balasubramanian SC .1989. Nutritive Value of IndianFoods. National Institute of Nutrition, ICMR, Hyderabad.
8. Wardlaw and Insel MG, Insel PM. 2004. Perspectives in Nutrition. Sixth Edition, McGraw Hill.
9. Srilakshmi B 2012. Nutrition Science. 4th Revised Edition, New Age InterntionalPublishers.
10. Khanna K, Gupta S, Seth R, Passi SJ, Mahna R, PuriS .Textbook of Nutrition andDietetics. Phoenix Publishing House Pvt. Ltd.
11. ICMR.2010. Recommended Dietary Allowances for Indians. Published by NationalInstitute of Nutrition, Hyderabad
12. Antia, F.P. and Abraham, P. 2011: Clinical Dietetics and Nutrition, Fourth Edition, Oxford University Press.
13. Joshi, V.D. 2005: Handbook of Nutrition and Dietetics, Vora Medical Publications, Mumbai.

## **B.Sc.FOOD SCIENCE**

### **SEMESTER2**

**TotalCredits fortheProgram:** 180credits

**Startingyearof implementation:** 2021-2022

**Nameof theDegreeProgram:** B.ScDegree/Honours andM.Sc

**Discipline/Subject:** FoodScience /Technology

#### **ProgramArticulationMatrix:**

Thismatrixlistsonlythecorecourses.Corecoursesareessentialtoearnthedegree inthatdiscipline/subject.Theyincludecoursessuchastheory,laboratory,project internshipsetc.Electivecoursesmaybelistedseparately

## **B.Sc. FOOD SCIENCE**

**FOOD PROCESSING AND PRESERVATION      52 hours**

#### **Course Objectives:**

1. To understand the source and variability of raw food material and their impact on food processing operations.
2. To study the principles and current practices of different processing techniques and its effects on process parameters and product quality.
3. To study the spoilage and deterioration mechanisms in foods and its preventive measures.
4. To have an in-depth understanding of water disposal, shelf life of the food material, packaging materials and food storage.

#### **Course Outcome:**

At the end of the Course, students will be able to



CO 1. Describes the principles of food preservation and suggest the application of the preservation process depending on the type of food.

CO 2. Determines the thermal processing conditions (time / temperature) for each type of food and propose a device that matches a particular conservation process.

CO 3. Chooses the appropriate application of certain conservation processes with regard to the preservation of quality and the satisfactory durability of food products.

CO 4. Optimizes process parameters for selected conservation processes taking into account the physico-chemical properties of food products.

### **Unit-I (13 hours)**

Food Processing: Primary, secondary and tertiary processing, historical perspective, traditional technologies used in food processing. Effects of processing on components, properties and nutritional value of foods. Food Preservation: History, factors affecting food spoilage (physical, chemical and biological). Dehydration and concentration: methods of drying and concentration, Types and methods of dryers. Food preservation methods

### **Unit-II (13 hours)**

Food Preservation: Thermal and non-thermal processing: sterilization, pasteurization, blanching, canning, refrigeration, freezing, Novel technology (HPP, PEF). Low Temperature: (Thawing, refrigeration, cold storage, de-hydrofreezing): Radiations: (Ultraviolet and ionizing irradiations). Preservation by fermentation - Curing and Pickling; Smoking Chemical preservatives - (Objectives, principles, types of preservatives)

### **Unit-III (13 hours)**

Methods in Food Processing - Microwave processing, Extrusion cooking, Ohmic Heating, Reverse Osmosis, Electrodialysis, Ultra-filtration, High Pressure Processing, Supercritical fluid extraction. Cereals, legumes and oilseeds: Structure, composition, primary processing, functionality in food system, processing of wheat, Rice, Peas, Beans, Groundnut, sunflower. Advances in fortification: synthetic nutrients, techniques of food fortification and stability of nutrients in relation to processing.

### **Unit-IV (13 hours)**

Fruits and vegetables: Pre-processing operations (washing, blanching, peeling, sorting)

and grading) in Tomato, pineapple, Potato and Cabbage. Meat and fish products: Types, composition, structure and utilization. Milk and milk products: Composition, physical properties of milk, milk fat: composition and structure, chemical reaction of fat (hydrolysis, auto-oxidation).

### **G 514.3P – Food Processing and Preservation (based on G 514.3)**

**(Each Practical session is of 3 hours duration)**

1. Sun drying and dehydration-cereals, legumes, vegetable based.
2. Study different types of browning reactions: enzymatic and non-enzymatic.
3. To study gelatinization behavior of various starches
4. To study the concept of gluten formation of various flours.
5. To study malting and germination.
6. To study dextrinization in foods.
7. Identification of pigments in fruits and vegetables and influence of pH on them.
8. Preparation of brix solution and checking by hand refractometer.
9. Estimation of salt content in brine.
10. Internal assessment and Practical test

### **Reference Books:**

1. Bawa. A.S, O.P Chauhanetal. Food Science. New India Publishing agency, 2013
2. Roday,S. Food Science, Oxford publication, 2011.
3. B. Srilakshmi, Food science, New Age Publishers,2002
4. Meyer, Food Chemistry, New Age,2004
5. De Sukumar., Outlines of Dairy Technology, Oxford University Press, 2007.
6. Ramaswamy H and MarcottM,Food Processing Principles and Applications CRC Press, 2006.
7. Desrosier NW and Desrosier JN, The Technology of Food Preservation, CBS Publication, New Delhi, 1998
8. Paine FA and Paine HY, Handbook of Food Packaging, Thomson Press India Pvt Ltd, New Delhi- 1992
9. Potter NH, Food Science, CBS Publication, New Delhi, 1998
10. Ramaswamy H and Marcott M, Food Processing Principles and Applications CRC Press, 2006

**SEMESTER3**

**TotalCredits fortheProgram:** 180credits

**Startingyearof implementation:** 2021-2022

**Nameof theDegreeProgram:** B.ScDegree/Honours andM.Sc

**Discipline/Subject:** FoodScience/Technology

**ProgramArticulationMatrix:**

Thismatrixlistsonlythecorecourses.Corecoursesareessentialtoearnthedegree inthatdiscipline/subject.Theyincludecourseessuchastheory,laboratory,project internshipsetc.Electivecoursesmaybelistedseparately

**Course Objectives:**

The objectives are to introduce the principles and methods of Food Quality Control and Assurance, principles and selection of panellists for sensory evaluation and Quality Management System and existing food Standards (ISO).

**Course Outcome:**

At the end ofthe Course,students willbe able to

CO 1. Analyse and understand the export quality control procedures.

CO 2.Provide frame work on the concepts of Quality Control Activities

CO 3. Learn about the applications of safety management in food industry.

CO 4. Define different food laws and regulations for quality management in food industry.

CO 4. Detect the adulteration in food samples

CO 5. Review of legislative approaches for the management of food safety

**BASICS OF FOOD SAFETY AND QUALITY CONTROL**

**Max. Marks: 80**

**Total lectures: 52 hrs.**

**UNIT I**

**(13 hours)**

**Food safety concept** - Importance of food safety in the food processing industry Risk classification, National and international food regulatory agencies, General food laws and food safety regulations, Nutritional labelling regulation (mandatory and optional nutrients, nutritional descriptors and approved health claims); Microbial contamination (including cross-contamination/indirect contamination) Chemical contamination, Physical contamination, Allergen contamination.

**UNIT II**

**(13 hours)**

**Food Safety Programs:** Definitions and importance, Good Manufacturing Practices (GMPs), Pest Control Program, Facility Maintenance, Personal Hygiene, Supplier Control, Sanitary Design of Equipment and Infrastructure, Procedures for Raw Material Reception, Storage and Finished Product Loading, Sanitation Program. (Sanitation Standard Operating Procedures (SSOPs)., Product Identification, Tracking and Recalling Program, Preventive Equipment Maintenance Program, Education and Training Program

**UNIT III**

**(13 hours)**

**Food Hygiene Programs:** Personal hygiene, Training programs, Infrastructure, Personal habits, Hygiene verification, Water in the food industry, Water sources, Water uses, Water quality, Treatments, Cleaning and sanitation, cleaning agents, sanitizing agents, Equipment and systems, Evaluation of sanitation efficacy, Pest Control,

**UNIT IV**

**(13 hours)**

**Hazard Analysis and Risk Assessment:** Physical hazards (metals, glass, etc), Chemical hazards (food additive toxicology, natural toxins, pesticides, antibiotics, hormones, heavy metals and packaging components), Biological hazards (epidemiology of biological pathogens: virus, bacteria and fungi). Principal of Hazard Analysis Critical Control Point (HACCP) system. Food safety regulation in India: An overview of Food Regulation in India; Food Laws and Structure, organization and duties of regulatory system. Highlight on Registration and Licensing process. Food safety management systems and certifications.

**REFERENCES:**

1. Nielsen, S.S, 2004, Introduction to chemical Analysis of foods, CBS Publishers, New Delhi.
2. Ranganna. S., 2001, Handbook of Analysis & Quality control for Fruit & Vegetable Products, Tata McGraw Hill, New Delhi.
3. Pomeranz.Y, Meloan.C.E, 1996, Food Analysis – Theory & Practice, CBS Publiushers, New Delhi.
4. Jacobs.M.B., 1999, Chemical Analysis of Food & Food Products, CBS Publiishers, New Delhi.
5. Jay.J.M, 1996, Modern Food Microbiology, CBS Publishers, New Delhi.
6. Debnath, 2005, Tools & Techniques of Biotechnology, Pointer Publishers, Jaipur.
7. Ingraham, John.L.2004, Introduction to Microbiology, 3 Ed., Thomson brocks/Cole Inc.
8. Tortora G.J et al, 2008, Microbiology: an introduction, Pearson Education
9. Nester, E.W, 2009, Microbiology, McGraw-Hill Higher Education
10. Dubey, R.C., Maheshwari, D.K., 2008, Textbook of Microbiology, S.ChandPublications,ND
11. Adams, M.R., Moss, M.O., 2007, Food Microbiology, New Age International Pvt. Ltd., ND.
12. Pelczar, Reid and Chan, 2008, Microbiology, McGraw hill Ed, ND
13. Ananthanarayan, Panikar, CKJ.,2006, Textbook of Microbiology, Oriental Longman Pvt. Ltd., Hyderabad.
14. Frazier, William, C. 2008, Food Microbiology, Tata McGraw Hill Ed., ND.
15. S.Roday 1998, food Hygiene and sanitation Tata McGraw Hill Ed., ND.
16. Bean Malicse 2012 Principles of food sanitation,safety and hygiene patima University

### **PRACTICALS**

#### **PRACTICAL PAPER III (: Basics of Food Safety and Regulatory Act)**

1. Introduction and study of microbiological instruments.
2. Cleaning of glass wares, preparation of media, cotton plugging and Sterilization.
3. Detection of adulteration in foods.
4. Screening tests for the detection of pathogens
5. Isolation of microorganisms from food samples.
6. Study of the microbiological quality of milk by MBR test
7. Determine the Critical Control Points for production line of Milk, Fruits & Vegetables and Meat industry as per HACCP system.
8. To prepare a chart of specifications for different Food products as specified by BIS.
9. Sterility and Swab test.
10. Food Safety audit

### **SEMESTER4**

**TotalCredits fortheProgram:** 180credits

**Startingyearof implementation:** 2021-2022

**Nameof theDegreeProgram:** B.ScDegree/Honours andM.Sc

**Discipline/Subject:** FoodScience/Technology

**ProgramArticulationMatrix:**

This matrix lists only the core courses. Core courses are essential to earn the degree in that discipline/subject. They include courses such as theory, laboratory, project internship etc. Elective courses may be listed separately

**Course Objectives:**

1. Develop an advanced understanding of microbiological issues associated with the food continuum.
2. Develop an understanding of the physiological processes by which microorganisms use to survive food processing interventions.
3. To enable understanding of the chemistry of food components, the chemical and biochemical reactions in foods.
4. To impart a systematic knowledge of basic and applied aspects of food chemistry

**Course Outcome:**

At the end of the Course, students will be able to

CO 1. Students will have a thorough understanding of structure and classification various Components of food..

CO 2. The students will know the process of complete digestion and assimilation of food Component.

CO 3. Students will have a thorough understanding of various factors responsible for food Spoilage.

CO 4. Define and have an overview on food chemistry including composition and the importance of water.

**FC--FUNDAMENTALS OF FOOD CHEMISTRY AND MICROBIOLOGY**

Max. Marks: 80

Total lectures: 52 hrs.

**UNIT I (13 hours)**

**1. Introduction-** Importance of food chemistry. Water in foods, structure and its properties. Water activity, free and bound moisture. **Carbohydrate:** functional properties of sugars and polysaccharides in foods, chemical reactions of carbohydrates. **Proteins:** Classification of proteins and their functional properties of proteins, Denaturation, renaturation, Gelation, and Hydrolysis of proteins. Browning Reactions in Food: Browning, Maillard reaction, Caramelization reaction.

**UNIT II (13 hours)**

**2. Lipids & Minerals:** Classification of lipids, Physical and Chemical properties of lipids. Effect of frying on fats, Changes in fats and oils on storage and its prevention, Technology of edible fats and oils - Refining, Hydrogenation and Interesterification, Minerals: Major and minor minerals, Toxic metals Natural Food Pigments: Introduction. and classification, Water soluble and insoluble food pigments (chlorophyll, carotenoids, anthocyanins and flavonoids, beet pigments) . Introduction to enzymes.

**UNIT III (13 hours)**

**3. Concepts of Microbiology:** Introduction, historical developments of general and food microbiology; Scope of microbiology, prokaryotes and eukaryotes; classification of microorganisms - a brief account; sources of microorganisms in foods; microbial growth, growth curve; factors affecting growth - intrinsic and extrinsic factors, uses of microorganisms, Food borne illness, types of Food borne illness, Basics of Microscopy.

**UNIT IV (13 hours)**

**4. Microbial Toxins and Control of Micro-organisms:** Microbial Toxins (Endotoxin and Exotoxin), Introduction and types. Control of Micro organisms: Control of micro organisms by physical, chemical and other chemotherapeutic agents, Hurdle technology, Aflatoxin

**REFERENCES**

1. Food Chemistry by L. H. Meyer (CBS Publisher, Delhi)
2. Food Facts and Principles by N. Shakuntala Manay & M. Shadaksharaswamy (New Age International (P) Ltd. Publishers, New Delhi)
1. Food Chemistry by O. R. Fennema, 2nd edn. (Marcel Dekker Inc.)

2. Food Chemistry by HDBelitz and W. Groech (Springer Publ.)
3. Food Additives by S.N. Mahindru
4. Food Processing and Preservation by B.Siavsankar (Prentice Hall India)
5. Pelezar, M. and Reid, R.D. (1993) Microbiology McGraw Hill Book Company, New York, 5<sup>th</sup> Edition.
6. Frazier, W.C. (1988) Food Microbiology, McGraw Hill Inc. 4th Edition.
7. Doyle, P. Bonehat, L.R. and Mantville, T.J. (1997): Food Microbiology, Fundamentals and Frontiers, ASM Press, Washington DC.
8. Textbook of Microbiology (6th edition) by Ananthnarayan & CK Paniker
9. Basic Food Microbiology by George J. Banwart
10. Food Microbiology by M R Adams and M O Mos
11. Industrial microbiology L.E. Casida
12. A textbook of Biotechnology by R.C. Dubey
13. Neelima Garg. Laboratory Manual of Food Microbiology. 2010. I.K. International

### **PRACTICAL PAPER II BV-(134.1)**

#### **FUNDAMENTALS OF FOOD CHEMISTRY AND MICROBIOLOGY**

1. Introduction and study of microbiological instruments.
2. Basic activities in the food microbiology laboratory (Cleaning of glass wares, Preparation of media, cotton plugging and Sterilization).
3. Techniques to isolate, culture and sub-culture microbes
4. Viable cell count by serial dilution technique
5. Staining techniques
6. Determination of moisture in a given food sample
7. Determination of ash in a given food sample.
8. Determination of crude fiber in a given food sample
9. Estimation of acidity of given food sample/beverage
10. Acid value of Fat /oil.
11. Determination of crude protein in a given food sample using Kjeldahl's apparatus

#### **PRACTICAL III**

##### **- Project Work- 1**

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