Rayat Shikshan Sanstha's

SADGURU GADAGE MAHARAJ COLLEGE, KARAD.

(An Autonomous)

Accredited By NAAC with 'A^{+} (3.63 CGPA)' Grade

ISO- 9001-2015 Certified

Affiliated to Shivaji University, Kolhapur

Bachelor of Science (B. Sc.)

DEPARTMENT OF FOOD SCIENCE (ENTIRE)

Under the Faculty of Science and Technology
Choice Based Credit System (CBCS)

Regulations in accordance with **National Education Policy**
to be implemented from Academic Year 2023-2024

Syllabus For

B. Sc. Part – II (Food Science -Entire)

SEMESTER III & IV

(Syllabus to be implemented from June 2023)

Rayat Shikshan Sanstha's

SADGURU GADAGE MAHARAJ COLLEGE, KARAD.

(An Autonomous College)

Regulations and Guidelines

Choice Based Credit System (CBCS) Syllabus for Bachelor of Science Part- II (Food Science - Entire)

- Guidelines shall be as per B.Sc. Regular Program.
- Rules and Regulations shall be as per B.Sc. Regular Programexcept CBCS R. B. Sc. 3 Structure of Program and List of Courses.

1. Title: B.Sc. II Food Science (Entire)

2. Year of Implementation: 2023-2024

3. Duration: One Year

4. Pattern: Semester wise CBCS

5. Medium of Instruction: English

6. Structure of Course:

a. Semester III:

Theory:06Papers

b. Semester IV:

Theory:06Papers

c. Practical's (Semester III & IV): 03 Papers

7. Examination Pattern:

- Internal Evaluation for Theory Paper – Each theory paper having **10 Marks**

  i) Home Assignments /Unit test/ Project Work/Viva / Online /Offline Test

- There shall be 6 theory papers each having **40 Marks**
- Practical Examination will be Conducted Annually – **100 Marks** for per subject.

8. Preamble:

This syllabus is so designed to give a sound basis to the undergraduate students of B.Sc. Food Science (Entire).

This syllabus is framed to accommodate the widening horizons of the discipline of food Science and reflect the current changing needs of the students. Students learn Food Science as a separate subject from B.Sc. I, which increase the employability of students in food Industry. The exposure of students to the subject will enable them of independent handling of food processing and packaging unit.

The syllabus is based on basic and applied approach with vigor and depth. At the same time precaution is taken to make the syllabus comparable to the syllabi of other universities and the needs of industries and research. The units of the syllabus are well defined, taking into consideration the level and capacity of students.

9. GENERAL OBJECTIVES OF THE PROGRAM

- To nurture the academicians with focus and commitment to their subject.
- To shape good and informed citizens form the students entering into the programme.
- To create a skilled work force to match the requirements of the society.
- To impart knowledge of science is the basic objective of this program me.
- To develop scientific attitude is the major objective so as to make the students open minded, critical and curious.
- To develop skill in practical work, experiments and laboratory materials and equipment along with the collection and interpretation of scientific data to contribute to science.

❖ PROGRAM SPECIFIC OUTCOMES:

- The students will graduate with proficiency in subject of their choice.
- The students will be eligible to continue higher studies and abroad in their subject.
- The students will be eligible to appear for the examination for jobs in government organization.
- The students will be eligible to apply for jobs with a minimum B.Sc. Food Science program.

10. Structure of Program and List of Courses are as follows:

Choice Based Credited System with Multiple Entry and Multiple Exit to be implemented From Academic Year: 2022-23

- **Second Year Bachelor of Science (Level-6) Programme Structure (NEP-2020 Pattern)**

Structure of B. Sc. Programme Semester- III & IV

Rayat Shikshan Sanstha's															
SADGURU GADAGE MAHARAJ COLLEGE, KARAD.															
COURSE STRUCTURE UNDER AN AUTONOMY															
B. Sc. FOOD SCIENCE (ENTIRE)															
B. Sc. II SEMESTER– III (Duration – 6 Months)															
Sr. No.	COURSE CODE	TEACHING SCHEME							EXAMINATION SCHEME						
		THEORY				PRACTICAL			THEORY					PRACTICAL	
		Credits	No. of lectures	Hours	COURSE CODE	Credits	No. of lectures	Hours	Hours	Theory	Internal	Marks (Min.)	Marks		
1	BFST22-301	2	3	2.4	BFSP22-307	4	6.4	8	2	40	10	16+4=20	50	Practical Examination is Annual	
2	BFST22-302	2	3	2.4					2	40	10	16+4=20	50		
3	BFST22-303	2	3	2.4	BFSP22-308	4	6.4	8	2	40	10	16+4=20	50		
4	BFST22-304	2	3	2.4					2	40	10	16+4=20	50		
5	BFST22-305	2	3	2.4	BFSP22-309	4	6.4	8	2	40	10	16+4=20	50		
6	BFST22-306	2	3	2.4					2	40	10	16+4=20	50		
7	AECC-C	---	3	2.4					---	---	---	---	---		
8	SEC-III	2	3	2.4					2	40	10	16+4=20	50		
Total of SEM I		14	24	19.2		12	19.2	24	14	280 + 70 = 350					
TOTAL NO OF CREDITS FOR SEMESTER – I : 26															

B. Sc. II SEMESTER– IV (Duration – 6 Months)																		
Sr. No.	COURSE CODE	TEACHING SCHEME							EXAMINATION SCHEME									
		THEORY				PRACTICAL			THEORY					PRACTICAL				
		Credits	No. of lectures	Hours	COURSE CODE	Credits	No. of lectures	Hours	Hours	Theory	Internal	Total Marks (Min.)	Total Marks		Max Marks	Min Marks		
1	BFST22-401	2	3	2.4	BFSP22-407	4	6.4	8	2	40	10	16+4=20	50	As per BOS Guid-lines	100	20		
2	BFST22-402	2	3	2.4					2	40	10	16+4=20	50					
3	BFST22-403	2	3	2.4	BFSP22-408	4	6.4	8	2	40	10	16+4=20	50		100	20		
4	BFST22-404	2	3	2.4					2	40	10	16+4=20	50					
5	BFST22-405	2	3	2.4	BFSP22-409	4	6.4	8	2	40	10	16+4=20	50		100	20		
6	BFST22-406	2	3	2.4					2	40	10	16+4=20	50					
7	AECC-D	4	3	2.4					2	60	40	24+16=40	100					
8	SEC-IV	2	3	2.4					2	40	10	16+4=20	50					
Total of SEM II		**18**	**24**	**19.2**		**12**	**19.2**	**24**	**16**	**340 + 110 = 450**					**300**			
Grand Total		**32**	**48**	**38.4**		**24**	**38.4**	**32**	**--**	**800+300=1100**								

TOTAL NO OF CREDITS FOR SEMESTER - IV: 30

TOTAL NO. OF CREDITS FOR SEMESTER - III + IV: (26+30)=56

- Student contact hours per week : 36.8Hours (Min.)
- Total Marks for B.Sc.-II (Including EVS) : **1100**
- Theory lectures and practical : 48 Minutes Each
- Total Credits for B.Sc.-II (Semester III & IV) : **56**

- **BFST – Bachelor of Food Science (Entire) Theory:** for Semester- III (BFST22-301 to BFST-306) and for Semester- IV (BFST22-401 to BFST-406)
- **AECC**- Theory: for Ability Enhancement Compulsory Course (AECC-C and AECC-D)- Environmental Studies – **EVS** (Theory – 60 & Project – 40 Marks)
- **BFSP – Bachelor of Food Science (Entire) Practical:** for (BFSTP22-407 to BFST-409)
- Practical Examination will be conducted annually for100 Marks per course (subject).
- There shall be separate passing for theory and practical courses also for Environmental Studies.
- The examination of each BFST22 course will be of 50 marks. Minimum 20 marks (40%) out of 50 are required for passing. Separate passing for SEE and CCE (Theory and Internal examination having separate passing).

- Students can exit after Level 5 with Certificate Course in Science (with the completion of courses equal to minimum of 52 credits).

- Students can exit after Level 6 with Diploma in Science (with the completion of courses equal to minimum of 104 credits).

- Students can exit after Level 7 with Bachelor of Science (with the completion of courses equal to minimum of 140

credits).
●SEC: Skill Based Courses (4 credits). Students have to select one for each semester from the pool of courses available at their respective colleges.

Note for SEC courses:

- SEC courses are of Self Study mode. The study material of all above courses will be made available on College website.
- The examination of each of the course will be of 50 marks having 25 MCQ questions. Minimum 20 marks (40%) out of 50 are required for passing.
- The duration of examination shall be conducted at the college level.
- The list of candidates along with marks is to be submitted to the College.
- The degree will be awarded only after successful completion of these courses.

OTHER FEATURES:

(A) LIBRARY:
Reference and Text Books, Journals and Periodicals, Reference Books for advanced studies are available in this college. – (List is attached with respective paper section)

(B) SPECIFIC EQUIPMENTS: Necessary to run the Course.
Computer, L.C.D., Projector

(C) LABORATORY SAFETY EQUIPMENTS:
1) Fire extinguisher
2) First aid kit
3) Fumigation chamber
4) Stabilized power supply
5) Insulated wiring for electric supply.
6) Good valves & regulators for gas supply.
7) Operational manuals for instruments.
8) Emergency exits**.**

B. Sc. Part II (Semester III and IV)

Course code	Name of Course	Course code	Name of course
Semester III		**Semester IV**	
BFST22-301	Meat and Poultry Technology	**BFST22-401**	Eggs, Fish and Poultry Technology
BFST22-302	Food Additives and Preservatives – I	**BFST22-402**	Food Additives and Preservatives - II
BFST22-303	Fruit and Vegetables Processing	**BFST22-403**	Food Processing and Preservation
BFST22-304	Cereal Processing	**BFST22-404**	Legume and Oilseed Technology
BFST22-305	Food Plant Design and Layout	**BFST22-405**	Food Safety and Microbial Standards
BFST22-306	Food Quality	**BFST22-406**	Quality Assurance and Certification
AECC-C	Environmental Studies (Theory)	**AECC-D**	Environmental Studies (Project)
SEC-III	Wine technology-I	**SEC-IV**	Wine technology-II

AECC – C and D: - Ability Enhancement Compulsory Course: Environmental Science

BFSP22-307	Meat and Poultry Technology, Food Additives and Preservatives – I	**BFSP22-407**	Eggs, Fish and Poultry Technology, Food Additives and Preservatives - II
BFSP22-308	Fruit and Vegetables Processing, Cereal Processing	**BFSP22-408**	Legume and Oilseed Technology, Food Processing and Preservation
BFSP22-309	Food Quality, Food Plant Design and Layout	**BFSP22-409**	Food Safety and Microbial Standards, Quality Assurance and Certification

Note: - Practical Examination will be Conducted Annually

SEMESTER-III

Subject Code	Title of Paper
BFST22-301	Meat and Poultry Technology
BFST22-302	Food Additives and Preservatives – I
BFST22-303	Fruit and Vegetables Processing
BFST22-304	Cereal Processing
BFST22-305	Food Plant Design and Layout
BFST22-306	Food Quality
AECC-C	Environmental Studies (Theory)
SEC-III	Wine technology-I
BFST22-307	Meat and Poultry Technology and Food Additives and Preservatives – I
BFST22-308	Fruit and Vegetables Processing and Cereal Processing
BFST22-309	Food Plant Design and Layout and Food Quality

Note: - Practical Examination will be Conducted Annually.

SEMESTER–III

Theory Paper- I BFST- 301 Meat Processing Technology

Unit I: Sources and developments of meat. Processing industries in India and importance in national economy. Muscle structure, chemical composition and physico-chemical properties of meat muscle. Abattoir design and layout.	09 lectures
Unit II: Pre-slaughter transport and care and ant mortem inspection, Slaughtering of animals and poultry, post-mortem inspection and grading of meat. Factors affecting post-mortem changes, properties and shelf life of meat.	09 lectures
Unit III: Processing and preservation of meat- mechanical deboning, aging or chilling, freezing, pickling, curing, cooking and smoking of meat.	09 lectures
Unit IV: Meat tenderization. – Principles and methods, Meat emulsions. Meat plant sanitation and safety, By-products utilization of abattoir.	09 lectures
Books: 1. Principles of Meat Science. Aberle E.D. Kendall Hunt Publication. ISBN: 9780787247201. 2. Principles of Meat Technology. Singh V. P. New India Publishing Agency, Delhi. ISBN: 9789380235554. 3. Handbook of Meat, Poultry and Seafood Quality. Kerth Wiley Backwell, 2012. ISBN: 9780470958322.	

SEMESTER–III

Theory Paper- II BFST- 302 Food Additives and Preservatives I

Unit I: Introduction of Food Additives; Scope, Functions and uses of Food Additives, Classification- Intentional & Unintentional Food additives; Types of food additives Toxicology and Safety Evaluation of Food Additives: Effects of Food Additives; Food Additives generally recognized as safe (GRAS).	09 lectures
Unit II: Naturally occurring food additives: Classification; Health Implications; Role in Foods. Tolerance levels & Toxic levels in Foods; Legal safeguard; Risks of food additives Acidulants, Different acidulants; Role in food processing, Food colorants, Natural & Synthetic food colorants. Classification of Food colorants; Chemical nature; Impact on health.	09 lectures
Unit III: Food Preservatives: Introduction, Classification- Natural & chemical preservatives; Mode of action; Role in Food processing Pigments: Importance; Utilization as food colour.	09 lectures
Unit IV: Stabilizers: Introduction; Types, Applications in food processing, Thickeners, Types, Applications in food processing. Emulsifiers: Introduction; Types; Applications in food processing.	09 lectures
Books: 1. Food Additives. A Larry Branen, P Michael Davidson and Seppo Salminen. CRC Book. 2. Food Additives. S.N. Mahindru. APH Publishing Corporation, Drya Ganj, New Delhi. 3. Food colours, Flavours and Additives Technolog. National Institute of Industrial Research, Kamla Nagar, Delhi.	

SEMESTER – III

Theory Paper- IV BFST- 303 Fruit and Vegetable Processing

Unit I: Production and processing scenario of fruits and vegetables in India and World. Scope of fruit and vegetable preservation industry in India. Present status, constraints and prospects. Overview of principles and preservation methods of fruits and vegetables.	09 lectures
Unit II: Commercial processing technology of fruits and vegetables. Primary processing and pack house handling of fruits and vegetables; Peeling, slicing, cubing, cutting and other size reduction operations for fruits and vegetables. Minimal processing of fruits and vegetables.	09 lectures
Unit III: Blanching operations and equipment. Canning: Definition, processing steps, and equipment, cans and containers, quality assurance and defects in canned products. Preparation and preservation of juices, squashes, syrups, sherbets, nectars, cordials, etc.; problems in squash and RTS; processing and equipment for above products and FSSAI specification. Preparation, preservation and machines for manufacture of crystallized fruits and preserves, jam, jelly and marmalades.	09 lectures
Unit IV: Preparation, preservation and machines for manufacture of preserve, concentrate, fruit wine, sauerkraut, chutney, pickles, sauce, puree, paste, ketchup; toffee, cheese, lather, dehydrated, wafers and papads, soup powders; FSSAI specification. Production of pectin and vinegar; Commercial processing technology of selected fruits and vegetables for production of various value added processed products.	09 lectures
Books: 1. A Handbook on Post-harvest Management of Fruits and Vegetables P. Jacob John. Daya Publishing House, Delhi ISBN: 9788170355328. 2. Postharvest: An introduction to the physiology and handling of fruit and vegetables. 6th edition Wills R. and Golding J. UNSW Press ISBN: 9781742247854. 3. Post-harvest Technology of Fruits and Vegetables – Vol. 1 Verma L. R. and Joshi V. K.Indus Publishing Company, Delhi ISBN: 8173871086. 4. Handbook of Analysis and Quality Control for Fruits and Vegetable Products Ranganna S. 2nd Edition, Tata-McGraw Hill, 2001.	

SEMSTER III

Theory Paper- IV BFST- 304 Cereal Processing

Unit I: Present status and future prospects of cereals; Morphology: physico-chemical properties; chemical composition and nutritive value.	09 lectures
Unit II: Rice: Paddy processing and rice milling: conventional milling, modern milling operations, milling machines, milling efficiency, byproducts of rice milling. Quality characteristics influencing final milled products. Parboiling: rice bran stabilization and its methods; Aging of rice; Enrichment – need, methods; processed foods from rice – breakfast cereals, flakes, puffing, canning and instant rice.	09 lectures
Unit III: Wheat: break system, purification system and reduction system; extraction rate and its effect on flour composition; Quality characteristics of flour and their suitability for baking. Corn: Corn milling – dry and wet milling, starch and gluten separation, milling fractions ad modified starches.	09 lectures
Unit IV: Barley: Malting and milling. Sorghum: Milling, Malting, Pearling and industrial utilization. Millets: Importance of Millet, composition, processing of millets for food uses, major and minor millets. Products and Byproduct of cereal and millets.	09 lectures

Books:

1. Technology of Cereals Kent NL Woodhead Publishing1983 ISBN: 9780080408347.

2. Post-Harvest Technology of Cereals, Pulses and Oil seeds A. Chakravarthy , Oxford and IBH Publishing Company, 2014.

3. Modern Cereal Science & TechnologyY. PomeranzVCH Publishing, 1987 ISBN: 9780895733269.

4. Hand Book of Cereal Science and Technology KeralKulpCRC Press, ISBN: 9780824782948.

5. Principles of Cereal Science and Technology. Hoseney RS2nd Ed. AACC., 1994.

SEMESTER -III

Theory Paper- V BFST- 305 Food Plant Design and Layout

Unit I: Plant Location, levels of Plant location. Location of layout: location factors, plant site selection. Location Theory and models, industrial buildings and grounds. Classification of Dairy and Food Plants, farm level collection and chilling center, space requirement.	09 lectures
Unit II: Overall design of an enterprise : Plant design, use of various metals, including plastic, glass, etc. in food industry, selection and specification – material design, concepts and manufacturing of various equipment's and machineries for food processing plant.	09 lectures
Unit III: Preparation of a Plant Layout: Plant Layout problem, importance, objectives, classical types of layouts. Evaluation of Plant Layout. Advantages of good layout. Organizing for Plant Layout, Data forms Common Problems in Plant Layout and Process scheduling.	09 lectures
Unit IV: Sitting of Process sections, Equipment selection and capacity determination Arrangement of process, and service equipment. Estimation of Services and Utilities Office layout, line balancing, Flexibility. Practical Layouts Maintenance of Food Plant Building, Illumination and ventilation, Cleaning and sanitization, painting and colour coding, Fly and insect control.	09 lectures
Books: 1. Plant Layout and Design James M.Moore Mac Millan, New York 1971. 2. Facility Planning And Layout Design ChandrashekarHiregoudar Technical Publications, 2017. 3. Engineering for Dairy and Food Products A.W. FaralRebert E., Kriger Pub Co., New York 1980.	

SEMESTER -III

Theory Paper- VI BFST- 306 Food Quality

Unit I: Food quality and its role in food industry need of quality control, factors affecting quality control. Quality attributes: dominant and hidden attributes. Factors influencing the food qualities: Soil, field practices, harvesting practices, procedures, packaging, transportation, storage, conditions, processing conditions, packaging and storage conditions of finished products.	09 lectures
Unit II: Color-role of colors in quality spectra, different types of colour measuring instruments. Color, consistency & sound measurement for kinesthetics. Viscosity:-types of fluids, different viscometers to measure viscosity. Texture: classification, role of firmness, yielding quality, juiciness, chewiness, fibrousness, grittiness, mealiness, stickiness, measurement of texture kinesthetic characteristics.	09 lectures
Unit III: Size and shape: - Method to find shape and size of food and food products. Defects: Classification, Genetic, physiological defects, structural, off-color, Entomological Defects: holes, Scars, lesions, off-coloring, curled leaves, pathological defects. Mechanical defects, Extraneous or foreign material defects.	09 lectures
Unit IV: Flavour: Definition and its role in food quality. Taste, classification, taste qualities, relative intensity, reaction time, effect of disease, temperature, and taste medium on taste, basic tastes and interaction of tastes. Odour: definition, Classification, neutral - mechanisms, Olfactory abnormalities, odor testing, techniques, thresholds, odor intensities.	09 lectures
Books: 1. Quality Assurance for Food Industry – A Practical Approach J. Andres Vasconcellos CRC Press Boca Raton [ISBN: 9780849319129]. 2. Food Quality Assurance – Principles and Practices InteazAlli CRC Press Boca Raton [ISBN: 9780203484883]. 3. HACCP User‟s Manual Corlett D.A. An Aspen Publication, Maryland. 4. Total Quality Assurance for the Food Industry Gould W.A. and Gould W.B. CTI Publication. 5. Food Industry Quality Control Systems Mark Clute CRC Press, Boca Raton [ISBN: 978-0-8493-8028-0].	

SEMESTER III

Theory Paper- VII AECC-C Environmental Studies (Theory)

Unit I : **Environment, Ecology and Ecosystems**: Introduction, Definition, Inter-relationship amongst and between them, components of environment, relationship between different environment components, Man-environment relationship, Impact of Technology of the Environment, Environmental Degradation.	09 lectures
Unit II : **Ecology and Ecosystems:** Introduction, ecology, objectives and classification of iconology, concepts of an ecosystem structure and functions of ecosystem, Components of ecosystem.	09 lectures
Unit III : **Energy Flow:** Introduction, Food Chain – grazing, detritus, Food Web, Ecological Pyramids – Pyramid of numbers, pyramids of biomass, pyramid of energy or productivity.	09 lectures
Unit IV : **Energy Flow in Ecosystem:** Introduction, Renewable resources, Non-renewable resources, Destruction versus conservation.	09 lectures

SEMESTER III

Theory Paper- VIII SEC-III Wine Technology- I

Unit I : Introduction Winemaking: Introduction to winemaking, definition and terminologies. Viticulture: Introduction to viticulture, definition and terminologies. History of wine-making and viticulture: Wine-producing regions of the world and different practices of wine making & viticulture. Status of Indian viticulture and winemaking.	09 lectures
Unit II : Introduction to grapevine. Grapevine: Classification, anatomy and function of various parts of grapevine. Cultivars and development of hybrids varieties of grapevine. Effect of climatic condition on the cultivation of grapevine (sunlight, temperature, wind, rain, hail, frost).	09 lectures
Unit III : Wine-making, Classification of wine: Generic classification, varietal classification, Vinification classification and classification on the basis of chemical Constituents. Flow chart of white wine-production and recommended varieties. Flow chart of Red wine-production and recommended varieties. Flow chart of Fortified wine-production and recommended varieties. Production of wine from fruits other than grapes.	09 lectures
Unit IV : Vine and Wine,: Variation in varieties selection, wines, harvesting, irrigation practices, clonal selection and other mechanization practices. Grape variety as criteria for quality wine production: Study of criteria such as tractability, distinctive flavors, other special characteristics. Automation in wine industry: Importance of automation operation in wine industries and concept of Programmed Logic Control System.	09 lectures

SEMESTER III

Lab I BFSP- 307 Meat Processing Technology & Food Additives and Preservatives I

Meat Processing Technology

Practical Exercises	**Topics**
1	Slaughtering and dressing of poultry bird.
2	Slaughtering and dressing of goat.
3	Determination of water holding capacity of meat.
4	Determination of meat pH.
5	Estimation of total meat pigments.
6	Preparation of meat products.
7	Tenderization of meat.
8	Visit to slaughter house.

Food Additives and Preservatives I

Practical Exercises	**Topics**
1.	Evaluation of GRAS aspects of Food Additives.
2.	E numbers for different food additives.
3.	Qualitative Tests for presence of benzoic acid in foods.
4.	Qualitative Tests for presence of sulphurous acid in foods.
5.	Quantitative determination of benzoic acid.
6.	Determination of nitrates and nitrites in Foods.
7.	Qualitative for presence of non-nutritive sweeteners.
8.	Identification of colors in food by TLC.

SEMESTER III

Lab II BFSP 308 Fruits and Vegetables Processing & Cereal Processing

Fruits and Vegetables Processing

Practical Exercises	**Topics**
1	Primary processing of selected fruits and vegetables.
2	Preparation of jam/ jelly/ marmalade from selected fruit.
3	Canning of mango/guava/ papaya.
4	Preparation of RTS beverage.
5	Preparation of squash.
6	Preparation of pickle.
7	Preparation of banana/ potato wafers
8	Preparation of fruit candy.
9	Preparation of dried onion/garlic/ginger.
10	Visit to fruits and vegetables processing unit.

Cereal Processing

Practical Exercises	**Topics**
1	Determination of physical properties of cereal grains.
2	Determination of chemical properties of cereal grains.
3	Germination of grains.
4	Studies on cooking quality of cereals (cooking time, grain elongation, etc.).
5	Functional properties of different cereal flour.
6	Determination of starch content of cereal.
7	Determination of fat acidity of cereals.
8	Visit to milling industry.

SEMESTER III

Lab III BFSP 309 Food Plant Design and Layout & Food Quality

Food Plant Design and Layout

Practical Exercises	**Topics**
1.	Preparation of project report
2.	Preparation of feasibility report
3.	Layout of food storage wares and godowns.
4.	Layout and design of cold storage
5.	Layout of milk and milk product plant
6.	Visit of milk processing plant
7.	Layout and design of bakery and related product plant
8.	Visit to bakery unit
9.	Layout and design of processing plant
10.	Layout and design of vegetable processing plant
11.	Visit to fruit and vegetable processing plant

Food Quality

Practical Exercises	**Topic**
1	Quality attributes of various food products.
2	Quality evaluation of product for colours.
3	Quality evaluation of product for size, shape.
4	Determination of viscosity of food products.
5	Measurement of insect damage.
6	Determination of textural quality profile.
7	Visit to fruit &vegetable market for quality assessment.

FOOD SCIENCE

Semester–IV

Course Code	Subject Title
BFST- 401	Eggs, Fish and Poultry Technology
BFST- 402	Food Additives and Preservatives II
BFST-403	Food Processing and Preservation
BFST-404	Legume and Oilseed Technology
BFST- 405	Food Safety and Microbial Standards
BFST- 406	Quality Assurance and Certification
AECC-C	Environmental Studies (Project)
SEC-III	Wine technology-II
Lab-V BFSP-407	Egg, Fish and Poultry Technology, Food Additives and Preservatives II
Lab-VI BFSP-408	Food Processing and Preservation, Legume and Oilseed Technology
Lab-VII BFSP-409	Food Safety and Microbial Standards, Quality Assurance and Certification

SEMESTER–IV

Theory Paper- I BFST- 401 Eggs, Fish and Poultry Technology

Unit I: Egg structure: Composition, quality characteristics, processing and preservation of eggs, Transport and care and grading inspection.	09 lectures
Unit II: Sources and developments of Fish industries in India and importance in national economy Classification of fish (fresh water and marine), composition of fish. Transport and care and ant mortem inspection, post-mortem inspection and grading of fish Factors affecting post-mortem changes, properties and shelf life of fish.	09 lectures
Unit III: Characteristics of fresh fish Processing and preservation of Fish- deboning, aging or chilling, reezing, pickling, curing, cooking and smoking, Fish products: surimi; Fish protein concentrates (FPC); Fish protein extracts (FPE), fish protein hydrolysates (FPH).	09 lectures
Unit IV: Slaughtering of poultry, post-mortem inspection and grading of poultry meat. Technology of manufacture of poultry products.	09 lectures
Books: 1. Fish Processing Technology. Hall G.M. Springer Publication ISBN: 9781461311133. 2. Meat Products Handbook – Practical Science and Technology. Gerhard Feiner. CRC Press, Boca Raton. ISBN: 9780849380105. 3. Handbook of Meat, Poultry and Seafood Quality. Kerth Wiley Backwell, 2012 ISBN: 9780470958322.	

SEMESTER–IV

Theory Paper- II BFST- 402 Food Additives and Preservatives II

Unit I: Anti-caking agents and Humectants: Introduction; Different Anti-caking agents and Humectants; Role in food processing Starch modifiers: Introduction; Chemical nature; Role in food processing. Antimicrobial agents, Clarifying agents, antifoaming agents, Fat mimetics and replacers: Introductions; Role in food processing.	09 lectures
Unit II: Taste and Flavoring agents: Introduction; Classification of flavors- natural & synthetic; Flavor enhancer/ Potentatior; Importance of taste and flavours; Role of flavoring agents in food processing.	09 lectures
Unit III: Bleaching agents: Introduction; Different bleaching agents; Role in food processing. Maturing agents: Introduction; Different maturing agents; Role in food processing.	09 lectures
Unit IV: Sweeteners: Introduction; Classification- Artificial sweeteners & Non-nutritive sweeteners; Health implications; Role in food processing.	09 lectures
Books: 1. Food Additives. A Larry Branen, P Michael Davidson and Seppo Salminen. CRC Book 2. Food Additives. S.N. Mahindru. APH Publishing Corporation, Drya Ganj, New Delhi. 3. Food colours, Flavours and Additives Technology Handbook NIIR, Institute of Industrial Research, Kamla Nagar, Delhi.	

SEMESTER–IV

Theory Paper- III BFST- 403 Food Processing and Preservation

Unit I: Food processing; food preservation; food spoilage – introduction, causes of food spoilage, food poisoning, food-borne intoxication, food-borne infection. Food preservation and processing: Introduction; necessary; methodology; principles and methods of food preservation. Preservation using sugar, salt and acids and chemicals. Type of chemical preservatives; sulphur dioxide, benzoic acid, etc. use of other chemicals like acidulants, antioxidants, mold inhibitors.	09 lectures
Unit II: High Temperature Preservation: Introduction; blanching; pasteurization; sterilization; canning. Low temperature preservation: Introduction; methods of low temperature preservation; chilling; refrigeration and cold storage; factors affecting refrigerated & frozen storage of foods; effect of freezing on constituents of foods.	09 lectures
Unit III: Drying, dehydration and concentration: Introduction; purpose; water activity and relative humidity; factors affecting rate of drying and dehydration; drying methods; changes during drying and dehydration; different driers; concentration- methods of concentration, changes; effect of drying, dehydration and concentration on quality of foods.	09 lectures
Unit IV: Food irradiation: Introduction; radiation sources; measurement of radiation dose; mechanism of action; type of irradiation; factors affecting food irradiation; effect of irradiation. Etc. Food fermentation: Introduction, methods, common fermented foods. Effect of processing on nutritional value of food.	09 lectures

Books:

1. A Handbook on Post-harvest Management of Fruits and Vegetables P. Jacob John. Daya Publishing House, Delhi ISBN: 9788170355328.
2. Postharvest: An introduction to the physiology and handling of fruit and vegetables Wills R. and Golding J. UNSW Press ISBN: 9781742247854.
3. Post-harvest Technology of Fruits and Vegetables Verma L. R. and Joshi V. K. Indus Publishing Company, Delhi ISBN: 8173871086.
4. Handbook of Analysis and Quality Control for Fruits and Vegetable Products Ranganna S. 2nd Edition, Tata-McGraw Hill, 2001.

SEMESTER–IV

Theory Paper- IV BFST- 404 Legume and Oilseed Technology

Unit I: Present status and future prospects of legumes and oilseeds; Morphology of legumes and oilseeds; Classification and types of legumes and oilseeds. Milling of legumes: home scale, cottage scale and modern milling methods, milling quality, efficiency and factors affecting milling; problems in dhal milling industry.	09 lectures
Unit II: Soaking and germination of pulses. Cooking quality of legumes – factors affecting cooking quality. Anti-nutritional compounds in legumes and oilseeds; Methods of removal of anti-nutritional compounds.	09 lectures
Unit III: Cooking quality of legumes – factors affecting cooking quality. Oilseeds: composition, methods of extraction. Desolventization and refining of oils: degumming, neutralization bleaching, filtration, deodorization, etc.	09 lectures
Unit IV: New technologies in oilseed processing. Utilization of oil seed meals for food uses i.e. high protein products like concentrate, isolates. Byproduct of pulses and oil milling and their value addition.	09 lectures

Books:

1. Technology of Cereals, Kent NL Woodhead Publishing1983. ISBN: 9780080408347.
2. Post Harvest Technology of Cereals, Pulses and Oil seeds A. Chakravarthy. Oxford and IBH Publishing Company, 2014.
3. Modern Cereal Science & Technology Y. Pomeranz VCH Publishing, 1987. ISBN: 9780895733269
4. Hand Book of Cereal Science and Technology KeralKulp CRC Press, ISBN: 9780824782948,
5. Principles of Cereal Science and Technology. Hoseney RS 2nd Ed. AACC., 1994

SEMESTER–IV

Theory Paper- V BFST- 405 Food Safety and Microbial Standards

Unit I: Hazards in food chain: physical, chemical and biological. Toxins in food: naturally occurring, bacterial and fungal.	09 lectures
Unit II: Intrinsic toxins produced during processing and storage of food. Metals as toxins: Sources, contamination, toxicity and elimination.	09 lectures
Unit III: Pesticide residues as toxin: Chlorinated and non-chlorinated Permitted and non-permitted food additives.	09 lectures
Unit IV: Microbial standards of fresh and processed foods. Risk assessment and management during food preparation.	09 lectures
Books: 1. Handbook of Food Toxicology Deshpande SSCRC Press. 2. Food Hygiene and Sanitation Roday Tata McGraw Hill Education, 2011. 3. Principles of Food Sanitation Marriot and Gravi Springer, 2006. 4. Food Safety and Toxicology Vries JD CRC Press, 1996. 5. Food Safety: Theory and Practice Knechtges PL Jones and Bartlett Publishers 2011.	

SEMESTER–IV

Theory Paper- VI BFST- 406 Quality Assurance and Certification

Unit I: Introduction to Quality: Defining quality, Dimensions of quality, Quality control &quality assurance, Quality Gurus' Contribution. Total Quality Management: Objectives, principles, implementation; Deming's 14 points on TQM, Benefits of TQM, Quality Tools, Quality Circle.	09 lectures
Unit II: HACCP: Introduction, History of HACCP, Definitions related to HACCP system, Principles of HACCP, Application of HACCP system, Implementation steps for HAACP system, Benefits of HACCP. ISO 22000: Introduction, History, Benefits, Objectives, ISO 22000 family of standards series, ISO standard document, Role of BIS in ISO 22000 GFSI, FSSC 22000, IFS, SQF, AIB, GRMS, PAS 96.	09 lectures
Unit III: PRP for Food Safety: GAP – objectives, principles, benefits; GLP – need, history, objectives, principles, bodies; GHP – objectives, principles; GMP – 12 122 | P a g e objectives, GMP in food industry. Accreditation and Certification: Introduction, Benefits, accreditation organizations, Certification, Types of certifications, Certification Bodies in India Quality Tools, Quality Circle.	09 lectures
Unit IV: Auditing and Surveillance: Introduction, Definition, Objectives of auditing, Types of Audit, Principles of Auditing, Audit Program Procedures, Audit Activities, Audit Competencies, Lead Auditor, Surveillance. Recent Update on the subject (if any) Documentation.	09 lectures
Books: 1 .Manual of Food Quality Control: Quality assurance in the food control microbiological laboratory, FAO, FAO Publication. 2 .HACCP and ISO 22000 – Application to Foods of Animal Origin Arvanitoyannis I.S., Wiley-Blackwell Publication, Oxford, [ISBN: 978-1-4051-5366-9] . 3 .Food Safety Management and ISO 22000 – Food Industry Briefing, Early Ralph, Food Industry Briefing Publication, [ISBN: 9781405193245]. 4 .ISO 22000: Food Safety Management Systems Requirements for Any Organization in the Food... ISO International Organization for Standardization. 5 .HACCP, GMP and ISO 22000 – Overview --- Institute of Workforce Education, Saint Augustine College Publication, [ISBN: 9781633051485] . 6 .HACCP – A Food Industry briefing , Mortimore S.E. and Wallace C.A. ,Wiley Blackwell New York, ISBN: 978-1-118-42723-1. 7 .Quality Management Essentials, Hoyle David, Elsevier Publication, and Oxford, UK [ISBN: 9780750667869. 8 .Sensory Evaluation of Foods, Piggot JR, Elbview applied Science, 1984.	

SEMESTER–IV

Theory Paper- VII AECC-C Environmental Studies – (Project)

Unit I : **Major Ecosystems:** Introduction, Forest ecosystem, Grassland Ecosystem, Desert Ecosystem, Aquatic Ecosystem, Estuarine ecosystem.	09 lectures
Unit II : **Population and Natural Resources:** Introduction, development of habitation pattern, environmental factors governing human settlement, population and pollution, reasons for overpopulation, aquatic population growth, demographic projections and population structures, production of food	09 lectures
Unit III : **Forest Resource:** Introduction, Indian scenario, Importance of Forests – Ecology and economically, uses of forest products, forest types, deforestation – causes, effects, forest degradation in India	09 lectures
Unit IV: **Energy Resources:** Introduction; Indian Scenario; Conventional energy sources and its problems; Non-conventional energy sources – advantages and limitations; Problems due to extra-exploitation of energy resources.	09 lectures

SEMESTER III

Theory Paper- VIII SEC-III Wine Technology- II

Unit I : Introduction to sensory evaluation of wine. Sensory evaluation and terminologies: Importance of sensory Evaluation of wine and study of terminologies used in describing wine. The basic tastes of wine and sensory perception: The taste of bitterness, acidity, salt, sweetness, glycerol and alcohol on the tongue.	09 lectures
Unit II : Commercial aspects of wine production. Comparison of wine with other beverages: Wine with vodka, Gin, Brandy, Whiskey, Rum, Beer, fruit wines fruit juice, carbonated drinks. Traditional and commercial wine-making: A comparison of traditional and new wine-making practices. Raw materials and equipment use in wine production: crusher, press fermentor, filtration and additives used in wines.	09 lectures
Unit III : The world of wine. Wine appellations and regulations: Study of wine laws of India. Chemical constituents of grapes and wines: Sugar, Acids, Phenolics and Alcohol. Wine and health: Beneficial and harmful effects of wine on the human health. Wine marketing: Importance of marketing in wine industry and the current wine marketing scenario.	09 lectures
Unit IV : The new concept in wine production. Organic wines: Organic viticulture and wine-making practices. The concept of precision viticulture: Definition of precision viticulture, advantages and disadvantages associated with precision viticulture, practices and application of precision viticulture in vineyard. New trends in the world of wine: Advantages and disadvantage of different closure (Screw cap, cork, Zork, synthetic cork, vino seal and crown caps) used for wine bottles.	09 lectures

SEMESTER IV

Lab V BFSP 407 Egg, Fish and Poultry Technology & Food Additives and Preservatives II

Egg, Fish and Poultry Technology

Practical Exercises	**Topics**
1.	Slaughtering and dressing of poultry bird.
2.	Composition and structure of egg.
3.	Determination of egg quality by Haugh unit.
4.	Preservation of shell egg.
5.	Study of anatomy and dressing of fish.
6.	Preparation of fish protein concentrate (FPC).
7.	Visit to Fish market and Poultry Farm.
8.	Visit to slaughter house.

Food Additives and Preservatives II

Practical Exercises	**Topics**
1.	Determination of diacetyl content in dairy products.
2.	Determination of total chlorophyll by Spectrophotometric method.
3.	Detection of chemical preservatives in foods.
4.	Study of effect of acidulants in fruit juices.
5.	Study of effect of stabilizers/thickeners on quality of foods.
6.	Study of effect of clarifying agents on the fruit juices.
7.	Role of emulsifiers in foods.
8.	Role of leaving agent in baked food product.
9.	Role and mode of action of antioxidant in food products.

SEMESTER IV

Lab VI BFSP 408 Food Processing and Preservation & Legume and Oilseed Technology

Food Processing and Preservation

Practical Exercises	**Topics**
1.	Determination of fruit firmness and its correlation with ripening.
2.	Wax coating of selected fruits.
3.	Ripening of banana using ethylene.
4.	Studies on effect of different storage temperatures on quality of fruits.
5.	Effect of storage transpiration rate of fruit.
6.	Packaging of fruits and vegetables.
7.	Effect of blanching of polyphenol oxidase activity.

Legume and Oilseed Technology

Practical Exercises	**Topics**
1.	Study on gelatinization of starch.
2.	Determination of amylase content of rice.
3.	Determination of fat acidity of cereals.
4.	Phenol test for cereals.
5.	Determination of sedimentation value.
6.	Milling of cereal grains.
7.	Visit to milling industry.

SEMESTER IV

Lab VII BFSP 409 Food Safety and Microbial Standards & Quality Assurance and Certification

Food Safety and Microbial Standards

Practical Exercises	**Topics**
1.	Estimation of Salmonella / Shigella / Staphylococcus from food samples.
2.	Estimation of fungal toxins from different types of foods .
3.	Detection of Lead.
4.	Detection of *Bacillus cereus.*
5.	Detection of *Campylabacter.*
6.	Detection of *Escherichia coli* and *coliforms.*
7.	Detection of *Listeria.*
8.	Detection of *Salmonella.*
9.	Detection of *Staphylococcus aureus.*
10.	Detection of *Clostridium perfringens.*
11.	HACCP for food industries by taking few models.
12.	Study of National and Codex microbial quality standards.
13.	Visit to food industry to study microbial safety.

Quality Assurance and Certification

Practical Exercises	**Topic**
1.	Activities of Quality Department.
2.	Application of HACCP to products.
3.	HACCP Plan for Fruits and Vegetables.
4.	Implementation procedure of ISO 22000.
5.	Preparation of documentation and records.
6.	Auditing- surveillance, mock audit.
7.	Visit to units with GMP, ISO, and HACCP certified plants.

Nature of Question Paper:

Theory-

	Nature of Question Paper	
Q. No.1	**Multiple choice based objective type (four options for each question be given)**	**08 Marks**
Q. No. 2	**Attempt any two of the following (out of three)**	**16Marks**
Q. No. 3	**Write a short note on any four of the following (out of six)**	**16 Marks**
Total		**40 Marks**
	Internal Examination (CCE)-Unit Test	**10 Marks**
Grand Total	**Grand Total Marks**	**50 Marks**

Practical-

Annual Practical examination

A) Every candidate must produce a certificate from the Head of the Department in his college, stating that he has completed in a satisfactory manner a practical course on the lines laid down from time to time by the Academic Council on the recommendations of the Board of Studies and that the laboratory Journal has been properly maintained. Every candidate must have recorded his/her observations in the Laboratory journal and written a report on each exercise performed. Every journal is to be signed periodically by a member of the teaching staff and certified by the Head of the Department at the end of the year. Candidates are to produce their journals at the practical examination and such journals will be taken into account by the examiners in assigning marks.

B) The practical examination will be conducted on two (2) consecutive days for each practicalnot less than 5 hours on each day of the practical exanimation.

C) BFST22-307 (Meat and Poultry Technology and Food Additives and Preservatives – I) BFST22-308 (Fruit and Vegetables Processing and Cereal Processing) BFSP22-407 (Egg, Fish and Poultry Technology & Food Additives and Preservatives II) and BFSP22-408 (Food Processing and Preservation & Legume and Oilseed Technology).

Q.1 Major Experiment 20 Marks.
Q.2 Minor Experiment 10 Marks.
Q.3 Major Experiment 20 Marks.
Q.4 Minor Experiment 10 Marks.
Q.5 Spotting 10 Marks (5 spots- each carry two marks)
Q.6 Journal 10 Marks.
Q.7 Case study 10 Marks.
Q.8 Viva-voce 10 Marks.

BFST22-309(Food Plant Design and Layout and Food Quality)
BFSP22-409 Food Safety and Microbial Standards & Quality Assurance and Certification.

Q.1 Major Experiment 20 Marks.
Q.2 Minor Experiment 10 Marks.
Q.3 Spotting 10 Marks (5 spots- each carry two marks).
Q.4 Major Experiment 20 Marks.
Q.5 Minor Experiment 10 Marks.
Q.6 Spotting 10 Marks (5 spots- each carry two marks).
Q.7 Tour Report 10 Marks.
Q.8 Journal 10 Marks.