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 2024-25

Syllabus For

B. Sc. Part – I (Food Science-Entire)

SEMESTER I & II

(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- I (Food Science-Entire)

- ❖ Guidelines shall be as per B.Sc. Regular Program.
- ❖ Rules and Regulations shall be as per B.Sc. Regular Program.
- ❖ Structure of Program and List of Courses.

1. Title: B.Sc. I Food Science (Entire)
2. Year of Implementation: 2024-2025
3. Duration: One Year
4. Pattern: Semester wise CBCS
5. Medium of Instruction: English
6. Structure of Course:

a. Semester I:
Theory: 08 Papers

b. Semester II:
Theory: 08 Papers

c. Practical (Semester I & II): 06 Papers

7. Examination Pattern:

- ❖ Internal Evaluation for Theory Paper – Each theory paper having **10 Marks**
- ❖ Home Assignments /Unit test/ Project Work/Viva / Online /Offline Test
- ❖ There shall be 08 theory papers each having **40 Marks**
- ❖ Practical Examination will be Conducted Semester wise – **50 Marks** for per subject.

8. Preamble:

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. Program Outcomes:

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

10. General Objectives:

a. Enrichment of basic knowledge in areas of Food Science.
b. Reconstruction and redesigning of the courses to suite local needs.
c. To develop aptitude of students in the field of research.
d. More emphasis on applied aspects of Food Science.

First Year Bachelor of Science (Level-6) Program Structure (NEP-2023 Pattern)

Structure of B. Sc. Program Semester – I & II

Rayat Shikshan Sanstha's

SADGURU GADAGE MAHARAJ COLLEGE, KARAD.

COURSE STRUCTURE UNDER AN AUTONOMY

B. Sc. Food Science (ENTIRE)

B. Sc. I SEMESTER– I (Duration – 6 Months)

Sr. No.	COURSE CODE	TEACHING SCHEME						EXAMINATION SCHEME								
		THEOY			COURSE CODE	PRACTICAL			THEORY					PRACTICAL		
		Credit	No. of lectures	Hours		Credits	No. of lectures	Hours	Hours	Theory	Internal	Total Marks (Min.)	Total Marks			
1	N-MJT-BFS-101	2	3	2.4	N-MJP-BFS -103	2	6.4	8	2	40	10	16+4=20	50	As per BOS Guid - lines	50	20
2	N-MJT-BFS-102	2	3	2.4					2	40	10	16+4=20	50			
3	N-MNT-BFS 110	2	3	2.4	N-MNP-BFS-112	2	6.4	8	2	40	10	16+4=20	50		50	20
4	N-MNT-BFS 111	2	3	2.4					2	40	10	16+4=20	50			
5	N-OET-BFS -120	2	3	2.4	N-OEP-BFS-122	2	6.4	8	2	40	10	16+4=20	50		50	20
6	N-OET-BFS-121	2	3	2.4					2	40	10	16+4=20	50			
7	N-AECC –A	--	3	2.4					2	40	10	16+4=20	50		-	-
8	N-IKS	2	3	2.4					2	50	-	20	50			
Total of SEM I		**14**	**24**	**19.2**		**06**	**19.2**	**24**	**16**	**330 + 70 = 400**				**150**		

TOTAL NO OF CREDITS FOR SEMESTER – I : 22

B. Sc. I SEMESTER– II (Duration – 6 Months)

Sr. No.	COURSE CODE	TEACHING SCHEME						EXAMINATION SCHEME								
		THEORY			COURSE CODE	PRACTICAL			THEORY					PRACTICAL		
		Credit	No. of lecture	Hours		Credits	No. of lecture	Hours	Hours	Theory	Internal	Total Marks (Min.)	Total Marks		Max Marks	Min Marks
1	N-MJT-BFS-201	2	3	2.4	N-MJP-BFS -203	4	6.4	8	2	40	10	16+4=20	50	As per BOS Guid - lines	50	20
2	N-MJT-BFS-202	2	3	2.4					2	40	10	16+4=20	50			
3	N-MNT-BFS 210	2	3	2.4	N-MNP-BFS-212	4	6.4	8	2	40	10	16+4=20	50		50	20
4	N-MNT-BFS 211	2	3	2.4					2	40	10	16+4=20	50			

5	**N-OET-BFS -220**	2	3	2.4	**N-OEP-BFS-222**	4	6.4	8		2	40	10	16+4=20	50		50	20
6	**N-OET-BFS-221**	2	3	2.4						2	40	10	16+4=20	50			
7	**N-AECC – B**	4	3	2.4						2	40	10	16+4=20	50		-	-
8	**N-SEC – I**	2	3	2.4						2	50	-	20	50			
Total of SEM II		**18**	**24**	**19.2**		**12**	**19.2**	**24**		**16**	**330 + 70 = 400**					**150**	
Grand Total		**32**	**48**	**38.4**		**24**	**38.4**	**48**		**--**	**800 + 300 = 1100**						

TOTAL NO OF CREDITS FOR SEMESTER - II: 30

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

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

- **BFS – MJT Bachelor in Food Science Major Entire Theory:** for Semester- I (N-MJT-BFS-101 to N-MJT-BFS-102) and for Semester- II (N-MJT-BFS-201 to N-MJT-BFS-202)
- **BFS – MNT Bachelor in Food Science -Minor Entire Theory** : for Semester – I (BFS – 110 MNT to BFS – 111 MNT) and for Semester – II (BFS – 210 – MNT to BFS – 211- MNT)

- **AECC**- Theory: for Ability Enhancement Compulsory Course (AECC-I and AECC-II)- (Theory – 60 & Project – 40 Marks)
- **FS – MJP, MNP & OEP Food Science (Entire) Practical:** for (BFS – 207 to BFS - 209)
- Practical Examination will be conducted Semester wise for 50 Marks per course (subject).
- There shall be separate passing for theory and practical courses.
- The examination of each 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.

Structure of the Course: B.Sc. Food Science B. Sc. Food Science

Level	Year	Sem.	Course Type	Course Code	Course Title	Credits	No. of Lectures / Practical's
4.5	I	Sem. I	Major	N-MJT-BFS-101	Post-Harvest tech - I	2T	30
			Major	N-MJT-BFS-102	Dairy Technology - I	2T	30
			Major	N-MJP-BFS - 103	Laboratory Exercises in Post – Harvest Tech. – I & Dairy Technology – I	2P	15
			Minor	N-MNT-BFS-110	Food Microbiology: Food Microbiology - I	2T	30
			Minor	N-MNT-BFS-111	Food Preservation – I	2T	30
			Minor	N-MNP-BFS-112	Laboratory Exercises in Food Microbiology - I & Food Preservation – I	2P	15
			OE /GE	N-OET-BFS - 120	Food Chemistry - I	2T	30
			OE /GE	N-OET-BFS-121	Chemistry – I	2T	30
			OE /GE	N-OEP-BFS-122	Laboratory Exercises Food Chemistry- I & Chemistry-I	2P	15
			AEC	N-AECC- A	English – I	2T	30
			IKS	N-IKS	Traditional Food Tech.	2T	30
		Sem. II	Major	N-MJT-BFS-201	Post-Harvest tech - II	2T	30
			Major	N-MJT-BFS-202	Dairy Technology - II	2T	30
			Major	N-MJP-BFS - 203	Laboratory Exercises in Post – Harvest Tech. – II & Dairy Technology – II	2P	15
			Minor	N-MNT-BFS-210	Food Microbiology: Food Microbiology - II	2T	30
			Minor	N-MNT-BFS-211	Food Preservation – II	2T	30
			Minor	N-MNP-BFS-212	Laboratory Exercises in Food Microbiology - II & Food Preservation – II	2P	15
			OE /GE	N-OET-BFS - 220	Food Chemistry - II	2T	30
			OE /GE	N-OET-BFS-221	Chemistry – II	2T	30
			OE /GE	N-OEP-BFS-222	Laboratory Exercises Food Chemistry-II & Chemistry-II	2P	15
			AEC	N-AEC – B	English - II	2T	30
			SEC	N-SEC – I	Food Auditing – I	2T	30

Bachelor of Science (B.Sc.)
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 2024-25

1. Implementation of Revised guidelines and rules:

The revised guidelines and rules shall be implemented gradually as mentioned below:

Level	Program	Course	From Academic Year
Undergraduate Program:			
Level 5	Undergraduate Certificate(One year or two semesters)	B.Sc. Part-I	2022-23
Level 6	Undergraduate Diploma(Two years or four semesters)	B.Sc. Part-II	2023-24
Level 7	Bachelor's Degree(Three years or six semesters)	B.Sc. Part-III	2024-25
Level 8	Bachelor's Degree with Honors /Research (Four years or eight Semesters)	B.Sc. Part-IV	2025-26

(If the candidate wants to exit after a certain level, the Awards after completing specific level will be: Under graduate Certificate in Science, Undergraduate Diploma in Science, B.Sc. And B.Sc. (Hon./Research) for Level-5, Level- 6, Level-7 and Level-8 respectively. Other provisions for multiple entry and exit as per the Institute's rules and regulations are applicable).

2. Eligibility Criteria: As per Ordinance – B.Sc. I

3. Pattern of B.Sc. Program: Combination of internal assessment and semester-end examination for B.Sc. will be 40:10 pattern shall be applicable for each theory paper in each semester wherein 40 marks shall be for Institutional (An Autonomous College- Affiliated Shivaji University, Kolhapur) Semester end examination and 10 marks for internal assessment except Environmental Studies. Only for Environmental Studies in Semester IV, 70 marks shall be for University examination for theory paper and 30 marks for project work.

4. Weightage: There shall be Three Year B.Sc. Program with 160 Credits. The candidate wish to exit with three years Degree Program Bachelor of Science (B.Sc.) (with the completion of courses equal to minimum of 160 credits).or The candidate wish to continue studies for Four Year B.Sc. (Hon./Research) may opt for 4th year which will have 26 credits for Sem. VII and 26 credits for Sem. VIII, total 52 credits for 4th year, out of them (4+2=6 ×4=24) credits for Discipline Specific Elective Courses (DSE) and 02 credits for SBC-7 of Sem.VII .Program will require 160 credits. (Please refer the university regulations and structure of the program for details).

Model Program Structure for Bachelor of Science (160Credits)

SEM	Discipline Specific Core Courses (DSC)(L+P)(Credits)	Discipline Specific Elective Courses (DSE)(L+P)(Credits)	Ability Enhancement Compulsory Courses (AECC)(L+P)(Credits)	Skill Enhancement Courses(SEC/VBC)		IKS Courses from Indian knowledge system	Total Credits
				Vocational Courses(L+P) (Credits) (Non CGPA)	Value Based Courses (P) (Credits) (Non-CGPA)		
I	**Food Science** **(2 x 6=12)** 2 Credit for each Theory subject **(4 x 3=12)** 4 Credit for each Practical subject **Total Credits= 24**	**Non-CGPA-I (Nil)**	**AECC- A** English for communication-I	--	**VBC(Nil)** NCC / NSS /Sports /Cultural, **etc.**	**IKS (2)** Traditional Food Technology	**26**
II	**Food Science** **(2 x 6=12)** 2Credit for each Theory subject **(4 x 3=12)** 2Credit for each Practical subject **Total Credits= 24**	**Non-CGPA-I (Nil)**	**AECC-B (4)** English for communication-II	**SEC-1 (2)** Food Auditing – I	**VBC(Nil)** NCC / NSS /Sports /Cultural, **etc.**		**30**
Total							**56**
III	**Food Science** **(2x6=12)** 2Credit for each Theory subject **(3x4=12)** 2Credit for each Practical subject **Total Credits= 24**	**26**	--	**SEC-3(2)** Multidisciplinary (Clinical Haematology)	**VBC(Nil)** NCC / NSS /Sports /Cultural, **etc.**		
IV	**Food Science** **(2x6=12)** 2Credit for each Theory subject **(3x4=12)** 2Credit for each Practical subject **Total Credits= 24**	**30**	**AECC-D (4)** Environmental science	**SEC-4 (2)** Multidisciplinary (Bio fertilizers – Production and Applications)	**VBC(Nil)** NCC / NSS /Sports /Cultural, **etc.**		

Total						**56**
Level 6:Exit with Diploma in Science (with the completion of courses equal to minimum of 116 credits)						

V	**Food Science** **(2x3=6)** 2Credit for each Theory subject **(4x1.5=6)** 2Credit for each Practical subject **Total Credits= 12**	**Biotechnology** **(2x1=2)** 2Credit for each Theory subject **(4x0.5=2)** 2Credit for each Practical subject **Total Credits= 4**	**AECC-E (4)** English communication III	**SEC-5(2)** Multidisciplinary (Bioinformatics-I)	**VBC(Nil)** NCC / NSS /Sports /Cultural, **etc.**	**22**
VI	**Food Science** **(2x3=6)** 2Credit for each Theory subject **(4x1.5=6)** 2Credit for each Practical subject **Total Credits= 12**	**Biotechnology** **(2x1=2)** 2Credit for each Theory subject **(4x0.5=2)** 2Credit for each Practical subject **Total Credits= 4**	**AECC-F (4)** English communication IV	**SEC-6 (2)** Multidisciplinary (Bioinformatics-II)	**VBC(Nil)** NCC / NSS /Sports /Cultural, **etc.**	**22**
Total						**44**
	120	**08**	**20**	**12 (Non CGPA)**	**00 (Non CGPA)**	**160**

Level 7 : Exit with three years Bachelor of Science B.Sc. (with the completion of courses equal to minimum of 160 credits) or continue studies for Bachelor of Science B.Sc. with (Honors/Research) four year Degree Program (with the completion of courses equal to minimum of 212 credits)						
VII	**Food Science** **(2x4=8)** 2Credit for each Theory subject **(4x4=16)** 4Credit for each Practical subject **Total Credits= 24**	**--**		**SBC-7(2)** Multidisciplinary (From Pool of Courses)	**--**	**26**
VIII	**Food Science** **(2x4=8)** 2Credit for each Theory subject **(4x4=16)** 2Credit for each Practical subject **Total Credits= 24**	**--**		**SBC-8 (2)** Multidisciplinary (From Pool of Courses)	**---**	**26**
Total						**52**
	176	**00**	**20**	**16 (Non CGPA)**	**00 (Non CGPA)**	**212**
Level 8 : Exit with four years Bachelor of Science B.Sc. with (Honors/Research) (with the completion of courses equal to minimum of 212 credits).						

Food Science (Entire) Total Credits points:

Levels	Sem.	DSC	DSE/OEC/GEC/IDS	AECC Languages And Env. Sci.	SEC (Multidisciplinary)	Total Credits
Level-5	I	T=(2x6=12) P=(2x3=6) Total=18	-	1X 4=4 (ENG)	SEC-I (2) VBC-I (Nil)	30
	II	T=(2x8=16) P=(2x4=8) Total=24	-	1 X 4=4 (ENG)	SEC-II (2)	30
Level-6	III	T=(2x6=12) P=(3x4=12) Total=24	-	-	SEC-III (2)	26
	IV	T=(2x6=12) P=(3x4=12) Total=24	-	1X4=4 (EVS)	SEC-IV (2)	30
Level-7	V	T=(2x3=6) P=(4x1.5=6) Total=12	T=(2x1=2) P=(4x0.5=2) Total=4	1X4=4 (ENG)	SEC-V (2)	22
	VI	T=(2x3=6) P=(4x1.5=6) Total=12	T=(2x1=2) P=(4x0.5=2) Total=4	1X4=4 (ENG)	SEC-VI (2)	22
						160
Level-8	VII	-	4X(4+2)=24 (DSE)	-	SEC-VII (2)	26
	VIII	-	4X(4+2)=24 (DSE)	-	SEC-VIII (2)	26
	Total Credits					212

1 Gradation Chart:

Marks Obtained	Numerical Grade (Grade Point)		CGPA	Letter Grade
Absent	0 (zero)		--	--
0 – 39	0 (zero)		0.0 – 4.99	F (Fail)
40 – 49	5		5.00 – 5.49	C
50 – 59	6		5.50 – 6.49	B
60 – 69	7		6.50 – 7.49	B+
70 – 79	8		7.50 – 8.49	A
80 – 89	9		8.50 – 9.49	A+
90 – 100	10		9.50 – 10.0	O (Outstanding)

Note:

1. Marks obtained > = 0.5 shall be rounded off to next higher digit.
2. The SGPA & CGPA shall be rounded off to 2 decimal points.

Calculation of SGPA & CGPA

1. Semester Grade Point Average (SGPA)

$$\textbf{SGPA} = \frac{\Sigma \text{ (Course credits} \times \text{Grade points obtained) of a semester}}{\Sigma \text{ (Course credits) of respective semester}}$$

2. Cumulative Grade Point Average (CGPA)

$$\textbf{CGPA} = \frac{\Sigma \text{ (Total credits of a semester} \times \text{SGPA of respective semesters}}{\Sigma \text{ (Total course credits) of all semesters}}$$

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. Food Science Semester I

Course Code and title: N-MJT-BFS-101Post -Harvest Technology-I

Credits: 02 **Total Lectures: 30**

Course Objectives:

- To learn general post -harvest techniques.
- To know the morphological structure of fruits and vegetables.
- To understand the effects of some chemical ripening of fruits.
- To get the importance of nutrients present in fruits and vegetables.
- Discuss about classification of different horticultural commodities.

Topic No.	Topics	Lectures
	Credit – I	
1.	**Unit I Importance of Post-Harvest Technology** Importance of post- harvest technology Page, Need for Post-harvest technology Page, Post-Harvest Physiology Page, Preservation and Processing Page, Goals of post-harvest Page, Sub Functioning chain of PHT.	7
2.	**Unit II Structure and Composition of Fruits, Vegetables** Structure of Fruits, and Vegetable, Composition of Fruits and Vegetables.	8
	Credit –II	
3.	**Unit III Physiology of Horticultural Produce** Physiology of fruits and vegetables, Respiration. Classification of horticultural commodities according to their respiration rate, Factors responsible for the respiration.	7
4.	**Unit IV Biochemistry of Horticultural Produce** Effects of ethylene, Ethylene Biosynthesis, Bio-chemical changes during ripening, Colour development in fruits and vegetables.	8

Course Outcomes: After completing the credits students should gain knowledge about:

i. Maturity Indices of fruits to be harvested.
ii. Varieties of fruits and vegetables for further value added product preparation.
iii. Biochemical changes during ripening of fruits.

References:

1. Amalendu Chakraverty, Arun S. Mujumdar, G.S. Vijaya Raghavan and Hosahalli S. Ramaswamy. 2003. Handbook of Post-Harvest Technology: Cereals, Fruits, Vegetables, Tea, and Spices. Marcel Dekker, Inc., NY, USA.
2. R.P. Srivastava and Sanjeev Kumar. 2002. Fruit & Vegetable Preservation: Principles andPractices, 3rd Ed. International Book Distribution Co., Delhi.
3. P.H.Pandey.1997.Post-HarvestTechnologyofFruitsand Vegetables.SarojPrakashan,Allahabad.

B.Sc. Food Science Semester I

Course Code and title: N-MJT-BFS-102 Dairy Technology - I

Credits: 02 **Total Lectures: 30**

Course Objective:

- To study the importance of milk in human diet.
- To learn about different types of milk products with percent milk use in India.
- To know the different steps of milk processing with instruments.
- To study the problems of milk supply in India.
- To study the dairy by products with their preparation.

Sr. No.	Topics	Lectures
	Credit – I	
1.	**Unit I Introduction of Milk and Milk Products** Definition of Milk, Introduction and current status of Milk and milk products in India. Percent Milk utilization pattern. Physicochemical properties of milk. Changes in milk on heating. Nutritional Composition of Milk. Colostrum, Composition. Laws and regulations, Milk standards. Milk products and their byproducts.	7
2.	**Unit II Handling and maintenance** Handling and maintenance of dairy plant equipment Dairy plant operations. Receiving, separation, clarification, pasteurization, standardization, Hmogenization , sterilization, storage, transport and distribution of milk.	8
	Credit –II	
3.	**Unit III Parameters of Milk Processing** Problems of milk supply in India, UHT, toned, humanized, fortified, reconstituted and flavored milks. In plant cleaning system.	7
4.	**Unit IV By Product Technology** a) Status, availability and utilization of dairy by-products in India and Abroad. Associated economic and pollution problems, Physico-chemical characteristics of whey, butter milk 8 and ghee residue, By- products from skim milk: Casein: types of commercial casein, their specifications, manufacturing processes with basic principles involved. b) Industrial and food uses of caseins c) Manufacture of sodium and calcium caseinates their physicochemical and functional properties and food applications d) Manufacture of casein hydrolysates and its industrial application.	8

Course outcome: -

- Student should be able to understand basic concepts of Instruments and its Application
- To be able to apply this knowledge in the laboratory tests of milk adulteration.
- Student should able to understand the main dairy products with their byproducts.
- Student should understand principle behind the instruments.
- Student will understand different parts of machineries used during processing of milk.

References: -

1. Sukumar De. Outlines of Dairy Technology Oxford publication.
2. Dr. S. S. Bhutkar Textbook of Technology of Milk & Milk Products, Agricos Publications.
3. Dr. S. S. Bhutkar Practical Manual of Technology of Milk & Milk Products, Agricos Publications. J. G. Davis Milk testing a laboratory control of milk Agribios India.

Laboratory Exercises in Post-Harvest Technology-I & Dairy Technology - I

Sr. No.	Name of the Experiment	Number of practical
1.	Practice in judging the maturity of various fruits and vegetables.	01
2.	Determination of Total Soluble Solids (TSS).	01
3.	Physical properties of stored grains.	01
4.	Determination of Acidity in Juice.	01
5.	Effect of ethylene on ripening process.	01
6.	Determination of amylose and starch content in cereal grains.	01
7.	Sampling and analysis of milk – Sp. gravity, physico- chemical properties and composition.	01
8.	Clarification and separation of milk.	01
9.	Standardization of milk for markets.	01
10.	Heat processing of milk – Pasteurization Sterilization.	01
11.	DMC and DYC reduction tests, presence of adulterants and preservatives.	01

B.Sc. Food Science Semester I

Course Code and title: N-MNT-BFS – 110 Food Microbiology - I

Credits: 02 **Total Lectures: 30**

Course Objective:

1. To study microbial toxicity in food.
2. To know the microbial changes in food.

Sr. No.	Topics	Lectures
	Credit – I	
1.	**Unit I Basic Food Microbiology** Brief history of food microbiology and introduction to important microorganisms in foods. Cultivation of microorganisms, Nutritional requirements of microorganisms, types of media used, methods of isolation.	7
2.	**Unit II: Sterilization and Disinfections** Primary sources of microorganisms in foods, physical and chemical methods used in the destruction of microorganism in foods:	8
	Credit –II	
3.	**Unit III: Fundamentals of Control of Microorganisms** Fundamentals of control of microorganism in foods: Extrinsic and intrinsic parameters affecting growth and survival of microbes' use of high and low temperature, dehydration,freezing, freeze-drying, irradiation and preservative	7
4.	**Unit IV: Food Spoilage** Contamination and microorganisms in the spoilage of different kinds of foods and such as cereal and cereal products, vegetable and fruits, fish and other sea foods, meat and meat products, eggs and poultry, milk and products, canned foods.	8

Course Outcome:

1. Analysis of fundamental parameters of microbial growth.
2. To demonstrate the undesirable microbial growth.
3. Student could explain the methods of isolation.
4. Learner could apply the basic types of media for microbial growth.

Books

1. Martin R. Adams and Maurice O. Moss. 2008. Food Microbiology, 3rd Ed., The RoyalSociety of Chemistry, Cambridge, UK.
2. James M. Jay. 2000. Modern Food Microbiology, 6th Ed. Aspen Publishers, Inc., Gaithersburg, Maryland, USA.
3. George J. Banwart. 1989. Basic Food Microbiology, 2nd Ed. Chapman & Hall, NewYork, USA.
4. William C. Frazier and & Dennis C. West off. 1987. Food Microbiology, 4th Ed. TataMcGraw Hill Education, New Delhi.

B.Sc. Food Science Semester I

Course Code and title: N-MNT-BFS – 111 Food Preservation-I

Credits: 02 **Total Lectures: 30**

Course Objectives:

i. To prepare student for handling advanced preservation techniques.
ii. To aware the student the spoilt food even using any preservation method.

Sr. No.	Topic	Lectures
	Credit – I	
1.	**Unit I Introduction** Definition and scope of Food Science and Technology, historical development of food processing and preservation, general principles of food preservation.	7
2.	**Unit II Preservation of food by low temperatures** Chilling; considerations relating to storage of foods at chilling temperature, applications and procedures controlled and modified atmosphere storage of foods. Freezing temperature: Freezing process, slow and fast freezing of foods Chilling; considerations relating to storage of foods at chilling temperature, applications and procedures controlled and modified atmosphere storage of foods. Freezing temperature: Freezing process, slow and fast freezing of foods and its consequences, other occurrences associated with freezing of foods. Technological aspects of pre-freezing, freezing, frozen storage and thawing of foods. Calculation of freezing time.	8
	Credit –II	
3.	**Unit III Preservation of foods by high temperature** Basic concepts in thermal inactivation of microorganisms-D, z, F values. Heat resistance of microorganisms. Cooking, blanching, pasteurization and sterilization of foods. Extrusion, baking, roasting, frying, dielectric heating, Ohmic, microwave, infrared and radio wave heating. Assessing adequacy of thermal processing of foods, general process of canning of foods, spoilages in canned foods.	7
4.	**Unit IV Chemical preservations** Principles, technological aspects and applications of sugar andsalt, antimicrobial agents, biological agent.	8

Course Outcomes:

Student should understand**:**

1. Basic concepts and technical parameters of each method.
2. Design and working principle of machineries used for preservation of food.
3. Mode of action of chemical preservative in food.

Books: -

1. Food Processing Technology: Principles and Practices. P.J. Fellows, Wood head.
2. Introduction to Food Engineering. R.P. Singh, and D.R. Heldman, Elsevier publ., Amsterdam, 5thedition, 2016.
3. Food science. N.N. Potter and J.H. Hotchkiss, Springer publ., 2012.
4. Food Processing: Principles and Applications. H.S. Ramaswamy and Marcotte, Taylor and Francis publ., 1st edition, 2005.
5. Industrial Drying of Foods. C.G.J. Baker, Blackie Academic and Professional, 1997.
6. Food science. B. Srilakshmi, New Age International, 2003.

B.Sc. Food Science Semester I

Course Code and title: Food Microbiology –I, Food Preservation-I

Credits: 02 **Total Practical: 15**

Sr. No.	Name of the Experiment	No. of practical
1.	Introduction to the basic microbiology laboratory practices.	01
2.	To study preparation of cotton plug for flask and tubes.	01
3.	To study wrapping of plates and pipettes.	01
4.	To study use and care of compound microscope.	01
5.	Study of laboratory equipment's –Autoclave, Incubator, Hot air oven, Weighing balance.	01
6.	To study preparation of slant, slab and plates using nutrient agar.	01
7.	Study different preservation methods of foods and vegetables.	01
8.	Use of additives (according to GRAS) in fruits, vegetables, milk and meat products.	01
9.	Study the different preservatives.	01
10.	Study the concept of shelf life of different foods.	01
11.	Study the concept of Asepsis and sterilization.	01
12.	Study preservation of food by dehydration and freezing method.	01

Course Code and title: N-OET-BFS- 120 Food Chemistry-I

Credits: 02 **Total Lectures: 30**

Course Objective:

- To study the correlation between food science and food chemistry.
- To learn about food nutritional importance.
- To understand the importance of macronutrients in food.
- To study the functions of all essential macronutrients in food.
- To study the classification of Carbohydrate, protein, lipid etc.

Topic No.		Lectures
	Credit – I	
1.	**Unit I Basic Food science:** Basic concept on Food, Nutrition and Nutrients. Classification of Food, Classification of Nutrients.	7
2.	**Unit II Carbohydrates** Definition, Classification, Structure and properties. Monosaccharides - glucose, fructose, galactose. Disaccharides - Maltose, lactose, sucrose Polysaccharides- Dextrin, starch, glycogen, resistant starch. Carbohydrates - Sources, daily requirements, functions.	8
	Credit –II	
3.	**Unit III Lipids** Definition, Classification & Properties. Fatty acids-composition, Properties, types. Lipids- Sources, daily requirements, functions. Role & nutritional significances of PUFA, MUFA, SFA, W-3 fatty acid.	7
4.	**Unit IV Proteins** Definition, Classification, Structure & properties. Amino acids Classification, types, functions. Proteins- Sources, daily requirements, functions. Factors affecting protein bio- availability including anti-nutritional factors.	8

Course outcome: -

- Student should be able to understand basic concepts of food chemistry.
- To be able to predict the changes in food while processing.
- Student should able to use different sources as a food ingredient for making valuable product.
- Student should understand the structure of chemical compound.
- Student should understand how the examples of food nutrients relevant with human life.

References: -

1. John W. Brady. 2013. Introductory Food Chemistry. Comstock Publishing Associates, Cornell University Press, Ithaca, USA.
2. H.-D. Belitz, W. Grosch and P. Schieberle. 2009. Food Chemistry, 4th Ed. Springer-Verlag Berlin Heidelberg.
3. Owen R, Fennema. 1996. Food Chemistry, 3rd Ed. Marcel Dekker, Inc., New York,USA.
4. L. H. Meyer. 1974. Food Chemistry. The AVI Publishing Co Inc., Connecticut, MA,USA.

B.Sc. Food Science Semester I

Course Code and title: N-OET-BFS- 121 Chemistry-I

Credits: 02 **Total Lectures: 30**

Course Objectives:

- To learn about the chemistry of industrial gasoline.
- To know how to draw the structures of molecular orbitals.
- Discuss how the chemistry is important in food science studies.
- Describe the different types of gases are important in scientific way.

Sr. No.	Topic	Lectures
	Credit – I	
1.	**Unit I Chemical Bonds** Chemical Bonding, Molecular orbital theory, bonding, antibonding and nonbonding orbitals. Molecular orbitals. MO configuration of H2, N2, O2, F2. Bond order. Diamagnetism and para magnetism.	7
2.	**Unit III Industrial Chemistry** Industrial Chemistry: Synthesis, properties and uses of silicones. Fuel gases: natural gas, water gas, semi water gas, carbonated water gas, producer gas, oil gas (manufacturing details not required). Fertilizers: urea, ammonium sulphate, ammonium nitrate, potassium nitrate NPK fertilizer. Triple superphosphate.	8
	Credit –II	
3.	**Unit III Covalent Bond** Covalent bond: orbital overlap, hybridization, geometry of organic molecules CH_4, C_2, H_4, C_2, H_2, C_6H_6. Inductive effect. Electrometric, mesomeric, hyperconjucative and steric effects. Effect in properties of compounds. Stereoisomerism Optical isomerism: symmetry, elements of symmetry. Cause of optical activity, tartaric acid, Racemization, Resolution. Geometric isomerism of maleic and fumaric acids.	7
4.	**Unit IV Solutions** Solutions types. Liquid in Liquid. Raoult's law. Deviation from ideal behavior. Binary liquid mixtures. Fractional distillation. Kinetics Rate, order, molecularity, pseudo first order, determination of order. Measurement of reaction. Effect of temperature on the rate. Energy of activation.	8

Course Outcomes:

After completing the credits students should gain knowledge about:

1. Milestones in chemistry.
2. Industrial fuel gases and its importance.
3. Learn about the chemical nature of different fertilizers.
4. Learn about the chemistry of covalent bonding.
5. Terms of solute, solvent and solution.
6. Basic fuel gases and their role.
7. Concept of Isomerism.

References:

1. Principles of Inorganic Chemistry; By Puri, Sharma & Kalia, 3rd and 4th edition.Inorganic Chemistry; By Gary L. Miessler & Donald A. Tarr; 3rd edition.
2. Atomic structure and chemical bonding; By Manas Chanda; 2nd edition.
3. Quantum Chemistry; By R. K. Prasad.
4. Inorganic chemistry- Principles of Structure and Reactivity; By James H.Huheey, Keiter, Medhi; 4th edition.
5. Modern Inorganic Chemistry; By R. D. Madan, Concise Inorganic Chemistry; By J. DLee; 5thedition.

B.Sc. Food Science Semester I

Course Code and title: N-OEP-BFS-222 Food Chemistry-I and Chemistry-I

Credits: 02 **Total Practical: 15**

Sr. No.	Name of the Experiment	Number of practical
1.	To determine moisture content of food sample.	01
2.	Determination of ash in a given food sample.	01
3.	Qualitative tests for carbohydrates, lipids, amino acids, and proteins in food samples.	01
4.	To determine adulteration carbohydrates, fat, oils and proteins in Food sample.	01
5.	Determination of Melting point of fats and oils.	01
6.	To study some simple tests to identify the presence of oils and fats in the given sample.	01
7.	Prepare dilute solutions of given concentrations of hydrochloric acid, sulphuric acid and nitric acid from their stock solution.	01
8.	Preparation of standard solutions.	01
9.	Preparation of standard solution of 0.1N potassium dichromate and determination of strength of ferrous ammoniumsulphate solution in normal terms & kg/dm3.	01
10.	Determination of acidity in commercial vinegar using NaOH.	01
11.	Determination of pH.	
12.	Study the pH change by common ion effect in case of weak acids and weak bases using universal indicator solution or pH paper.	01

Course Code and title: N-AECC -A English for Communication - I

Credits: 02 **Total Lectures: 30**

Sr. No.	Topic	Lectures
	Credit – I	
1.	**Unit I Use of English in Business Environment** Business Vocabulary: Vocabulary for banking, marketing and for maintaining public relations. What is a sentence? Elements of a sentence Types of sentences: Simple, compound, complex	7
2.	**Unit II Writing a Letter of Application and CV/Resume Topics** Structure of a letter of application for various posts CV/ Resume and its essentials.	8
	Credit –II	
3.	**Unit III Presenting Information/Data Topics** Presenting information/data using graphics like tables, pie charts, tree diagrams, bar diagrams, graphs, flowcharts.	7
4.	**Unit IV Interview Technique** Dos and don'ts of an interview preparing for an interview Presenting documentsLanguage used in an interview	8

Books

1. Herekar, Prakash. Business Communication. Pune: Mehta Publications, 2007.
2. Herekar, Prakash. Principals of Business Communication. Pune: Mehta Publications, 2003.
3. Pardeshi, P.C. Managerial Communication. Pune: Nirali Prakashan, 2008.
4. Pradhan, N.S. Business Communication. Mumbai: Himalaya Publishing House, 2005.
5. Rai, Urmila & S. M. Rai. Business Communication. Himalaya Publishing House, 2007.
6. Sethi, Anjanee & Bhavana Adhikari. Business Communication. New Delhi: Tata McGraw Hill Tickoo, Champa & Jaya Sasikumar. Writing with a Purpose. New York: OUP, 1979.
7. Sonie, Subhash C. Mastering the Art of Effective Business Communication. New Delhi: Student Aid Publication, 2008.

Course Code and title: N-IKS Traditional food processing

Credits: 02 **Total Lectures: 30**

Course Objective:

- To know the importance of traditional in current situation.
- To learn about the recipes of making different traditional items.
- To learn about the methods of milling grains.
- To study the application of traditional ways to extract edible oil.
- To study the use of traditional food for specific illnesses.

Sr. No.	Topics	Lectures
	Credit – I	
1.	**Unit I Fermented foods-** Idli, Bread, Yogurt, Butter, Cottage Cheese, Sausage, Soya sauce, Pickles. Beverages – Coffee, tea. Aquaculture – General Principles, Prawn and Oyster farming. Foods of Microbial Origin- SCP – Yeast and algal.	7
2.	**Unit II Traditional Methods of Food Processing** Traditional methods of milling grains like wheat and corn , equipments and processes as compared to modern methods.Equipments and processes for edible oil extraction.	8
	Credit –II	
3.	**Unit III Health Aspects of Tradional Foods** Comparison of traditional foods with typical fast foods / junk foods – cost, food safety, nutrient composition, bioactive components; energy and environmental costs of traditional foods; traditional foods used for specific ailments /illnesses.	7
4.	**Unit III Traditional Food Patterns** Typical food preserves, beverages, snacks, desserts and sweets, street foods; IPR issues in traditional foods.	8

Course outcome: -

- To understand the historical and traditional perspective of foods and food habits.
- To understand the wide diversity and common features of traditional Indian foods and meal patterns.

References: -

1. Sen, Colleen Taylor Food Culture in India Greenwood Press, 2005.
2. Davidar, Ruth N. Indian Food Science: A Health and Nutrition Guide to Traditional Recipes: East West Books, 2001.

Course Code and title: N-MJT-BFS – 201 Post-Harvest Technology - II

Credits: 02 **Total Lectures: 30**

Course Objective:

- To learn advance post-harvest techniques.
- To know the morphological structure of fruits and vegetables.
- To understand the effects of some chemical ripening of fruits.
- To get the methods of in fruits and vegetables.
- Discuss about classification of different horticultural commodities.

Sr. No.	Topics	Lectures
	Credit – I	
1.	**Unit I Judging Maturity in Horticultural Produce** Judging Maturity in Horticultural Produce Page, Computational methods Page, Physical methods Page, Chemical methods Page, Physiological maturity Page, Harvesting Page, Harvesting methods-Manual methods Page, Mechanical harvesting Page, Necessary care during Harvesting Page.	7
2.	**Unit II Post- harvest treatments on horticultural produce** Introduction, post-harvest treatments, Pre-cooling :Pre-cooling, Types of Pre-cooling, Precautions to increase pre cooling efficiency ,Cleaning Washing, Dressing and Water spray, Introduction, Cleaning, Washing, Page, Sorting.	8
	Credit –II	
3.	**Unit III Post- harvest treatments I** High temperature – Curing / Drying / Hot water treatments Vapour heat treatment Degreening, Curing, Drying, Hot water treatments, Vapour heat treatment, Degreening Chemical treatment-Disinfestation ,Introduction, Disinfestation Page Methods of disinfestation, Post-harvest diseases of fruits, Chemicals used to control spoilage,Post-harvest pests.	7
4.	**Unit IV Post- harvest treatments II** Sprout Suppressants, Introduction Page, Physiological basis for sprouting, Methodsof sprout suppression, Mineral Application, Chemical used to extend the shelf life andquality, Fruit coating Waxing, Wax Coating , Fruit coating , Fruits suitable for waxing ,Types of Waxing, Commercial waxes, Methods of wax application ,Concentration of wax.	8

Course outcome: -

- To understand the industrial methods and perspective of foods and food parameters.
- To understand agricultural aspects to make value added products.

References Books:-

1. Amalendu Chakraverty, Arun S. Mujumdar, G.S. Vijaya Raghavan and Hosahalli S. Ramaswamy. 2003. Handbook of Post-Harvest Technology: Cereals, Fruits, Vegetables, Tea, and Spices. Marcel Dekker, Inc., NY, USA.
2. R.P. Srivastava and Sanjeev Kumar. 2002. Fruit & Vegetable Preservation: Principles and Practices, 3rd Ed. International Book Distribution Co., Delhi.
3. P.H. Pandey. 1997. Post-Harvest Technology of Fruits and Vegetables. Saroj Prakashan, Allahabad.

B.Sc. Food Science Semester I
Course Code and title: N-MJT-BFS- 202 Dairy Technology - II

Credits: 02 **Total Lectures: 30**

Course Objective:

- To Study different machineries used in dairy industry.
- To learn about different types of milk products with percent milk use in India.
- To know the different steps of milk processing with instruments.
- To study the problems of milk supply in India.
- To study the dairy by products with their preparation.

Sr. No.	Topics	Lectures
	Credit – I	
1.	**Unit I Fermented Milk** Technology of fermented milks, Introduction and Preparation of starter culture, Introduction and Preparation of dahi, Introduction and Preparation of yoghurt, Introduction and Preparation of shrikhand).	7
2.	**Unit II Milk products processing** Milk products processing viz. cream, butter, ghee, cheese, condensed milk, evaporated milk, whole and skimmed milk powder ice-cream, butter oil, khoa, channa, paneer and similar products.	8
	Credit –II	
3.	**Unit III Judging and grading** Judging and grading of different milk products, Cheese spreads by spray and roller drying techniques, EMC (Enzyme modified cheese).	7
4.	**Unit IV Enzymes in dairy processing** Enzymes in dairy processing and sanitization viz. selection and use of dairy cleaner and sanitizer	8

Course outcome: -

- Student should be able to understand basic concepts of Instruments and its Application
- To be able to apply this knowledge in the laboratory tests of milk adulteration.
- Student should able to understand the main dairy products with their byproducts.
- Student should understand principle behind the instruments.
- Student should understand different parts of machineries used during processing of milk.

Books

1. J. David Technological Advances in Indigenous Milk Products Jain Publication.
2. S. S. Bhutkar Practical Manual of Technology of Milk & Milk Products, Agricos Publications.
3. Sukumar De. Outlines of Dairy technology Oxford publication.

B.Sc. Food Science Semester I

Course Code and title: Post-Harvest Technology-II and Dairy Technology-II

Credits: 02 **Total Practical: 15**

Sr. No.	Name of the Experiment	Number of practical
1.	Estimation of Ascorbic acid from fresh and dehydrated material.	01
2.	Pre cooling packing methods for export or international trade.	01
3.	Preservation by drying and dehydration.	01
4.	Methods and equipment's of freeze drying.	01
5.	Preparation of Jam, jellies, Marmalade.	01
6.	Preparation of pickle.	01
7.	Preparation of butter and Ghee.	01
8.	Preparation of Ice-cream.	01
9.	Preparation of dahi, shrikhand and lassi.	01
10.	Preparation of khoa and khoa based sweets.	01
11.	Preparation of channa, paneer and channa based sweets.	01
12.	Visit to Dairy plant.	01

B.Sc. Food Science Semester I

Course Code and title: N-MNT-BFS- 210- Food Microbiology - II

Credits: 02 **Total Lectures: 30**

Course Objective:

- To Study different machineries used in dairy industry.
- To learn about different types of milk products with percent milk use in India.
- To know the different steps of milk processing with instruments.
- To study the problems of milk supply in India.
- To study the dairy by products with their preparation.

Sr. No.	Topics	Lectures
	Credit – I	
1.	**Unit I** Importance and significance of microbes in food science.	7
2.	**Unit II:** Microbial spoilage of foods Factors affecting kinds, numbers, growth and survival of microorganisms in foods, Intrinsic factors, pH, water activity, nutrients etc. and Extrinsic factors: Relative humidity, temperature and gaseous atmosphere.	8
	Credit –II	
3.	**Unit III:** Chemical changes caused by microorganisms Changes in nitrogenous organic compounds, non-nitrogenous organic compounds, organic acids, other compounds, lipids, pectic substances, Contamination of foods, Sources of contamination, Genera of bacteria, Maintenance of anaerobic conditions, Asepsis removal of microorganisms, Intermediate moisture foods.	7
4.	**Unit IV** Food borne intoxications and infections, types of food involved toxicity and symptoms, chemical properties, environmental conditions.	8

Books

1. James M. Jay. 2000. Modern Food Microbiology, 6th Ed. Aspen Publishers, Inc., Gaithersburg, Maryland, USA.
2. George J. Banwart. 1989. Basic Food Microbiology, 2nd Ed. Chapman & Hall, New York, USA.
3. William C. Frazier and & Dennis C. West off. 1987. Food Microbiology, 4th Ed. Tata McGraw Hill Education, New Delhi.

Course outcome: -

- Student should be able to understand basic concepts of Instruments and its Application.
- To be able to apply this knowledge in the laboratory tests of milk adulteration.
- Student should able to understand the main dairy products with their byproducts.
- Student should understand principle behind the instruments.
- Student should understand different parts of machineries used during processing of milk.

B.Sc. Food Science Semester I

Course Code and title: N-MNT-BFS – 111 Food Preservation-I

Credits: 02 **Total Lectures: 30**

Course Objectives:

j. To prepare student for handling advanced preservation techniques.

iii. To aware the student the spoilt food even using any preservation method.

Sr. No.	Topic	Lectures
	Credit – I	
1.	**Unit I Preservation by water removal** Drying of various foods, water activity and its effect on the keeping quality, sorption isotherms and their use. Characteristics of food substances related to their dehydration behaviors, drying phenomenon, factors affecting rate of drying, methods of drying of various food products, type of driers and their suitability for different foods; intermediate moisture foods.	7
2.	**Unit II Preservation by irradiations** Isotopes and electron-based radiations, units and doses, effect on microorganisms and different nutrients; dose requirements for radiation preservation of foods, safe limits, irradiation mechanism and survival curve, irradiation of packaging materials.	8
	Credit –II	
3.	**Unit III Hurdle technology** Hurdle technology definition and applications. Effects of various food processing operations on the nutritive value of foods.	7
4.	**Unit IV Advance processing** Aseptic Processing, Pulsed electric fields, Membrane processing, reverse osmosis**,**microfiltration, ultra filtration, dialysis.	8

Books

1. Food Processing Technology: Principles and Practices. P.J. Fellows, Wood head Publishing, Oxford, 3rd edition, 2009.
2. Food Processing: Principles and Applications. H.S. Ramaswamy and M. Marcotte, Taylor and Francis publ., 1st edition, 2005.
3. Food science. B. Srilakshmi, New Age International, 2003.
4. Food science. N.N. Potter and J.H. Hotchkiss, Springer publ., 2012.
5. Industrial Drying of Foods. C. G. J. Baker, Blackie Academic and Professional, 1997.
6. Introduction to Food Engineering. R.P. Singh, and D.R. Heldman, Elsevier publ., Amsterdam, 5thedition, 2016.
7. Introduction to Food Process Engineering. Smith, P.G., Springer publ., 2 nd edition, 2011.

B.Sc. Food Science Semester I

Course Code and title: Food Microbiology-II and Food Preservation -II

Credits: 02 **Total Practical: 15**

Sr. No.	Name of the Experiment	Number of practical
1.	Simple staining.	01
2.	Negative staining.	01
3.	Microbial examination of different food materials.	01
4.	Isolation of bacteria by streak plate/spread plate technique.	01
5.	Isolation and detection of mold from bread.	01
6.	Detection of biomolecules- Carbohydrates and proteins. .	01
7.	Perform pasteurization of fluids using different methods.	01
8.	Drying of foods using different methods.	01
9.	Cut – out analysis of canned foods.	01
10.	Preparation of Amla candy.	01
11.	Principle and working of blanching process.	01
12.	Visit to Fruit processing plant.	01

Course Code and title: N-OET-BFS- 220 Food Chemistry- II

Credits: 02 **Total Lectures: 30**

Course Objective:

- To study the chemical reaction in food.
- To learn about the sources of food.
- To understand concepts of cooking.
- To study use and application of methods of cooking.
- To study the changes during germination of grains.

Sr. No.	Topic	Lectures
	Credit – I	
1.	**Unit I Food groups** Basic 4, 5&7 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.	7
2.	**Unit II Pulses and grams** Varieties of pulses & grams, composition, nutritive value, cooking quality of pulses, germination and its effect. Vegetables - Classification, composition, nutritive value, selection and preparation for cooking, methods and principle involved in cooking. Fruits - Composition, nutritive value, changes during ripening, methods and effects of cooking.	8
	Credit –II	
3.	**Unit III Beverages** Classification, nutritive value, Milk based beverages- methods of preparing tea and coffee, fruit-based beverages and preparation of carbonated non – alcoholic beverages. Spices and Condiments - Uses and abuses. Fats and Oils - Types of oils, function of fats and oils, Shortening effects of oil, smoking point of oil, factors affecting absorption of oil.	7
4.	**Unit IV Meat & marine Science** Structure, composition, nutritive value, selection of meat, post mortem changes in meat, aging, tenderness, methods of cooking meat and their effects. Poultry – types, composition, nutritive value, selection, methods of cooking. Fish - Structure, composition, nutritive value, selection of fish, methods of cooking and effects.	8

Course outcome: -

- Student should be able to understand basic concepts of physicochemical changes.
- To be able to understand the effects of cooking on food.
- Student should be able to understand the changes in ripening.
- Student should understand nutritional importance of fish, poultry, and meat.
- Student should understand different technical concepts in beverage industry.

References: -

1. John W. Brady. 2013. Introductory Food Chemistry. Comstock Publishing Associates, Cornell University Press, Ithaca, USA.
2. H.-D. Belitz, W. Grosch and P. Schieberle. 2009. Food Chemistry, 4th Ed. Springer-Verlag Berlin Heidelberg.
3. Owen R, Fennema. 1996. Food Chemistry, 3rd Ed. Marcel Dekker, Inc., New York, USA.
4. L. H. Meyer. 1974. Food Chemistry. The AVI Publishing Co Inc., Connecticut, MA, USA.

Course Code and title: N-OET-BFS- 221 Chemistry- II

Credits: 02 **Total Lectures: 30**

Course Objective:

- To study working and instrumentation of instruments.
- To learn applicability of instruments in chemistry.
- To understand concepts of aromatic compounds.
- To study the classification of amino acids.
- To study different types of systems.

Topic No.		Lectures
	Credit – I	
1.	**Unit I General Chemical methods** Metals General methods of extraction of metals. Types of ores. Methods of ore dressing. Reduction methods, electrical methods, types of refining Van Arkel Zone refining.	7
2.	**Unit II Aromatic compounds** Electrophilic substitution in benzene- Mechanism of nitration, halogenation, alkylation, acylation, sulphonation, Preparation and properties of naphthalene. Heterocyclics: Preparation and properties of furan, thiophene, pyrrole and pyridine.	8
	Credit –II	
3.	**Unit III Amino Acids** Classification, preparation and properties, preparation of peptides. Classification of proteins by physical properties and by biological functions. Carbohydrates: classification, preparation and properties of glucose and fructose. Discussion of open chain ring structures of glucose and fructose.	7
4.	**Unit IV Energetics** Definition of first law thermodynamics. Types of systems. Reversible, irreversible. Isothermal and adiabatic processes. Spontaneous processes, Joule Thomson effect. Enthalpy, bond energy. Need for the second law. Carnot cycle and Carnot theorem. Entropy and its significance. Free energy change.	8

Course outcome: -

- Student should be able to understand basic concepts of extraction methods.
- To be able to apply this knowledge in the laboratory
- Student should able to handle instruments.
- Student should understand principle behind the instruments.
- Student should understand different chemicals used in laboratory.

References: -

1 John W. Brady. 2013. Introductory Food Chemistry. Comstock Publishing Associates, Cornell University Press, Ithaca, USA.

2. H.-D. Belitz, W. Grosch and P. Schieberle. 2009. Food Chemistry, 4th Ed. Springer-Verlag Berlin Heidelberg.
3. Owen R, Fennema. 1996. Food Chemistry, 3rd Ed. Marcel Dekker, Inc., New York, USA.
4. Lillian Hoagland Meyer. 1974. Food Chemistry. The AVI Publishing Co Inc., Connecticut, MA, USA.

Practical of Chemistry- II and Food Chemistry- II

Credits: 02 **Total Practical's: 15**

Sr. No.	Name of the Experiment	Number of practical
1.	Determination of relative strength of acids.	01
2.	Hardness of water.	01
3.	Alkalinity of an acid.	01
4.	Estimation of acetone.	01
5.	Estimation of Vitamin C.	01
6.	Identification of pigments in a given food sample.	01
7.	Extraction and estimation of total sugars from food products.	01
8.	Estimation of crude fat contents of foods by Soxhlet method.	01
9.	Estimation of total Nitrogen of foods by Micro Kjeldahl methods.	01
10.	Separation of amino acids by paper chromatography.	01
11.	Estimate the quantity of Vitamin A in food sample.	01
12.	Estimate the quantity of ascorbic acid by titration method in food sample.	01

Course Code and title: N-SEC-I Food Auditing -I

Credits: 02 **Total Lectures: 30**

Course Objective:

1. To study the food laws and regulations.
2. To learn about the concept of auditing in food industry.
3. To understand about documentation.
4. To study how to set up the laboratory.
5. To understand the process of central and state licenses.

Topic No.		Lectures
	Credit – I	
1.	**Unit-I** **Food Laws and Standards of India and International Food Laws:** I. Food Safety and Standards Act of India, 2006: Provision, definitions and different sections of the Act and implementation. II. FSS Rules and Regulations (2011) as amended from time to time - a) Licensing and registration: Central license, State license, Registration, b) Regulations for Contaminants, Toxins and Residues and restriction of sales. f) Food Safety and Standards (Food or Health Supplements, Nutraceuticals, Foods for Special Dietary National Laws and Standards a) Agricultural Produce Act, 1937 (Grading and Marketing) b) Export (Quality Control & Inspection), Act, 1963 and Rules c) Bureau of Indian Standards relevant to Food Safety (Water, Infant Formula etc. Legal Metrology Act IV.	7
2.	**International Food Control Systems/ Laws, Regulations and Standards/Guidelines with regard to Food Safety:** a) CODEX Alimentarius Commission: History, Members, Standard setting and Advisory mechanisms: JECFA, JEMRA, JMPR b) WTO agreements: SPS/TBT Role of OIE, IPPC.	8
3.	**What is accreditation**: Different accreditation bodies (NABL, APLAC, ILAC). Requirements for ISO/IEC 17025:2017, documentation, pre-requisites for accreditation, management requirements, technical requirements, measurement of traceability.	7
4.	**Laboratory safety:** Personnel and laboratory hygiene, emergency planning, General hazards in a food laboratory, safety equipment, storage of chemicals, acids, flammables etc, handling compressed gases, centrifuge, chemical and biological spills and waste disposal.	8

Course outcome: -

1. Student should be able to understand the different procedures of accreditation.
2. To be able to apply this knowledge in the laboratory
3. Student should able to handle instruments as per SOP.
4. Student should understand national and international standards.
5. Student should understand safety procedures.

References: -

1. Aswathappa. 2010. International Business. Tata McGraw-Hill Education, New Delhi.
2. Fransis Cherunilam. 2010. International Business: Text and Cases, 5th Ed. PHI Learning, New Delhi.
3. Inteaz Alli. 2004. Food Quality Assurance: Principles and Practices. CRC Press, Boca Raton, FL, USA.
4. R. E. Hester and R. M. Harrison. 2001. Food Safety and Food Quality. Royal Society of Chemistry, Cambridge, UK.
5. Ronald H. Schmidt and Gary E. Rodrick. 2003. Food Safety Handbook. John Wiley & Sons, Inc., Hoboken. New Jersey, USA.

Course Code and title: N-AECC -B English for Communication - II

Credits: 02 **Total Lectures: 30**

Sr. No.	Topic	Lectures
	Credit – I	
1.	**Unit I Group Discussion** Preparing for a Group, Discussion Initiating a Discussion, Eliciting Opinions, Views, Expressing Agreement/ Disagreement Making Suggestions; Accepting and DecliningSuggestions Summing up.	7
2.	**Unit II Business Correspondence** Writing Memos, emails, complaints, inquiries, etc. Inviting Quotations Placing Orders,Tenders.	8
	Credit –II	
3.	**Unit III English for Negotiation** Business Negotiations Agenda for Negotiation Stages of Negotiation.	7
4.	**Unit IV Interview Technique** Dos and don'ts of an interview preparing for an interview Presenting documentsLanguage used in an interview.	8

References -

1. Pardeshi, P.C. Managerial Communication. Pune: Nirali Prakashan, 2008.
2. Pradhan, N. S. Business Communication. Mumbai: Himalaya Publishing House, 2005.
3. Rai, Urmila & S. M. Rai. Business Communication. Mumbai: Himalaya PublishingHouse, 2007.
4. Sethi, Anjanae & Bhavana Adhikari. Business Communication. New Delhi: TataMcGraw Hill.
5. Sonie, Subhash C. Mastering the Art of Effective Business Communication. New Delhi:Student Aid Publication, 2008. Tickoo, Champa & Jaya Sasikumar. Writing with a Purpose. New York: OUP, 1979.
6. Whitehead, Jeoffrey & David H. White head. Business Correspondence. Allahabad:Wheeler publishing, 19.